# UN GLOBAL COMPACT

# COMMUNICATION ON ENGAGEMENT (COE)

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Period covered by this Communication on Engagement

From: January 2020 To: January 2022

**Contents**




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## Part I. Statement of Continued Support

13th January 2022

To our stakeholders:

I am pleased to confirm that the University of Greenwich reaffirms its support to the United Nations Global Compact and its Ten Principles in the areas of Human Rights, Labour, Environment and Anti-Corruption. This is our Communication on Engagement with the United Nations Global Compact. We welcome feedback on its contents.

In this Communication of Engagement, we describe the actions that our organization has taken to support the UN Global Compact and its Principles as suggested for an organization like ours. We also commit to sharing this information with our stakeholders using our primary channels of communication.

Sincerely yours,

Professor Jane Harrington
Vice Chancellor
University of Greenwich

## Part II. Description of Actions and Measurement of Outcomes

As part of our commitment to the Global Compact, the University of Greenwich pledged to participate in and engage with the UN Global Compact in the following ways:

- Ensure that the ten principles are central to and incorporated in our teaching offer in our relevant programmes delivered by the University of Greenwich including the Natural Resources Institute (NRI), a research institute based in our Faculty of Engineering and Science;
- Be guided by the ten principles in undertaking our research at the University of Greenwich;
- Engage with the UK Global Compact Network to promote through public engagement and education, the principles of the Global Compact.

# Our Values

## Inclusivity, Excellence, Determination, Ambition and Creativity

Our values are our essential shared beliefs and principles that define who we are, and inspire and motivate us in achieving our Strategic Plan. Our behaviours are the qualities and ways of working we admire in each other and enhance our overall effectiveness as they're "how" we work together.

### We are inclusive

- We are open-minded and open-hearted, embracing new people, ideas and ways of working to create a better world.
- As one of the most culturally diverse universities in the world, this is an inclusive community where everyone is welcome and feels nurtured.
- London is a city that requires you to be open-minded in every way and as a university we reflect the changing needs of our wider society.

- We like to challenge the way people think and introduce new ideas and concepts that will inform their world-view.
- Many of our students and staff strive to make a difference in their communities and pursue knowledge and learning because they want to improve the lives of others. This generosity of spirit is alive and well at our university.

### We strive for excellence

- We set ourselves high standards in everything we do and never accept second best.
- We focus on doing the right things and doing them right.
- To be truly excellent requires discipline and rigour and a willingness to accept constructive criticism.
- Excellence is a habit that we practice diligently.

## We have the determination to succeed

- This is a university that operates in the real world where life is challenging.
- We encourage tenacity and resilience so that we can overcome adversity.
- Our most successful alumni are people who have real motivation to achieve their dreams and to transform the lives of others.
- A fierce determination to learn, improve and succeed has helped transform the lives of countless people worldwide.

## We are relentlessly ambitious

- We are relentlessly ambitious for every student that comes to the university.
- We develop confidence and self-belief so that our alumni are able to realise their full potential.
- For centuries Greenwich has been a focal point for ambitious ideas that have resulted in dramatic global progress. We continue to push for personal and collective advancement in the same way.

## We use our creativity

- This is a world that needs creativity more than ever.
- Finding innovative solutions to challenging, contemporary problems requires new ways of thinking and working.
- We develop, admire and celebrate those people who have the ability to think differently and then apply these innovative, creative ideas into the real-world.

## Responses to specific commitment in University of Greenwich Letter of Support

### Ensure that the ten principles are central to and incorporated in our teaching offer in our relevant programmes delivered by the University of Greenwich including the Natural Resources Institute (NRI), a research institute based in our Faculty of Engineering and Science

The University of Greenwich (UoG) is keen to support the ten principles in our teaching offer. In particular the work of NRI is pivotal in this approach, focusing on food, agriculture, environment and sustainable livelihoods. NRI's work in these areas is recognised globally. Our staff work on cutting edge development issues and this is reflected in the teaching programmes offered by the Institute. Our portfolio of undergraduate and postgraduate courses continues to grow and develop, ensuring that **environmental, sustainable and ethical issues** are highlighted. Our commitment to the **Sustainable Development Goals (SDGs)** is also reflected in our teachings, some of which are included here:

#### Environmental Science, BSc

With its mix of natural and physical sciences and emphasis on sustainability, our BSc Hons Environmental Science degree prepares students for careers that have real impact on the world. Students develop their understanding of the interactions between living systems and the physical landscape and its processes, and how society affects these. **They investigate solutions to environmental issues from scientific, political, legal and philosophical perspectives**, **documenting the human impact on the landscape and explore environmental conflicts and issues.** Our students go on to have careers in, amongst other areas, management roles in the **environmental, land, conservation and heritage sectors.**

#### Physical Geography, BSc

From climate change to conservation, students on our Physical Geography, BSc Hons degree, study some of the most important issues facing the world today. Students learn the main techniques of investigation and data analysis used in Physical Geography while covering landforms, oceans, atmosphere, flora and fauna. **Modules also explore the impact of human activity on the natural environment.** Popular career options for our Geography graduates include **conservation, environmental consulting, the civil service and teaching.**

#### Agriculture for Sustainable Development, MSc

This course is for graduates and professionals looking for greater knowledge and expertise in **sustainable agricultural development**. It provides students with a strong understanding of the fundamentals of crop production, such as **adaptation to climate and other environmental changes**. Students then explore how this expertise can help to **design effective food production systems without placing unsustainable demands on the environment.** The emphasis is on agriculture in tropical or developing countries, but the approaches can be used globally. **The course integrates natural, social and economic sciences.** It draws on our unrivalled expertise in an array of disciplines, including crop production, pest and disease management, postharvest technologies, climate change adaptation, and agricultural economics and marketing. The course is delivered by world-leading scientists from the award-winning NRI, who are working on **sustainable agriculture projects** around the world. We use real global case studies in our teaching, and students have an opportunity to play a meaningful role in current research projects.

## Food Innovation, MSc

This MSc in Food Innovation is aimed at graduates and professionals looking to build careers in the food science industry (and especially in product development). The course builds their knowledge and understanding of how ingredients are developed and launched, from concept to completion. It is based on the expertise of staff working in areas including human nutrition and public health, food chemistry and microbiology, product development, packaging, food safety, legislation, and **sustainability.** The course prepares students for a career in product development science, with expertise in food and nutrition. They develop insight into the development of healthy and nutritious food and learn how to enhance **sustainability and creativity within food chains**.

## Food Safety and Quality Management e-learning, MSc/PGDip/PGCert

For professionals involved in the safe supply of food to consumers, this online Master's in Food Safety and Quality Management provides the knowledge and skills to advance their career. For those working in the food supply chain, our online MSc Food Safety and Quality Management provides an ideal opportunity to consolidate their experience and learn more about their industry. Students study safety and quality management systems following the **'farm-to-fork'** approach, as well as the agents of foodborne illness and the control and enforcement measures **that ensure our food is safe**. This online course is based upon the successful taught course, which has run since 2001. It benefits from the expertise and experience of the NRI food safety and quality management team, which has carried out research for over 40 years.

### Applied Food Safety and Quality Management, PGDip/MSc

Our Master's in Applied Food Safety and Quality Management is designed for professionals working in food manufacturing who wish to boost their career with a new qualification. On this course, students learn about the requirements for providing **safe and wholesome food** to consumers with our specialist course in applied food safety and quality management. We follow the **farm-to-fork** approach to address a wide variety of food safety and quality management issues. Topics include good governance and national control systems, food inspection and testing services. Students cover the **management of food safety and quality across the supply chain,** as well as how to design and implement safety and quality management systems to meet **national and international legislation**. The course is research-informed and is taught by staff at the award-winning NRI, with its unique knowledge base and industry experience.

## Global Environmental Change, MSc

With our MSc Global Environmental Change, students develop the knowledge and skills to address some of the world's major challenges. Study topics include **climate change, environmental law and policy, meteorology and sustainability**. This wide-ranging programme reflects the strength of unique expertise held within our prizewinning NRI whose recent interdisciplinary research ranges from practical areas with a direct relevance to **climate adaptation** - such as agricultural practices - to issues of **equity and environmental economics**. NRI academics who run modules for the MSc Global Environmental Change have contributed to global initiatives such as the Intergovernmental Panel on Climate Change (IPCC) assessment reports.

## Be guided by the ten principles in undertaking our research at the University of Greenwich

The University of Greenwich expects the highest standards in the conduct of all research undertaken in its name. This includes research undertaken by staff, students, visiting or

emeritus staff, associates, contractors and consultants.

**Implementing ethical principles**
In order to embed these principles, and recognising its obligations to the wider research community, to the funders of research and to society as a whole to uphold the integrity of academic research, the University of Greenwich is committed to implementing the principles and commitments of the UUK Concordat to support research integrity.

The UUK concordat's five commitments are:

- maintaining the highest standards of rigour and integrity in all aspects of research
- ensuring that research is conducted according to appropriate ethical, legal and professional frameworks, obligations and standards
- supporting a research environment that is underpinned by a culture of integrity and based on good governance, best practice and support for the development of researchers
- using transparent, robust and fair processes to deal with allegations of research misconduct should they arise
- working together to strengthen the integrity of research and to reviewing progress regularly and openly.

**Key policies**

- Code of Practice for Research – presents the guiding principles and standards of good practice in research across all subject disciplines and fields of study in the university.
- Procedure for Investigating Research Misconduct - documents the procedures that the university will adhere to when investigating any allegation of research misconduct.
- Research Ethics Policy - The university's commitment to high-quality research and enterprise culture, with the highest possible standards of integrity and practice.
- Academic Regulations for Research Awards - the framework and criteria in the assessment, examination and awarding of a university research award.
- Ethical Research Collaboration Policy - GRE risk assesses projects and funders as part of the bid management process. The Ethical Research Collaboration Policy sets out the process by which an increased risk would be managed.

## Engage with the UK Global Compact Network to promote through public engagement and education, the principles of the Global Compact.

UoG is a member of the UN Global Compact Network UK, attending AGMs in June 2020 and September 2021, as well as outreach activities in April 2020 and topic specific webinars/sessions, including those offered by the UNGC - in particular through the UNGC Annual Conferences. We will work to engage with the UN Global Compact Network UK to promote through public engagement and education, the principles of the Global Compact.

# The 10 Principles of the UN Global Compact

## Human Rights

Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights; and
Principle 2: make sure that they are not complicit in human rights abuses.

The University's **Business, Human Rights and the Environment Research Group (BHRE)** undertakes research on the impact of commercial activities and business working methods on the enjoyment of **human rights and the environment.**

The BHRE was created by Professor Olga Martin-Ortega in 2013. It brings together researchers from different disciplines, including law, criminology and business. Its core members are based at the University of Greenwich, whilst affiliated members are based all over the world.

The BHRE develops high quality, policy relevant research in a number of research areas. It also provides training and capacity building to public bodies, governments, unions and civil society organisations.

**Our Research:**

- Modern Slavery, Human Rights and Public Procurement
- Human Rights Due Diligence in Global Supply Chains
- Transparency and Human Rights in the Electronics Supply Chain
- Promoting Sustainable Production and Consumption
- Research Units: LETs Lab; FinLed and Human Rights at Sea

### Modern Slavery, Human Rights and Public Procurement

**What we do**

Public procurement is the purchase by the public sector of the goods and services it needs to carry out its functions Worldwide, government buying has a value of approximately €1000 billion per year and it comprises, for instance, on average 12% GDP in OECD countries. This means that it accounts for a significant proportion of the overall global economy. The 'state duty to protect' under Pillar I of the UN Framework on Business and Human Rights calls for states to fulfil their obligations and address their potential impacts on human rights as an economic actor, including in the area of public procurement. Therefore public sector buying has an essential role to play in facilitating States' fulfilment of their duties to protect, respect, and fulfil human rights. As "mega-consumers," governments have the purchasing power to set standards that can shift markets towards sustainable production, to exercise leverage over suppliers towards this goal –and to lead by example in introducing human rights into supply chain management. In the past, however, little consideration has been given to the human rights impacts of the central state and other public bodies in terms of their role as a consumer, by comparison, for instance, to that focused on transnational corporations via their supply chains. BHRE works closely with public buyers to

address this policy and accountability gap, developing best practices in public procurement with regard to human rights.

With our partners we have produced a series of resources, including Guidance on Protection Human Rights in Supply Chain, Guides on how to report under the Modern Slavery Act, and eLearning suit, Research Reports, Policy Papers and academic outputs. We also organise our regular Greenwich Symposia on Responsible Public Procurement which we have held since 2014. See, **Public Buyers Engagement and Resources.**

Our work to combat modern slavery in public supply chains was a finalist in the Research with Impact Green Gown Awards.

**Who we work with**

We are working directly with public buyers and buyer organisations in the Higher Education and Local Government sectors including London Universities Purchasing Consoritum, Higher Education Procurement Association, NHS Commercial Solutions and the Local Government Association. Olga is a member of the Board of Directors of LUPC. We are also part of the Transparency in Supply Chains Modern Slavery Strategy and Implementation Group of the UK Home Office Modern Slavery Prevention Unit. Internationally we advise governments, including Canada, the OSCE and the United Nations on their own efforts to combat human rights abuses in their supply chain. With the International Labour Organisation we are developing policy and advocacy on Fair Labour Recruitment and Public Procurement.

We also lead an international network of academics, practitioners and policy makers working on procurement and human rights, the International Learning Lab on Procurement and Human Rights.

*The SAPIENS Project*:

SAPIENS -Sustainability and Procurement in International, European, and National Systems- Horizon 2020 Marie Skłodowska-Curie Actions Innovative Training Network (ITN) (2021-2025 (€3.9 million). The objective of SAPIENS is to foster interdisciplinary research into the evolving use of public procurement to address the social and environmental challenges of the 21st century. It aims to create a significantly increased European knowledge base and research capacity on the law, the economics and the business sciences of sustainable public procurement, thus helping Europe in addressing social and environmental challenges. At the heart of the project are 15 PhD projects on various multidisciplinary aspects of Sustainable Public Procurement linked to the achievement of the Sustainable Development Goals (SDGs). The network is an interdisciplinary collaboration, pooling world-leading researchers from relevant disciplines of law, economics and business studies. The project is managed from the University of Turin (Italy) led by the Network Coordinator Professor Roberto Caranta and together with the University of Greenwich includes University of Birmingham (UK), University of Copenhagen (Denmark), Lodz Polytechnic (Poland), Corvinus University of Budapest (Hungary), Tor Vergata University of Rome (Italy), Hasselt University (Belgium), University of Gävle (Sweden), Babes-Bolyai University Romania). Moreover,18 partners, including the European Bank for Reconstruction and Development, the International Training Centre of the International Labour Organisation, George Washington University, Fair Trade Advocacy Office, Electronics Watch and Eating City, as well as national agencies and public purchasers are contributing to the training programme.

Professor Martin-Ortega leads ESR 8 Protecting Human Rights and Dignity through Procurement and is the second supervisor in ESR 7 Enforcing Sustainability and Social Requirements in Contract Performance.

For more information access the SAPIENS website.

## Human Rights Due Diligence in Global Supply Chains

### What we do

In order to fulfil their corporate responsibility to respect human rights corporations much exercise human rights due diligence, this is, identify, prevent, mitigate and remediate the human rights impacts of their activities and commercial relations. Olga Martin-Ortega has been working on developing this standard of corporate behaviour and making companies accountable for failing to respect human rights and remediate abuses since 2014. This work is directly linked to our work on Modern Slavery, Human Rights and Public Procurement, as we develop human rights due diligence tools for the public sector and on Transparency and Human Rights in the Electronics Supply Chain, as we advocate for human rights led transparency as a key element of substantive due diligence. Our research informs wider recommendations we provide on how to improve practice, policies and legislation, both at national and international level, which we publish in a series of BHRE Policy Briefs and Papers.

### Who we work with

Our work has served as the basis for the European Parliament recommendations to the European Commission in the legislative process to adopt mandatory human rights due diligence obligations for European companies and those operating within the European Union. See policy paper commissions by the European Parliament: European Parliament Directorate-General for External Policies, *'EU human rights due diligence legislation: Monitoring, enforcement and access to justice for victims'- Human Rights Due Diligence Legislation - Options for the EU: Briefing 2*, June 2020 (Claire Methven O'Brien and Olga Martin-Ortega). Olga recently presented this work at the Raoul Wallenberg Institute on THE MOMENTUM FOR mHRDD IN THE EU (Webinar series). Olga discussed enhanced spaces for stakeholder participation and access to information through mHRDD and the potential for the EU initiative to address corporate transparency and due diligence from a human rights approach and cristalise a right to know for all stakeholders impacted by corporate abuse. Webcast available here and on the RWI On Human Rights podcast.

In this work we also collaborate with a range of civil society organisations, including Electronics Watch, Good Electronics, the Fair Trade Advocacy Office, Brot fur dei Welt (Bread for the World) and Corporate Justice UK. Commissioned by the Fair Trade Advocacy Office and Brot für die Welt, we produced the Report, '*Making Human Rights Due Diligence Work: An Analysis of Impact and Legal Options*', June 2020 (Valerie Nelson, Olga Martin-Ortega and Michael Flint).

## Transparency and Human Rights in the Electronics Supply Chain

### What we do

The global electronics industry is a huge, complex, fast-growing, immensely profitable production network, employing millions of people around the world. It is, on the other hand, also an industry where fundamental rights of workers are violated on a massive scale. Workers around the world are working under precarious and toxic conditions, resulting in poor livelihoods, and high rates of despair, injury and even death. Corporate secrecy around and

of business operations and trade relations plays a key role in perpetuating these harms. As part of our work on Transparency and Human Rights in the Electronics Industry we research the human rights challenges along the whole supply chain, from minerals and raw material extraction to manufacturing components and assembling final consumer products. Our current projects are focused on the definition of transparency applied specifically to the electronics supply chain, how to develop effective monitoring frameworks and procedures to assess, prevent, mitigate and remediate human rights violations and involve workers in such processes directly and how to involve public buyers in this challenge when they procure electronics goods.

**Who we work with**

We have been at the forefront of international practice on responsible procurement of electronics through our work with Electronics Watch and the Good Electronics Network. Olga is currently a member of the Board of Trustees of Electronics Watch and has contributed to the drafting of its Contract Clauses v.2 and the drafting and negotiating of the Terms of Engagement with the Responsible Business Conduct. We are a key organiser and contributor the its Annual Conference.

As part of our collaboration with Good Electronics we have led the Transparency Working Group of Good Electronics and produced the Report "Beyond corporate transparency. The right to know in the electronics industry' (2020). Our work with the International Labour Rights Forurm has also focused on Worker Driven Monitoring in the electronics supply chain, and produced the Report "Time for a Reboot: Monitoring in China's Electronics Industry" (2018).

Olga also acted as a technical advisor to the Green Electronics Council guide on public procurement and has participated in the HP Living Progress discussions.

## Promoting Sustainable Production and Consumption

*Un/Archived Textiles Project*

**What we do**

At the Un/Archived Textiles project we aim to address and promote sustainable consumption and production patterns as part of the UN Sustainable Development Goals (SDG12). The project involves developing a hub at the University of Greenwich for swapping clothes, organising repair stations and mending workshops using natural dye by young creatives. School of Law graduates, staff and external collaborators have all worked together to organise events and create awareness through social media platforms (TikTok and Instagram). In our clothes show events marbles are given to swappers as tokens, in return for the clothes dropped off at one of the collection points. This is then followed by a swap date, where swappers get to pick out any pre-loved clothing and enjoy its recirculation, depending on the number of marbles they have. For collection and swapping dates plus many more events, including webinars, keep your eyes on our instagram @unarchivedtextiles. For general enquires or new business please enter in contact with Eva Souchet.

**Who we work with**

The project started at Amnesty International student society namely and later in collaboration with The Royal Society of Arts, RSA. With the RSA we organised a highly successful event on Human Rights in the Fashion and Textile Industry (March 2020), which combined panel

discussions, clothing swaps and repair stations. The panel discussions concerned accountability, role of governments, corporations, workers and public buyers. Our events in 2021 include collaborations with Chamu Kuppuswamy (University of Hertfordshire); Karen Da Silvaa (independent); By Wuzzy; and ZeroNegativity.

*The DATUM Project*

BHRE is part of the multidisciplinary group developing DATUM funded by Innovate UK. DATUM is a research and development project of a collaborative multi-player locative game experience for Shopping Centres. The game aims to promote ethical consumption by supporting the re-opening of sustainable commerce through audio and augmented reality (AR). It explores and engages players in mindful consumption behaviours through small data mining activities following prompts on their mobile devise. The focus of the game is encouraging ethical consumer behaviour through nudging the consumer part of corporate human rights due diligence and technology as a tool to modify behavioural patterns. DATUM is created and produced by ZU-UK, body\>data\>space and University of Greenwich (BHRE, LETS Lab and CLEI – Co-creating Liveness in Embodied Immersion).

DATUM- Small Data Mining- Olga Martin-Ortega, Co-Principal Investigator, Innovate UK (£228,900)

## Research Units: LETs Lab; FinLed and Human Rights at Sea

***LETS Lab:*** The Law, Emerging Tech & Science (LETS) Lab, is an interdisciplinary research cluster providing a collaborative hub for scholars sharing expertise or research interests in digital aspects of a wider socio-legal substratum, such as: data protection and online profiling, digital economy and fintech regulations, blockchain and smart contracts, digital forensics, computational propaganda and content regulation, BCI and affective computing, automated decision making.

LETS Lab brings together academics and students from various disciplines and backgrounds working on tech related aspects in their fields and allows them to gain insight from different perspectives. Most importantly it provides a strong network that facilitates and supports synergies in future research ventures. If you are interested in joining our network, email Dr Argyro Karanasiou to discuss ways of getting involved. We welcome expressions of interest from academics, students, practitioners, and professionals.

***FinLED*** (Financial Industry: Law, Ethics & Development) provides a unique platform for scholars and practitioners to work collaboratively, bringing together academia and industry in this active network. It promotes research collaboration and sharing best practice relating to financial services industry; in particular, with a focus on financial law and regulation, ethical finance and investment, as well as how financial industry can facilitate sustainable development, etc. FinLED also focuses on a special stream with a particular emphasis on the emerging economies' issues within its agenda and scope. We investigate and research the latest legal and ethical issues relating to the financial industry, identify and address the key obstacles to promote ethical business within the industry, share the best practices, and generate practical impacts, through research, publication, and knowledge exchange. If you wish to be involved, please contact Dr. Jing Bian.

***Human Rights at Sea***: This Research Cluster is led by Professor Steven Haines, who works in close collaboration with the international NGO Human Rights at Sea. He is one of his Trustees. Human Rights at Sea's mission is to raise awareness, implementation and accountability of human rights provisions throughout the maritime environment, especially

where they are currently absent, ignored or being abused. It aims to promote human rights (as set out in the Universal Declaration of Human Rights and subsequent United Nations conventions and declarations) for seafarers, fishermen and others involved in working at sea throughout the world.

https://www.gre.ac.uk/las/research/bhre/our-research

### Safeguarding

As part of providing a safe environment in which to work and study, and protecting the public, the University has a Safeguarding Policy and a Safeguarding Officer network. This framework should be used to report concerns that may arise about **children** (anyone under 18), **vulnerable adults** (those over 18 who are vulnerable to harm or exploitation due to their personal situation and/or social circumstances), and **radicalisation** (the process by which an individual becomes vulnerable to supporting terrorism and the extremist ideologies associated with terrorist groups).

Concerns can relate to students, staff or members of the public, and may relate to an individual's behaviour or how they are being affected by the behaviour of others.

Online courses available to all staff include:

- Safeguarding essentials (covering child protection)
- Safeguarding against extremism (covering Prevent and radicalisation)

NRI (www.nri.org) is a specialist institute of the University of Greenwich. Combining the expertise of natural and social scientists, NRI engages in research, teaching, training, and consultancy to address significant challenges and opportunities in the sectors and countries in which we work. Our work supports the Principles of the UN Global Compact and the Sustainable Development Goals which is evidenced in our work focusing on sustainable trade and responsible business. More detail on our recent work to support Human Rights is highlighted later in this COE.

## Labour

Principle 3: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;
Principle 4: the elimination of all forms of forced and compulsory labour;
Principle 5: the effective abolition of child labour; and
Principle 6: the elimination of discrimination in respect of employment and occupation.

The University's **Department of Human Resources and Organisational Behaviour** focuses on developing a greater understanding of how work affects people's lives, and how people's behaviour at work affects an organisation's success. We are committed to developing our students' employability as managers and good organisational citizens of the future.

## Accreditation's and professional bodies

Our MA in Human Resource Management leads directly to full chartered membership of the Chartered Institute of Personnel and Development (CIPD), while students on other Human Resource Management programmes may apply to become student members of the CIPD.

## Research

Research activity ensures that our teaching and learning is kept fresh, relevant and up to date.

We highlight here the work of two Research areas:

**The Work & Employment Research Unit (WERU)**

WERU's areas of expertise cover a wide spectrum of employment-related topics, in the UK and internationally.

Areas of Expertise include welfare-to-work policy, whistleblowing, trade union renewal, dispute resolution, labour courts, pay systems, equality, income distribution, the public sector, privatization, leadership, management coaching, small and medium-sized enterprises, urban regeneration, transnational industrial relations, and cross-cultural management.

Our research is funded by academic sources as well as trade unions and government bodies, and we have published in top-ranked journals in the fields of industrial relations, management, and economics. We have hosted the annual conferences of Industrial Relations in the European Community (2008) and the British Universities Industrial Relations Association (2011), as well as numerous seminars and one-day and two-day workshops.

**Leadership and Organisational Behaviour Research Group**

We are committed to fostering excellent scholarship in order to enrich our understanding of human behaviour in organisations and to have a meaningful impact on local and international communities.

**Our values**

**Ongoing Learning and Development**
We provide opportunities throughout the year for the development of relevant knowledge, skills and abilities of members and friends. A core part of the activities of our group is the four different types of events that we host: The Compass Seminar Series; The Paper Development Series; Professional Development Workshops; and LOB Classics Reading Group.

**Collaboration and Support**
Through collaboration and mutual support, we help one another realise our goals of producing excellent research that has an impact on professional practice and the wider community. Through our workshops we capitalize on each others' strengths, and in doing so, we all learn through the process.

**Reach Out to the Scholarly Community**

We have a keen interest in reaching out to other research groups within the broader scholarly community. We regularly invite guest speakers to our events, and all of our events are open to anyone to attend.

## Equality, Diversity and Inclusion (EDI)

The University takes active steps to provide an inclusive environment for students, staff and visitors as outlined in the Public Sector Equality Duty of the Equality Act 2010. We value Equality, Diversity and Inclusion (EDI) and take active steps to provide an inclusive environment for students, staff and visitors irrespective of their age, disability, gender, gender re-assignment, marriage or civil partnership, pregnancy or maternity, race, religion or belief (non-belief) and sexual orientation as outlined in the Public Sector Equality Duty of the Equality Act 2010.

### Gender Pay Gap Report

Universities, alongside all other employers of more than 250 people must publish and report specific figures about their gender pay gap. The University's Gender Pay Gap report is available through the following link: https://docs.gre.ac.uk/rep/human-resources/gender-pay-gap-report

### Equality, Diversity and Inclusion Strategy

The Equality, Diversity and Inclusion Strategy 2019-2022 is a declaration of the University of Greenwich's commitment to place the promotion of equality, diversity and inclusion at the heart of the University. We believe that having a clear Equality and Diversity Policy Statement for staff and students reinforces our expectations of the values and behaviours that all members of the University community should exhibit. The policy outlines that the University will take steps to encourage staff, students and visitors to the University to:

- Treat others with respect at all times, and promote an environment free of all kinds of bullying and harassment.
- Actively discourage discriminatory behaviours or practices.
- Participate in training and learning opportunities that would enable them to adopt best practice.

#### Equality and Diversity training

We have two online training modules available for University students and staff to complete. These training modules help to build confidence in recognising equality, diversity and inclusion in every day practice.

Equality, Diversity and Inclusion in Practice online training comprises of two courses:

- Equality and Diversity Essentials
- Managing Diversity

#### EDI Annual Report

- EDI Annual Report 2020-2021
- EDI Annual Report 2019-2020

More information is available at: https://www.gre.ac.uk/hr/edi#disabilityinfo which includes detailed information on:

**Diversity and Network Groups**

**LGBT+ Staff Network**

**Disability Staff Network**

**Disability Named Contacts (DNC)**

**BAME Staff Network**

**Women Staff Network**

## Union recognition

Staff have a choice of Union representation including UCU, Prospect, Unison and the GMB who are able to discuss, consult and negotiate on policies, terms and conditions of Employment for collectively bargained staff. Students have a very active Students Union (https://www.greenwichsu.co.uk/).

## Anti-Slavery and human trafficking

The University of Greenwich is committed to preventing acts of modern slavery and human trafficking from occurring within its business and supply chain, and imposes the same high standards on its suppliers.

Our Anti-Slavery and human trafficking statement for the financial year 2020/21 is made pursuant to section 54(1) of the Modern Slavery Act 2015 ('the Act') and constitutes the University of Greenwich's modern slavery and human trafficking statement for the financial year commencing 1 August 2020 and ending 31 July 2021. It also describes planned actions in 2021/22.

This statement has been approved the University's Governing Body, which, together with the Audit Committee, will review and update it as necessary on an annual basis. Commencing with its 2019/20 statement, the University's Modern Slavery statements are submitted to the government's voluntary Modern Slavery Statement Registry and this statement will also be submitted to the Registry.

The full statement can be viewed through the following link: University of Greenwich Modern Slavery Statement

## Staff Training

The University has a Learning and development Programme available to all staff which includes courses in Bribery Prevention; Data Protection; Equality and Diversity Essentials; Managing Diversity and Safeguarding against Extremism

Further information is available through our staff Development hub: https://www.gre.ac.uk/staff-development

And also through: https://www.gre.ac.uk/hr/learning-and-development/programme

## Aurora

The University also supports the Aurora Programme which is organised by the Leadership Foundation for Higher Education for all people who identify as a woman. It was designed to help address the issue of the reducing numbers of women in senior posts in Higher Education. The Programme aims to enable a wide range of women in academic and professional roles to think of themselves as future leaders and to develop leadership skills and strategies.

We also have coaching schemes and work shadowing schemes to support staff development,

All of this is underpinned by our **Equality and Diversity Policy Statement:**

The University of Greenwich is committed to promoting equality and diversity, and to providing an inclusive and supportive environment in which all individuals have the opportunity to contribute to their full potential. This is central to our commitment to excellence in all that we do: teaching, research and enterprise.

We believe that having a clear policy on equality for staff and students, as well as meeting our statutory requirements, under the Equality Act 2010, will further demonstrate this commitment, and be consistent with values and behaviours that all members of the greater university community should exhibit.

The University of Greenwich aims to create an environment in which students and staff are selected and treated solely on the basis of their merits, abilities and potential, regardless of age, disability, gender reassignment, marriage or civil partnership, pregnancy or maternity status, race, religion or belief, sex, sexual orientation, trade union membership or non-membership, socio-economic background, or on the basis of being a part-time or fixed term worker.

The University has responsibility for adhering to this statement and other University policies which it will inform. The whole University community has a responsibility to apply the principles of this statement in our policies, practice and behaviours. We recognise our responsibility to provide guidance and training on equality and diversity issues to both students and staff.

We welcome our general public sector equality duty to have due regard for the need to:
- Eliminate unlawful discrimination, harassment and victimisation
- Advance equality of opportunity, and
- Foster good relations.

The University will take steps to encourage staff, students and visitors to the University to:
- Treat others with respect at all times, and promote an environment free of all kinds of bullying and harassment
- Actively discourage discriminatory behaviours or practices
- Participate in training and learning opportunities that would enable them to adopt best practice.

The University is committed to taking action to change unfair and discriminatory practices wherever they occur.

The University will:
- Publicise and raise awareness of our equality and diversity policy statement and related

policies amongst staff and students
- Operate a fair, open and transparent procedure for the recruitment of staff and students
- Provide fair and accessible opportunities for training and promotion for staff
- Operate fair and transparent procedures for student assessment, progression and attainment of awards
- Promote the use of inclusive language and avoid the use of words or phrases which are discriminatory or exclusive in all University publications and correspondence
- Ensure that any new or updated policies and procedures are analysed for any adverse impact they might have on equalities, and take any necessary action to mitigate this.
- Publish equality information annually, and publish equality objectives which show how we plan to tackle particular inequalities or disadvantages, and reduce or remove them.

This policy statement will apply to all other policies and procedures within the University.

NRI's recent work to support Labour rights in our project work is highlighted later in this COE

# Environment

Principle 7: Businesses should support a precautionary approach to environmental challenges;
Principle 8: undertake initiatives to promote greater environmental responsibility; and
Principle 9: encourage the development and diffusion of environmentally friendly technologies.

## University of Greenwich Sustainability https://www.gre.ac.uk/sustain/strategy

The University of Greenwich proudly applies sustainable development across all of its activities.

We strive to make significant improvements in all areas where we have an impact or influence, driven by our **Sustainability Policy.** We have a policy consultation every two years, with an annual sign off by our Vice-Chancellor and is audited as part of our ISO 104001 (2015) environmental management certification.

Our annual sustainability reports provide our progress against KPIs and key projects. The **2019-2020 report** highlights that we have been able to cut our Scope 1 emissions (direct including energy and our transport) by 46% since 2009/10 and have reduced waste generation 26% since 2009. It provides details of improvements, actions and recommendations for students and staff to help take action to maximise our University's sustainable potential. In-depth analysis of our **carbon footprint can be found here**.

**Everyone is responsible and has a part to play in achieving our target of reaching Net Zero by 2030 (Action Plans currently in consultation and creation)**. Our new Sustainability and Estates Strategies are also being produced, with our Green Travel Plan likewise expected to be finalised in 2021, cementing our ambitions to decarbonise and invest in a sustainable future. Visit our dedicated blog's page to see how our consultation processes take place.

Our Corporate Strategy 2030 states on page 20 that the university will "*Create a green and sustainable university and actively encourage and support sustainable development and principles of sustainable learning and teaching practice in curriculum development and delivery."* In June the university also committed our teaching staff to include sustainability in their programmes. This is included in the Curriculum Framework.

Our Sustainability Management Board – see https://www.gre.ac.uk/sustain/strategy - has responsibilities to help develop and implement our strategy and to help achieve our goals.

We work with our Students' Union and students in a range of ways to help them to apply sustainability in their learning, research, work and lives.

**Visit our sustainability information and support hub**

The support of precautionary approaches to environmental challenges; initiatives to promote greater environmental responsibility; and the development and diffusion of environmentally friendly technologies is at the heart of the development work undertaken by the NRI. In the next section of this COE we will provide details of some of the projects we have undertaken to show how we put our expertise into practice.

# Anti-Corruption

Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery.

The University of Greenwich Anti-bribery Policy sets out the university's approach to preventing incidents of bribery and corruption and is designed to comply with the relevant United Kingdom legislation (The Bribery Act 2010).

**[Extract]**
The University has a zero-tolerance policy towards acts of bribery and corruption as described in the Bribery Act 2010. This Policy sets out the University's approach to minimising the risk of Bribery Act offences, and the potential consequences facing any person who breaches the Policy, or the law.

Scope. The Bribery Act 2010 is applicable to an organisation's activities anywhere in the world, and sets out both organisation-level and personal responsibilities. To match the scope of the law, this Policy applies to:

- All locations and geographic functions of the University;
- All partners, offices, and subsidiary companies;
- All the University's staff, including employees, contract, agency and temporary workers, irrespective of location or work, as well as Members of the Governing Body;
- Other parties when they represent or hold themselves out as working or acting for the University, such as agents and students; and

- Persons and organisations with whom the University enters into contracts, who will be expected either to have their own satisfactory anti-bribery policies and processes, or to abide by this one.

Who is responsible for preventing Bribery Act offences? It is everyone's responsibility to help ensure that the University's business is conducted honestly and fairly. Everyone who is listed above is within the scope of the policy, and is responsible for helping the University to comply with the law, the terms of this Policy and associated procedures. They must all identify the risk of bribery and consider the duty to make appropriate disclosures in reporting instances of bribery as necessary. This policy also names specific post holders who have particular responsibilities for Bribery Act compliance.

Further information and a complete copy of our policy is available through the following link: https://docs.gre.ac.uk/rep/human-resources/anti-bribery-policy

Our staff receive mandatory training for bribery prevention.

**The University of Greenwich Finance Committee** has overall responsibility for advising the Governing Body on all issues pertaining to financial and estates management within the University. The Committee monitors the financial position of the University on a regular basis.

Our Accounts are audited annually by external Auditors and are published on our website. Our latest accounts are available at: https://docs.gre.ac.uk/__data/assets/pdf_file/0029/259760/report-and-financial-statements-for-the-year-ended-31-july-2021.pdf

## Public Interest (Whistleblowing) Disclosure Policy and Procedure

This policy sets out the arrangements and obligations that apply when an individual wishes to make a public disclosure about the conduct of the university or colleagues.

**[Extract]**
The University is committed to the highest standards of openness, probity and accountability and encourages a free and open culture in dealings between its officers, employees and all people with whom it engages in business and has legal relations. In particular, the University recognises that effective and honest communication is essential if concerns about breaches or failures are to be effectively dealt with and the organisation's success ensured. It seeks to conduct its affairs in a responsible manner taking into account the requirements of funding and regulatory bodies, relevant governance codes and standards, and the standards in public life set out in the reports of the Committee on Standards in Public Life (in particular, the seven principles of public life articulated by the committee, known as the 'Nolan Principles').

The Public Interest Disclosure Act 1998 (the Act) gives legal protection to employees and former employees against being dismissed or suffering detriment as a result of publicly disclosing certain serious concerns. It aims to promote greater openness in the workplace and all University's employees are obliged by their contract of employment to give honest and faithful service to their employer. This includes an obligation not to disclose confidential

information about the University's affairs, unless it is in the public interest to do so, and the disclosure is made in line with this policy.

This policy applies to members of the University, meaning employees of the University, workers employed by the University's contractors or agencies, members of the University's Governing Body and students. Where a member of the University discovers information which they believe shows malpractice/wrongdoing within the University then this information should be disclosed without fear of reprisal, and may be made independently of line management. Members of the University are expected to use this procedure rather than air their complaints outside the institution. It would not be a breach of this policy, however, where a disclosure is made to one of the agencies that has been designated as a prescribed third party to whom public interest disclosures may be made. Wider disclosure, for instance to the media, is not to a prescribed third party and such disclosures, even where made in the public interest, may not be protected under the Act and may be considered a breach of this policy. Advice and guidance are available from Protect, the whistleblowing charity, the University's trade unions, Greenwich Students' Union, or Citizens Advice.

Members who make disclosures under this policy that they reasonably believe are substantially true, and who do not make disclosures for the purpose of personal gain, will not under any circumstances be subjected to any form of detriment or disadvantage as a result of having raised their concerns.

More information is available at: https://docs.gre.ac.uk/rep/human-resources/public-interest-whistleblowing-disclosure-policy-and-procedure

## Public Services International Research Unit

The Public Services International Research Unit (PSIRU) examines the social, economic and political aspects of privatisation and liberalisation in water, energy, waste management, health care and social care. It also addresses the general questions of the role and structure of public services and public finance, both in the EU and in developing countries.

We look at the role of multinational companies and the international financial institutions, especially the World Bank. PSIRU addresses a range of related issues, including: **corruption**, digitalisation**,** public enterprise, public sector pay, public-private partnerships and PFI, pension funds, and social network analysis.

We also carry out research commissioned by a range of bodies, principally from international and national trade unions and voluntary sector bodies, and from other institutions including the European Commission, ILO and **UNRISD.**

PSIRU participates in research projects, networks and proposals in partnership with other researchers across Europe and the rest of the world. As part of its core work, PSIRU maintains an extensive database on public services and privatisation

https://www.gre.ac.uk/research/groups/crew/public-services-international-research-unit

NRI is fully committed to this principle both in its everyday working and in its project work – more information follows.

# Natural Resources Institute, University of Greenwich

The Natural Resources Institute (NRI) (www.nri.org) is a specialist institute of the University of Greenwich. Combining the expertise of natural and social scientists, we engage in research, teaching, training, and consultancy to address significant challenges and opportunities in the sectors and countries in which we work.

Among these challenges are the issues of food and nutrition security, agriculture and sustainable development in the face of **climate change, land and environmental management, markets and responsible business, capacity strengthening, and gender and inequality**

**NRI's work is focused on making a significant contribution to achievement of the UN Sustainable Development Goals. The Institute carries out strategic and applied research that is focused on the food and agricultural sectors of developing countries with broad objectives of contributing to poverty reduction, economic growth, food/nutrition security and sustainable development**

NRI operates a Quality Management System which is certified through the British Standards Institute to ISO 9001:2015. Our registration number is: FS54723.

NRI is a leader in natural resources research, promoting efficient management and use of renewable natural resources in support of sustainable livelihoods. Research is primarily focused on developing and emerging economies. NRI's presence and research partnerships in developing countries, and its training and capacity building programmes, provide the platform for the Institute to develop and disseminate key technologies and knowledge. This has resulted in substantial impact at farmer and community level, and has made significant contributions to the international research community. Much of the work also involves interaction with the developed world where it is equally applicable. Our Research and Development work is also organised to address thematic challenges.

## Research Overview

NRI is a leader in natural resources research, promoting efficient management and use of renewable natural resources in support of sustainable livelihoods. Research is primarily focused on developing and emerging economies. NRI's presence and research partnerships in developing countries, and its training and capacity building programmes, provide the platform for the Institute to develop and disseminate key technologies and knowledge. This has resulted in substantial impact at farmer and community level, and has made significant contributions to the international research community. Much of the work also involves interaction with the developed world where it is equally applicable.

### Agriculture, Food and Veterinary Sciences

NRI researchers address challenges and opportunities relating to the spectrum of activities from food production to consumption, with a focus on low- and middle-income countries

particularly in sub-Saharan Africa but increasingly also on those related to the UK. At the primary production end of the scale this includes a particular emphasis of the vectors of disease of people, livestock and crops. Our work post-harvest concentrates on durable and perishable crops to, reduce losses, enhance financial and/or nutritional crop value, improve storage and preservation, improve food processing technologies, ensuring food safety and quality management and, address food loss and waste – all with the ultimate aim of improving the livelihoods and nutritional status of vulnerable, less advantaged populations.

**Aquatic Biotechnology and Biology**

We study and process algae for future food, for feed to improve farmed animal health and welfare, for biofuels and as a source of green chemicals and nutraceuticals. We investigate the impact of climate change and disease on aquatic species in natural and aquaculture settings.

**Chemical Ecology and Plant Biochemistry**

The Chemical Ecology Group works on the identification and use of naturally-produced chemicals for control of pests, particularly in the developing countries.

**Ecosystem Services**

Climate change and biodiversity loss are two of the biggest global challenges in the coming decades, primarily due to their impacts on the provision of ecosystem services.

**Food Systems**

The Food Systems Research Group addresses challenges and opportunities relating to the spectrum of activities from food production to consumption.

**Pest Behaviour**

The work of the Pest Behaviour Group ranges from laboratory-based research to analyse the basic physiology and behaviour of pests and vectors through field-based studies of pest behaviour and ecology to translational research where knowledge of pest behaviour is used to develop innovative control technologies.

**Plant Health**

The Plant Health Group's research focusses on reducing yield losses caused by pests and diseases through application of integrated natural and social science approaches. Fundamental research to understand complex plant-virus-vector interactions are focussed on providing critical components needed to generate impact through improved and sustainable control measures.

## Anthropology and Development Studies

NRI social scientists are committed to researching major questions about how households and communities in the global South escape from poverty, how they make themselves more resilient to external trends, and how they can be helped by governments and their policies, civil society, market actors, and international agencies. We research these questions in projects we design and lead ourselves, and in collaboration with colleagues from the biophysical sciences, in NRI and beyond.

**Development Studies**

Our research addresses poverty and vulnerability, and how poor people themselves, governments, the private sector and civil society can help overcome them.

# Development Programmes Overview

NRI's Development Programmes address significant developmental challenges and opportunities arising from global trends, emergent policy issues, capacity limitations and problems in the sectors and countries in which we work. We aim to contribute to enhanced livelihoods and poverty reduction in some of the world's poorest countries. We apply our knowledge and experience to bring about improvements in food security and nutrition, sustainable agricultural productivity and natural resource management, market access and income generation. We assist local organisations in strategy and skills development and use

the results of our work to inform policy processes and debates. The programmes draw on the interdisciplinary strengths of NRI working in collaboration with a broad range of partners.

**Food Loss, Waste Reduction and Value Addition**
Improving resource use through value addition, technical solutions for food loss and waste, and providing guidance to researchers and practitioners.
**Food Systems for Improved Nutrition**
Developing, evaluating and supporting the implementation of sustainable strategies to increase access to nutritious diets for all people.
**Sustainable Agricultural Intensification**
Increasing food production efficiency to feed a growing global population, while maintaining ecosystem services, conserving biodiversity and promoting social equity.
**Climate Change, Agriculture and Natural Resources**
Responding to climate change by understanding the challenges posed by climate variability and developing mitigation and adaptation strategies.
**Capacity Strengthening for Agricultural Development and Food Security**
Supporting individuals and organizations to strengthen their ability in high-quality demand-led research and learning, leading to developmental impact.
**Gender and Social Difference**
The Gender and Social Difference programme conducts innovative and high-quality research and practice for demonstrable impact on equality and gender justice.
**Land, Rural Institutions and Governance**
The programme aims to assist policy and institutional innovation for sustainable, socially inclusive economic development in rural areas.
**Sustainable Trade and Responsible Business**
Generating knowledge on the impact of trade and private sector initiatives in support of equitable and environmentally sustainable development.
**Root and Tuber Crops in Development**
Improving nutrition, food security and incomes through research and development, capacity building and policy advice.

**Highlighting some of NRI's work which particularly supports the UN principles and sustainable development goal includes:**

## Smart and sustainable pest control awarded Queen's Anniversary Prize

**For millions of the world's poorest people, particularly in the developing world, serious animal and insect pests bring dangerous diseases, death and hunger, and destroy crops, infrastructure and livelihoods. NRI's pest management work focuses on providing sustainable, innovative pest management solutions, as alternatives to chemicals and poisons that can severely harm the users, their communities, animals and the wider environment, and are often expensive and ineffective**.

In 2019, NRI's innovative research on **sustainable pest management** was honoured with a prestigious Queen's Anniversary Prize for Higher and Further Education. Awarded to UK universities and colleges every two years, the Queen's Anniversary Prizes are managed by the Royal Anniversary Trust. The Prizes recognise excellence, innovation, impact and benefit for the winning institution and for people and society in the wider world. In early 2020, the university was presented with a silver gilt medallion and prize-winner's certificate during a special reception at Buckingham Palace.

NRI's interdisciplinary teams of specialists work together with the communities affected by pests in the UK, and worldwide. They aim to better understand the risks posed by pests and how they occur, their interaction with their human, animal or plant hosts, and the benefits of safely and **sustainably** controlling them.

NRI's pest management programme looks specifically at four key areas, including: blackfly transmitting 'river blindness', rodents spreading disease and destroying crops and infrastructure, mosquitoes transmitting dangerous diseases including malaria, dengue and Zika, and insect pests that threaten the horticulture industry. Our current programme builds on NRI's pioneering work from the beginning of the 20th century, including novel work on locust plagues in Africa, mapping their movements and **designing control technologies**, in addition to our more recent work on plant disease vectors.

Over 20 pest management specialists are behind this achievement, with expertise spanning pest behaviour, chemical ecology, plant biochemistry, zoology, entomology, molecular biology and social development. Our teams have worked in collaboration with partners from over 50 countries, from public, non-governmental, academic and private sectors in Africa, Asia, the Caribbean, Europe, Latin America, North America and the Pacific.

The Award of this Queen's Anniversary Prize recognises NRI's world-leading work that balances pest control with protecting our **environment**. In line with NRI's mission, our pest management work is focussed on achieving the **Sustainable Development Goals**, with particular emphasis on promoting **sustainable agriculture and climate action, reducing hunger, achieving food and nutrition security, and ensuring health and wellbeing.** NRI's combination of academic excellence and practical application supports our postgraduate and undergraduate programmes where our students learn to become future leaders in the field.

## FOOD SYSTEMS FOR IMPROVED NUTRITION

Achieving **sustainable, ethical and efficient food systems** in support of human health is among the greatest challenges facing the global community. Improving nutrition is a core priority of the current international development agenda, and an area of increasing attention for many national governments, research institutions and the international development community. **SDG 2 highlights the multi-dimensional nature of food and nutrition security**, encompassing the quantity of food available and issues of resilience, nutrient content and food safety, with targets incorporating both agriculture and nutrition, underlining the importance of food-based approaches in addressing nutritional challenges. Examples of our research in this area include exploring gender-sensitive approaches to support nutritionally vulnerable population groups, building information about diets in smallholder farming communities in low-income countries to highlight nutritional challenges and guide programmes and policy, and developing the full nutritional potential of small pelagic fish.

### Exploring opportunities to improve nutrition and health through gender-sensitive agroforestry

Despite living in one of the most biodiverse areas on the planet, many of the indigenous communities of the Amazonas Region in Peru experience high levels of poverty, food insecurity and malnutrition. Over half of the region's indigenous children under five years of

age suffer from chronic undernutrition and anaemia. A team of researchers from NRI, led by Dr Pamela Katic, is working on a project entitled 'Intercultural models to improve nutrition and health of indigenous populations through gender-sensitive agroforestry practices in Peru'. The project's 'intercultural' and interdisciplinary approach aims to integrate traditional and conventional knowledge, regarding nutrition and health as the result of complex interactions between biological, sociocultural and **environmental** factors.

In the Amazon, many households practise agroforestry, in which trees are included in agricultural systems. This provides income, strengthens local ecosystems, and supports plant and animal biodiversity. Funded by the UK Medical Research Council and Peruvian Research Council, this project is working with communities involved in coffee- and cocoa-based agroforestry in two areas of Peru's Amazonas Region, to build evidence on the impacts of agroforestry on human nutrition and health.

Together with local partners, including the Instituto de Investigación Nutricional (Nutrition Research Institute) and Instituto de Investigaciones de la Amazonía Peruana (Research Institute of the Peruvian Amazon), the team is exploring how women's roles in agroforestry systems affect their nutritional status, time use, care-giving and diets, and how this can guide opportunities to improve maternal and child nutrition.

In 2019, NRI researchers led preliminary and scoping fieldwork activities. Dr Aurélie Bechoff conducted interviews with local authorities to understand institutional linkages between the health, **environment**, and agriculture sectors. Dr Kate Wellard worked with male and female community members to develop historical timelines and maps, to understand key events, relationships and priorities within the two project areas. Dr Julia de Bruyn led a series of participatory activities using visual prompts, to build lists of local food resources and understand how access to foods varies across the year.

Future components of this project aim to measure the nutritional status and diets of women and young children, during the rainy and dry seasons. The team will evaluate the influence of agroforestry practices, use of wild biodiversity and women's time use on the nutritional status and diets of women and children. Using the information collected, this project aims to work with communities to co- design, prioritise and evaluate different strategies to improve nutrition and health.

## FOOD LOSS, WASTE REDUCTION AND VALUE ADDITION

Food loss and waste, including postharvest losses, represent both a major global challenge and an opportunity for improved resource use through value addition. NRI has been working to reduce losses and waste after harvest since the food crisis of the 1970s. **The importance of food loss and waste reduction is recognised in SDG 12 'Responsible, Consumption and Production', SDG 2 'Zero Hunger', and several others**. Experts from our Centre for Food Loss and Waste Reduction (FLoW) use their experience, insight and capability to measure food loss and waste, develop technical solutions, assess upgrading opportunities and provide guidance to researchers and practitioners, both in the UK and overseas.

## SUSTAINABLE AGRICULTURAL INTENSIFICATION

Increasing agricultural productivity is essential to feeding a fast-growing population and has potential to lift rural families out of poverty. **Sustainable Agricultural Intensification (SAI)**

provides the means to do this with limited resources, while protecting our living environment and conserving natural and agricultural biodiversity. **The ambition for SAI is highlighted in SDG 15 – Life on Land, which aims to sustainably manage forests, combat desertification, halt and review land degradation and halt biodiversity loss; and SDG 2 – Zero hunger which seeks to ensure sustainable food production systems and implement resilient agricultural practices.** Examples of NRI's work in this field include supporting SAI by generating evidence and tools and facilitating learning on equity, trade-offs and access to agricultural services, exploring the genetic diversity and local adaptation of enset, and building resilience to climate and market fluctuation for sustainable coffee production in Central America.

## Enabling more equitable Sustainable Agricultural Intensification in Africa

Agricultural lands currently occupy over 37% of the Earth's land surface. With global food production projected to double by 2050 to meet the demands of a growing population, it is vital that agricultural productivity is increased in a way that safeguards finite land resources and ecosystem services, whilst responding to climate change and other **environmental concerns**. In sub-Saharan Africa, there are increasing and multiple demands on agriculture, where it is a major contributor to economic growth and improving livelihoods, alongside food security.

**Sustainable Agricultural Intensification** (SAI) is concerned with increasing agricultural productivity with limited available resources, while protecting our living **environment** and conserving natural and agricultural biodiversity. The SAIRLA programme (Sustainable Agricultural Intensification Research and Learning in Africa), funded by the UK's Department for International Development and jointly run by NRI, is also concerned with understanding the social implications of different pathways to achieving SAI.

Since 2015, the SAIRLA programme has been working to co-generate, share and facilitate use of evidence and tools by decision makers and other stakeholders to inform policy and investment processes that will support the development of SAI in ways that enable poorer smallholders, particularly women and youth in Africa, to participate in and benefit from agricultural development. The programme has commissioned eight major research projects and facilitated multi-scale social learning though National Learning Alliances within and across six countries in sub-Saharan Africa to understand, engage with and inform decisions in three major areas:

i) Conditions and tools to address equity: SAIRLA-supported initiatives have gathered evidence on how to enable poorer smallholders, women and youth to participate in and benefit from SAI. Key areas include the level of access of these diverse groups to land and agricultural inputs and services, and the extent of decision makers' access to locally relevant indicators and evidence. Engagement with local government decision makers has strengthened their capacity to achieve national targets for supporting women and youths (Tanzania), and facilitating dialogues around customary land titling (Malawi and Zambia).

ii) Managing social, **environment** and economic trade-offs in SAI: SAIRLA strengthened the capacity of stakeholders in agricultural development to understand and make informed decisions around trade-offs in SAI. Programme partners developed participatory tools and games for testing different scenarios, including enabling extension decision makers to start to shift the discourse away from technology adoption to supporting farmers' decision making in

their complex farming systems (Zambia), and a tool assessing **environmenta**l and productive trade-offs in agricultural development.

iii) Improving access and provision of appropriate services to all farmers in support of SAI: access to information is critical for farmers and other actors to make appropriate decisions. SAIRLA projects tested ICT options for two-way communication between farmers and extension services or input suppliers. Outcomes include: an established public-private ICT for Agricultural Extension platform which is informing implementation of national ICT extension policy in Ethiopia; district extension services have been empowered to guide national extension strategies in Malawi; in Ghana, through engagement with journalists and a national task force, the prevailing narrative for control of a major new insect pest, fall armyworm, was changed leading to a switch in government investment in pest control from synthetic pesticides to biopesticides. More about SAIRLA can be found here https:// sairla-africa.org/.

## CAPACITY STRENGTHENING

NRI recognises that capacity strengthening for agricultural development and food security is fundamental to achieving the **Sustainable Development Goals**.

Researchers and other stakeholders in smallholder agricultural systems need new skills to work together effectively, to engage in high-quality, demand-led research and learning, and to deliver innovative solutions to **promote sustainable development** – especially in the face of climate change. Policy makers and civil society organisations require enhanced capacity to demand, evaluate and utilise evidence so that impact is achieved. Our new Food and Nutrition Security Initiative (FaNSI) aims to expand our research capacity and support our partners in Africa with a specific focus on addressing climate change, food loss and waste, **sustainable agricultural intensification** and food systems for nutrition.

## Working together to address food and nutrition security: FaNSI

Ensuring global food and nutrition security is one of the major challenges of our time. It is also one of the most complex, which requires multi- and interdisciplinary approaches and collaboration, across organisations and across the world. Launched in mid-2019, NRI's Food and Nutrition Security Initiative (FaNSI), funded under Research England's 'Expanding Excellence in England' (E3) scheme, aims **to expand our research capacity with a specific focus on addressing climate change, food loss and waste, sustainable agricultural intensification and food systems for nutrition.**

As we strengthen our capacity in current areas of expertise and bring in staff with new skills in areas such as big data, public health nutrition and food innovation, this enables us to support our partners in Africa in new ways and to develop new partnerships. This builds on NRI's long history of working in partnership with international collaborators, with some partnerships spanning several decades.

Current African university partners in FaNSI are the Federal University of Agriculture, Abeokuta, Benue State University and Bayero University in Nigeria; Lilongwe University of Agriculture and Natural Resources in Malawi; Haramaya University in Ethiopia; Eldoret University in Kenya; the Nelson Mandela African Institute of Science and Technology, and Sokoine University of Agriculture in Tanzania. NRI is committed to supporting the African

Centres of Excellence (ACE) at these universities to promote regional specialisation in areas that address regional challenges.

Initial activities in FaNSI's first year involved meetings with partner organisations in Ethiopia, Kenya, Nigeria and Tanzania to discuss areas of mutual interest and types of activities, future research collaboration and potential synergies with NRI's Development Programmes. In Nigeria, Prof Andrew Westby and Dr Tim Chancellor visited Bayero University and Benue State University. Dr Tim Chancellor and Professor John Morton visited Haramaya University in Ethiopia, which hosts the African Center of Excellence for Climate Smart Agriculture and Biodiversity Conservation. In Kenya, Professor Andrew Westby and Dr Tim Chancellor visited the International Centre of Insect Physiology and Ecology (ICIPE), and Eldoret University. In Tanzania, they were welcomed to the Nelson Mandela African Institution of Science and Technology (NM-AIST), and to Sokoine University of Agriculture which hosts the African Centre of Excellence for Innovative Rodent Pest Management and Biosensor Technology Development.

At all venues, the visitors toured facilities and met with members of the university management and held productive discussions covering research collaboration and joint activities under FaNSI. NRI has provided eight PhD studentships for students from partner organisations and ideas on joint supervision of PhD students and exchange visits of staff and students were shared. The students and their research topics have been identified and they are scheduled to complete their registration in early 2020. NRI now has Memoranda of Understanding with each of the African university partners and some activities, such as the preparation of joint research proposals, have begun.

As the FaNSI research team grows, NRI will continue to support our partners in Africa to strengthen their capacity and to help train the next generation of scientists and agricultural practitioners to overcome the challenges of food and nutrition insecurity.

## LAND, RURAL INSTITUTIONS AND GOVERNANCE

NRI's work in this field aims to assist policy and institutional innovation **for sustainable, socially inclusive economic development in rural areas,** particularly in Africa, with a focus on improved governance of land and natural resources, extending market participation by small farmers, strengthening rural advisory services and the social impact of agricultural and other investments, **and responds to several SDGs.** Examples of NRI's current work in this area includes the farmers and scientists working together to create new agri-tech solutions through Farmer Research Networks, and the lessons and findings from five years' work on land governance and responsible land investment through DFID's LEGEND programme.

## LEGEND's legacy: providing practical lessons and policy analysis for responsible land investments

A 'land grab' can be described as the acquisition of large land areas by private companies, governments or individuals, without taking into account the land and resource rights of the communities settled there. Without the consent of local communities, conflicts and risks related to land tenure are particularly acute, affecting land and resource users, whose existing land rights are frequently not recognised or protected by official land registration systems, and investors and other stakeholders involved in land acquisitions who are unlikely to achieve

effective control over the land or generate significant returns from such risky investments. Such circumstances, especially in sub-Saharan Africa, raise questions for development policy about how investments in land-based resources and the companies involved can become more responsible. **Responsible investments in land can be understood as those that recognise and respect legitimate land and resource rights and which are carried out in accordance with agreed international soft law principles, human rights, and environmental principles and standards**.

From 2015–2020, NRI's Julian Quan, Professor of Land and Development Practice, provided technical leadership and coordination for DFID's LEGEND programme, 'Land: Enhancing Governance for Economic Development', implemented in collaboration with the Overseas Development Institute (ODI), the International Institute for Environment and Development (IIED), with the consulting firm KPMG providing overall project management. LEGEND's aim is to promote innovation in land governance to foster more **responsible land-based investment** by the private and public sectors through mobilising knowledge and skills to strengthen land policy and practice, and by promoting innovation in land governance, globally and in priority countries.

NRI provided technical management and support on a set of LEGEND pilot projects which ran from 2016–2019 in Malawi, Mozambique, Sierra Leone, and Tanzania, and Zambia. Supported through the LEGEND challenge fund, these projects sought to test how private companies and civil society organisations could collaborate in the implementation of **agribusiness investments**, and to develop innovative tools and approaches that could be adopted and implemented at greater scale. Positive outcomes from the pilots include significant increases in tenure security for community members, reduction of land-related conflicts, improved relations between project-affected people and companies, and in various cases, rapid creation of new economic opportunities and community organisational capacity, and significant benefits for women.

The team has synthesised lessons and findings from five years' work **on land governance and responsible land investment**, including developing eight key practical lessons that companies can take up to help provide a **better governance environment** in which responsible agricultural investment can operate. The lessons include: the need to address land tenure issues from the beginning of investment planning by improving risk assessment and due diligence, the importance of documenting and securely registering land rights systematically, the need for companies to ensure free and prior community consent from the land rights holders through fair and open consultation and negotiation processes, and to address land tenure as **a key environmental, social and governance issue in operations and sustainability policies.** The lessons highlight the need of communities to access legal support to protect these rights, to participate effectively in negotiation with companies, and to achieve redress for harm done. Working with the Land Portal, the team created a set of webpages on responsible land-based investments with case studies of practical experiences, resources and guidance on good practice generated by the projects and developed by the local partners. All LEGEND's publications are available at: landportal.org/partners/legend

## ROOT AND TUBER CROPS IN DEVELOPMENT

Root and tuber crops, including cassava, sweet potato, yams, potato, cocoyams and other minor root crops, are important to agriculture, food security and income for 2.2 billion people in developing countries. Several factors constrain the contribution of root and tuber crops to development; they are often affected by pests and diseases passed on through vegetative

propagation and, compared to cereal crops, they are bulky and have a relatively short shelf-life. NRI's team of experts undertakes world- leading research and development activities to address key challenges at all stages of root and tuber crop value chains, from farm to fork. NRI's strategies for root and tuber crop development are economically sound, environmentally, culturally and socially appropriate and gender sensitive, to ensure broad-based beneficial development outcomes.

## Developing cassava value chains in Africa: outcomes, impacts and lessons learned

'**Mobilizing' just one cassava root takes an enormous amount of time, energy, logistics and hard work. Once harvested, this tropical root crop – an important staple food – needs to be processed quickly, for fresh cassava roots begin to deteriorate 72 hours after harvest. From the field, the bulky roots are loaded onto trucks then transported to processing plants by roads which can be difficult to navigate. Other challenges include the need to increase yield and managing pests and diseases.**

During its five years of operation, from 2014–2019, the CAVA2 project mobilized 2.37 million tonnes of roots, exceeding all targets. The project, whose aim was to improve the lives of smallholder farmers, successfully developed value chains in the five project countries of Nigeria, Ghana, Uganda, Tanzania and Malawi, enabling smallholder cassava farmers to access new markets for High Quality Cassava Flour, Starch, Ethanol, and a variety of improved traditional products. Business models were tailored to each country, location and market context, and implementation plans were developed to enable both women and men to participate and benefit. CAVA2 was supported by the Bill & Melinda Gates Foundation, and led by Nigeria's Federal University of Agriculture, Abeokuta (FUNAAB) and NRI.

Of the 2.37 million tonnes of cassava roots, more than 70% went to new value chains. There is strong evidence that smallholders benefitted from these markets as indicated by increases in farm and non-farm assets, such as farm tools, radios, televisions and electric fans. Smallholders adopted **productivity-enhancing technologies** to enable them to increase their yields by 58–154% in response to these market opportunities. CAVA2 aimed to generate $177 million of gross income from sales of cassava roots from smallholder farmers and sales of products by cassava processors. At the end of the project, smallholder gross income was $369.1 million and the number of direct beneficiaries amounted to 153,738, of whom 43% were female.

**Innovations and improvements in processing technology design and manufacture** were important drivers in value chain development, especially where they contributed to reduced fuel usage and enhanced quality assurance. In Nigeria, for example, current drying technologies are significantly better than those at the start of the predecessor project, CAVA1: fuel usage reduced from 374 to 65 litres/tonne of dried product; throughput increased from approximately 100kg/hour to around 330kg/hour of dried product and efficiency increased from 11% to 55%. Overall, 87 flash dryers were installed across Nigeria, Malawi, Tanzania and Uganda. In Ghana, where investments focussed on the use of bin dryers, 21 were installed.

Sun-drying using smallholder farmer-supplied roots remained important for producing high-quality products for diverse markets. In Malawi, Uganda and Tanzania, sun-dried cassava was supplied to the new markets for livestock feed and breweries. 1,270 community processing

groups and many of the 569 small and medium-scale enterprises engaged in the project were involved in sun drying.

Important project lessons learned include: modifying approaches to specific contexts, flexibility and the ability to innovate during implementation, accessing wide-ranging technical expertise, **the need for an enabling environment for policy and finance, availability of business planning and management support, and the importance of quality management**. It is hoped the benefits from this project will continue to increase; with additional investment, the aim would be to scale up and scale out CAVA initiatives to become well established and sustainable industries with more than one million beneficiaries. There are also opportunities for the modernization of traditional cassava value chains in ways that protect the livelihoods of women who currently depend on them.

## CLIMATE CHANGE, AGRICULTURE AND NATURAL RESOURCES

Responding to climate change is one of the most urgent challenges facing humankind. The most severe impacts are likely to be suffered by the poorest and most vulnerable in society who live in more **fragile environments** and have the least resources to adapt and recover. The majority of the world's poor continue to live in rural areas and their livelihoods are heavily dependent upon agriculture and natural resources, which will be severely affected by climate change. Therefore, there are serious implications for their food security, health and well-being. NRI's work in this field aims to understand these challenges better, to build adaptive capacities, and to develop appropriate strategies for **sustainable and equitable rural adaptation.**

Highlights of our work include informing policy on climate change, land and food security through contribution to the IPCC's Special Report on Climate Change and Land, enhancing the capacity of climate change scientists in Africa, and predicting the impacts of climate change on global trade.

### Informing policy on climate change, land and food security: IPCC Special Report

**How will food security be further endangered by climate change? How do current global systems of producing and distributing food contribute to climate change through greenhouse gas emissions? How is land degradation, including desertification, exacerbating and exacerbated by climate change? These questions are addressed in the Special Report on Climate Change and Land (SRCCL), released in 2019 by the Intergovernmental Panel on Climate Change (IPCC), the UN body for assessing the science related to climate change. This landmark report assesses a huge range of literature on the interactions between climate change, land degradation, and food insecurity. Importantly, IPCC assessments such as this provide governments with scientific information that they can use to develop policies to tackle climate change.**

NRI's John Morton, Professor of Development Anthropology with expertise on climate change and agriculture, was one of 12 Lead Authors of the Report's final chapter entitled, 'Risk management and decision making in relation to **sustainable development'**. This chapter translates findings from earlier chapters into key risks to land-based systems and aspects of

food security, identifies possible policy responses to such risks at various scales, and considers the implications of risks and responses for decision-making processes and governance.

The chapter highlights broader aspects of decision making and governance, such as the participation of communities, the inclusion of women, respect for indigenous and local knowledge, and land tenure policies that are based on understanding of how land is actually owned and accessed in developing countries. Professor Morton notes how taking these aspects into account can contribute both to managing the risks to livelihoods and food security from climate change and land degradation, and to reducing the extent to which food production systems and other human land-uses contribute to greenhouse gas emissions.

Professor Morton also leads NRI's Development Programme on 'Climate Change, Agriculture and Natural Resources,' one of the focus areas of our Food and Nutrition Security Initiative (FaNSI) which aims to expand research capacity on climate change, food loss and waste, **sustainable agricultural intensification** and food systems for nutrition.

The SRCCL Summary for Policymakers is available at: https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf

SRCCL Chapter 7 'Risk Management and Decision Making in Relation to Sustainable Development' is available at: https://www.ipcc.ch/site/assets/uploads/2019/08/2i.-Chapter-7_FINAL.pdf

Professor Morton was a Lead Author on smallholder and subsistence agriculture within the chapter on Food, Forests and Fibre of the Fourth Assessment Report of the IPCC and as such he was recognised as contributing to the award of the 2007 Nobel Peace Prize to the IPCC. He subsequently served as Coordinating Lead Author on Rural Areas for the Fifth Assessment Report of 2014, before serving again as Lead Author on the Report highlighted above.

## GENDER AND SOCIAL DIFFERENCE

Our innovative and high-quality research and practice in **gender and social difference** aims to make a demonstrable impact by **reducing inequalities and achieving gender justice in sustainable development.** The ultimate aim is to contribute to theory, policy and practice to benefit the lives of women, men, girls and boys, as a matter of human rights, gender justice and good development. Our work includes projects identifying and integrating different user preferences for roots, tubers and bananas (RTB) products into breeding programmes, investigating inequalities in cassava commercialisation in smallholder communities, reflecting on gender in our organisational culture, research agendas and project implementation, and improving understanding of how maternal agency, maternal workload and the food environment affect food choices.

## SUSTAINABLE TRADE AND RESPONSIBLE BUSINESS

Making enterprise, trade and consumption **more responsible and sustainable** has the potential to have a huge impact on millions of workers and communities whose lives are directly affected by business, and on local and global environments. **NRI's Sustainable Trade & Responsible Business programme** aims to generate knowledge and lessons on the sustainability of trade and responsibility in business, in a context of globalization and changing

world trade patterns, rising authoritarian governments, growing corporate and elite power, and crises in global social and ecological systems. It is critically important that social, environmental and economic dimensions are appropriately considered in an integrated manner in research, policies and programmes which aim to support economic development. Our work in this area includes generating evidence for learning on **Sustainable Forest Landscape Initiatives, promoting regenerative economies, and analysing value chains for sustainable development, across economic, social and environmental dimensions.**

## Sustainable Forest Landscape Initiatives: generating evidence for learning

**Tropical forests are biodiverse habitats that are extremely valuable to local and indigenous peoples. At a global level, tropical forests have a vital role in climate change mitigation, water flow regulation and other ecosystem services. The need to restore and better protect them has never been greater.**

International attention is increasingly focused on integrated approaches at a landscape level. Diverse approaches are being implemented on the ground, but there is limited evidence on their effectiveness. Progress on achieving international declarations and commitments designed to protect and restore forests, protect biodiversity and balance environmental and human wellbeing has been underwhelming. There is thus a need for evidence on what kinds of territorial interventions and mechanisms are working and for whom, in terms of achieving forest protection, restoration, and livelihoods.

Recent work from NRI's Sustainable Trade and Responsible Business (STRB) Development Programme is generating lessons on new, donor-supported, integrated forest-landscape initiatives, identifying areas of potential improvement and building understanding on how to evaluate such initiatives.

NRI has been centrally involved in an independent team, led by LTS-NIRAS International and in collaboration with Aidenvironment, providing evaluation-for-learning on the 'Partnerships for Forests' programme, DFID and BEIS's flagship climate forestry programme. **The programme catalyses finance and develops sustainable business models for forest protection and restoration in Africa, South-East Asia, and Latin America.**

The team is conducting studies in close cooperation with the programme to provide ongoing insights and lessons to help the programme adapt its management to improve its effectiveness and impact. In 2019, the team conducted evaluation-for-learning studies on cocoa, palm oil, and on the Bukit Tigapuluh Integrated Landscape Programme in South Sumatra, Indonesia. A study on Non-Timber Forest Products and Land Governance in Latin America is ongoing. In Indonesia, the team evaluated three components of the Integrated Landscape Programme: i) **a sustainable rubber plantation initiative**, with a set-aside area for wildlife conservation as a buffer to the National Park, home to endangered Sumatran tigers and elephants, funded through a new type of Landscape Bond; ii) **an Ecosystem Restoration Concession company** developing multiple non-timber forest products to fund restoration and protection of the area, and iii) **a new land manager protection forum** established to support more smart patrolling and data sharing.

Lessons from the Indonesia study are informing the Partnerships for Forests programme and DFID. They include: the importance of promoting landscape-level governance involving land rights, stakeholder participation, community empowerment and law enforcement; making

production- protection linkages work to incentivise behaviour change; developing financial models to support innovation and scaling; ensuring 'fairness' in trading relations; the role of M&E for adaptive management and enhancing the potential for Transformational Change through programmatic approaches. The team has developed an innovative evaluation and learning methodology, including a Transformative Change Framework (TCF) to analyse different projects in the portfolio. The TCF helps to identify the desired forest-landscape value chain and livelihood system changes, the system conditions which need to shift to achieve changes in the root causes of deforestation, and analysis and scoring of the design and emerging evidence to inform programme managers. The TCF is contributing to strategic changes to optimise transformative impact.

## Analysing value chains for sustainable development

**A value chain, or the journey a commodity takes from production to consumer, involves a variety of activities performed by different operators, with the aim of delivering a valuable product to the market and eventually the consumer. Each link in the chain can pose a potential loss in value, or serve as an opportunity to ensure sustainable development for the people and natural environment involved.**

Harnessing the pivotal role of the value chain, the Directorate General for International Cooperation and Development (DEVCO) of the European Commission created an analytical approach known as 'VCA4D' **which includes analysis of three elements of sustainability – economic, social and environmental**. The aim of the approach is to help guide investment decisions and sectorial policy dialogue with partner countries' governments on value chain development. This was part of the EC's 2014–2020 cycle, aimed at food security and inclusive development as the main focal sector of intervention, emphasising particularly the role of agriculture, private sector intervention and investment.

Running from 2016–2022, the Value Chain Analysis for Development (VCA4D) project was created to provide decision-makers with evidence-based information that relates to **sustainable development strategies**. The project is managed by NRI on behalf of Agrinatura, the European Alliance on Agricultural Knowledge for Development which comprises over thirty universities and research organisations in Europe.

Value chain analysis can help in decision making by assessing appropriate indicators, setting up baseline surveys or informing on the changing situation of the actors related to the intervention. The goal of the methodology is to provide evidence-based elements, supported by indicators measured quantitatively or based on expert assessment, to answer the four framing questions on each value chain (VC): 1) what is the contribution of the VC to economic growth? 2) Is this economic growth inclusive? 3) Is the VC socially sustainable and 4) Is the VC environmentally sustainable? Typically, each study has four team members: an economist, a social scientist, and environmental scientist specialising in Life Cycle Assessment, and a national expert from the country where the study is being undertaken.

To date, some thirty-five VC studies have been undertaken across the globe on a range of commodities and a further fifteen are scheduled over the next two years. Besides the overall management, NRI has also provided technical expertise in fourteen of these studies.

Cattle value chains in Southern Africa were reported in NRI's Annual Review 2017–2018; this edition features developments on value chain studies on cashew in Sierra Leone and vanilla in Papua New Guinea.

## INSECTS, PESTS AND HUMAN AND PLANT HEALTH

At NRI, we deal with both beneficial and harmful insects, and other pests including rodents and birds, which have an impact on human and plant health. Our work in this area includes harnessing the beneficial roles of insect pollinators and natural pest regulators to boost crop production, developing sustainable pest management and building understanding of monkey malaria in humans.

NRI's full annual review can be seen at: https://www.nri.org/publications/annual-reviews/42-annual-review-2019-2020/file and is included in this COE.

## Due Diligence

NRI has put in place in place a Due Diligence process which we apply to the Project Partners we work with. This process covers requirements such as recognition and effective procedures covering anti-slavery, anti-fraud, corruption, bribery, financial stability, Whistleblowing, safeguarding and ethics,

More information and regular updates on our work are available through our website: www.nri.org

# NATURAL RESOURCES INSTITUTE

## ANNUAL REVIEW 2019-2020


Knowledge for a sustainable world

UNIVERSITY of GREENWICH

NRI | Natural Resources Institute

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# Annual Review 2019-2020

The Natural Resources Institute (NRI) is a specialist institute of the University of Greenwich. Combining the expertise of natural and social scientists, we engage in research, teaching, training, and consultancy to address significant challenges and opportunities in the sectors and countries in which we work.

Among these are the challenges of food and nutrition security, agriculture and sustainable development in the face of climate change, land and environmental management, markets and responsible business, capacity strengthening, and gender and inequality. These global challenges are addressed through our thematic areas of work which are covered in this Annual Review.

**www.nri.org**

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**Front cover photo:** Women from a village in central Tanzania, who used picture-based record charts to document their household diets for one day each month over eight consecutive months. The women are pictured with a poster showing temporal changes in food access during the study period. This novel research tool was developed and validated by Dr Julia de Bruyn through the Innovative Methods and Metrics for Agriculture and Nutrition Actions (IMMANA) fellowship grant scheme. Photo: J de Bruyn.

# Contents

# Foreword

**Professor Jane Harrington, Vice-Chancellor, University of Greenwich**

Since joining the University of Greenwich as Vice-Chancellor in December 2019, I have been fascinated to learn about the work of the Natural Resources Institute. As I get to know the people that make up NRI – the staff, students and collaborators – it's clear to see their passion for their work, and their drive to make the world more equitable and sustainable.

As you will read in this Annual Review, NRI's work covers a broad range of issues, tackling some of the world's most pressing challenges, from poverty to food insecurity, gender and social inequality, sustainable development, and many more. Through teamwork and academic excellence, NRI's teams are consistently awarded grants from diverse funders to develop sustainable solutions to these global challenges.

One example of their work is about sustainably controlling serious pests, for which they were awarded the Queen's Anniversary Prize for Further and Higher Education in 2019. The whole University is proud of this outstanding achievement, which once again shows the power of applied research that is having real impacts on people's lives across the world.

NRI's work also demonstrates how our students are being taught by practicing experts in their field. As lecturers, they share not only their expertise, but also their passion for their work, helping our students realise their potential and the ambition to change the world through their work. Enjoy reading and learning more about NRI.

# Introduction

**Professor Andrew Westby, Director of NRI**

Welcome to NRI's Annual Review, covering our work from 2019–2020. The extraordinary global events of 2020 further reinforce our determination to continue our work to identify critical issues, undertake targeted research, and design sustainable interventions that make a difference, in line with the UN's Sustainable Development Goals.

NRI could not do the work it does without the people that make up our diverse teams – of dedicated professional services and academic staff, our students from undergrad to postgrad, and our international partners, many of whom we have been working with for many decades.

In 2019, our Institute continued to grow – notably through our new 'Food and Nutrition Security Initiative' (FaNSI), funded under Research England's 'Expanding Excellence in England' (E3) scheme. FaNSI aims to expand our research capacity with a specific focus on addressing climate change, food loss and waste, sustainable agricultural intensification and food systems for nutrition – find out more on page 21.

2019 was also NRI's 125th Anniversary, an important milestone which allowed us to celebrate NRI's achievements and to reflect on the story of our Institute – read more on page 78. This self-reflection and commitment to change is particularly significant in 2020 – a year of global reflection and action on issues of race, gender and social difference. Equality, diversity and inclusion are intrinsic to NRI's work and ethos and we remain committed to improving our institutional culture and practices.

In looking to the future of our Institute, we will seek to further strengthen our partnerships, forging closer, more inclusive collaborations and sharing knowledge with our partners along the food chain and across the world. We hope you enjoy reading about our work. Join us!

Dr Zuberi Seguni (Tanzania Agricultural Research Institute), an entomologist on the African Cassava Whitefly Project (ACWP), collecting whitefly from cassava in Western Uganda.



# HIGHLIGHTS FROM THE YEAR

# Smart and sustainable pest control awarded Queen's Anniversary Prize

Andrew Westby and Gillian Summers

**For millions of the world's poorest people, particularly in the developing world, serious animal and insect pests bring dangerous diseases, death and hunger, and destroy crops, infrastructure and livelihoods. NRI's pest management work focuses on providing sustainable, innovative pest management solutions, as alternatives to chemicals and poisons that can severely harm the users, their communities, animals and the wider environment, and are often expensive and ineffective.**

In 2019, NRI's innovative research on sustainable pest management was honoured with a prestigious Queen's Anniversary Prize for Higher and Further Education. Awarded to UK universities and colleges every two years, the Queen's Anniversary Prizes are managed by the Royal Anniversary Trust. The Prizes recognise excellence, innovation, impact and benefit for the winning institution and for people and society in the wider world. In early 2020, the university was presented with a silver gilt medallion and prize-winner's certificate during a special reception at Buckingham Palace.

NRI's interdisciplinary teams of specialists work together with the communities affected by pests in the UK, and worldwide. They aim to better understand the risks posed by pests and how they occur, their interaction with their human, animal or plant hosts, and the benefits of safely and sustainably controlling them.

NRI's pest management programme looks specifically at four key areas, including: blackfly transmitting 'river blindness', rodents spreading disease and destroying crops and infrastructure, mosquitoes transmitting dangerous diseases including malaria, dengue and Zika, and insect pests that threaten the horticulture industry. Our current programme builds on NRI's pioneering work from the beginning of the 20th century, including novel work on locust plagues in Africa, mapping their movements and designing control technologies, in addition to our more recent work on plant disease vectors.

Over 20 pest management specialists are behind this achievement, with expertise spanning pest behaviour, chemical ecology, plant biochemistry, zoology, entomology, molecular biology and social development. Our teams have worked in collaboration with partners from over 50 countries, from public, non-governmental, academic and private sectors in Africa, Asia, the Caribbean, Europe, Latin America, North America and the Pacific.

The Award of this Queen's Anniversary Prize recognises NRI's world-leading work that balances pest control with protecting our environment. In line with NRI's mission, our pest management work is focussed on achieving the Sustainable Development Goals, with particular emphasis on promoting sustainable agriculture and climate action, reducing hunger, achieving food and nutrition security, and ensuring health and wellbeing. NRI's combination of academic excellence and practical application supports our postgraduate and undergraduate programmes where our students learn to become future leaders in the field.

Clockwise from top left: NRI's Dr Frances Hawkes testing the mosquito trap in Malaysia; Pear midge adult on the buds of a pear tree; *Gerbilliscus brantsii*, a major pest of maize in sandy soil areas of South Africa where the rodents dig up and eat newly germinating maize seed; 3D image of a blackfly based on micro-CT scanning which does not show the transparent wings.

# FOOD SYSTEMS FOR IMPROVED NUTRITION >

Achieving sustainable, ethical and efficient food systems in support of human health is among the greatest challenges facing the global community. Improving nutrition is a core priority of the current international development agenda, and an area of increasing attention for many national governments, research institutions and the international development community. SDG 2 highlights the multi-dimensional nature of food and nutrition security, encompassing the quantity of food available and issues of resilience, nutrient content and food safety, with targets incorporating both agriculture and nutrition, underlining the importance of food-based approaches in addressing nutritional challenges. Examples of our research in this area include exploring gender-sensitive approaches to support nutritionally vulnerable population groups, building information about diets in smallholder farming communities in low-income countries to highlight nutritional challenges and guide programmes and policy, and developing the full nutritional potential of small pelagic fish.


# Exploring opportunities to improve nutrition and health through gender-sensitive agroforestry

Julia de Bruyn, Kate Wellard, Aurélie Bechoff and Pamela Katic

**Despite living in one of the most biodiverse areas on the planet, many of the indigenous communities of the Amazonas Region in Peru experience high levels of poverty, food insecurity and malnutrition. Over half of the region's indigenous children under five years of age suffer from chronic undernutrition and anaemia. A team of researchers from NRI, led by Dr Pamela Katic, is working on a project entitled 'Intercultural models to improve nutrition and health of indigenous populations through gender-sensitive agroforestry practices in Peru'. The project's 'intercultural' and interdisciplinary approach aims to integrate traditional and conventional knowledge, regarding nutrition and health as the result of complex interactions between biological, sociocultural and environmental factors.**

In the Amazon, many households practise agroforestry, in which trees are included in agricultural systems. This provides income, strengthens local ecosystems, and supports plant and animal biodiversity. Funded by the UK Medical Research Council and Peruvian Research Council, this project is working with communities involved in coffee- and cocoa-based agroforestry in two areas of Peru's Amazonas Region, to build evidence on the impacts of agroforestry on human nutrition and health.

Together with local partners, including the Instituto de Investigación Nutricional (Nutrition Research Institute) and Instituto de Investigaciones de la Amazonía Peruana (Research Institute of the Peruvian Amazon), the team is exploring how women's roles in agroforestry systems affect their nutritional status, time use, care-giving and diets, and how this can guide opportunities to improve maternal and child nutrition.

In 2019, NRI researchers led preliminary and scoping fieldwork activities. Dr Aurélie Bechoff conducted interviews with local authorities to understand institutional linkages between the health, environment, and agriculture sectors. Dr Kate Wellard worked with male and female community members to develop historical timelines and maps, to understand key events, relationships and priorities within the two project areas. Dr Julia de Bruyn led a series of participatory activities using visual prompts, to build lists of local food resources and understand how access to foods varies across the year.

Future components of this project aim to measure the nutritional status and diets of women and young children, during the rainy and dry seasons. The team will evaluate the influence of agroforestry practices, use of wild biodiversity and women's time use on the nutritional status and diets of women and children. Using the information collected, this project aims to work with communities to co-design, prioritise and evaluate different strategies to improve nutrition and health.

A member of an indigenous community in the Peruvian Amazon handles photographs of food items, with their names in Spanish and Awajún languages, which are used as visual prompts to build an inventory of local food resources and describe how access to foods varies across the year.

# Building the picture of household food access in rural Tanzania

Julia de Bruyn

**If a researcher came to your house and asked you to list every ingredient of every meal eaten by members of your household the previous day, how readily could you provide this information? Perhaps you might forget some items, or feel uncomfortable about speaking openly, not knowing what an interviewer might think of your household's diet or how they might use this information.**

Information about diets in smallholder farming communities in low-income countries can highlight particular nutritional challenges, and guide programmes and policies to improve diet quality. Collection of dietary information is often limited by the time, skill and resources involved – so, despite their limitations, food recall interviews are commonly used, and often only once or twice over the course of a project.

Julia de Bruyn, a nutrition researcher at NRI, has recently completed a fellowship grant which developed and evaluated a new method, whereby people in rural communities use picture-based charts to record foods consumed within their own household on a given day. Funded by the Innovative Methods and Metrics for Agriculture and Nutrition Actions (IMMANA) scheme, this method was proposed to reduce inaccuracies due to poor recall, increase participants' engagement in research, and enable data to be collected at regular intervals over the course of a year.

With around one in five people in this study never having attended school, the use of pictures was intended to allow records to be kept regardless of respondents' level of literacy. For one day each month, over eight consecutive months, respondents used charts to indicate all foods eaten in their household that day. When compared to conventional interview-based techniques, analyses showed participant-completed charts to be an accurate and low-cost way to collect dietary information.

Findings about the consumption frequency of different foods, including nutrient-rich animal-source foods (such as milk, meat and eggs) and seasonally available fruits and vegetables, has been shared with community members, and with agriculture and health agencies at district and national levels. An improved picture of diets and food access, and how these change over time, will inform NRI's ongoing work on strategies to enhance nutrition in low-income countries, including through the current Food and Nutrition Security Initiative (FaNSI).



Male and female field assistants in Tanzania training members of rural communities to use picture-based charts to record foods consumed by their household on a given day. This research tool has been validated as an alternative to interview-based methods, to document changes in food access over time.

# Small but mighty: enhancing the superfood potential of small pelagic fish

John Linton

**Over one million tonnes of small, whitebait-like fish are caught in the Great Lakes and rivers of eastern and central Africa each year. Small pelagic fish (SPF) are one of the best sources of micronutrients and essential vitamins, and they are affordable by the people most at risk of malnutrition and stunting. Known colloquially as Dagaa, Mukene, Usipa and Kapenta, large quantities of SPF are harvested, mainly by small-scale fishers, processed by small-scale processors and marketed through traditional market channels. With increased pressure on larger species such as Tilapia and Nile Perch, the volumes of SPF available for harvest are increasing. However, it has been estimated that as much as 40% of SPF production is lost through postharvest losses, nutritional losses and alternative (less efficient) uses such as animal feed. This equates to around 400,000 tonnes of fish that are not reaching the plates of the people who need it to ensure their food and nutrition security.**

NRI is working in partnership with the Lilongwe University of Agriculture and Natural Resources (LUANAR) and the CGIAR Center, WorldFish, to better understand the role of capture fisheries, and particularly SPF, in the food systems of the African Great Lakes region. By doing so, this collaboration aims to support enabling policy, appropriate investment and strengthened capacities which would ensure both the public and private sector are maximizing the contribution of SPF to human health and livelihoods – particularly for those who need it most.

Having completed the groundwork during the first stages of the CGIAR Research Program on Fish Agri-Food Systems (FISH; www.fish.org), NRI, WorldFish and LUANAR have joined forces to appoint two post-doctoral research fellows and to provide two PhD scholarships. Colleagues from the three organisations, in close collaboration with other experts, organizations and initiatives, have begun detailed research and analysis along the complex SPF value chains in the Great Lakes region. Focusing first on inland fisheries and the small fish species that constitute the majority of catches, the research aims to address the complexities of land use and governance of fisheries, examining aquaculture inputs derived from capture fisheries.

In collaboration with the Australian National University, the team will further develop and refine the WorldFish 'Fish Sector Model' to generate projections relevant to smaller regional and national scales. National and regional trade analyses of the African Great Lakes region and fish trade corridor will allow the team to examine how domestic and intraregional trade affects capture fisheries production, resource exploitation and the distribution of livelihood and nutrition benefits of fish.

Using quantitative fisheries and demography research, the team will examine changes in productivity, ecological status and the income and nutritional status of men, women and children reliant on SPF. The study will also focus on the value chains of dried small fish, which are especially important because of their high nutritional value, affordability and accessibility to poor consumers in remote regions far from the source of production.

It is envisaged that the research will allow the team to make recommendations to change policy and practice, thus reducing post-harvest losses, maximizing economic contribution and realizing the full nutritional potential of the superfood that is small pelagic fish.



Small pelagic fish being sold in a market in Blantyre, Malawi. The round basket contains all the little bits of off-cuts which are sold as animal feed.

# FOOD LOSS, WASTE REDUCTION AND VALUE ADDITION >

**Food loss and waste, including postharvest losses, represent both a major global challenge and an opportunity for improved resource use through value addition. NRI has been working to reduce losses and waste after harvest since the food crisis of the 1970s. The importance of food loss and waste reduction is recognised in SDG 12 'Responsible, Consumption and Production', SDG 2 'Zero Hunger', and several others. Experts from our Centre for Food Loss and Waste Reduction (FLoW) use their experience, insight and capability to measure food loss and waste, develop technical solutions, assess upgrading opportunities and provide guidance to researchers and practitioners, both in the UK and overseas.**



## From research to commercial application, innovative solutions keeping produce fresher for longer

**At the Produce Quality Centre (PQC) in Kent, UK, experts in the storage of perishable produce are working with UK business to develop innovative solutions for application along the supply chain, to reduce postharvest losses and food waste, improve crop quality and nutritional value, and increase shelf life. The PQC is a collaborative venture between NRI and NIAB-EMR, a leading horticultural research institute. The Centre supports the fresh produce industry with specialist advice, carrying out customised trials and analyses using controlled atmosphere and packaging facilities in a setting that can simulate the commercial environment. Two examples of work in this area are:**

## Fresher apples for longer with innovative storage

Richard Colgan, Lori Fisher, Ros Fisher, Clare Hopson, Debbie Rees and Karen Thurston

**Commercial apple producers are tasked with the challenge of storing fruit efficiently so that it can be sent to retailers throughout the year. The PQC teamed up with stakeholders within the UK apple industry (Storage Control Systems (SCS) Ltd, Goatham & Son, Avalon Produce, and Sainsbury's) on a project to optimise storage conditions by developing a technology to monitor the status of apple consignments during storage.**

Apples may be stored for several months through a combination of low temperature and a reduction in oxygen concentration, both of which slow down the metabolism and therefore slow down the ripening of the fruit, essentially putting the fruit into 'hibernation'. This project involved the development of the SafePod, a chamber that can be placed within a controlled atmosphere store for commercial apples in order to monitor the metabolic status of the fruit. When the oxygen in the atmosphere is too low, the fruit starts to ferment. Specifically, the SafePod is able to analyse the respiratory characteristics of the apples, and to detect the point at which this happens. The SafePod therefore provides a mechanism for selecting the optimum oxygen concentration, low enough to slow metabolism, but not so low that the fruit starts to ferment. While SCS Ltd designed and built the equipment, the scientists at NRI carried out a detailed study of apple fruit behaviour over three seasons and developed the algorithms by which the respiratory characteristics could be related to apple quality. During the course of the project, it was also discovered that by monitoring the rate of respiration it was possible to predict the development of fruit disorders, ensuring that the fruit was taken out and used before it deteriorated.

Through this project, the team's expertise will help the apple industry to increase quality, reduce waste and provide consumers with delicious and nutritious apples throughout the year. SafePod has been identified as one of the high-impact outputs of research funded by BBSRC and is currently being tested by major apple suppliers in both the UK and the USA. Adaptations of the same technology are being investigated for the potential to improve storage of fresh produce during sea freight, reducing losses during global transport and allowing produce to be transported by sea rather than air, thereby reducing the production of greenhouse gases.

**Placed on a raised wooden platform, this Perspex box is the 'SafePod', covering crates of apples nestled within green netting. The SafePod monitors the metabolic status of the fruit and provides a mechanism for selecting the optimum oxygen concentration for storage.**

# New research under the sun: keeping berries cool

Richard Colgan, Lori Fisher, Ros Fisher, Clare Hopson, Debbie Rees and Karen Thurston

**More than just a seasonal snack, for many consumers, berries have become one of their five-a-day – an anti-ageing, antioxidant, everyday essential. These delicious and nutritious soft fruits need tender care at all stages of their postharvest life, in order to arrive at their destination, juicy, fresh and ready to be enjoyed. Together with industry partners, NRI researchers are working on 'Project Coolberry2' to develop an innovative 'cooling rig' which allows fruit to be cooled immediately in the field once picked, rather than waiting several hours before arrival at the packhouse.**

The project was conceived by NRI and JD Cooling Ltd, one of the UK's leading farm refrigeration companies. Project trials are being carried out at the facilities of project partner, Berry Gardens Ltd, a major supplier of strawberries to the UK supermarkets, with additional engineering support from Hennock International. Incorporation of an infra-red vision system provides the possibility of monitoring the fruit to ensure cooling is optimised to meet the individual needs of fruit consignments. Scorpion Vision – leading players in vision systems – are designing a camera system that can cope with humidity and changes in temperature in order to feed back crop temperatures during cooling to the refrigeration plant. NRI scientists are using this equipment to carry out trials to investigate the response of strawberries to temperature changes in order determine the cooling regimes that provide the optimum fruit quality and shelf-life. The protocols developed are central to the potential of the technology. Cooling fruit quickly will help to maintain quality, extend the shelf-life of fruit and reduce waste, while cooling-efficient packaging will reduce energy usage.

Cooling fruit quickly will help to maintain quality, extend the shelf-life of fruit and reduce waste, while cooling-efficient packaging will reduce energy usage.



Bright red strawberries in clear plastic punnets are placed on the 'cooling rig' developed through Project Coolberry2.

# Developing an innovative press to solve a cassava processing bottleneck

Marcelo Precoppe

**NRI experience in improving cassava production and value addition in sub-Saharan Africa has focussed on many steps along the value chain, from farm to fork. As fresh cassava roots are highly perishable and must be consumed or processed within 72 hours after harvesting, much of the processing takes place in villages on a small scale. To process cassava into flour, fresh cassava roots are peeled by hand, washed manually, grated using an abrasive drum, dewatered using a hand-operated press, then the mash is pulverised with a grater, then dried using different types of dryer or drying techniques. Once dried, the cassava is milled into flour. However, most of the industrial cassava processing technology that is currently available is not suitable for village-based agro-processing.**

NRI's Dr Marcelo Precoppe, a Crop Postharvest Technologist with expertise in the engineering design process, has been focusing on the dewatering stage of cassava processing – the mechanical removal of liquid from grated cassava – as this is a major bottleneck in the operation. Solving this bottleneck reduces postharvest losses of cassava, and technical improvements lower costs and increase efficiency.

Mechanical dewatering is a particularly important step in cassava processing and can lead to substantial fuel savings. The alternative is to remove water from food materials by thermal evaporation which is an energy-intensive process, due to the high latent heat of water vaporization. However, part of the water can be removed by inexpensive nonthermal processes, like mechanical pressing or centrifugation. In Africa, mechanical dewatering of cassava is mostly done with a screw-operated or jack-operated press – an operation that entails a large amount of hard physical work by the village processors, the throughput is low, and it usually takes one hour to press 100 kg.

Undertaken as part of the CGIAR Research Program on Roots, Tubers and Bananas, Dr Precoppe has been developing an innovative press for dewatering cassava. To replace the traditional mechanical presses, the team first developed a model using chain hoists. The grated cassava is inserted into bags and the bags are placed into a metal 'basket'. The basket is lifted off the ground with the aid of chain hoists, and as the basket rises, the grated cassava is pushed against a stationery metal press above it, and the liquid is released through holes. The press is easy to use, does not require physical strength and it can process 500 kg in one hour. The success of this first model prompted requests from the collaborators for a smaller and more affordable press. To reduce costs, the team replaced the chain hoists with easy-to-use hand winches, and the machine was properly dimensioned using a Discrete Element Method (DEM), to ensure optimum design and efficiency of the finished equipment.

The project was carried out in collaboration with partners and cassava processors in Ghana, where the prototype presses were built and are being tested. The machinery is receiving positive feedback from the equipment manufacturer and processors and has the potential to make substantial fuel savings.



The innovative press for dewatering cassava: a metal frame with a system of pulleys and hand winches on each of the vertical supports used for lifting the basket easily.

# SUSTAINABLE AGRICULTURAL INTENSIFICATION >

**Increasing agricultural productivity is essential to feeding a fast-growing population and has potential to lift rural families out of poverty. Sustainable Agricultural Intensification (SAI) provides the means to do this with limited resources, while protecting our living environment and conserving natural and agricultural biodiversity. The ambition for SAI is highlighted in SDG 15 – Life on Land, which aims to sustainably manage forests, combat desertification, halt and review land degradation and halt biodiversity loss; and SDG 2 – Zero hunger which seeks to ensure sustainable food production systems and implement resilient agricultural practices. Examples of NRI's work in this field include supporting SAI by generating evidence and tools and facilitating learning on equity, trade-offs and access to agricultural services, exploring the genetic diversity and local adaptation of enset, and building resilience to climate and market fluctuation for sustainable coffee production in Central America.**

**A SAIRLA partner presents a poster to a group of participants, to explain one of a range of ICT tools and approaches shared at the SAIRLA-supported 'ICT in agricultural extension systems in Ethiopia: stakeholders' dialogue and market place event https://ict4eas-ethiopia.com/**



# Enabling more equitable Sustainable Agricultural Intensification in Africa

Jeremy Haggar and Richard Lamboll

**Agricultural lands currently occupy over 37% of the Earth's land surface. With global food production projected to double by 2050 to meet the demands of a growing population, it is vital that agricultural productivity is increased in a way that safeguards finite land resources and ecosystem services, whilst responding to climate change and other environmental concerns. In sub-Saharan Africa, there are increasing and multiple demands on agriculture, where it is a major contributor to economic growth and improving livelihoods, alongside food security.**

Sustainable Agricultural Intensification (SAI) is concerned with increasing agricultural productivity with limited available resources, while protecting our living environment and conserving natural and agricultural biodiversity. The SAIRLA programme (Sustainable Agricultural Intensification Research and Learning in Africa), funded by the UK's Department for International Development and jointly run by NRI, is also concerned with understanding the social implications of different pathways to achieving SAI.

Since 2015, the SAIRLA programme has been working to co-generate, share and facilitate use of evidence and tools by decision makers and other stakeholders to inform policy and investment processes that will support the development of SAI in ways that enable poorer smallholders, particularly women and youth in Africa, to participate in and benefit from agricultural development. The programme has commissioned eight major research projects and facilitated multi-scale social learning though National Learning Alliances within and across six countries in sub-Saharan Africa to understand, engage with and inform decisions in three major areas:

i) Conditions and tools to address **equity**: SAIRLA-supported initiatives have gathered evidence on how to enable poorer smallholders, women and youth to participate in and benefit from SAI. Key areas include the level of access of these diverse groups to land and agricultural inputs and services, and the extent of decision makers' access to locally relevant indicators and evidence. Engagement with local government decision makers has strengthened their capacity to achieve national targets for supporting women and youths (Tanzania), and facilitating dialogues around customary land titling (Malawi and Zambia).

ii) Managing social, environment and economic **trade-offs** in SAI: SAIRLA strengthened the capacity of stakeholders in agricultural development to understand and make informed decisions around trade-offs in SAI. Programme partners developed participatory tools and games for testing different scenarios, including enabling extension decision makers to start to shift the discourse away from technology adoption to supporting farmers' decision making in their complex farming systems (Zambia), and a tool assessing environmental and productive trade-offs in agricultural development.

iii) Improving access and provision of appropriate **services** to all farmers in support of SAI: access to information is critical for farmers and other actors to make appropriate decisions. SAIRLA projects tested ICT options for two-way communication between farmers and extension services or input suppliers. Outcomes include: an established public-private ICT for Agricultural Extension platform which is informing implementation of national ICT extension policy in Ethiopia; district extension services have been empowered to guide national extension strategies in Malawi; in Ghana, through engagement with journalists and a national task force, the prevailing narrative for control of a major new insect pest, fall armyworm, was changed leading to a switch in government investment in pest control from synthetic pesticides to biopesticides. More about SAIRLA can be found here https://sairla-africa.org/.

# The tree against hunger: exploring genetic diversity and local adaptation of enset, the 'false banana'

Lucie Buchi and Jeremy Haggar

**Enset (*Ensete ventricosum*) is the less well-known relative of one of the world's most popular fruits, the banana (*Musa* sp.). According to the FAO, every year 114 million tonnes of bananas are grown on approximately 5.6 million hectares of land in 135 countries. In contrast, and despite growing wild across much of East and Southern Africa, enset has only ever been domesticated and cultivated in one small region of southern Ethiopia, where it is a main staple. Cultivated for its corm (fleshy underground stem) and pseudostem (trunk), rather than for its fruit which is inedible, enset is sometimes called the 'false banana', though a more fitting moniker would be 'the tree against hunger' as it has exceptionally high productivity and the ability to buffer seasonal food deficit.**

A new two-year project aims to enhance food security in Ethiopia by investigating the genetic diversity and local adaptation of enset and nine associated crops and trees, together with productivity and soil fertility. Supported by the Global Challenges Research Fund (GCRF), the project is led by Royal Botanic Gardens, Kew, with partners NRI and Queen Mary University in the UK, and Ethiopia's Hawassa University, Addis Ababa University and Ethiopian Biodiversity Institute. The project aims to better understand the genetic diversity of enset and associated crops, and their local adaptation patterns, in order to guide farmers in the choice of optimal varieties for their current soil and climatic conditions. The project is also concerned with future distributions of varieties, linked to potential changes in habitat suitability according to future climate projections.

During the project's first year, partners collected more than one thousand soil and leaf samples of all project crops, in eight different altitudinal transects in southern Ethiopia. In the second year, the team will extract DNA from the leaf samples and carry out analyses to detect local adaptation patterns across the altitudinal gradients. This will allow the team to tailor advice to farmers on varietal choice. The soil samples will be analysed for carbon and nutrient concentration, to assess the fertility and sustainability of the different crops. In situ measurements to assess crop productivity and aboveground carbon storage will complement the soil measurements to evaluate the potential for carbon sequestration of the different crops and systems. Such analyses will guide advice to farmers on best practices for sustainable agriculture.

By improving understanding of the crops' genetic diversity, local adaption, productivity and soil fertility, this project aims to understand how changes in the agri-systems can affect the sustainability of agriculture in southern Ethiopia, and whether enset can harness its great potential for food security – ultimately living up to its name 'the tree against hunger'.



In an enset plantation in south-west Ethiopia, a woman and children look on as another women engages in traditional enset processing.

# Sustainable coffee in Central America: building resilience to climate and market fluctuation

Jeremy Haggar and Stefania Cerretelli

**Every day, over two billion cups of coffee are consumed worldwide, with the popularity of the beverage continuing to rise. Consumers can choose the strength, roast, origin, blend, style and 'notes' of their brew, with many also choosing to buy coffee that is certified 'sustainable', or with a 'carbon-neutral' label. How can farmers increase production to meet demand and sustain their livelihoods, whilst ensuring their beans are produced in a sustainable way?**

A project led by Professor Jeremy Haggar is addressing the compromises and issues faced by coffee farmers from estates to small-scale indigenous producers in Costa Rica and Guatemala who depend on coffee for their livelihoods. The aim of the project is to identify the production practices that maintain profitability, without damaging the environment and negatively affecting future yields. Production can be increased by cultivating more land or increasing the intensity of production on existing land, both of which can have negative environmental effects. This project will generate evidence as to how to achieve the best balance between profitability and sustainability whilst taking into account variations in climatic conditions, plant disease outbreaks and fluctuations in market prices that affect productivity and economic returns.

The team will compare coffee agri-systems in Costa Rica, where production has been more intensive within agroforestry systems, and in Guatemala where traditional coffee agroforestry systems [check systems understood by general reader] predominate. Within the different coffee agri-systems, the project aims to quantify the ecosystem services – the benefits that nature provides us, and that contribute to our wellbeing – including biodiversity, soil retention, nutrient recycling, carbon storage and recreation. The research will study the role of different kinds of coffee agroforestry or 'shaded coffee' – growing coffee bushes under shade trees similar to how they would grow in the wild – in providing a more flexible, resilient agri-system that allows farmers to adapt coffee management according to their economic circumstances and climatic conditions.

In the first year of the project, the team has collected data from 90 farms in each country to evaluate their economic performance and indicators of the ecosystem services generated. Significantly, the majority of these farms were assessed during another project led by Prof Haggar 10 years ago. This will enable evaluation of how the farms have survived or adapted to disease outbreaks, flooding and drought and wild fluctuations in coffee price over the past decade, and establish the productive and economic farm characteristics that generate resilience to these stresses on the agri-system and farmers' livelihoods.

There is considerable concern among both coffee producers and in the coffee industry as to the impacts of market and climate variation on the viability of the sector. The results of this project will contribute to the national climate mitigation and adaptation strategies of the coffee sector in each country, and potentially globally, by identifying the production strategies that enable producing profitable coffee, without depleting the ecosystem services that contribute to the resilience of coffee production.

*'Sustainability Intensification Trade-Offs in Coffee Agroforestry in Central America' project partners are the Centre for Ecology and Hydrology, UK, the Tropical Agricultural Research and Higher Education Centre (CATIE) in Costa Rica and the Universidad del Valle (UVG) in Guatemala, with collaboration from the National Coffee Institutes of both countries, and is funded by the Global Challenges Research Fund (GCRF) through Biotechnology and Biological Sciences Research Council (BBSRC).*



Project partners extracting soil cores amongst the green coffee trees in a plantation in Guatemala.

# CAPACITY STRENGTHENING >

**NRI recognises that capacity strengthening for agricultural development and food security is fundamental to achieving the Sustainable Development Goals. Researchers and other stakeholders in smallholder agricultural systems need new skills to work together effectively, to engage in high-quality, demand-led research and learning, and to deliver innovative solutions to promote sustainable development – especially in the face of climate change. Policy makers and civil society organisations require enhanced capacity to demand, evaluate and utilise evidence so that impact is achieved. This section includes a selection of NRI's work in this field, and highlights our new Food and Nutrition Security Initiative (FaNSI) which aims to expand our research capacity and support our partners in Africa with a specific focus on addressing climate change, food loss and waste, sustainable agricultural intensification and food systems for nutrition.**



## Working together to address food and nutrition security: FaNSI

Tim Chancellor

**Ensuring global food and nutrition security is one of the major challenges of our time. It is also one of the most complex, which requires multi- and interdisciplinary approaches and collaboration, across organisations and across the world. Launched in mid-2019, NRI's Food and Nutrition Security Initiative (FaNSI), funded under Research England's 'Expanding Excellence in England' (E3) scheme, aims to expand our research capacity with a specific focus on addressing climate change, food loss and waste, sustainable agricultural intensification and food systems for nutrition.**

As we strengthen our capacity in current areas of expertise and bring in staff with new skills in areas such as big data, public health nutrition and food innovation, this enables us to support our partners in Africa in new ways and to develop new partnerships. This builds on NRI's long history of working in partnership with international collaborators, with some partnerships spanning several decades.

Current African university partners in FaNSI are the Federal University of Agriculture, Abeokuta, Benue State University and Bayero University in Nigeria; Lilongwe University of Agriculture and Natural Resources in Malawi; Haramaya University in Ethiopia; Eldoret University in Kenya; the Nelson Mandela African Institute of Science and Technology, and Sokoine University of Agriculture in Tanzania. NRI is committed to supporting the African Centres of Excellence (ACE) at these universities to promote regional specialisation in areas that address regional challenges.

Initial activities in FaNSI's first year involved meetings with partner organisations in Ethiopia, Kenya, Nigeria and Tanzania to discuss areas of mutual interest and types of activities, future research collaboration and potential synergies with NRI's Development Programmes. In Nigeria, Prof Andrew Westby and Dr Tim Chancellor visited Bayero University and Benue State University. Dr Tim Chancellor and Professor John Morton visited Haramaya University in Ethiopia, which hosts the African Center of Excellence for Climate Smart Agriculture and Biodiversity Conservation. In Kenya, Professor Andrew Westby and Dr Tim Chancellor visited the International Centre of Insect Physiology and Ecology (ICIPE), and Eldoret University. In Tanzania, they were welcomed to the Nelson Mandela African Institution of Science and Technology (NM-AIST), and to Sokoine University of Agriculture which hosts the African Centre of Excellence for Innovative Rodent Pest Management and Biosensor Technology Development.

At all venues, the visitors toured facilities and met with members of the university management and held productive discussions covering research collaboration and joint activities under FaNSI. NRI has provided eight PhD studentships for students from partner organisations and ideas on joint supervision of PhD students and exchange visits of staff and students were shared. The students and their research topics have been identified and they are scheduled to complete their registration in early 2020. NRI now has Memoranda of Understanding with each of the African university partners and some activities, such as the preparation of joint research proposals, have begun.

As the FaNSI research team grows, NRI will continue to support our partners in Africa to strengthen their capacity and to help train the next generation of scientists and agricultural practitioners to overcome the challenges of food and nutrition insecurity.

**As part of NRI's FaNSI programme, this new greenhouse, constructed by Cambridge HOK, has compartments with independent temperature, humidity and lighting control which will allow our scientists to undertake growth experiments under different environmental conditions, and adds to our existing quarantine greenhouse facilities.**

# Soft skills prove durable to ensure sustainable food security

Claire Coote

**Feeding a growing population and addressing climate change requires agricultural production to intensify in a sustainable way, with innovation being key to making this happen. This was the rationale behind the establishment of the Tropical Agricultural Platform (TAP), launched initially in 2012, a G20 initiative to promote agricultural innovation in the tropics, hosted by the UN Food and Agriculture Organization (FAO). The TAP focuses on developing capacities and linkages for supporting innovation in the tropics, where sustainable agricultural intensification is particularly pertinent. In order to achieve robust, sustained growth and to facilitate adaptation to address environmental, economic and social changes, it is vital to enhance the skills, capacities, communication and idea generation among all the people involved in agriculture: farmers and their organizations, agricultural researchers, educators and extensionists, policy makers and commercial operators serving the sector.**

Many organisations set up to support farmers have not changed their working methods over recent decades and are not well informed about how farmers manage the challenges they face. The TAP's 'Common Framework' approved in 2016, sets out the types of functional capacities, or 'soft skills' that are needed in the agriculture sector. The Common Framework was tested by the four-year project, Capacity Development for Agricultural Innovation Systems (CDAIS), funded by the EU and implemented by Agrinatura and FAO in eight tropical countries.

NRI worked on the CDAIS project with agricultural stakeholders in Bangladesh and Rwanda. The results showed that providing training in topics such as group leadership, conflict management, communication, development of plans, and undertaking investigations together to consider more remunerative markets for their produce, can increase farmers' control over their enterprises and help them realise their visions of better, more stable incomes, brighter futures for their children and more development for their country. By working with researchers and extension officers, the farmers become less deferential and more confident in their demands for support and expertise.

Promising results from the pilot countries point to the relevance of this approach. The techniques, concepts and methods used could be valid for many farmers, who have not had the advantage of much education, live from hand-to-mouth, have limited confidence to approach those who could help them, and who are struggling to find ways forward to address the challenges and unknowns of climate change or pandemics.

NRI's work has shown how achieving food security is a complex challenge which cannot be overcome by solely focusing on solving one particular technical problem rather than considering the context, geo-politics, customs and resources of a particular agricultural system. It is crucial for interventions to consider the ways that agricultural stakeholders work together and to include support to actively enhance their capacity and 'soft skills'.




Participants on a CDAIS-sponsored Learning and Exposure Visit from the Bandarban Pineapple Innovation Partnership in Bangladesh visit the fields of a pineapple farmer in Kerala, India, to gather information related to production, postharvest management and marketing of produce.

# LAND, RURAL INSTITUTIONS AND GOVERNANCE >

**NRI's work in this field aims to assist policy and institutional innovation for sustainable, socially inclusive economic development in rural areas, particularly in Africa, with a focus on improved governance of land and natural resources, extending market participation by small farmers, strengthening rural advisory services and the social impact of agricultural and other investments, and responds to several SDGs. Examples of NRI's current work in this area includes the farmers and scientists working together to create new agri-tech solutions through Farmer Research Networks, and the lessons and findings from five years' work on land governance and responsible land investment through DFID's LEGEND programme.**



## Farmers and scientists creating new agri-tech solutions: Farmer Research Networks in Malawi

Kate Wellard

**Land degradation, climate change, pests and diseases, and lack of access to farm inputs and markets are some of the obstacles faced by millions of smallholder farmers in Africa who struggle to produce food for their families and secure an income. Substantial investments have been made in developing agricultural technologies to address these challenges but uptake by farmers has often been low. One reason for this has been insufficient understanding of different farmers' needs, resources and environments. Over the past four decades, various approaches have been promoted to increase farmer participation in development of agricultural technologies. Such participatory approaches have strengthened farmer agency in the research and development process but are generally resource-intensive, localised and small-scale.**

Farmer Research Networks (FRN) are an innovative participatory approach, which aim to address farmers' problems, strengthen farmers' proven capacity to innovate and facilitate positive and sustainable change for farmers at scale. McKnight Foundation's Collaborative Crop Research Program (CCRP) have been developing FRNs with groups of farmers, working with research and development organisations, which engage in research and are networked to share information and learning.

NRI researchers, Dr Kate Wellard, Richard Lamboll and PhD student, Frank Tchuwa, have been collaborating with Lilongwe University of Agriculture and Natural Resources, on a McKnight Foundation-supported project on Farmer Research Networks in Malawi. The research examined four farmer-centred approaches – Farmer Field Schools, Farmer Research Teams, Lead Farmers and FRN – being promoted in farming communities in Malawi. It aimed to understand how these approaches contribute to genuine and productive engagement of resource-poor farmers in agricultural research and development; in particular, to developing and scaling sustainable soil health technologies.

Findings show that the different approaches provide opportunity for engaging smallholder farmers in soil health innovation. However, their effectiveness is constrained by competing objectives of implementing organisations, lack of institutional and policy support, challenges in scaling technology options for different farmer contexts, and unequal relations among farmers and with development agents.

The project is engaging policymakers, scientists and development practitioners to improve the design, implementation and policy context of farmer-centred agricultural research and extension programmes.

**Women and men farmers, participating in Farmer Research Networks that experiment on different soil health options, are observing the performance of a plot with cowpeas. This plot will be rotated with maize in the next rainy season (2020/21). The picture was captured in Kasungu district in central Malawi (Mkanakhoti Extension Planning Area).**

# LEGEND's legacy: providing practical lessons and policy analysis for responsible land investments

Julian Quan

**A 'land grab' can be described as the acquisition of large land areas by private companies, governments or individuals, without taking into account the land and resource rights of the communities settled there. Without the consent of local communities, conflicts and risks related to land tenure are particularly acute, affecting land and resource users, whose existing land rights are frequently not recognised or protected by official land registration systems, and investors and other stakeholders involved in land acquisitions who are unlikely to achieve effective control over the land or generate significant returns from such risky investments. Such circumstances, especially in sub-Saharan Africa, raise questions for development policy about how investments in land-based resources and the companies involved can become more responsible. Responsible investments in land can be understood as those that recognise and respect legitimate land and resource rights and which are carried out in accordance with agreed international soft law principles, human rights, and environmental principles and standards.**

From 2015–2020, NRI's Julian Quan, Professor of Land and Development Practice, provided technical leadership and coordination for DFID's LEGEND programme, 'Land: Enhancing Governance for Economic Development', implemented in collaboration with the Overseas Development Institute (ODI), the International Institute for Environment and Development (IIED), with the consulting firm KPMG providing overall project management. LEGEND's aim is to promote innovation in land governance to foster more responsible land-based investment by the private and public sectors through mobilising knowledge and skills to strengthen land policy and practice, and by promoting innovation in land governance, globally and in priority countries.

NRI provided technical management and support on a set of LEGEND pilot projects which ran from 2016–2019 in Malawi, Mozambique, Sierra Leone, and Tanzania, and Zambia. Supported through the LEGEND challenge fund, these projects sought to test how private companies and civil society organisations could collaborate in the implementation of agribusiness investments, and to develop innovative tools and approaches that could be adopted and implemented at greater scale. Positive outcomes from the pilots include significant increases in tenure security for community members, reduction of land-related conflicts, improved relations between project-affected people and companies, and in various cases, rapid creation of new economic opportunities and community organisational capacity, and significant benefits for women.

The team has synthesised lessons and findings from five years' work on land governance and responsible land investment, including developing eight key practical lessons that companies can take up to help provide a better governance environment in which responsible agricultural investment can operate. The lessons include: the need to address land tenure issues from the beginning of investment planning by improving risk assessment and due diligence, the importance of documenting and securely registering land rights systematically, the need for companies to ensure free and prior community consent from the land rights holders through fair and open consultation and negotiation processes, and to address land tenure as a key environmental, social and governance issue in operations and sustainability policies. The lessons highlight the need of communities to access legal support to protect these rights, to participate effectively in negotiation with companies, and to achieve redress for harm done. Working with the Land Portal, the team created a set of webpages on responsible land-based investments with case studies of practical experiences, resources and guidance on good practice generated by the projects and developed by the local partners. All LEGEND's publications are available at: landportal.org/partners/legend



Smallholder farmers supplying Illovo Sugar in Maragra, Mozambique, engaged in participatory land rights mapping, to identify and secure their plots.

# ROOT AND TUBER CROPS IN DEVELOPMENT >

**Root and tuber crops, including cassava, sweet potato, yams, potato, cocoyams and other minor root crops, are important to agriculture, food security and income for 2.2 billion people in developing countries. Several factors constrain the contribution of root and tuber crops to development; they are often affected by pests and diseases passed on through vegetative propagation and, compared to cereal crops, they are bulky and have a relatively short shelf-life. NRI's team of experts undertakes world-leading research and development activities to address key challenges at all stages of root and tuber crop value chains, from farm to fork. NRI's strategies for root and tuber crop development are economically sound, environmentally, culturally and socially appropriate and gender sensitive, to ensure broad-based beneficial development outcomes. This snapshot of our work looks at creating novel control methods to combat crop pests and diseases sustainably, and collating lessons learned from a project adding value through farm production, processing and business development.**

**Between the veins of a cassava leaf, this extreme close-up shows the adult and eggs of the cassava whitefly *Bemisia tabaci*, the vector of cassava mosaic disease and cassava brown streak disease.**



## Cassava whitefly control for sustainable food security in sub-Saharan Africa

John Colvin, Mark Parnell and Sharon van Brunschot

**Cassava is a uniquely important crop for food security. Almost one billion people around the world rely on this drought-tolerant, starchy root crop as a staple food and source of income. Sub-Saharan Africa produces more than half of the world's cassava, mostly as a subsistence crop. Since the 1990s, however, disease pandemics have caused production losses of more than US$1 billion every year. Two virus diseases, cassava mosaic disease (CMD) and cassava brown streak disease (CBSD), have become the largest constraints to production and food security. Both are spread by a tiny pest insect – the cassava whitefly, *Bemisia tabaci*.**

Funded by the Bill & Melinda Gates Foundation since 2014, the African Cassava Whitefly Project (ACWP) aims to increase cassava productivity and reduce food insecurity for millions of sub-Saharan African farmers, by tackling its most devastating pest and disease problems.

Phase 1 of the project (2014–2019) involved a global team of over 50 scientists, 13 postgraduate students and experts, whose primary focus was to undertake research to understand both how and why whitefly became 'super-abundant' in East Africa. This successful phase generated more than 43 scientific articles published in open-access, high-impact journals. Key discoveries included: (i) new knowledge and insights into complex biological, molecular, and ecological characteristics of the cryptic biological species of *B. tabaci* present on cassava and other crops in East and West sub-Saharan Africa; (ii) an overall clear understanding of the contributing factors to cassava whitefly 'super-abundance' in East Africa; (iii) characterisation of the biochemical and molecular mechanisms associated with whitefly resistance in cassava; and (iv) high-quality genomes of six key African cassava and non-cassava utilising *B. tabaci* populations.

Phase 2 of the project (2019–2022), involves a multidisciplinary team of researchers from 12 institutions based across nine countries. Together, they are implementing whitefly control approaches based on the key research and discoveries of phase 1, such as insecticidal formulations for coating cassava stem cuttings (planting material). They are also creating and field-testing a pipeline of novel control methods, to solve the whitefly and disease problem sustainably.

In the immediate term, Africa-based ACWP2 scientists are conducting large-scale farmer and stakeholder participatory evaluation programmes in Malawi, Tanzania and Uganda. These programmes are focused not only on the evaluation of promising cassava varieties that are disease- and whitefly-resistant, but also on education, training and outreach activities involving key stakeholders. In the medium term, the team are advancing 'pre-breeding' activities for pyramiding (combining) multiple sources of whitefly resistance into disease-resistant cassava varieties. Whitefly have an impressive ability to evolve rapidly to counteract control measures used against them; the pyramiding strategy, therefore, is essential to ensure durable control. For the longer term, ACWP scientists are working to 'future proof' cassava by utilising a biotechnological approach called ribonucleic acid interference (RNAi). RNAi is a naturally occurring biological process that functions to regulate the activity of specific genes. This process, often referred to as 'gene silencing', has evolved in plants and animals over millions of years and it can be harnessed for insect pest management. Our scientists are progressing research and development of cassava plants that, when fed upon, switch off genes in the insect that are critical to their survival.

Our multi-dimensional project in Phase 2 aims to provide durable African cassava whitefly control, in order to reduce the risks of future whitefly-borne disease pandemics in sub-Saharan Africa.

# Developing cassava value chains in Africa: outcomes, impacts and lessons learned

Andrew Westby, Adrienne Martin and Ola Ogunyinka

**'Mobilizing' just one cassava root takes an enormous amount of time, energy, logistics and hard work. Once harvested, this tropical root crop – an important staple food – needs to be processed quickly, for fresh cassava roots begin to deteriorate 72 hours after harvest. From the field, the bulky roots are loaded onto trucks then transported to processing plants by roads which can be difficult to navigate. Other challenges include the need to increase yield and managing pests and diseases.**

During its five years of operation, from 2014–2019, the CAVA2 project mobilized 2.37 million tonnes of roots, exceeding all targets. The project, whose aim was to improve the lives of smallholder farmers, successfully developed value chains in the five project countries of Nigeria, Ghana, Uganda, Tanzania and Malawi, enabling smallholder cassava farmers to access new markets for High Quality Cassava Flour, Starch, Ethanol, and a variety of improved traditional products. Business models were tailored to each country, location and market context, and implementation plans were developed to enable both women and men to participate and benefit. CAVA2 was supported by the Bill & Melinda Gates Foundation, and led by Nigeria's Federal University of Agriculture, Abeokuta (FUNAAB) and NRI.

Of the 2.37 million tonnes of cassava roots, more than 70% went to new value chains. There is strong evidence that smallholders benefitted from these markets as indicated by increases in farm and non-farm assets, such as farm tools, radios, televisions and electric fans. Smallholders adopted productivity-enhancing technologies to enable them to increase their yields by 58–154% in response to these market opportunities. CAVA2 aimed to generate $177 million of gross income from sales of cassava roots from smallholder farmers and sales of products by cassava processors. At the end of the project, smallholder gross income was $369.1 million and the number of direct beneficiaries amounted to 153,738, of whom 43% were female.

Innovations and improvements in processing technology design and manufacture were important drivers in value chain development, especially where they contributed to reduced fuel usage and enhanced quality assurance. In Nigeria, for example, current drying technologies are significantly better than those at the start of the predecessor project, CAVA1: fuel usage reduced from 374 to 65 litres/tonne of dried product; throughput increased from approximately 100kg/hour to around 330kg/hour of dried product and efficiency increased from 11% to 55%. Overall, 87 flash dryers were installed across Nigeria, Malawi, Tanzania and Uganda. In Ghana, where investments focussed on the use of bin dryers, 21 were installed.

Sun-drying using smallholder farmer-supplied roots remained important for producing high-quality products for diverse markets. In Malawi, Uganda and Tanzania, sun-dried cassava was supplied to the new markets for livestock feed and breweries. 1,270 community processing groups and many of the 569 small and medium-scale enterprises engaged in the project were involved in sun drying.

Important project lessons learned include: modifying approaches to specific contexts, flexibility and the ability to innovate during implementation, accessing wide-ranging technical expertise, the need for an enabling environment for policy and finance, availability of business planning and management support, and the importance of quality management. It is hoped the benefits from this project will continue to increase; with additional investment, the aim would be to scale up and scale out CAVA initiatives to become well established and sustainable industries with more than one million beneficiaries. There are also opportunities for the modernization of traditional cassava value chains in ways that protect the livelihoods of women who currently depend on them.



Women members of the Mbawala Community Processing Group present their cassava drying on raised beds in Mtwara, Tanzania.

# CLIMATE CHANGE, AGRICULTURE AND NATURAL RESOURCES >

**Responding to climate change is one of the most urgent challenges facing humankind. The most severe impacts are likely to be suffered by the poorest and most vulnerable in society who live in more fragile environments and have the least resources to adapt and recover. The majority of the world's poor continue to live in rural areas and their livelihoods are heavily dependent upon agriculture and natural resources, which will be severely affected by climate change. Therefore, there are serious implications for their food security, health and well-being. NRI's work in this field aims to understand these challenges better, to build adaptive capacities, and to develop appropriate strategies for sustainable and equitable rural adaptation. Highlights of our work include informing policy on climate change, land and food security through contribution to the IPCC's Special Report on Climate Change and Land, enhancing the capacity of climate change scientists in Africa, and predicting the impacts of climate change on global trade.**



## Informing policy on climate change, land and food security: IPCC Special Report

John Morton

**How will food security be further endangered by climate change? How do current global systems of producing and distributing food contribute to climate change through greenhouse gas emissions? How is land degradation, including desertification, exacerbating and exacerbated by climate change? These questions are addressed in the Special Report on Climate Change and Land (SRCCL), released in 2019 by the Intergovernmental Panel on Climate Change (IPCC), the UN body for assessing the science related to climate change. This landmark report assesses a huge range of literature on the interactions between climate change, land degradation, and food insecurity. Importantly, IPCC assessments such as this provide governments with scientific information that they can use to develop policies to tackle climate change.**

NRI's John Morton, Professor of Development Anthropology with expertise on climate change and agriculture, was one of 12 Lead Authors of the Report's final chapter entitled, 'Risk management and decision making in relation to sustainable development'. This chapter translates findings from earlier chapters into key risks to land-based systems and aspects of food security, identifies possible policy responses to such risks at various scales, and considers the implications of risks and responses for decision-making processes and governance.

The chapter highlights broader aspects of decision making and governance, such as the participation of communities, the inclusion of women, respect for indigenous and local knowledge, and land tenure policies that are based on understanding of how land is actually owned and accessed in developing countries. Professor Morton notes how taking these aspects into account can contribute both to managing the risks to livelihoods and food security from climate change and land degradation, and to reducing the extent to which food production systems and other human land-uses contribute to greenhouse gas emissions.

Professor Morton also leads NRI's Development Programme on 'Climate Change, Agriculture and Natural Resources,' one of the focus areas of our Food and Nutrition Security Initiative (FaNSI) which aims to expand research capacity on climate change, food loss and waste, sustainable agricultural intensification and food systems for nutrition.

The SRCCL Summary for Policymakers is available at: https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf

SRCCL Chapter 7 'Risk Management and Decision Making in Relation to Sustainable Development' is available at: https://www.ipcc.ch/site/assets/uploads/2019/08/2i.-Chapter-7_FINAL.pdf

*Professor Morton was a Lead Author on smallholder and subsistence agriculture within the chapter on Food, Forests and Fibre of the Fourth Assessment Report of the IPCC and as such he was recognised as contributing to the award of the 2007 Nobel Peace Prize to the IPCC. He subsequently served as Coordinating Lead Author on Rural Areas for the Fifth Assessment Report of 2014, before serving again as Lead Author on the Report highlighted above.*

Residues of the previous season's maize crop (right), juxtaposed with irrigated maize (left) grown during the dry season. What is the effect of climate change on key food crops like maize?

# Enhancing the capacity of climate change researchers in Africa

John Morton

**As a growing number of countries declare a climate emergency, climate strikes and protests sweep the world, and the entire scientific community reaches a consensus on anthropogenic global warming, the effects of climate change continue to be keenly felt in sub-Saharan Africa, with impacts on agriculture, the environment, human health and livelihoods. It is therefore more crucial than ever that African researchers are able to make a significant contribution to scientific knowledge on climate change.**

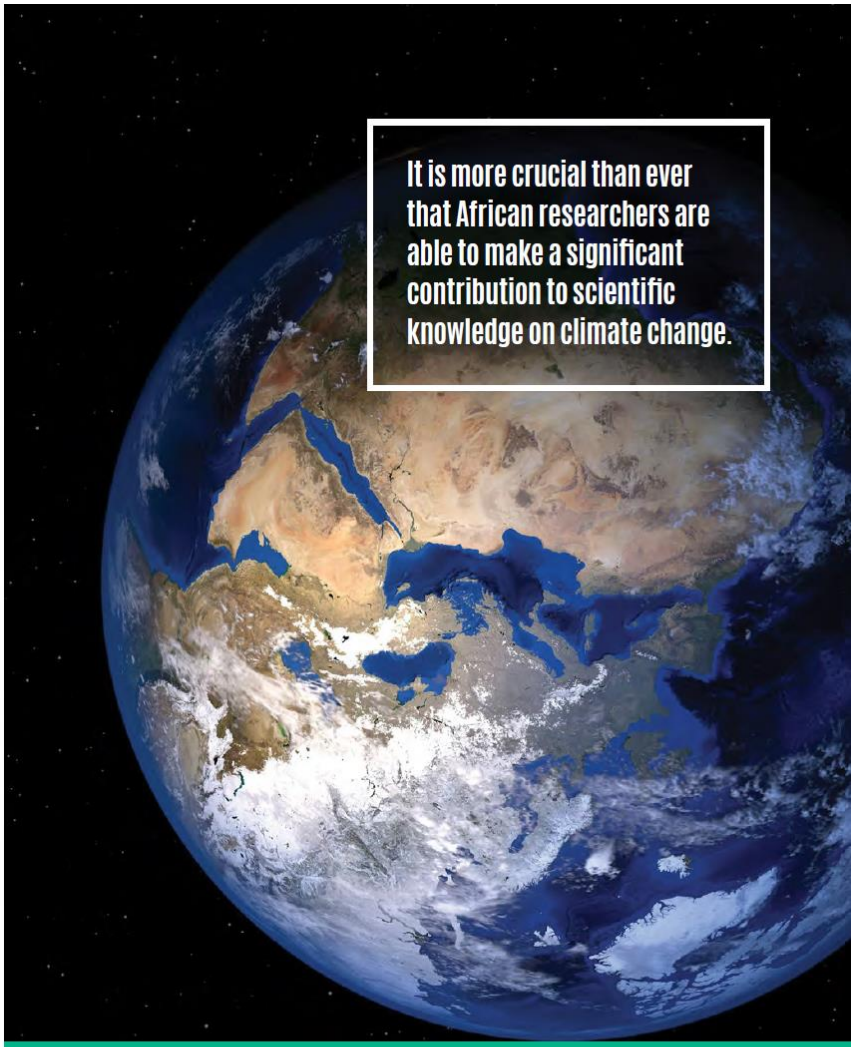
The DFID-funded programme known as CIRCLE (Climate Impact Research Capacity and Leadership Enhancement), led by the Association of Commonwealth Universities, was set up to fund African early-career researchers working on various aspects of climate change to spend a year at another African university or research institution. The visiting fellows were further supported by a network of 'Specialist Advisers' from universities and institutions in India, Norway, Spain, Sweden, Turkey, the UK, and the CGIAR system, who offered advice on research design, implementation and dissemination. Thirteen NRI staff members served as Specialist Advisers over the programme's five years, supporting over 50 visiting fellows.

NRI's Professor John Morton led the Quality Support Component of the programme, and published a report on 'Organisational Strategies and Structures for Climate Change Research in sub-Saharan Africa'. The report is based on a questionnaire survey and on interactions Professor Morton had with research leaders from the 30 African universities in 10 African countries involved in CIRCLE. The report highlights both good practice and constraints experienced by African universities in organising climate change research. Recent experience of CIRCLE institutions shows that establishment of dedicated interdisciplinary climate change research centres is feasible and can be productive within a relatively short timeframe. The report also covers the topics of linking to regional and global partners, facilitating engaged and interdisciplinary research, accessing climate data, and incentivising researchers through promotion procedures.

Much needs to be done to reverse historic inequities in research funding and allow African institutions to work in climate change research to their full potential. Such support can go hand in hand with measures to foster research collaboration and networking between institutions (subnational, national, inter-African, South-South and South-North) and to address the specific needs for promoting climate change research that is interdisciplinary and engaged with both communities and decision makers.

The report is available here: https://www.nri.org/images/documents/development-programmes/climate_change/publications/Organisational_Strategies_and_Structures_for_Climate_Change_Research_in_Sub-Saharan_Africa.pdf






The planet Earth, as seen from space.

# Climate vulnerability and global trade: projecting future scenarios

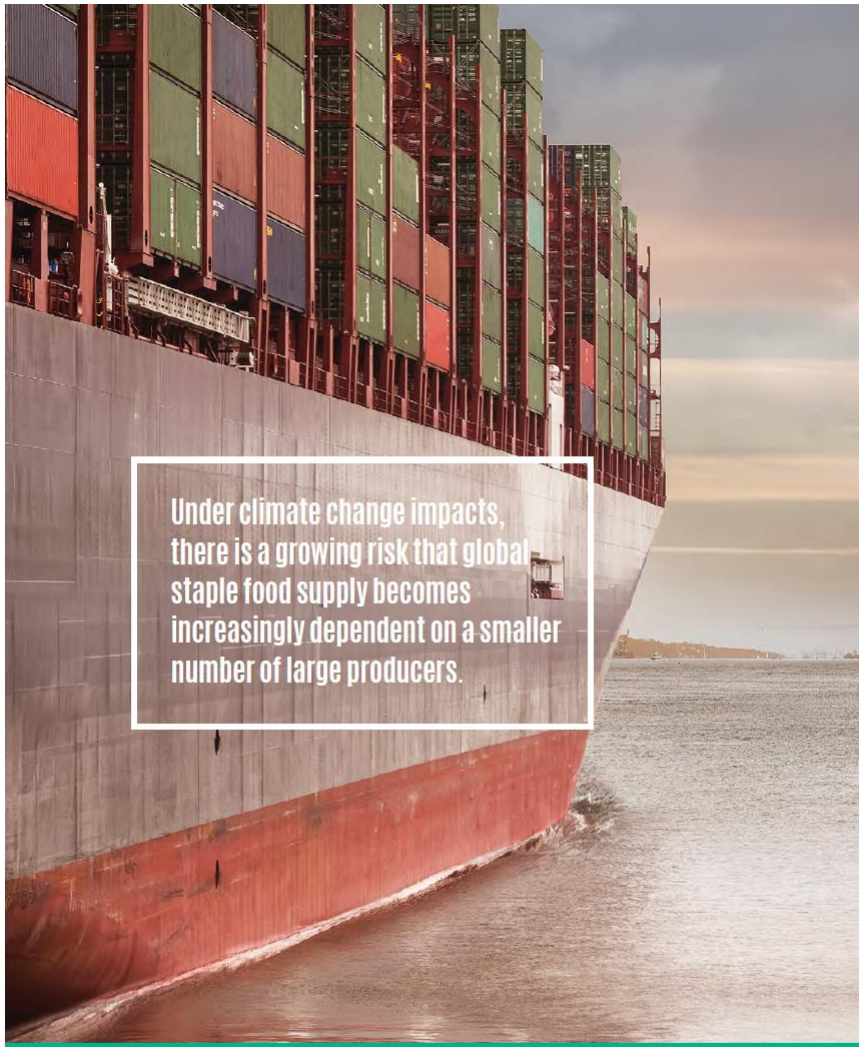
Conor Walsh

**In 2018, the top 10 biggest exporters of grain supplied over 75% of the global export grain trade, whilst the top 10 importing countries accounted for just 38% of the global grain traded volume. This concentration of suppliers means there is a potential bottleneck in supply, while more and more regions are becoming increasingly dependent on grain imports. An example from 2010 shows how a drought in Russia prompted a reduction in grain yields of approximately 10%. As Russia is also a big consumer of grain, this had a disproportionate impact on their exportable surplus, prompting an export embargo. The reduction in grain exports had a profound impact on Egypt, which was heavily dependent on this comparatively cheaper Russian grain, requiring the country to source alternative, more expensive imports and resulting in a sharp increase in food prices. Food price inflation exacerbated social tensions which contributed to the political upheaval witnessed at the time. This shows the degree to which global trade is susceptible to, and unable to cope with, the adverse effects of climate change, and is a clear example of 'climate vulnerability'. In addition, the global trade of raw materials, goods and services involves the exchange of global fossil fuel consumption. In recent years, there has been increased dependency on key energy exporters, with industrialised high-consuming countries becoming net importers of emissions produced in other countries.**

Under climate change impacts, there is a growing risk that global staple food supply becomes increasingly dependent on a smaller number of large producers. If projections for the anticipated levels of grain imports, reflecting elements such as population growth, are incorporated into climate scenarios, then various scenarios of consumption at the national scale can be developed. Comparing projected hubs of imports and exports with future climate impact maps, helps to identify where and when trade may become more vulnerable to climate shocks. By highlighting the regions that are likely to become more import dependent in the future, it will encourage development of strategies to manage this within these constraints.

In 2019, NRI's Dr Conor Walsh, along with colleagues across several other universities, published a series of detailed scenarios projecting global trade and shipping demand at high granularity across different climate change futures. The team used a mixed methodology linking several related activities. For bulky commodities like grain, a material flow analysis model was developed which incorporated inputs from climate models to estimate future output and tradeable surplus for a number of key grain crops by country and type. The estimates of production/consumption were entered as inputs in an econometric model which assessed the historic relationships between production, GDP and trade, and then used country and scenario-specific future GDP estimates (from IPCC scenarios) to project future bulk trade volumes between each origin and destination country, to 2050. Trade of energy commodities and associated emission levels were also incorporated based on the same GDP and population growth estimates. The results indicate how much global fossil fuel consumption is traded but also shows that a decarbonisation pathway will still require significant global transport of biofuel. However, the significant rate of growth in container trade seen in the 2000s is not replicated, and more regional trade emerges, as opposed to intercontinental trade. This interacts acutely with the challenges of food provision and diversification of supply. A possible scenario of future dependence on emerging bread-basket regions with currently under-utilised land, prompts questions around the acceptability of expecting such regions to become export orientated. The scenarios become a valuable policy- and decision-making tool to address technological and operational change required of the shipping sector, if it is to deliver mitigation in line with the Paris Agreement.

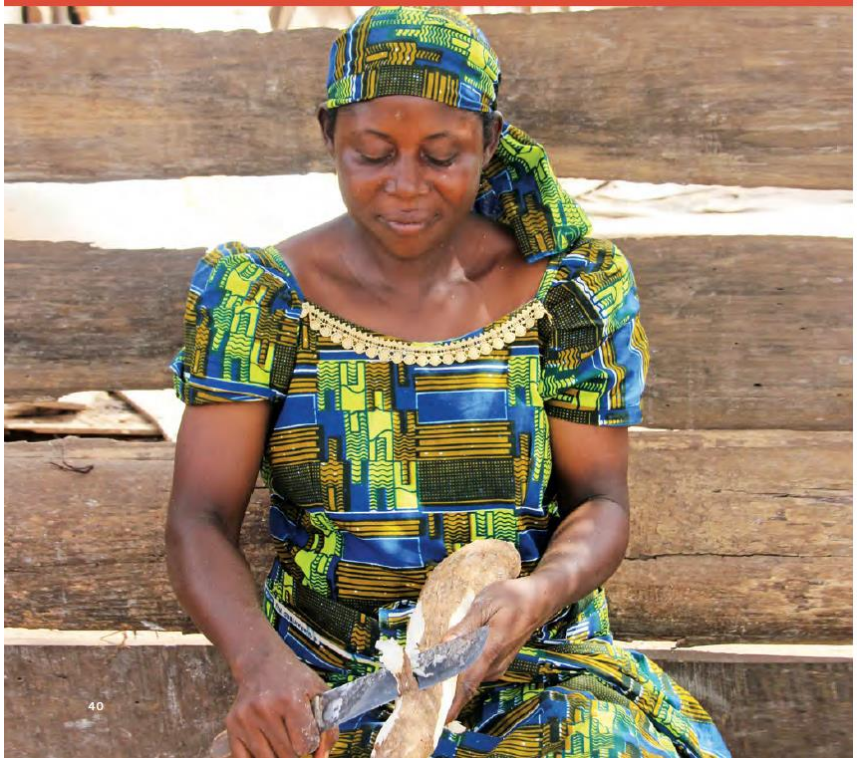





A container ship on the water, transporting commodities such as grain.

# GENDER AND SOCIAL DIFFERENCE >

Our innovative and high-quality research and practice in gender and social difference aims to make a demonstrable impact by reducing inequalities and achieving gender justice in sustainable development. The ultimate aim is to contribute to theory, policy and practice to benefit the lives of women, men, girls and boys, as a matter of human rights, gender justice and good development. This selection of our work includes projects identifying and integrating different user preferences for roots, tubers and bananas (RTB) products into breeding programmes, investigating inequalities in cassava commercialisation in smallholder communities, reflecting on gender in our organisational culture, research agendas and project implementation, and improving understanding of how maternal agency, maternal workload and the food environment affect food choices.





## The role of gender in RTB product preferences and cassava commercialisation

Lora Forsythe

### Gender in RTB product preferences

**Root, tuber and banana (RTB) crops are vital for food security and income generation for millions of people across sub-Saharan Africa. Breeders of RTB crops are continuously developing new varieties better adapted to pests and diseases, climate change, new markets and shifts in consumption. However, many of these varieties meet with significant problems of acceptability to men and women stakeholders in RTB value chains, hindering adoption and dissemination. To meet this challenge, NRI is collaborating on a project, led by CIRAD, which aims to link local consumer preferences with breeders' selection criteria, to encourage adoption along the value chains of cassava, yam, sweet potato and cooking banana products. The focus countries are Benin, Cameroon, Ivory Coast, Nigeria and Uganda.**

NRI's Dr Lora Forsythe leads the research area aimed at understanding the socio-economic and cultural drivers of food quality preferences, and developing food product profiles to support crop breeding programmes. Achievements in 2019 included a participatory and interdisciplinary study of quality preferences and their relationship to factors of gender and social difference, conducted by eight research teams in West and East Africa. The study has generated valuable knowledge of the quality traits that determine user preferences and RTB varietal adoption. The research methodology is published (online) in the International Journal of Food Science and Technology.

### Inequalities in cassava commercialisation

Insights from a study on cassava commercialisation in southern Nigeria and Malawi, by Dr Forsythe and Professor Adrienne Martin, were presented at the Development Studies Association annual conference and the paper submitted for publication. Based on mixed-method, longitudinal panel interviews and household surveys conducted between 2009 and 2014, the study examined changes in smallholder livelihoods brought about through the growth in cassava markets. It investigated whether and how smallholders were participating and benefiting from the growth in demand, and whether the processes were inclusive. Using a new conceptual framework, the study demonstrates that there are significant differences in smallholder participation in cassava commercialisation processes that vary by geography, gender and ethnicity as these value chains are deeply embedded within a specific social context. Differences are a result of distinct commercialisation strategies, involving both 'commercial' and 'non-commercial' behaviour, which can be linked to different levels of women's agency, the social conditions influencing access to key resources, and ability and willingness to cope with risk. This study presents conceptual and empirical reflections that question the mainstream development narratives regarding smallholders and commercialisation.

A woman member of a cassava processing group peels fresh cassava roots in Ogun State, Nigeria.

# Gender in action at NRI: our institutional culture

Lora Forsythe

**Staff involved in the Gender and Social Difference Programme also encourage critical reflection on our organisational culture, research agendas and project implementation. In this light, we have led and supported a number of initiatives including the University of Greenwich's Women's Network, which aims to provide a safe, supportive and confidential forum for sharing experiences, networking and discussing solutions to issues affecting women members of staff across the University, raise awareness about diversity and inclusion, and contribute to the policies and practices of the University.**

Aurora is an inclusive training programme run by Advance HE, supporting staff who identify as women to fulfil their leadership potential, and to redress the gender imbalance in leadership roles in the UK's higher education sector. NRI has supported six members of staff to complete this programme, which the University has been promoting for six years.

Inspired by the Aurora programme for Women's Leadership in Higher Education, NRI's Caroline Troy has helped to run a book club for all University staff, to read and discuss titles related to women's leadership, rights and equality.

Under NRI's Food and Nutrition Security Initiative (FaNSI), described in more detail in the Capacity Strengthening section in this publication, NRI has recruited two gender and food systems specialists, enhancing NRI's gender and social difference team with complementary skills and experience, and increasing our prospects for engaging in inequalities-focused projects.

> Staff involved in the Gender and Social Difference Programme also encourage critical reflection on our organisational culture, research agendas and project implementation.



Men and women stand side by side to form a circle of hands.

# Understanding how maternal agency, maternal workload and the food environment affect food choices

Kate Wellard

**Poor nutrition in the first 1,000 days of a child's life increases their susceptibility to disease and can lead to death or stunted growth, impairing cognitive ability and reducing school and work performance. Malnutrition during infancy can have profound effects on a person's ability to achieve their full human potential. Agricultural development programmes can have positive impacts on young child nutrition by increasing household food production, increasing available income to purchase healthy foods, and empowering women to make decisions on how household income is spent. With women in many rural societies shouldering both food production and domestic responsibilities, such programmes may affect child nutrition positively or negatively, depending on their impact on women's workload and time available for childcare.**

NRI researchers, Dr Kate Wellard, Dr Pamela Katic, Dr Lora Forsythe and PhD student, Gwen Varley, are collaborating with the London School of Hygiene and Tropical Medicine and the Africa Innovations Institute in Uganda on a research project under the Drivers of Food Choice programme supported by UK Aid and the Bill & Melinda Gates Foundation. The research aims to understand how maternal agency, maternal workload and the food environment interact and affect women's food choices and child diets. In this context, maternal agency refers to the freedom of a mother to formulate ideas, make choices and use resources for the wellbeing of herself and her child – and contributes to empowerment. The project has been working with rural communities in Eastern Uganda, conducting a set of detailed assessments including maternal and child diets, women's time use, livelihoods and gender empowerment.

Results show dietary diversity of both mothers and infants to be inadequate. Almost all mothers are working over 10.5 hours a day (the threshold for empowerment in time use in the International Food Policy Research Institute's Women's Empowerment in Agriculture Index) and only a tiny minority are considered to have achieved overall empowerment. Links between women's empowerment, women's time use and dietary diversity are being explored. The study has identified women's perceptions of ease of access to different foods, whether from their own farms, local markets or other sources, as important in improving diets. Producing a diverse set of food crops and livestock has been found to contribute positively to child dietary diversity.

Communication of findings on factors driving improved child diets will be targeted to policy makers and planners in Uganda and internationally to improve design of nutrition-sensitive agricultural programmes.



A woman with her daughter in Bugiri District, Busoga, Uganda, both preparing sweet potatoes and amaranth, which is a meal commonly eaten when income is scarce.

# SUSTAINABLE TRADE AND RESPONSIBLE BUSINESS >

**Making enterprise, trade and consumption more responsible and sustainable has the potential to have a huge impact on millions of workers and communities whose lives are directly affected by business, and on local and global environments. NRI's Sustainable Trade & Responsible Business programme aims to generate knowledge and lessons on the sustainability of trade and responsibility in business, in a context of globalization and changing world trade patterns, rising authoritarian governments, growing corporate and elite power, and crises in global social and ecological systems. It is critically important that social, environmental and economic dimensions are appropriately considered in an integrated manner in research, policies and programmes which aim to support economic development. This selection of our work in this area includes generating evidence for learning on Sustainable Forest Landscape Initiatives, promoting regenerative economies, and analysing value chains for sustainable development, across economic, social and environmental dimensions.**

Workers in a garment factory making blue jeans in Bangladesh.



## Beyond responsible business: promoting regenerative and democratic economies

Valerie Nelson

**A devastating factory fire, a deadly building collapse or severe environmental damage highlight the consequences of irresponsible business. Though less widely reported, in many countries the exploitation of workers and human rights abuses occur on a daily basis, including non-payment of the minimum wage or poor working conditions. In some cases, labour rights are worsening. In agriculture, many workers only have access to precarious, informal-sector work with low wages. With more than two thirds of global trade flowing through global value chains, such conditions continue to characterise the production of large amounts of goods which reach consumers' shelves. For companies to be truly responsible, they need to address a whole range of issues relating to human rights and the environment, including climate mitigation.**

Initiatives that seek to enable companies and sectors to change and become more responsible have proliferated, but how effective are they and what is their impact? Recent research from NRI's Development Programme on Sustainable Trade and Responsible Business (STRB) has explored whether global companies are becoming more responsible, and what drivers and mechanisms are involved. Research shows that 'responsible business' rhetoric commonly fails to reflect reality. There is also a huge transparency gap, rendering it difficult to assess the current status, or even the direction of change, in different industries and sectors. Making business more responsible has the potential to have a huge positive impact on everyone, especially the millions of poor workers and communities whose lives are directly affected by business. However, it is difficult to find clear evidence that sectors and industries are becoming more responsible based on voluntary initiatives.

NRI's STRB team recently completed a performance evaluation of the DFID programme 'Responsible, Accountable and Transparent Enterprise' (RATE) – which focused on prominent Responsible Business Initiatives, including: the Global Reporting Initiative, UN Global Compact, World Benchmarking Alliance, ShareAction, Ethical Trading Initiative, Humanity United, and Shift, who work with the majority of leading global companies. These organisations all seek to engage business to be more responsible and to ensure and improve the safety and well-being of poor people and workers affected by business, as well as addressing the environmental impact of business. However, evidence of the effectiveness and impact of these Responsible Business Initiatives is lacking. The NRI team supported the partner organisations to develop theories of change, to build their monitoring, evaluation and learning capacity, and to periodically reflect upon their impact. Such processes are encouraging the Responsible Business Initiatives to make strategic changes to try and increase their positive impacts on communities, workers and environments. The STRB team has also published academic research based on the evaluation studies, revealing the *systemic constraints* in responsible business supply chains around the world, especially the limitations of levers involving purely voluntary measures, because of the power of countervailing competitive commercial pressures.

There is an urgent need for enterprise, economics and politics to be more resilient (able to recover from shocks and stresses), regenerative (restores, renews and regrows assets), and accountable (answerable to and driven by communities and the public). In collaboration with partners around the world, future research in STRB will focus on what this really means in practice, and what levers and mechanisms are required. A particular focus will be on what is needed to achieve regenerative economy transitions that anchor the circulation of products and services in more localized patterns, and the implications for fair, ethical and environmental business models based on global exchange.

# Sustainable Forest Landscape Initiatives: generating evidence for learning

Valerie Nelson

**Tropical forests are biodiverse habitats that are extremely valuable to local and indigenous peoples. At a global level, tropical forests have a vital role in climate change mitigation, water flow regulation and other ecosystem services. The need to restore and better protect them has never been greater.**

International attention is increasingly focused on integrated approaches at a landscape level. Diverse approaches are being implemented on the ground, but there is limited evidence on their effectiveness. Progress on achieving international declarations and commitments designed to protect and restore forests, protect biodiversity and balance environmental and human wellbeing has been underwhelming. There is thus a need for evidence on what kinds of territorial interventions and mechanisms are working and for whom, in terms of achieving forest protection, restoration, and livelihoods.

Recent work from NRI's Sustainable Trade and Responsible Business (STRB) Development Programme is generating lessons on new, donor-supported, integrated forest-landscape initiatives, identifying areas of potential improvement and building understanding on how to evaluate such initiatives. NRI has been centrally involved in an independent team, led by LTS-NIRAS International and in collaboration with Aidenvironment, providing evaluation-for-learning on the 'Partnerships for Forests' programme, DFID and BEIS's flagship climate forestry programme. The programme catalyses finance and develops sustainable business models for forest protection and restoration in Africa, South-East Asia, and Latin America.

The team is conducting studies in close cooperation with the programme to provide ongoing insights and lessons to help the programme adapt its management to improve its effectiveness and impact. In 2019, the team conducted evaluation-for-learning studies on cocoa, palm oil, and on the Bukit Tigapuluh Integrated Landscape Programme in South Sumatra, Indonesia. A study on Non-Timber Forest Products and Land Governance in Latin America is ongoing. In Indonesia, the team evaluated three components of the Integrated Landscape Programme: i) a sustainable rubber plantation initiative, with a set-aside area for wildlife conservation as a buffer to the National Park, home to endangered Sumatran tigers and elephants, funded through a new type of Landscape Bond; ii) an Ecosystem Restoration Concession company developing multiple non-timber forest products to fund restoration and protection of the area, and iii) a new land manager protection forum established to support more smart patrolling and data sharing.

Lessons from the Indonesia study are informing the Partnerships for Forests programme and DFID. They include: the importance of promoting landscape-level governance involving land rights, stakeholder participation, community empowerment and law enforcement; making production-protection linkages work to incentivise behaviour change; developing financial models to support innovation and scaling; ensuring 'fairness' in trading relations; the role of M&E for adaptive management and enhancing the potential for Transformational Change through programmatic approaches. The team has developed an innovative evaluation and learning methodology, including a Transformative Change Framework (TCF) to analyse different projects in the portfolio. The TCF helps to identify the desired forest-landscape value chain and livelihood system changes, the system conditions which need to shift to achieve changes in the root causes of deforestation, and analysis and scoring of the design and emerging evidence to inform programme managers. The TCF is contributing to strategic changes to optimise transformative impact.



A female worker from the local community presents the nursery for tree seedlings to restore the ecosystem restoration concession, Indonesia.

# Analysing value chains for sustainable development

Andy Frost

**A value chain, or the journey a commodity takes from production to consumer, involves a variety of activities performed by different operators, with the aim of delivering a valuable product to the market and eventually the consumer. Each link in the chain can pose a potential loss in value, or serve as an opportunity to ensure sustainable development for the people and natural environment involved.**

Harnessing the pivotal role of the value chain, the Directorate General for International Cooperation and Development (DEVCO) of the European Commission created an analytical approach known as 'VCA4D' which includes analysis of three elements of sustainability – economic, social and environmental. The aim of the approach is to help guide investment decisions and sectorial policy dialogue with partner countries' governments on value chain development. This was part of the EC's 2014–2020 cycle, aimed at food security and inclusive development as the main focal sector of intervention, emphasising particularly the role of agriculture, private sector intervention and investment.

Running from 2016–2022, the Value Chain Analysis for Development (VCA4D) project was created to provide decision-makers with evidence-based information that relates to sustainable development strategies. The project is managed by NRI on behalf of Agrinatura, the European Alliance on Agricultural Knowledge for Development which comprises over thirty universities and research organisations in Europe.

Value chain analysis can help in decision making by assessing appropriate indicators, setting up baseline surveys or informing on the changing situation of the actors related to the intervention. The goal of the methodology is to provide evidence-based elements, supported by indicators measured quantitatively or based on expert assessment, to answer the four framing questions on each value chain (VC): 1) what is the contribution of the VC to economic growth? 2) Is this economic growth inclusive? 3) Is the VC socially sustainable and 4) Is the VC environmentally sustainable? Typically, each study has four team members: an economist, a social scientist, and environmental scientist specialising in Life Cycle Assessment, and a national expert from the country where the study is being undertaken.

To date, some thirty-five VC studies have been undertaken across the globe on a range of commodities and a further fifteen are scheduled over the next two years. Besides the overall management, NRI has also provided technical expertise in fourteen of these studies.

Cattle value chains in Southern Africa were reported in NRI's Annual Review 2017–2018; this edition features developments on value chain studies on cashew in Sierra Leone and vanilla in Papua New Guinea.



Attieke, a dish made from cassava, being steamed at a market in Côte d'Ivoire.

# Vanilla's value in Papua New Guinea: enhancing sustainable development?

Claire Coote and Richard Lamboll

**Vanilla is second only to saffron in value and can be worth more than silver by weight, though the global market is characterised by extreme price fluctuations. Around 80% of global annual production, around 2,000–3,000 tonnes, comes from Madagascar off the coast of east Africa. Other tropical countries have tried to seize a share of this lucrative market, including Papua New Guinea (PNG) in the southwestern Pacific Ocean, which currently produces approximately 10% of world supplies.**

A team from NRI, the Instituto Superior de Agronomia, Portugal and PNG's University of Technology undertook a review for the EC's VCA4D project implemented by Agrinatura, to ascertain whether the vanilla value chain contributed to inclusive economic growth and social and environmental sustainability. Work focused on East Sepik province where 80% of the vanilla crop is produced. At the time of the study, global vanilla prices were very high due to the impact of the recent tropical cyclone Enawo on production in Madagascar.

The team carried out stakeholder interviews, focus group discussions and a household survey, which highlighted the importance of vanilla to the East Sepik economy, while raising social and environmental sustainability concerns. The major advantage of vanilla is that men, women and youth with rights to land in the right agro-ecological zone, can plant a small area and make a good income, although demands on labour, including for hand pollination, are high. Vanilla contributes to income for an estimated 17,000 smallholder households, many in remote areas. It also supports informal traders, exporters and service providers such as banks, freight forwarders and airlines; most of PNG's vanilla has to be airfreighted between the production areas and the export point. High-quality beans, cured by the growers, are exported to North America, Europe and Australasia, while lower grades go mainly to Indonesia.

Women participate in and benefit from the vanilla value chain in PNG, although there are major challenges for gender equality, especially regarding men's greater access to and use of household income. When prices are good, vanilla proceeds appear to contribute to improving household nutrition security and living conditions – farmers and traders are encouraged to invest their earnings into assets for continued future benefits. However, there are concerns regarding health and negative social outcomes; there is a tendency for incomes to be spent by men on alcohol which can exacerbate abuse and fuel domestic violence against women.

Further challenging characteristics include high dependence on cross-border exports to Indonesia; low yields, estimated at 56kg per hectare a year for cured beans, and the substantial expansion in land area planted to vanilla at the expense of primary/secondary forest.

The team's analysis highlights the importance of improving productivity and quality, encouraging food-cash crop intercropping, adapting growing techniques to climate change, recognising the role of women and youth in the vanilla value chain and ensuring appropriate policy and extension support. Such interventions should consider collaborative partnerships involving public, private and civil society organisations. Ultimately, an optimal vanilla value chain will require improving trust and relationships between farmers, farmer organisations, traders, exporters and importers.




Dr Veronica Bue, vanilla value chain national expert, talking to male vanilla farmers at Situm village, Morobe province, Papua New Guinea.

# Cash for cashews: analysing the value chain for inclusive development in Sierra Leone

Ravinder Kumar

**Many people know cashew nuts as a favourite snack or ingredient, though unless you've seen them growing, you might be surprised to know that the 'nut' is actually a seed, which grows from the bottom of a curious 'cashew-apple'. Originally from Brazil, the plant was taken to Goa in India by the Portuguese, from where it spread throughout south-east Asia and Africa. Today, almost 4 million metric tonnes of cashews are produced globally. Most of Africa's cashew is grown in west Africa, where it is one of the most important emerging cash crops in the region.**

Along with the major producers, Côte d'Ivoire, Guinea-Bissau, Nigeria, Benin, Burkina Faso, Ghana, Senegal and Gambia, Sierra Leone has a burgeoning cashew value chain. Under the VCA4D project, a team of four experts conducted a rigorous cashew value chain analysis in the country. NRI Associate Professor Ravinder Kumar contributed as the team's social expert, exploring whether the value chain is socially sustainable and whether growth in the value chain can be socially inclusive. The study results show that with a 2.5-hectare cashew farm (median cashew land in the country), a farmer in Sierra Leone can, under most conditions, earn annual profits (after deducting cost of production) almost equivalent to the living wage (USD 800) in the country. Cashew can, therefore, be a poverty alleviation tool. This is achievable if high-quality planting material is provided to the farmers along with the necessary management inputs and accessible finance.

The study identified two clear risks relating to working conditions in the value chain: a) The wages of farm-level workers, working on farms and mid-size/large cashew plantations are very low – much less than minimum wages, and b) the 'informal' nature of wage employment in the cashew value chain makes it difficult to implement or monitor compliance with labour standards.

On food and nutrition security, the findings suggest that cashew value chain development has the potential to increase the stability of incomes and food security for cashew producers and processors. The study further illustrated existing 'social capital' in the value chain. The cashew value chain has seen many novel experiments such as the 'block farming model' from the company Balmed and a 'semi-block farming' concept promoted by Italian NGO, COOPI. In such models, the harvest is shared among the company, landowners and youth groups/workers, using a formula based on the international produce price. The landowners allow youth workers to access a designated plot, the company supplies farm and management inputs, and all three groups share in benefits arising from the sale of cashew. The study suggested that the development and strengthening of these initiatives are important to achieve the country's export potential of approximately 10,000 tonnes of cashew.

Women are economically very active and play significant roles throughout the cashew value chain. Whilst men mostly control incomes from cashew farming, women have direct control of incomes earned from processing and trading engagements. More participation for cashew producers and processors in existing Farmer-Based Organisations and Agri-business Companies can be encouraged as these organisations can provide various services to their members. Cashew Processing Units, established by COOPI, are starting to play a role in input and output markets. The social analysis shows that the cashew value chain currently carries low social risks and offers promising opportunities for pro-poor and inclusive economic development in the country.

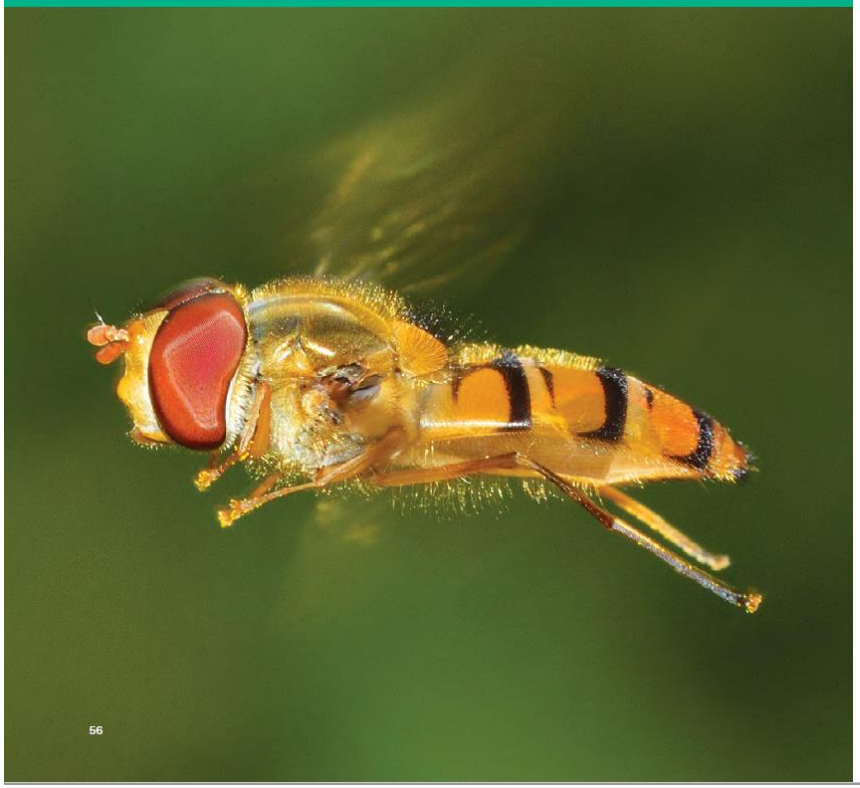
The study findings were shared and deliberated on in a workshop in April 2019 in the country, where over 40 decision makers, programme and policy actors participated. The study is contributing to the development of a cashew promotion policy framework in the country.



Cashew growing in the field: the bright orange fruit is the 'cashew-apple', below which the cashew nut grows as a seed.

# INSECTS, PESTS AND HUMAN AND PLANT HEALTH

**At NRI, we deal with both beneficial and harmful insects, and other pests including rodents and birds, which have an impact on human and plant health. Here we highlight examples that show how our work in this area is harnessing the beneficial roles of insect pollinators and natural pest regulators to boost crop production, developing sustainable pest management and building understanding of monkey malaria in humans.**





## Of pollinators, predators and parasitoids: boosting beneficial insects for better agroecosystems >

**NRI works on a range of beneficial insects – some provide pollination services, which are essential for making sure that crops and wildflowers grow, others are natural pest regulators which help to reduce farmers' reliance on synthetic insecticides. The overall aim of this work is to ensure food security in a sustainable way for a growing population.**

### Beneficial hoverflies provide pollination and crop protection services

Don Reynolds

**A recent study on migratory hoverflies shows their significant contributions to ecosystem services – their larvae prey on many types of pest aphids making them important biocontrol agents, and the adults, considered second only to bees as the most effective pollinators, feed on many kinds of pollen. Migratory hoverflies also provide food for a range of predators including birds.**

NRI's Dr Don Reynolds is part of an international group of scientists that have used entomological radar to study hoverflies flying up to 1km high in the skies above southern England. Over a ten-year period, Dr Reynolds and his colleagues examined the biomass of, and seasonal flux in, numbers of migrant hoverflies. The study was led by the University of Exeter with collaboration between NRI and Rothamsted Research in the UK, Nanjing Agricultural University, China, and the Max Planck Institute, Germany and partly funded by the Biotechnology and Biological Sciences Research Council (BBSRC).

The team found that up to four billion hoverflies migrate to and from Britain each year, significantly more than previously thought, and unlike other species of pollinators which are in decline, hoverfly numbers have been relatively stable over the last decade. The study also shows that hoverfly migrations are adaptive, showing a strong seasonal preference in their migratory flight direction, and that hoverflies are very mobile, allowing them to locate the best habitats. The dual role and behaviour of hoverflies make them uniquely beneficial to humans.

A close-up of a hoverfly, mid-flight.

# Predators and parasitoids: controlling legume pests the natural way

Victoria Woolley, Sarah Arnold, Steve Belmain and Phil Stevenson

**Predators such as ladybirds directly consume the pest, whereas parasitoids, like parasitoid wasps, lay eggs on or inside pest insects that grow and ultimately kill the pest. Non-crop habitats such as field margins provide shelter, alternative prey/hosts and nectar to support populations of natural enemies. The biology of natural enemies and the importance of non-crop habitats to these insects in smallholder farming ecosystems is poorly understood, particularly in Africa.**

The NaPROCLA project (**N**atural **P**est **R**egulation on **O**rphan **C**rop **L**egumes in **A**frica) aims to identify the most important natural enemies in East African smallholder farms and develop techniques to augment their populations through improved agroecosystems management. During the first year of this project, researchers from NRI, Lilongwe University of Agriculture and Natural Resources (Malawi), Nelson Mandela African Institute of Science and Technology (Tanzania) and Egerton University (Kenya) identified the most common natural enemies in smallholder bean farms by trapping insects and performing DNA barcoding. One of the most important natural enemies identified so far is the parasitoid wasp *Aphidius colemani* which parasitizes black bean aphid, a destructive pest of beans. Future work will focus on identifying which field margin plants are best able to support *A. colemani* and determining how this can be implemented in the field. More information on the project can be found at www.agriculturalecosystems.org. *Funded by GCRF-BBSRC under the Sustainable Agriculture in Sub-Saharan Africa (SASSA) call.*

**One of the most important natural enemies identified so far is the parasitoid wasp *Aphidius colemani***



Parasitoid wasp viewed under a microscope. It was caught during field work for the NaPROCLA project in Tanzania and will be identified by DNA barcoding.

# Midges guide the scent of success for better cocoa pollination

Sarah Arnold

**Tiny midges are the pollinators of cacao flowers, from which we get cocoa beans, the raw material for chocolate. Until now, little was known about how the midges find these flowers. Together with researchers in the UK, Trinidad and Tobago, Jamaica, Argentina and Australia, NRI's Sarah Arnold was part of a project aimed at finding out whether the scent of the flower helped the midges to find it, with the ultimate aim of understanding how to improve pollination. The project, known as 'CocoaPOP', was led by Phil Stevenson, with Steve Belmain, David Hall, Dudley Farman, and Dan Bray joining Sarah on the NRI team.**

To discover the smell of the cacao flower, the researchers used specialist entrainment apparatus to extract the odours from flowering trees on farms in Jamaica and Trinidad and Tobago. The apparatus works by blowing filtered air around the flower and drawing the air sample into a tube where the chemicals responsible for the scent can be captured for later analysis. NRI's chemists were able to use these odour samples to build a more complete picture of the scent of the flowers than had ever previously been possible, including finding that older research had wrongly identified some of the chemicals. With this new information, they attempted to replicate the bouquet in the lab, to find out how the midges reacted to this odour.

With the help of a midge specialist in Australia, and assistance from Mr Jude Lee Sam, a Trinidadian cacao farmer, the UK and Trinidadian researchers captured live midges from cacao farms and bred them in the NRI labs – the first time these tiny insects had been bred over multiple generations in a laboratory, anywhere in the world. This meant that NRI researchers were able to test whether the midges liked both the natural scent of cacao flowers, and the laboratory-replicated version. They seemed to like the flowers' natural scent, though not all species, and not all the time. But they appeared indifferent to the replica scent bouquet, which lacked a few minor chemicals that are particularly hard to obtain and could be more important than previously realised in attracting midges to flowers.

Understanding how pollinators find and choose flowers can help us breed crops with more attractive flowers, and design ways to conserve them better. Now we know we can breed midges from cacao farms in the lab, there are so many more questions we can ask and hopefully improve production of cocoa. Find out more about the project: http://www.cocoapop.eu/

*This project was co-funded by the EU's Programme for Science and Technology with the African, Caribbean and Pacific Group of States (ACP S&T II).*



A field assistant at La Reunion Cocoa Research Station in Trinidad demonstrates hand pollination of cocoa flowers. Without insect pollination, the only alternative would be to pollinate the flowers by hand – a complex operation with such small and delicate flowers.

# Seeking solutions to serious insect pests targeting agriculture and forestry >

**NRI works to combat a wide range of serious insect pests threatening agriculture and other industries which are essential for food security and human livelihoods. By understanding how these pests interact with each other and their surroundings, our Chemical Ecology Group is developing sustainable ways to control them that do not negatively affect the environment.**

## Black vine weevils and the scent of attraction: pioneering trap targets serious pest

David Hall

**Black vine weevils are a serious problem for growers trying to produce fruit, vegetables and flowers: they feed on virtually any plants they can find, they don't have to mate to produce large numbers of eggs, and they are notoriously difficult to get rid of. The caterpillars eat the roots of plants and can live in the soil where they are very well hidden and protected. By the time they transform into adult weevils, the damage is often done.**

Insecticides targeted to the caterpillars can be applied to seedlings before planting, or sprayed on the crop against the adults. However, only a small number of insecticides are allowed, and all growers want to avoid using them on food crops because of the possibilities of leaving chemical residues on their produce, making it potentially unsafe for consumers and unmarketable.

NRI scientists have been working with colleagues at Harper Adams University and ADAS, an agricultural and environmental consultancy in the UK, to identify the naturally occurring chemicals in plants which attract the vine weevils. The vine weevils 'smell' the chemicals with their antennae, and NRI scientists used a technique pioneered at NRI to record electrical responses from the antennae when it is stimulated by an attractive chemical. The scientists identified a blend of chemicals which was tested at Harper Adams in the laboratory and shown to attract vine weevils into prototype traps they had developed. This was the first time it had been possible to lure vine weevils into traps with a blend of chemicals, and opens up the possibility of trapping vine weevils to prevent them from eating crops and laying eggs to produce more vine weevils.

The trap is being tested by growers, and the blend of chemicals is being further refined in laboratory tests. The aim is to develop a tool for gardeners and growers that stops vine weevils destroying their crops that doesn't use insecticides and is safe to use for both users and consumers.



A close-up of a black vine weevil on a green plant.

# A novel solution for controlling the large pine weevil, the silent tree killer

David Hall, Dan Bray, Steve Harte

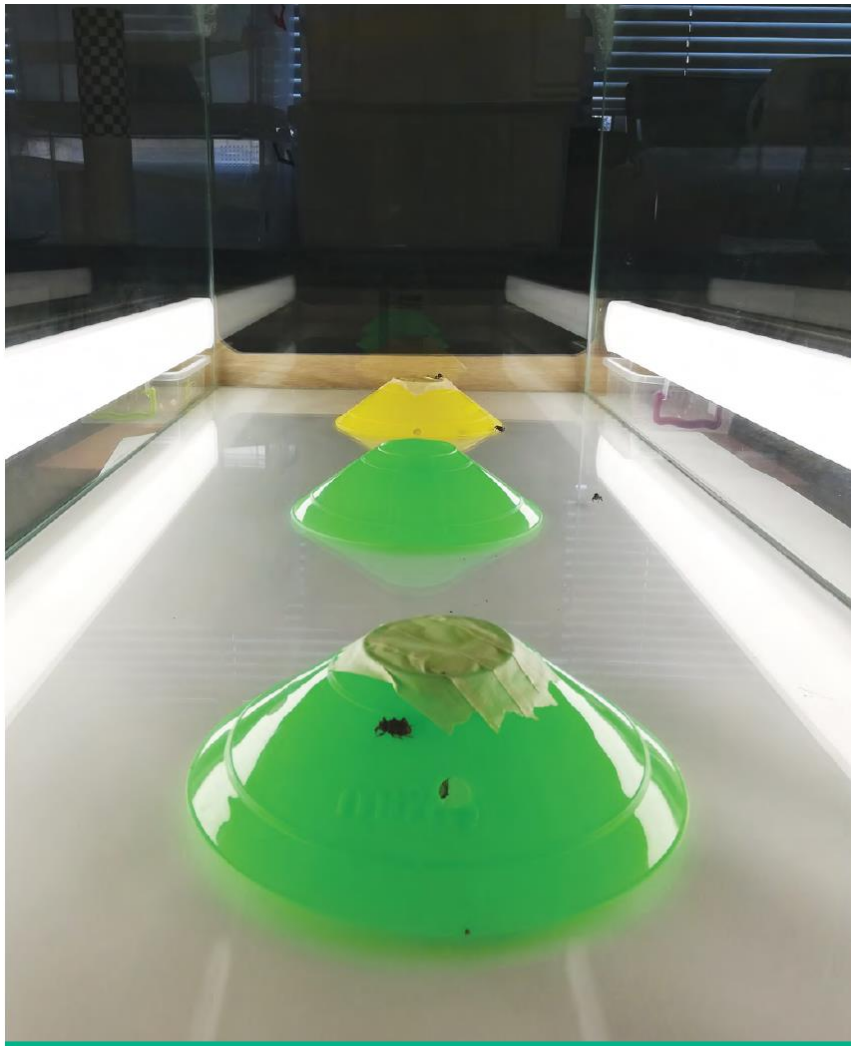
**The forestry sector contributes over £1 billion to the Scottish economy and sustains more than 30,000 jobs. Forestry also plays a central role in tackling the Climate Emergency and moving to a low-carbon economy by absorbing carbon dioxide from the atmosphere and turning it into sustainable, renewable materials for construction, paper and biofuel. Furthermore, well-managed woodlands provide significant environmental benefits, help to improve people's quality of life and support a diverse range of species.**

The large pine weevil, or *Hylobius abietis*, is a devastating pest to the forestry industry across Europe, causing up to 100% losses of new plantings and undermining the ability of forests to continue providing the benefits we derive from them. The weevils' 'nurseries' are in dead felled tree stumps, where they lay their eggs from which larvae hatch and adults develop. The weevils emerge from stumps as adults up to 5 years after an initial clear felling, and feed on any tree saplings subsequently planted.

Current control strategies involve leaving clear-fell sites fallow for up to 5 years, with associated economic losses, or using insecticides in tree nurseries prior to planting or in the forest after planting – an approach that is effective in most cases. However, with the reduction of pesticide use being a requirement of sustainable forestry, this project will create a powerful new tool that will help achieve that aim.

NRI, in collaboration with Forest Research and Sentomol, a company specialising in delivering pest management solutions based on semiochemicals (such as pheromones), is developing a novel solution to controlling this pest. The project is funded by Forestry and Land Scotland and Scottish Enterprise. NRI will identify attractive chemicals to lure the weevils into specially designed catch-and-release devices, where they are infected with biological control agents such as nematodes or fungi. These agents will be specific for insects like *Hylobius*, and can be passed from weevil to weevil in the forests. This approach should provide long-term management of *Hylobius* weevils over wide rather than small areas, with the benefit of no secondary or lasting effects on the ecosystem or wider environment.





In the lab, this glass box houses some large pine weevils with a number of green and yellow plastic cones in the centre, with strip lights down each side. This set-up is designed to test the effects of colour and scent on Hylobius attraction, in an arena designed to be sensory neutral.

# Fall Armyworm: using fungi to halt its devastating march through Africa and beyond

Mandela Fernandez-Grandon

**In 2016, scientists found fall armyworm in West Africa. Soon it spread across the continent, where it is present in at least 18 countries to date. However, it didn't stop there, and last year it was found in East Asia with fear of a similar spread. The pest is not a 'worm' at all but actually a moth species and a major threat to agriculture, with the caterpillars feeding on nearly 100 different species of plant and causing losses of up to a third of staple foods such as maize in some countries. The pest first arrived from the Americas, where, although a significant problem, it is better regulated by the local predators and pathogens.**

One of the pathogens that naturally controls the pest is fungi which, while harmless to humans, will infiltrate the defences of the caterpillars and reproduce inside them releasing toxins in the process. When the fungi have killed the caterpillar host, they will develop spores ready to be picked up by another unsuspecting caterpillar. Unfortunately for farmers, the pest appears to have arrived without its antagonists.

Working with partners in the affected areas, a team at NRI is looking at finding ways that farmers could introduce these fungi, and potentially enhance their speed of action by combining them with other natural products. The Chemical Ecology team at NRI received fall armyworm specimens in China, which had been collected by project partners from fields in Fujian province where the pest is a growing problem. The team brought the specimens back to the NRI laboratory where they have since been successfully reared. Experiments are now commencing to see which fungi the armyworm succumb to and how best to integrate this into a sustainable solution for growers.

Experiments are commencing to see which fungi the armyworm succumb to and how best to integrate this into a sustainable solution for growers.



A fall armyworm marches its way across a leaf.

# Researching the link between deforestation and monkey malaria in humans >

Frances Hawkes

**Malaria is a deadly disease affecting over 200 million people every year. The deadliest species of malaria parasite in Africa is Plasmodium falciparum; other species commonly found in humans are *P. vivax*, *P. malariae* and *P. ovale*. The parasite is usually transmitted from one person to another in the bite of infected mosquitoes. However, in 2004, the malaria species *P. knowlesi*, which had previously only been found in Old World monkeys, like the long-tailed macaques, was detected in humans in Sarawak in Malaysian Borneo. Since then, the number of human cases of *P. knowlesi* has grown, spreading to most south-east Asian countries. In Malaysia, it is now the most common form of malaria in humans.**

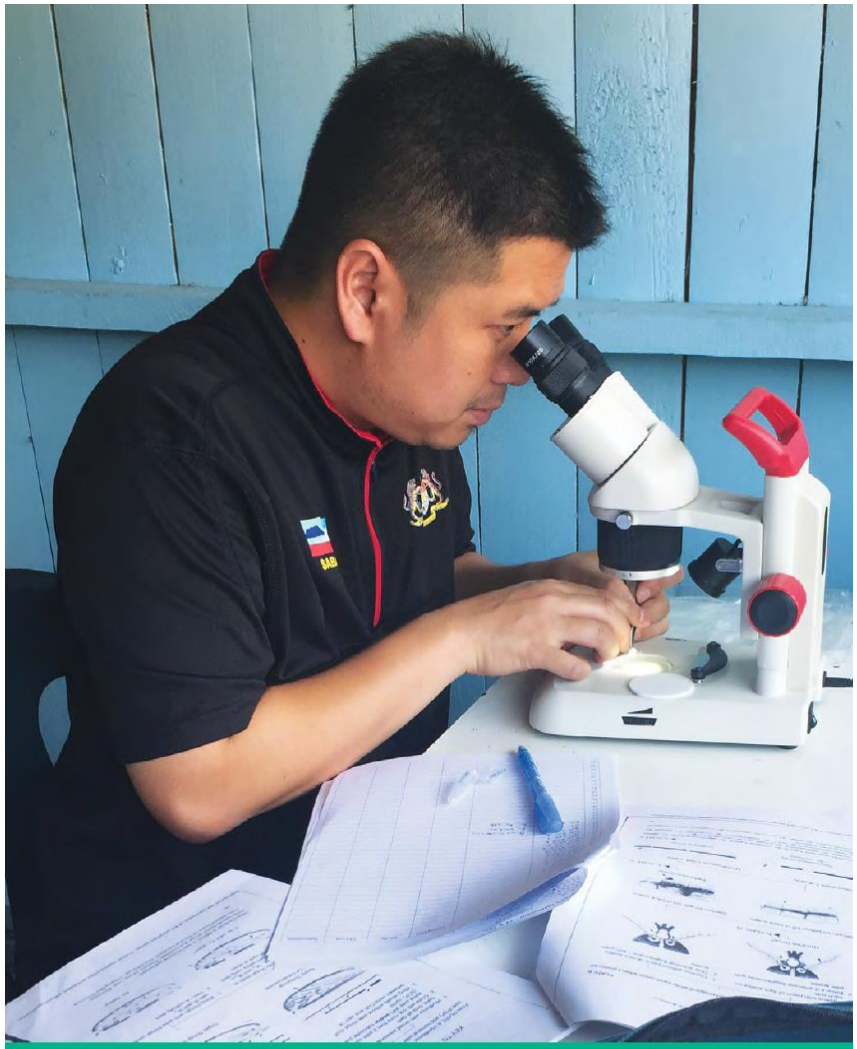
The crossover from monkeys to humans is concerning because people tend to have very little immunity to protect them if they become infected. The standard measures which help humans avoid being bitten, such as bed nets and repellents, cannot be applied to wild monkeys, presenting a real challenge to controlling the spread of disease.

NRI's Dr Frances Hawkes worked with Professor Chua Tock Hing of the Universiti Malaysia Sabah on a study, published in 2019, to examine whether the rapid environmental change in the region has fundamentally altered interactions between the mosquito vectors of *P. knowlesi* and humans, and that this in turn has resulted in disease 'spillover' from macaques into humans. Malaysia had the highest rate of forest loss of any country between 2000 and 2012, largely driven by the demand for oil palm and other tropical crops.

In collaboration with the Ministry of Health, the project sought to explore the relationship between deforestation and the location of Anopheles mosquitoes, the females of which transmit malaria. The team studied the mosquito species and their level of infection with different malaria parasites in two highland areas of Malaysian Borneo – Ranau and Keningau districts – where cases of *P. knowlesi* were on the rise.

Dr Hawkes and the team sampled mosquitoes in three different habitat types: forest edges, plantations and human settlements, to see whether the species and their parasites differed between the various habitats. The team reported finding *Anopheles donaldi* mosquitoes infected with *P. knowlesi* parasites for the first time, as well as the confirmed local vector *Anopheles balabacensis*. This has implications for which mosquito control interventions are deployed to reduce *P. knowlesi* transmission, because the different behaviour of these two species may require different approaches to be effective. *Anopheles donaldi* were found in greater numbers where the forest was more fragmented by clearings, plantations and other land uses, suggesting they are exploiting new niches created in these disturbed landscapes. In general, the forest edge areas sampled had more mosquitoes and a greater diversity of mosquito species than were found in plantations. Human settlements had the fewest mosquitoes and the smallest number of species. The results are significant because a key step in combating any species of malaria parasite is understanding how the disease is transmitted, by which mosquitoes and where.





Dr Benny Manin, from collaborating institute Universiti Malaysia Sabah, looks through a microscope to identify the species of mosquitoes collected from different habitats in the highlands of Malaysian Borneo.

# RESEARCH-LED TEACHING >

Contact: Claire Coote

NRI's research responds to global challenges. Our researchers also supervise the research of our PhD students and teach on our undergraduate and postgraduate programmes, with new elements from their research and enterprise work being rapidly introduced into individual courses and lectures. In this section, NRI alumni give their perspectives of studying an Undergraduate degree with us and how this helped shape their future, discover our specialist Master's degrees, and hear about our burgeoning student community with 'NRIPS', the Natural Resources Institute Postgraduate Society.

Harrison Lambert, Biology graduate and NRI PhD student, at the Medway campus.



## My Future in Five: undergraduate perspectives of life and study at NRI and beyond

Linden Kemkaran

**'My Future in Five' is a series of articles created by NRI Communications Officer, Linden Kemkaran, who chats for five minutes with NRI alumni and current students, asking them all about their time studying at NRI, and how they've used their degrees to get where they are today or where they hope to get to with an NRI degree. This selection of excerpts introduces former and current students from our undergraduate degree programmes in Biology, Environmental Science and Physical Geography.**

### Harrison Lambert, Biology

*Harrison Lambert studied for his undergraduate degree at NRI, and after exploring a few different career avenues, he has returned to study for his PhD. A life-long lover of the natural world, Harrison wanted a career that combined ecology, agriculture, and helping those in need.*

"I originally applied to study biological sciences at the University of Greenwich, but I was offered a place on the integrated Master's in Biology (MBiol), run jointly by NRI and the University's School of Science. This introduced me to NRI and its 'green sciences' programmes.

Insects have always been a big part of my life, so I jumped at the chance to study Comparative Physiology (a module on the Biology programmes). A-Levels (further education qualifications in the UK) only really covered human biology and this showed me the different physiology of various animals and insects which I found fascinating. It's also where I first met my PhD supervisor, Dr Frances Hawkes, when she delivered a lecture that compared general insect physiology to other physiological systems. In my second year I got more choices and I started picking some modules taught by NRI specialists, and then by my third year I was solidly interested in ecology, but also entomology (the study of insects and their relationship to humans, the environment, and other organisms) with a special focus on pests.

After I graduated, I didn't really know what I wanted to do. I applied to teaching, which is something that I'm still interested in and may go back to in the future, but at the time just didn't feel right. I also applied to the Copper Rivet distillery in Medway and was offered a job. I saw it as a once-in-a-lifetime chance as it's a hard industry to get into and I was there for nearly two years working as a distiller. It's a grain-to-glass distillery and we brewed wheat, barley and rye before distilling them into various products like whisky, gin and vodka. I started a diploma there, but bizarrely once I got good at the job it became less interesting to me. I guess the insects were calling me back!

I started attending public lectures at NRI and seeing old friends and faces again. I mentioned that I was looking to do a PhD and received lots of encouragement. And then this amazing opportunity came up to do a PhD looking at the interactions of climate-adapted rice agricultural systems, and its subsequent effects on disease vector biology and ecology – or how different forms of rice cultivation in Tanzania, including those adapted to climate change, affect the ecology of mosquitos and their malaria transmission.

Coming back to NRI felt like coming home. Being surrounded by all these incredibly clever people that have similar ideals to me is great. I like it here, and I like the people here. I grew up in Medway, about five minutes from NRI but I didn't know of its existence and the fundamentally important work that it does, before studying here. It has such a rich history, and to be able to say that I am part of the organisation makes me quite proud."

## Louise Sinnock, Environmental Science

*Mature student Louise Sinnock is studying for a degree in environmental science. Louise gave up her job as a veterinary nurse to pursue her ambition to learn more about the natural world.*

"I loved veterinary nursing but the thrill had gone. Every day was the same; running the nurse clinics, weighing the animals, booking appointments. It had become more of an administrative role and I felt I needed something to change. I've got three young sons aged 10, 8 and 4 and I was thinking – is this all I'm ever going to do? Get up, go to work in a job where I feel unfulfilled, then come home and be mum, which is amazing, don't get me wrong – being a mum is the best part of my life – but I wanted to do something for me.

I searched online for courses and I found out who the programme leader was for the University of Greenwich environmental science degree and I emailed him directly. Dr Peter Burt, a Principal Scientist in NRI's Agriculture, Health and Environment Department invited me to come and see him and we talked for a bit and I realised I could study for a degree full time.

Dr Burt is now my tutor and is incredibly helpful and supportive of my studies, as is everyone at the University. In my first year as an undergraduate, I did an internship at NRI and worked with PhD students and NRI researchers who study crop pests and vector roles within malaria transmission, and I finally worked out where I see myself in the future.

I've always been passionate about the natural world and from a very young age I was obsessed with animals; I'd watch endless documentaries. The environmental science degree is perfect as it has a bit of everything. We look at geographical and biological subjects or natural processes, from weather systems, environmental change and geology, to evolution and ecology and how it all interlinks and has an impact overall. I'm currently doing a project in environmental archaeology, looking at how evidence found today can tell us about past societies and their interactions and impact within the environment.

Now in my second year, the deadlines are closer together and the topics more in-depth, so I've had to readjust a bit. I'm using my knowledge and experience of the mosquito's role in malaria transmission that I gained through my internship at NRI, to help me finalise my dissertation. After that I'd like to pursue a PhD and then go into research.

Talking directly to Dr Peter Burt was crucial in establishing if I was right for the degree, and if the degree was right for me. He also saved me time by taking into account my 'real-world' experience working at the vet's surgery and all the conservation work I'd done, negating the need to do an access course. My only regret is that I didn't make the move sooner."



Wearing a white lab coat and protective glasses, Louise Sinnock, Environmental Science student, takes part in lab-based activities at the Medway Campus.

## Jessica Sanders, Geography

*Jessica Sanders graduated from the University of Greenwich in 2018 with a first-class degree in Geography BSc (Hons). She trained to be a teacher but found the pull of university life too strong, and now works at Greenwich's Medway campus as an Employability Officer.*

"When I was studying Geography for my degree, the programme was incredibly interesting and varied. We covered meteorology, climate, chemical analysis of rivers, air pollution, and some human geography – for instance – why cities are getting hotter.

I chose the University of Greenwich as the programmes had more physical geography elements compared to others, and when I came to an open day, I found everyone to be really welcoming and friendly and the facilities, like the lecture theatres for example, were all excellent. The Medway campus in Chatham also had the added benefit of being close to where I lived which was a really important factor as I didn't want to commute or live away from home.

I really enjoyed it all and now that I work here on the same campus, I sometimes fantasise about how nice it would be, being back in lectures! My favourite part of the programme was the field trips, being able to put into practice what we did in the classroom. We visited Spain, the Lake District and the Peaks.

My current job doesn't specifically use my geography qualification, but my transferable skills are being put to good use all the time. It's so nice coming back here to work – I always loved being on the Medway campus, with its sense of history and the beautiful old buildings, and I can still use all the facilities we did as students. It's great that I know my way around already and see lots of familiar faces in my day-to-day work.

The advice I'd give to anyone considering studying geography as a subject is just do it! It's such a varied and interesting subject and it can lead to so many career options. It gives you a wider perspective when you graduate and you can apply to most jobs rather than being narrowed down to just one particular path."

> The programme was incredibly interesting and varied. I chose the University of Greenwich as the programmes had more physical geography elements



Jessica Sanders, Geography graduate, on graduation day in front of Rochester castle.

# Your food and the climate crisis: discover more with a postgraduate degree at NRI

Gillian Summers

**Think 'climate change' and you might not necessarily envisage your favourite food. But if you care about climate change and the future of our planet, then caring about the origins of the food on your plate would be a smart move.**

By studying at NRI, students can work towards a world-changing career in food, environment, agriculture or sustainable development, discover how climate change impacts on our food supply, and help devise solutions to this and other global challenges.

NRI has a range of one-year programmes starting in September, some of which also have a January start, providing opportunities for those looking to enhance their career in the UK or overseas. From September 2020, we are adding two MScs to our degree portfolio, both of which will run for two years and include a one-year paid industrial placement.

Postgraduate programmes at NRI are thorough and practical, designed and taught by researchers responding to real-world problems – you can find out more about our projects and approaches in this Annual Review and on our website www.nri.org.

Think once more about the food you eat: for example, a chicken and avocado sandwich and a coffee – a simple meal with complex issues. Each element links to NRI's postgraduate degrees:

Was the chicken from your sandwich reared in suitable conditions and given adequate feed, adhering to food safety standards? By studying **Applied Food Safety and Quality Management** PGDip/MSc, you'll learn from food sector experts, have membership to the Institute of Food Science & Technology (IFST). You can sit the Royal Society for Public Health (RSPH) Level 3 Award in HACCP for Food Manufacturing, and enhance your chances of getting a great job after graduation, with 100% employment rate for alumni. You can also learn from home with our part-time *Food Safety and Quality Management e-learning* MSc/PGDip/PGCert, giving you the chance to enhance your skills and industry knowledge as you study alongside your day job.

Recent news reports show how some avocado plantations are unsustainably using water and soil to try and keep up with consumer demand. Do you know how the avocado you eat was grown and whether the farmers received a viable price? Study our **Agriculture for Sustainable Development** MSc, where you'll learn about topics like the different drivers of deforestation and sustainable sourcing with NRI's experts on sustainable agriculture and agroecology, and discover our research into assessing the impact of Fairtrade on coffee farmers.

How was it decided that chicken and avocado was a good mix for a sandwich? On the **Food Innovation** MSc, students learn to design the next big food trend with food industry partners. Enhance your skills, knowledge, tools, creativity and sustainability within the food chain and develop practical solutions and value-added products and processes.

Have you thought about where your coffee comes from? With our Master's in **Global Environmental Change**, you'll gain a solid foundation in environmental science, data collection and analysis, and land/water-use interactions. You'll learn about the links between climate change and global trade, corporate social responsibility, and the management of responsible natural resources.

Find out more: www.nri.org/study/postgraduate-taught-programmes



A student prepares some fruit and vegetables for a practical session in the NRI food lab.

# Meet NRIPS, the NRI Postgraduate Society

NRIPS Committee

**The Natural Resources Institute Postgraduate Society, known as 'NRIPS', was formally created in February 2015, with the aim of enriching the academic, social and intellectual interests of its members. Run by postgraduate research students for postgraduate research students, the society is governed by a committee structure that is elected on an annual basis by the NRI postgraduate student body.**

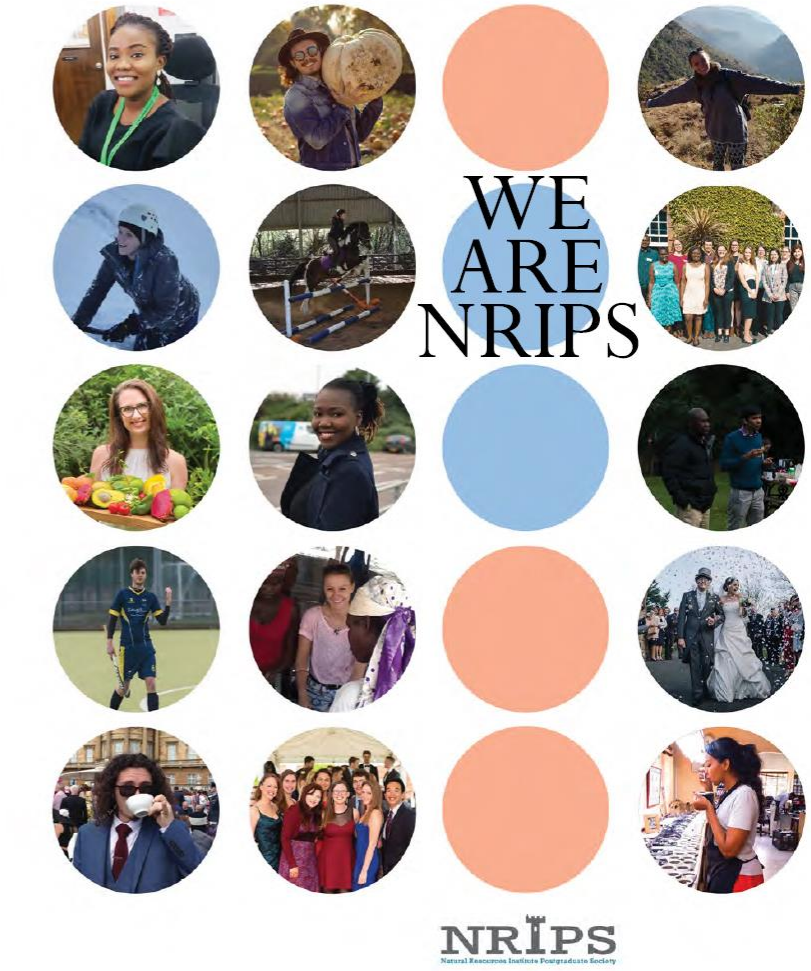
The society meets monthly for a range of activities including lunchtime presentations by PhD students, academic training sessions, workshops with peer-learning experience, and the opportunity to discuss issues of relevance to the NRI postgraduate student community, such as publishing academic papers, qualitative research methods and post-PhD career options.

NRIPS organises and runs the Annual NRIPS Symposium, first conceived in 2016 as a way for PhD and MPhil students to present and discuss their work on a professional platform, sharpen their communication skills and foster networking across the Institute. The Symposium provides a welcoming atmosphere and an appropriate academic environment for NRI research students to showcase their research and gather valuable feedback from participants. The event's networking opportunities bring together students and staff from NRI's Research Groups and Development Programmes to explore research from different disciplines whilst enhancing the NRI research community.

Each NRIPS Symposium begins with a 'keynote speech' by a distinguished speaker. This is followed by three sessions, organised according to the stage of the students' research degree – early, middle, or final. This format optimises the time available and enables the audience to give focused feedback and advice. The formal presentations are accompanied by poster-viewing sessions and discussions, with certificates awarded for the best presentations and posters. An accompanying symposium booklet containing biographies and abstracts of the research students is produced and published by the committee.

NRIPS is also committed to organising monthly social events – from 'potluck' dinners, to bowling, ice skating, and movie nights, in addition to celebrating members' academic and personal milestones. Since its inception, the society has successfully organised and facilitated seasonal gatherings for the whole Institute, including the annual autumn picnic and Christmas party. New students are invited to join NRIPS, and the whole NRI community is welcome to take part in the society's activities and events.

To find out more, follow NRIPS on Facebook at NRI Postgraduate Society or on Twitter @NRIPSociety




A montage of photos of members of NRIPS – the community of postgraduate students at NRI.

# 125 years of the Natural Resources Institute

Andrew Westby

**2019 marked the 125th year since the opening of the Scientific and Technical Department of the Imperial Institute – NRI's oldest predecessor organisation. This important milestone is both a celebration of NRI's achievements and an opportunity to reflect on the story of our institute, including the colonial heritage that marked its formative years. NRI today is a vastly different institute with an ethos and mission focused on sustainable development for all; we reiterate our position against any form of racism, discrimination or injustice, and remain committed to improving our institutional culture and practices. This self-reflection and commitment to change is particularly significant in 2020 – a year of global reflection and action on issues of race, gender and social difference. We reflect too on the changing relationship of scientific research to international development and on our contribution to today's shared agenda of the SDGs.**

Together with a team of colleagues, NRI's Director, Professor Andrew Westby, gave a public lecture in December 2019, explaining some of the complicated history of the Institute and its predecessor organisations, highlighting some globally important scientific contributions, prestigious prizes and awards, and the exciting work that NRI does today. Here is a snapshot of the lecture.

Conceptualised in the 1880s as a permanent exhibition site to commemorate Queen Victoria's Golden Jubilee, the Imperial Institute was designed to showcase and promote products from the British Empire, through a series of public exhibitions and galleries, and to advise on the utilisation and availability of raw materials. Its Scientific and Technical Department gathered information and undertook research on tropical products and their uses in industry and commerce. Over time, the focus shifted to include improving the productivity and storage of food crops, tackling pests and diseases and resource depletion, with the aim of improving food security, social and economic welfare and natural resource conservation. The Imperial Institute's research arm evolved into the Tropical Products Institute (TPI), established in 1958, and other specialist governmental organisations emerged, including the Centre for Overseas Pest Research (COPR) (formerly the Anti-Locust Research Centre) and the Land Resources Development Centre (LRDC).

In 1983, TPI and COPR were combined into the Tropical Development Research Institute (TDRI), while the LDRC retained separate status. In 1987, LRDC and TDRI were amalgamated to form the Overseas Development Natural Resources Institute (ODNRI) and the Institute moved to its current home in a former naval base in Chatham Maritime in Medway, Kent. ODNRI became NRI in 1990, and in 1996, NRI became part of the University of Greenwich.

Capturing 125 years' worth of research is a daunting task; highlights from the Anniversary lecture include our pioneering work on the important tropical root crop, cassava, locust control, the discovery of aflatoxin, controlling disease-transmitting species including tsetse and blackfly, climate change, and combating malaria with a novel mosquito trap. Our training expertise began in the 1990s with specialist courses on Natural Resources, Postharvest Horticulture and Grain Storage Management, and continue with our current Bachelor's, Master's and Doctorate degrees in a range of subjects related to food, agriculture, environment, and sustainable livelihoods.

In looking to the future of our Institute, we will seek to further strengthen our partnerships, forging closer, more inclusive collaborations and sharing knowledge with our partners along the food chain and across the world. We remain focused on working together to identify critical issues, undertake targeted research, and design sustainable interventions that make a difference.

**NRI staff at the Medway campus during NRI's 125th Anniversary year.**

## Annual Review story contributors

**Food systems for improved nutrition**

- Dr Julia de Bruyn, Senior Fellow in Food Systems and Nutrition
- Dr Kate Wellard, Principal Research Fellow - Natural Resource Management and Innovations
- Dr Aurélie Bechoff, Research Fellow: Food Technologist
- Dr Pamela Katic, Senior Social Scientist (Quantitative Socio-economic Methods)
- John Linton, Commercial Director

**Food loss, waste reduction and value addition**

- Dr Richard Colgan, Reader in Postharvest Physiology
- Dr Lori Fisher, Enterprise Development Fellow
- Dr Ros Fisher
- Clare Hopson, Postharvest Technical Assistant
- Dr Debbie Rees, Principal Scientist, Reader in Plant Physiology
- Karen Thurston, Postharvest Research Assistant and Facility Manager
- Dr Marcelo Precoppe, Crop Postharvest Technologist

**Sustainable Agricultural Intensification**

- Professor Jeremy Haggar, Professor of Agroecology
- Richard Lamboll, Principal Scientist: Socio-Economist
- Dr Lucie Büchi, Senior Lecturer in Crop Ecology / Researcher in Agroecology
- Dr Stefania Cerretelli, Doctor in Ecology

**Capacity strengthening**

- Dr Tim Chancellor, Director of Capacity Strengthening and Partnerships
- Claire Coote, Principal Economist

**Land, rural institutions, governance and finance**

- Dr Kate Wellard, Principal Research Fellow - Natural Resource Management and Innovations
- Professor Julian Quan, Professor of Land and Development Practice

**Root and tuber crops in development**

- Professor John Colvin, Professor of Entomology and Plant-Virus Epidemiology
- Mark Parnell, Commercial Manager
- Dr Sharon van Brunschot, Visiting Fellow in Agricultural Entomology and Plant Pathology
- Professor Andrew Westby, Professor of Food Technology
- Professor Adrienne Martin, Professor of Development Studies
- Dr Ola Ogunyinka, Monitoring, Evaluation and Impact Specialist

**Climate change, agriculture and natural resources**

- Professor John Morton, Professor of Development Anthropology
- Dr Conor Walsh, Environmental Scientist

**Gender and social difference**

- Dr Lora Forsythe, Associate Professor in Gender, Inequalities and Food Systems
- Dr Kate Wellard, Principal Research Fellow – Natural Resource Management and Innovations

**Sustainable trade and responsible business**

- Professor Valerie Nelson, Professor of Sustainable Development, Social Development Specialist
- Professor Andy Frost, Professor of Agri-Food Systems Innovation
- Claire Coote, Principal Economist
- Richard Lamboll, Principal Scientist: Socio-Economist
- Ravinder Kumar, Associate Professor of Monitoring and Impact

**Insects, pests, and human and plant health**

- Dr Don Reynolds, Fellow in Pest Behaviour
- Dr Victoria Woolley, Post-doctoral Research Fellow
- Dr Sarah Arnold, Senior Lecturer – Insect Behaviour and Ecology
- Professor Steve Belmain, Professor of Ecology
- Professor Phil Stevenson, Professor of Plant Chemistry
- Professor David Hall, Professor of Chemical Ecology
- Dr Daniel Bray, Senior Research Fellow in Chemical Ecology
- Dr Steven Harte, Post-doctoral organic chemist/ chemical ecologist
- Dr Mandela Fernandez-Grandon, Research Fellow in Behavioural Entomology
- Dr Frances Hawkes, Senior Research Fellow – Behavioural Entomologist

**Research-led teaching**

- Linden Kemkaran, Communications Officer
- Gillian Summers, Communications Specialist
- NRIPS Committee

**NRI 125**

- Professor Andrew Westby, Professor of Food Technology



## Photo credits

| | |
|---|---|
| Front cover: | Julia de Bruyn |
| Page 1: | Sharon van Brunschot |
| Page 3: | Clockwise from top left: R Brown; J Cross; Steve Belmain; Dr Martin JR Hall, Natural History Museum |
| Page 4: | Julia de Bruyn |
| Page 7: | Julia de Bruyn |
| Page 9: | John Linton |
| Page 10: | Debbie Rees |
| Page 13: | Richard Colgan |
| Page 15: | Marcelo Precoppe |
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| Page 80-81: | NRI |

## The NRI Team

**NRI's team is made up of over 130 members of staff including natural and social scientists, technicians, and specialists in project management and administration, communication, finance, IT and other fields. We are based at the University of Greenwich Medway campus in Chatham, UK, with many of our staff undertaking overseas assignments all over the world, working with international partners to achieve our mission.**

**To see the full list of staff and their contact details, visit: www.nri.org/about/organisation-and-staff/all-staff**

**Senior Management Team**

**Professor Andrew Westby,** Director of NRI, Faculty Director of Research and Enterprise

**Professor Ben Bennett,** Deputy Director of NRI, Deputy Faculty Director of Research and Enterprise

**Professor Adrienne Martin,** Director of Programme Development

**John Linton,** Commercial Director

**Dr John Orchard,** Director of Postgraduate Research Studies

**Dr Tim Chancellor,** Director of Capacity Strengthening and Partnerships

**Claire Coote,** NRI Teaching and Learning Leader

**Professor Vegard Iversen,** Head of Livelihoods and Institutions Department

**Professor Andy Frost,** Head of Food and Markets Department

**Professor Richard Hopkins,** Head of Agriculture, Health and Environment Department

UNIVERSITY of GREENWICH

NRI | Natural Resources Institute

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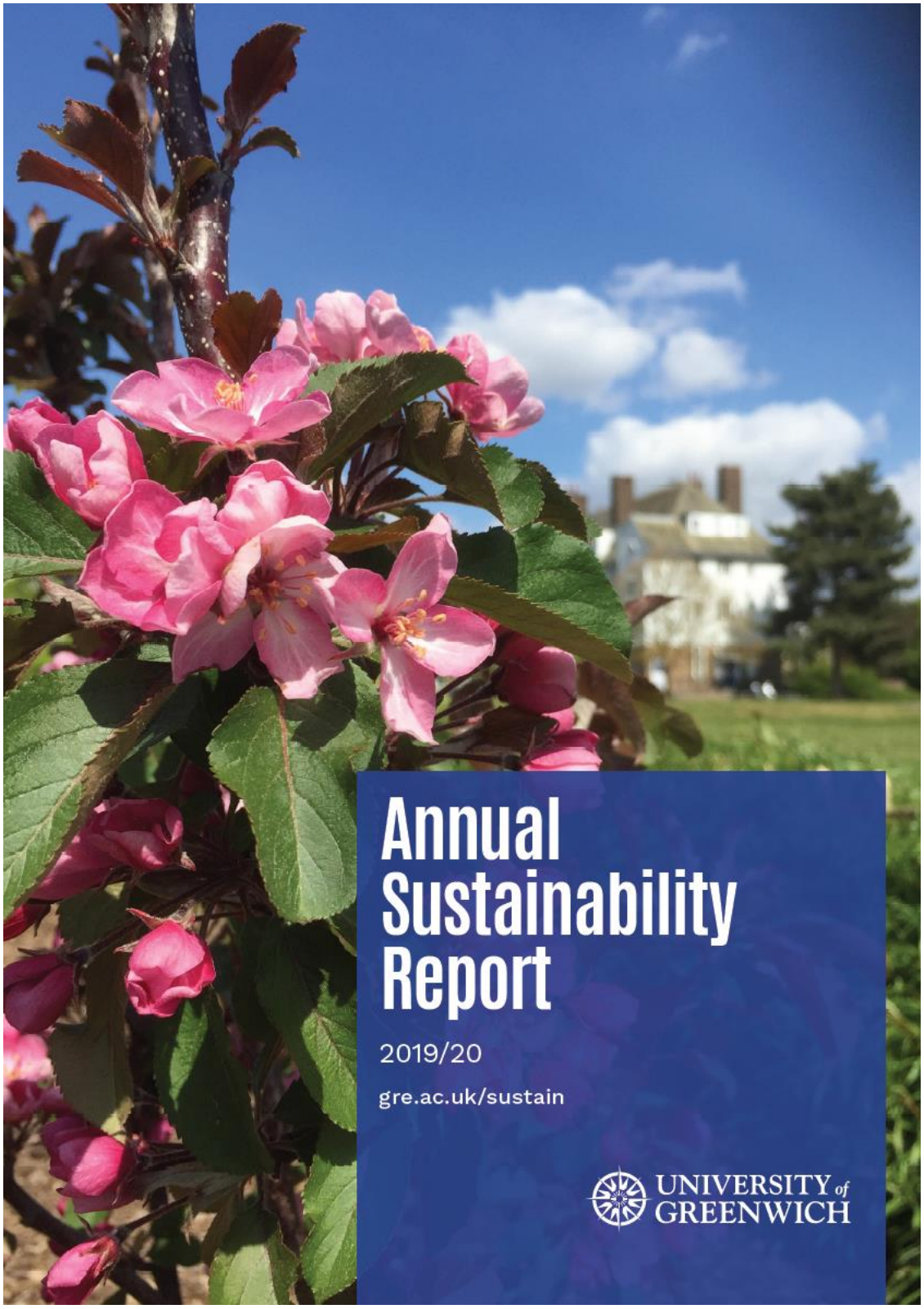
N151-3

**The latest University of Greenwich Sustainability Report is included here highlighting our commitment to sustainability and our progress in supporting the SDGs.**



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## Highlights

14th in People and Planet's University League

Ranked in the top 101-200 universities in the global Times Higher Education Impact Rankings

Fairtrade University Accredited since 2012

15 student volunteers receiving training and gaining skills through Student Switch Off

123,590 kWh and 38 tonnes (both estimates) of carbon saved though student resident actions through Student Switch Off initiative

36,209 kWh of electricity generated from Avery Hill's solar panels

46% reduction of carbon emissions against 2009/10 Carbon Management Plan baseline of a 40% reduction target.

57% recycling rates (excluding construction wastes)

Supply chain emissions increased by 5,950 tonnes (scope 3 emissions)

**ISO14001 (2015) Certified (Estates & Facilities Directorate)**

# Foreword from
# Professor Jane Harrington, Vice Chancellor.

I am delighted to be writing this foreword to our Fifth Annual Sustainability Report. At a time when we are starting to witness the clear damage to the environment that climate change is making due to our actions, it makes me proud to reflect on the work that is being done by the University of Greenwich and makes me determined to do even more.

With the help of our shared principles and values of inclusivity, collaboration and impact we know that we can do amazing things, as we have already done them in response to a global pandemic. I know that we will be able to adapt and to reimagine the way we do things.

The teams around the university continue to work hard to bring us closer to reaching our institutional goals. We are already actively encouraging and supporting sustainable development and principles of sustainable learning and teaching practice in curriculum development and delivery. We are also committed to address pollution, minimise harmful emissions, and increase the awareness and understanding of sustainable development. Our ISO14001 Certified Estates and Facilities Directorate is also leading the way by:

- achieving 46% reduction of carbon emissions against 2009/10 Carbon Management Plan baseline of a 40% reduction target
- generating 36,209 kWh of electricity from Avery Hill's solar panels
- saving around 123,590 kWh and 38 tonnes of carbon through a Student Switch Off initiative

Thanks to the hard work of all our staff, students, and partners, we continue to be recognised externally. For the 8th consecutive year, we're proud to have achieved a First Class award in the People and Planet University (Green) League and we achieved 14th position of all universities and colleges in the UK. We have also ranked in the top 101-200 universities in the global Times Higher Education Impact Rankings, ranking extremely highly in the areas of responsible production and consumption (24th).

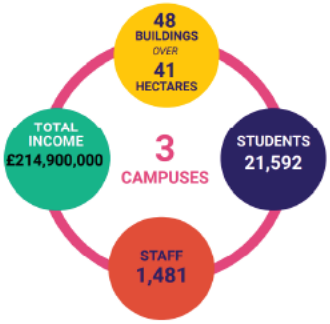
All of the above are just the key highlights of the progress made so far, with more work being done in the background and even much more work that still needs to be done. There are huge challenges ahead. But what makes the University of Greenwich so special is our ability to work together to solve the problems of our world. We know that we must do our bit and that we can make the world a safer place for the future generations.

**Professor Jane Harrington,**
Vice-Chancellor.

# Introduction

At the University of Greenwich our mission is to transform lives through inspired teaching and research. We seek to improve society and the lives of all those who study with us through the embodiment of our values of excellence, determination, inclusivity, creativity and ambition. Based at three historically important campuses, we combine rich heritage with significant high-tech learning and research facilities, providing an environment which stimulates enquiry, celebrates scientific endeavour, and promotes well-being.

Our progress is recognised externally in our University League placing (14th) and recognition for our contributions in contributing to the UN Sustainable Development Goals (SDGs) covering this reporting period through the THE Impact Rankings where we did particularly well in the SDGs: Responsible Consumption and Production (24th), Life on Land (66th) Reduced Inequalities (68th), Climate Action (75th) and Partnership for the Goals (77th) We submitted to 10 SDGs in 2019/20 and only one of the SDG's submitted fell into the 201-300 with the rest falling into the 101-200 grouping.




### Impact of the Coronavirus Pandemic

The Coronavirus pandemic created significant and rapid changes in how the university operated and delivered its teaching, research and professional services. This has resulted in operational impacts and opportunities from March to July 2020 of this reporting year have created anomalies to our Estates Directorate reporting figures and a large proportion of change will be due to the pandemic rather than operational improvements.

Almost overnight the university switched from working predominantly on-campus to remote working although practical courses and certain site-based research work continued. Students and staff teams rapidly re-evaluated how to work effectively with an almost total move to remote working and learning. This has created challenges, not only in terms of delivering services, but also challenges for students and staff in terms of disruption to normal working ways and also isolation during lock downs.

With far less on-site activity there was a significant reduction in energy and water consumption, procurement (especially of office consumables and print) and a reduction in the amount of waste generated. Home working significantly reduced business travel and commuting of students and staff. A significant impact was the significant reduction of business flights.

It must be recognised that with home working and study that some of the environmental impacts of undertaking work will be transferred from the campus to the home.

In May 2021 Sodexo began delivering the Integrated Facilities Management contract, bringing additional staff resource to focus on how to deliver the contract with sustainability in mind.

## Greenwich's approach to sustainability

The nature of our organisation is complex, and the social, economic and environmental impact of our activities and the extent of our academic influence are as far reaching as they are long lasting. However, so too are the influences on the university. This is why we take a risk management approach. We seek to anticipate regulatory changes, student needs, resource demands and internal requirements, as well as the longer term global mega-trends that will ultimately affect all our futures. Understanding and recognising these influences in the context of the university allows us to plan for the future, helps us achieve our goals and create a resilient institution. We are motivated by our ability to empower change, the difference we as individuals can make and the significance of our global contribution when we act together; from the smallest action to life-changing research. Our Sustainability Policy is ambitious and wide-ranging, providing high level aims and objectives that help drive efficiencies and raise awareness amongst the next generation of leaders.

## How we are progressing on our policy is set out within this report.

The following report sets out our progress where relevant against targets. It also sets out how we are contributing to the SDGs especially through work delivered by our academic community.

### Governance

The Sustainability Management Board (SMB) exists to help provide direction and accountability for the delivery of sustainability at Greenwich.

The Board comprises professional services staff with responsibilities for key sustainability related impacts including Estates and Facilities, Finance, Procurement, and Information and Library Services. Importantly it also includes key representatives

from our Faculties and the Students' Union to ensure the group can connect our students, academics (including teaching and research staff) to the potential that exist in the application of sustainability at Greenwich. It also helps us take advantage of the many opportunities that we can utilise coming from within and outside of the university relating to sustainability. Importantly it is chaired by one of the Deputy Vice Chancellors providing an important connection to improve strategic decision making that takes into account sustainability. To view a copy of the SMB structure visit: https://www.gre.ac.uk/sustain/strategy

## About this report

The university is fully committed to functioning as a socially responsible and sustainable institution, aiming to minimise our impact on the environment and to achieve significant cultural, economic, environmental and social contributions at local, national and international levels.

This report has been prepared by the Sustainable Development Unit to illustrate the university's performance against our most significant sustainability impacts for the academic year 2019/20 and includes examples of our achievements as well as tips that our students, staff and wider community can take to continue supporting our goals. The data for this report represents our owned activities only and is mostly sourced from the Estates Management Record 2019/20 that is publicly available from the Higher Education Statistics Agency (HESA).

It's important to us that we create materials that our students, staff and other interested parties want to engage with, therefore your feedback is welcomed and encouraged. If you have suggestions for future content or any questions regarding the data within this report and the work the University is doing then please contact us:

sustainability@gre.ac.uk
0208 331 8794
@sust_Greenwich
@UoGSustainability
@ecoteamgreenwich
www.greenwich.ac.uk/sustain

## Contributing to the SDGs

The university recognises the importance of delivering sustainability across its work, including teaching, research and operations. The contributions we make can be clearly indetified and reported against using the UN Sustainable Development Goals (SDGs).

These are 17 agreed goals covering social, environmnetal and economic sustainability objectives that are to be delivered in the developed and developing world. Our research particularly helps us with the latter.

To help us engage stakeholders and illustrate our contributions to the Goals this report sets out the SDGs our work delivers.

Each of the impact areas sets our how we are contributing to the SDGs with a more comprehensive section of this report stating how we are contributing to the goals particularly through our teaching and research.

Building on work we piloted in Medway campus in 2018-19 we have been working with staff to help them understand how they are contributing to the Goals. This has included the promotion of the SDG Teach In that encourages teaching staff to explore the SDGs. We have also been encouraging staff to consider the goals in their teaching through workshops that explore staff understaning of sustainability and using the Goals as a means that identifies conenections to staff work. Operationallly we have used the goals to promote our sustainability practices around the campus. As an example we used these to promote our second disposables free outlet at Medway when we launched this in the first term of 2019/20.

Our positioning in the Times Higher Impact Ranking further supported the importance of integrating and showcasing the Goals in our work. This certainly created further interest locally and strategically in persuance of sustainability and thus the SDGs.

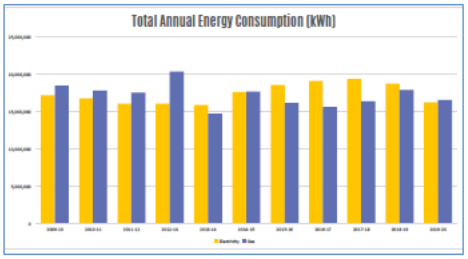
# Energy

Target:

- **To reduce Non Residential Energy Consumption by 14% by 2022 from a 2015/16 baseline**

Our energy consumption has a significant impact on the environment as well as our utilities spend. Costing approximately £3 million a year, it is important that as a University we strive to meet our energy needs as efficiently as possible, ensuring we optimise resource use, deliver value for money and minimise our reliance on the burning of fossil fuels.

In 2019/20, we used 32.9 million kWh of energy, equivalent to meeting the annual energy needs of 2,189 homes. Energy consumption in 2019/20 fell by approximately 8% compared with 2018/19 reflecting reductions of electricity use though efficiencies but particularly impacted by the pandemic creating a reduction of approximately 5% and a reduction of 10% of gas use again affected by the shut-down of buildings on our campuses due to the pandemic.




The university has set a strategic KPI to reduce our energy consumption by 14% by 2022 across all non-residential areas. This has been set against a 2015/16 baseline as it best represented our operations at the time. In 2019/20 we have reduced non residential energy use by 0.6 mWh against the 27.9 mWh baseline figure (milestone target for 2019/20 is 25.5 mWh). The planned disposal of Mansion site was expected to have occurred within this target time-frame and has contributed to this milestone target not being met.

Having a focus on energy use is important as it provides a clear understanding of how efficient we are in using energy. It has implications on our carbon footprint, especially where energy comes from fossil fuels, such as gas for heating and power, or where from what the electricity is generated that we use to power our campuses

**"To reduce energy use and to further explore the possibilities of less carbon intensive energy sources"**

many electrical needs. There's also a direct cost implication as for every unit we are able to save through energy conservation and efficiency actions we will save money that can be reinvested into our teaching, research and improve our student and staff experiences.

Since the Carbon Management Plan baseline position in 2009/10 our estates have seen the addition of Devonport Halls, the Medway Student Hub and the Dreadnought building, all of which have inevitably contributed to increases in energy consumption across our estates.

In this year Phase 1 of refurbishment of the old Students' Union, the Cooper Building was completed. Now the home of Greenwich Research and Enterprise the building illustrated examples of innovative energy efficient investments. Intelligent Thorlux energy saving lighting systems were installed throughout providing data including data telling us individual luminary energy use, room occupancy and centralised control to help set power down and switch off settings.

The university subscribed to the National Union of Students' (in 2019/20 this became the Students for Sustainability) Student Switch Off campaign. This is an initiative promoting energy efficient behaviours of our students living in UoG halls.

The implementation of the new Integrated Facilities Management contract in May 2020 has created opportunity to target and embed energy efficiency in across facilities management services. Additional staff resource and expertise available from elsewhere in the company has assisted with energy efficiency. The overarching contract includes more training and engagement of on the ground staff in addition to analytical support of energy use through the central expertise available though the contract deliverers, Sodexo.

Support includes technical input to improve the energy efficiency of processes and systems, plus engagement support to help UoG energy users.

As stated in the introduction the pandemic has reduced energy use, particularly electricity. It was impossible to close all buildings as teaching and research was ongoing in certain areas. The impact will mean that the year is unusual and does not provide an accurate trend for in terms of our energy efficiency progress. The 2020/21 figures will similarly be an outlier data set skewing electricity and gas use though changes of energy usage patterns.

## Contributing to the SDGs

# Carbon

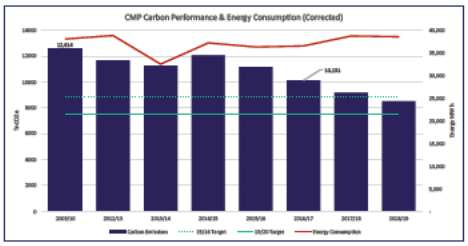
**Target:**

- **To achieve a 40% reduction in Scope 1 & 2 emissions by 2020 against a 2009/10 baseline (Carbon Management Plan target)**

Our Scope 1 and 2 carbon emissions, that's the carbon produced directly from emission sources owned by the university (i.e. gas used for our boilers and fuel in our vehicles) and purchased electricity, have reduced by 52.4% as compared with our 2005 Higher Education Funding Council for England (HEFCE) target of a 40% reduction to be achieved by 2020.

A separate Carbon Management Plan (CMP) target that includes a wider scope of carbon contributions from our estate has continued to improve, with a 46% carbon reduction against our 2009/10 CMP baseline against a 40% target to be achieved by 2020.

The university calculates its carbon footprint in two ways: A location footprint which includes the

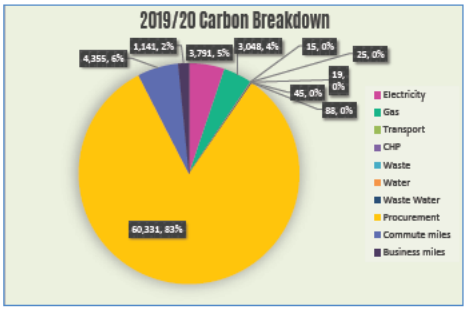



carbon footprint of our gas, university fleet and business emissions in addition to those emitted from the electricity used with a national electricity conversion factor applied. The other measure: market based includes the same as location based calculation but takes into account that as the university uses 100% carbon free electricity then this is means our true carbon footprint relates directly to our actual emissions.

Our location based footprint is: 8,468 tonnes and our market based footprint is 4,658 tonnes

The pie chart breaks down our carbon footprint into a range of categories. Procurement (Supply Chain) (categorised as Scope 3 emissions) has a significant impact on our carbon emissions suggesting we need to buy less or buy items or services with a lower carbon footprint. Work on this will focus as it will be incorporated into

**"To reduce energy use and to further explore the possibilities of less carbon intensive energy sources"**




the forthcoming Net Zero Carbon Action plan in 2023. Travel is also significant particularly private transport (cars) for commuting and the use of business flights.

Excluding Scope 3 emissions are significant but are difficult to manage as these our outside of our direct control. We can better manage our Scope 1 emissions, by de-carbonising our heating and transport systems which will be considered in the Net Zero Carbon Action plan due out in 2022.

## Contributing to the SDGs

### SDG7

- Solar (photovoltaic) cells generate zero carbon energy on the roofs of Avery Hill Halls, Stockwell Street and the Wolfson Centre (Medway). In the past five years our Avery Hill PV cells have generated over 190,000 kWh of electricity, enough to power nearly 51 average UK households for a year.
- The carbon footprint of our electricity is zero tonnes as it is 100% sourced from clean energy sources.

### • SDG9

- More efficient boilers installed in Medway & Greenwich
- Increasing output from Medway refined used cooking oil powered CHP
- Carbon reducing research undertaken by UoG academics includes Carbon8

### SDG13

- Continuing reduction of university carbon footprint
- Exceeding targets of Carbon Management Plan
- Research delivering lower carbon world in many faculties

# Transport and Travel

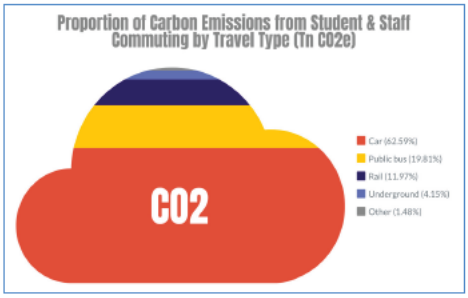
**Target:**

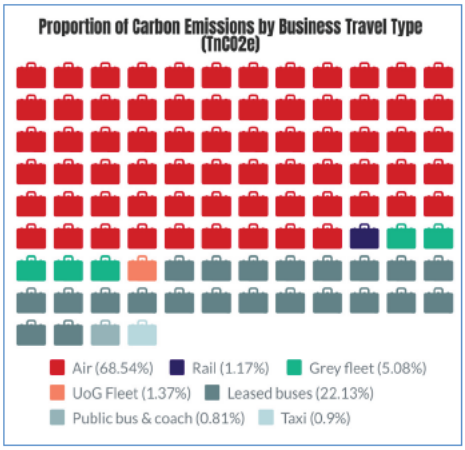
- **To achieve a 40% reduction in Scope 1 university vehicle fleet emissions by 2020 (2009/10 baseline) 10% reduction achieved by 2017/18**
- **To achieve a 20% reduction in Scope 3 work related travel emissions by 2020 (2012/13 baseline) 45% reduction achieved by 2017/18**
- **To achieve a 20% reduction in Scope 3 commuting emissions by 2020 (2007 baseline) 2% reduction achieved by 2017/18**

Our transport needs have substantial environmental impacts but through changing behaviours or modes this can be reduced. Impacts include traffic congestion, carbon emissions, air, water, noise and light pollution, road casualties, stress and the fracturing of communities that can come through high volume road use.

Having three campuses creates challenges for us as many students and staff travel between sites. A large commuter student community plus employees travelling into campus have transport needs that we seek to influence. The university can seek to improve travel needs and habits through changes in the services we provide and the advice and incentives we offer. The university's Travel and Transport team works to ensure this happens and has a focus to reduce carbon emissions within its service areas.

The Natural Resources Institute initiated its Carbon Working Group with a main aim to reduce the carbon footprint of its travel related emissions, particularly those relating to flights. This working group has been analysing flight usage and developing a methodology to help staff make decisions to ensure that any flight or journey taken takes carbon into account with the aim of significant reductions in emissions.




**"To minimise harmful emissions arising from business travel, commuting & deliveries"**

## Contributing to the SDGs

### SDG3

- Initiatives (e.g. Better Points) rewarding staff and students to walk and cycle (and catch public transport) an leave car at home
- Dr Bike provided so bikes can be fixed and used
- Investments in low emission and electric vehicles reducing health impacts of community.

### SDG11

- Improvements to UoG travel provision reducing pressures on local public transport
- Green Travel Plan helping reduce congestion and pollution

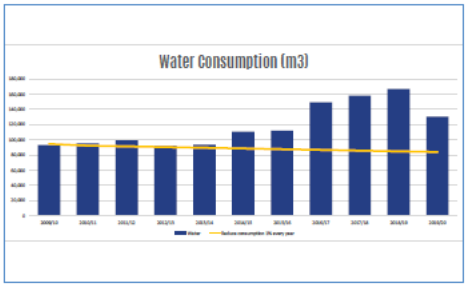
### SDG13

- Reductions in UoG fleet carbon emissions (1/3rd of 2009/10 figures)
- Working with faculties to reduce business travel (including flights).

# Water

**Target:**
- **To reduce water consumption by 1% per annum**

Water can be taken for granted, however with increasing pressures on water supplies because of reduced rainfall and warmer temperatures due to climate change it is important that all organisations seek to reduce the pressures on water supplies.




The graph above illustrates that in 2019/20 our water consumption dropped dramatically. Covid related closures of buildings has had a significant impact, however, improvements have also been achieved as no large water leaks occurred and with monthly water meter reads any potential water leaks can be dealt with much sooner.

Achieving the target using the baseline year will be a challenge, especially where owe have grown the estate and increased student numbers. A continuing focus on water saving will continue. The disposal of Mansion site will provide a water reduction saving of up to 5% per annum, improvements to the estates infrastructure will also help with plans identified to install systems that can improve water efficiency in halls of residences.

As we have a large number of students living n our halls of residences we know there is a large amount of water used domestically, for washing-up, flushing toilets and showering and washing. Through Student Switch Off we encourage students to shorten their showers and wash up using bowls and putting plugs in sinks. This has the potential of not only reducing waster use significantly but for hot water we can also save energy and carbon too.

The launch of the Integrated Facilities Management contract provides opportunities to better manage water use by making efficiencies and also reducing leaks through the monthly water meter reads. Water use data now is reported and analysed with Sodexo and university staff to identify reasons for unusually high water use and to investigate reasons for this and to review water use following any efficiency interventions.

We closely manage watering our grounds and only do so in the goal mouth areas of our football pitches and the Community Edible Garden both at Southwood site in addition to watering the planters outside Drill Hall Library at Medway and some of the living roofs on the Stockwell Street Building. We select more drought tolerant plants for our beds and do not water our grass areas even in the hottest and driest of years. We invested in waterless urinals at all campuses which have saved significant volumes of water in addition to replacement of taps with low flow alternatives. We encourage staff and students to avoid wasting water by not leaving taps running and reporting drips and leaks. Plans for any redevelopment of the estate will investigate the potential for grey water, rainwater harvesting and also look to ensure sustainable drainage systems are designed in to reduce any surface water flooding that could occur downstream of the campuses

**"To reduce water use and establish a utilities monitoring and targeting system"**

## Contributing to the SDGs

### SDG6
- Provision of free water at all outlets and in increasing numbers of water fountains around our campuses

### • SDG11
- Research undertaken to increase the amount of green-spaces on buildings as living walls and roofs reducing storm run off
- Ongoing investment in sustainable drainage schemes reducing peak flow incidents and potential local flooding incidents

### SDG12
- Ongoing initiatives looking at circular economy and reuse actions to reduce manufacturing resource impacts including water use.

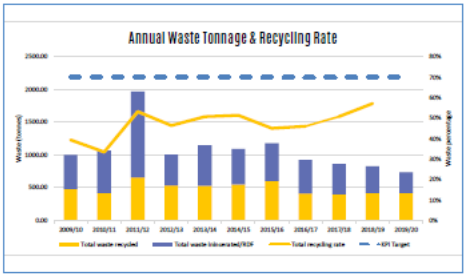
### • SDG13
- Reductions in water use will cut our scope 3 carbon emissions

### SDG14
- Regular audits of process and procedures to ensure water is used efficiently and that we avoid pollution incidents
- Research undertaken in many parts of the university aimed at improving water quality and water habitats.

# Consumption, Waste and Recycling

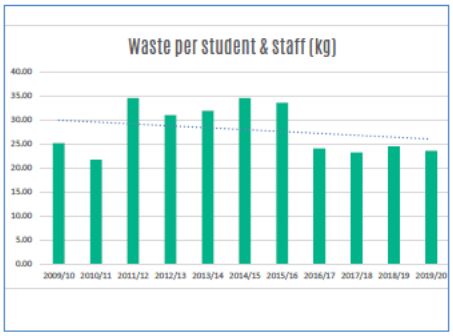
**Target:**

- **To achieve a 70 % recycling rate (by weight) of non-construction wastes**
- **Reduce total weight of non-construction wastes by 5% annually**




The above graph shows we are continuing to generate and dispose of less waste than ever, with a 26% reduction since 2009/10. Although we have missed the reduction target the improvement is impressive and we continue to expect further reductions through initiatives, such as our work to encourage a switch from disposable to reusable hot drinks containers and the surplus reuse platform Warp-It. Some of the reduction will have been the result of the closure of some of the campuses due to Covid between March and July 2020. The university has rolled out a new MFD printers and this is part of a digital first approach to avoid the use of printing wherever possible. This will ultimately reduce paper procurement and ultimately its disposal. The impact of Covid meant that the End of Term Reuse campaign did not run which can result in over 6 tonnes of materials reused rather than disposed of.

The graph also illustrates that our recycling rate has improved markedly to 57% up 6% on the previous year. Although this is a good figure evidence around the campus indicates that there are lower levels of recycling in our halls and often high levels of contamination on campus. The new IFM contract provides a more detailed level of waste and recycling information that will help us better breakdown waste generated from particular buildings including providing splits between residential and campus wastes. Importantly the new waste contract will provide us with the accurate weight of the bin per lift, rather than an estimated weight per bin.




## Contributing to the SDGs

### SDG11

- Our aim is to reduce our waste generation to reduce associated impacts on London
- We support resource re-homing between our campuses and local community groups, including local charities and schools

### SDG12

- We seek to reduce unnecessary consumption through communications, procurement advice and the Warpit furniture reuse scheme
- We have internal systems to reuse resources and work with the British Heart Foundation to take useful items to be sold in their shops

### SDG13

- The less waste we create the less carbon is emitted
- We also aim to increase our recycling rates that will reduce our carbon footprint
- None of our waste goes to landfill

### SDG14

- We have litter management systems in place to avoid wastes entering watercourses
- We have banned disposable plastics from our catering outlets reducing impacts of ocean plastics

### SDG15

- We encourage reusable hot drinks containers and promote zero littering actions.

# Consumption, Waste and Recycling Initiatives

## WARPIT

Warpit was launched to help the university maximise the use of resources no longer needed in one part of the university and made available for reuse in another. Using an online platform, to create matches between what was on offer to what was needed the system helped generate savings of X in 2019/20. This included materials reused internally and also it created an easier way of creating donations of surplus items to external organisations including old peoples homes, and hospitals.

Although we don't have year by annualised figures for Warpit it has to 1st October 2021 achieved £74,000 in cost avoidance, 16 tonnes of waste being landfilled, 35 tonnes of carbon emissiosn (48 tree equivalents)savings includes X. The platform mostly helps rehome furniture and surplus stationary, it can also be used to enable better sharing of equipment that may otherwise be infrequently used.

David Jackson leading Warpit has been working with individuals, departments and campus Facilities teams and Sodexo to ensure the project is maxising its potential.

Note if you have materials you want to make available to others or have items you need email sustainability@gre.ac.uk

## Multi Functional Devices

Pre-pandemic university staff and student's printing use was relatively significant, At a cost of approximately £30K per year in paper alone the university can make significant printing reductions as recongised during the pandemic closures when much work was transfered from paper based to digital.

New printers were installed in January and February. These provide higher energy efficiency, lower print cost and better data and analytics to provide feedback to users about print use.

The initiative reviewed printer demand, rationalising our MFD stock especially in light of recent departmental moves. Personal printers were also reviewed and reduced as part of the replacement programme.

The university expects that significant reductions in printing will continue as staff and students return to campus, especially where they have not used printes when working from home. Increased and improved digitally led systems and processes and changes to how staff store data will mean a reduction of print too.

## David Jackson: The opportunities for consumption reduction and reuse at Greenwich

Our recycling rate target is 70%, and to date we have only hit that figure twice, in the years between 2016 and 2018. Our recycling rate hit 64% this year and is an improvement on last year's figure of 51%, but we need to review our communications across the campuses to ensure segregation occurs as best practice. For internal reuse, offices and rooms are often in constant change, meaning that furniture items commonly come in and out of requirement. Avoiding immediate disposal and considering reuse offers a financially and environmentally benefit. By re-using items we are:

Saving money – by avoiding the procurement purchase of new items – to date we have avoided £74,000 of new items

- Reducing the amount of waste disposed of – to date we have saved 16 tonnes of waste
- Reducing carbon emissions – to date we have saved 35 tonnes of carbon emissions
- Becoming a more sustainable organisation.

For items that are no longer required by the University, but are of still good quality, we make contact with organisations to offer furniture donations. Over 300 items have been donated to schools, care homes, charities and NHS Trusts; avoiding £17,000 of furniture expenditure, 3 tonnes of waste and 9 tonnes of carbon emissions.

Everyone has a responsibility, with our 'End of Term Reuse' campaign directed towards students moving out of halls in June to donate unwanted items to charity. Students donate 3 tonnes on average every year and 30 tonnes of carbon emissions. Our partner charity for the past few years has been with the British Heart Foundation. Discussions with local food banks are underway for left food items, in addition to holding Christmas donation events. Our Bargain Corner shop

**David Jackson, Sustainability Projects Officer, Sustainable Development Unit.**

**"To prevent pollution and to promote 'zero waste', encouraging Reduce, Reuse, Recycle to minimise our impact"**

# Sustainable Food

**Target:**
- **Fairtrade Foundation University**
- **Food for Life Gold**
- **Marine Stewardship Council Award for sustainable fish**

The provision of delicious and sustainable food is really important to us and we are proud of the progress we have made.

We have retained Food for Life Gold at all our outlets and for all our menus. We have held Fairtrade University status from 2012 to May 2020 and are now in a 'working towards' status for Fairtrade Foundation University award as part of the new audit and award scheme that will be assessed in 2022. We also retain our MSC certification as all seafood comes from MSC certified stocks.

Working in partnership with our caterers BaxterStorey (who provide food at all campuses apart from Southwood Site), Sodexo (who provide catering at the Dome) and the Students' Union we have collaborated to develop initiatives and partnerships that are recognised externally. Our Sustainable Food Steering Group continues to work together to continually improve our food and drink offer.

In 2018/19 we opened our first disposable free cafe at Queen Mary, in 2019/20 we opened our second at Pilkington Cafe in Medway. Alongside this work we initiated a plan to develop a completely disposable food and drink container initiative at Pilkington cafe. This as stalled with the pandemic and will be picked up again when students and staff return to campus in sufficient numbers.

The university working with its caterers and customers has been increasingly considering the sustainability of meals. This has resulted in vegan hot meals becoming available in all outlets every day of the week. This is meeting the changing expectations of customers providing healthier options that have a lower environmental impact.

The university and partners have also been actively engaging staff and students to highlight issues of sustainability importance. Our annual Ethical Food and Fairtrade Fortnight is an example of this that has provided on-site and online events, activities and information sharing.

https://blogs.gre.ac.uk/greengreenwich/ethical-food-fairtrade-fortnight-highlights/

## Contributing to the SDGs

### SDG2
- Research undertaken by the university's Natural Resources Institute has lead to significant reductions in food wastage and poverty reduction in less developed countries

### SDG3
- At our outlets we have sought to continually improve the healthiness of diets, increasing the amount of plant based ingredients

### SDG6
- We provide free drinking water at all outlets and have increased the number of water fountains on our campuses

### SDG11
- Our food provision, delivery and partnership working has delivered sustainability befits for London and the region. Where possible we use local suppliers and reduce delivery frequencies

### SDG12
- We promote principles of the circular economy in our outlets through reuse and recycling

### SDG13
- Food wastage is managed to avoid this wherever possible and food waste is bio-digested generating energy and fertiliser. No food waste is sent to landfill where it could rot and generate the greenhouse gas methane

### SDG14
- Having MSC accreditation means we source seafood only from sustainable fish stocks

### SDG15
- Our accreditations require responsible farming practices. We stock organic, Rainforest Alliance and Fairtrade products all having lower impacts upon nature and promote plant based diets.

# Ecosystems Services

**Target:**
- **To develop and implement a biodiversity policy that seeks to protect and enhance wildlife on campus.**

We are fortunate to have three beautiful and varied campuses. Each of these offer opportunities to encourage nature to thrive.

Ecosystems services is a term used to describe the many and varied benefits that humanity freely gains from properly functioning ecosystems. These provide us with agricultural produce, timber, and aquatic organisms such as fish. They also provide us with clean drinking water, the decomposition of waste, and the natural pollination of crops and other plants, essential to our own success as a species.

Our estates offer a variety of biodiverse and valuable natural spaces. Greenwich lies between the River Thames and Greenwich Park and at Stockwell Street our academics have created an incredibly diverse space used for research and valued by wildlife. Medway campus has a rich area of woodland, some of which the university is interested in making wider ecosystem improvements. At Avery Hill we have large green spaces which are actively managed to support the many species that live or pass through our campus.

At Avery Hill here is also an organic food garden and a forest garden, both cared for by volunteers. The diversity of habitats brings an abundance of insect, bird and animal species. This then brings opportunities to use the spaces for teaching, research and leisure and well-being, illustrating that the protection and improvement of our natural spaces is an investment vital to all our futures. The Edible Garden and forest garden welcomes our Primary Education and Early Years students every year to learn how natural spaces can be used to encourage children to connect with nature and also to realise its importance in their lives.

The beautiful Medway campus has woodland areas, green spaces, beehives, and is the home for a significant amount of critically important research and teaching on Ecosystem Services, farming and land use practices. We are keen to make further improvements to the natural value and the ability for our students and staff to engage with these spaces, if interested please get in touch.

**"To protect and conserve the heritage buildings we occupy and to actively protect and enhance wildlife on campuses carbon intensive energy sources"**

## Contributing to the SDGs

### SDG2
- Our volunteer run Community Edible Garden provides fruit and vegetables available for free for any of our students, staff and local community to harvest and enjoy

### SDG3
- At Greenwich we encourage natural spaces and encourage people to use them to improve their physical and mental health

### SDG4
- We provide a range of taught courses that focus on the importance of natural systems and the need and means to protect them

### SDG6
- By improving our natural spaces we are better able to regulate water flow and maintain the water quality of water that passes over our estates

### SDG11
- Our volunteers teach other volunteers how to grow their own fruit and vegetables and also encourage others to create their own gardens at home or in their own communities. We welcome volunteers from the University and beyond

### SDG8
- We demonstrate and train people to be more self-sufficient and to learn how we can embrace natural systems to help us grow food organically and without waste

### SDG13
- We encourage the increase of biological life that can improve the capacity of our estates to absorb carbon. Through our spaces we are also able to illustrate the impacts of climate change on natural spaces

### SDG14
- Our operations and outreach work aims to reduce the amount of pollutants that can enter our 'blue' environment

### SDG15
- Through our ecosystems related policies, plans and actions we continually seek to protect and improve our natural spaces.

# Construction and Refurbishment

The university has a rich and varied estate, ranging from the historic 17th Century architectural masterpiece of Greenwich Maritime and the Edwardian redbrick splendour of Medway Campus to the parkland mosaic of buildings at Avery Hill and the futuristic and sympathetic BREEAM Excellent rated Stockwell Street building.

Many of our older and particularly our historic buildings have unique challenges, particularly in making them meet the dynamic nature of our teaching, student and staff needs.

In 2019/20 the Estates Team in collaboration with end users worked on projects across the university and particularly on the old Students' Union the Cooper Building and also on the first phase of redevelopment of the Southwood site.

The Grade 2 listed Cooper Building was redesigned to meet the needs of our research and innovation focused work and them new home of Greenwich Research and Enterprise. The buildings was updates to maximise the utility of space though better design of workspaces and improvements to energy efficiency such as the installation of Thorlux lighting system which has advanced data capture and energy management that ensures efficient energy use balanced with user needs. Further to this biophilic design elements were integrated with the use of natural finishes, a living wall and the full utility of natural light. The use of sustainable carpet tiles was also a requirement to ensure the sustainability of the site was maximised where possible.

The planned closure of the Mansion site meant that any remaining teaching, office, library and other uses could be transferred to Greenwich and the Southwood campus. A re-evaluation of existing spaces at Avery Hill was undertaken to maximise utility. As some specialist spaces were still needed including library and chemistry labs and additional lecture space the university made a decision that delivered core sustainability outcomes. Existing modular buildings were utilised, one reused and transported from Mansion, the other a temporary two story building was transported from Greenwich to Southwood Site. A new modular library was designed and transported to site and installed over the period of a week or so. Thus building provided a useful linkage between Fry and Grey buildings and provides a library, academic and office space.

Such modular builds mean that they fulfil sustainability aspirations. These are built off-site, often using sustainable and reusable and ultimately recyclable materials that usually have high thermal efficiency. At their end of use they can be simply unbolted and moved to another location to be reused fulfilling a circular economy goal.

**"To incorporate the principles of sustainable development into all new build & refurbishment projects"**

# Construction and Refurbishment

## Contributing to the SDGs

### SDG3

- We design and operate our buildings to meet all potential user needs and to ensure that the health and well-being of our users are met

### SDG4

- The University is proud of the high quality teaching it delivers and the hard work our students undertake in pursuing their educational goals

### SDG5

- The University seeks to ensure that our estate ensures that our gender equality commitments are met

### SDG6

- Through our continual improvement of our estate we aim to increase the numbers of water fountains, although this can be restricted by our building's heritage protections

### SDG7

- The University generates its own solar power and buys almost carbon free electricity from its supplier

### SDG8

- Our contracting of building work requires suppliers to provide decent, and safe working environments

### SDG9

- We work with partners to identify where we can integrate effective innovations to our estate that can deliver social, environmental and economic benefit

### SDG10

- We consider users in all design and build decisions to reduce inequalities

### SDG11

- We aim to ensure we build and operate our buildings in ways that complement the sustainability needs an ambitions of the areas our campuses are located in

### SDG12

- We design and build estates that aim to reduce the material and waste in their construction and use and work closely with contractors to ensure they do too.

### SDG13

- It is critical for our success that we seek to reduce the carbon emissions of our work. It is crucial that we design and build with energy and carbon reduction in mind, with a particular focus on engineering out fossil fuels from our buildings. We are on an ongoing journey and this work will keep the Estates team focused for many years ahead

### SDG14

- We have the ability to build in systems that can help protect the blue environment. This includes ensuring we are able to ensure that buildings and their users use water efficiently and we have systems in place to avoid polluting water courses

### SDG15

- We are fortunate to have beautiful and often biodiverse rich campuses and it is essential that our estates development work protects and improves the natural environment. The Estates team are fully aware and engaged on our Ecosystems Services work and this will increase with the integration of ecosystems services thinking into our estates planning and development work.

# Education and Research

The university sector has a major role in helping deliver sustainability and contributing to the **Sustainable Development Goals** (SDGs). The next section illustrates many examples of how we are delivering the Goals in our teaching and research

The ability to influence and engage our student body on sustainability is a real opportunity. Research conducted by the Higher Education Academy and the National Union of Students clearly also shows that students demand sustainability is taught to them. Rising awareness of global challenges and the need for action means students are wanting to be part of the solution and we can therefore illustrate the relevance of sustainability and integrate it into our courses. Having sustainability 'literate' graduates is increasingly important to employers who are looking for the skill sets that sustainability learning and application can bring.

Many of the solutions we need will come from research and innovation from the university sector. The Natural Resources Institute is seen as a global leader in areas of agronomy, crop and pest science, climate change and food storage. Academics are capitalising on research, creating spin-out businesses able, for example, to make construction materials out of waste and creating net carbon negative products (**Carbon8**).

## Sustainability in Teaching

Sustainability can be incorporated or applied to almost every part of our teaching work. It can be used to connect up subjects with issues the world faces and illustrate some of the solutions that are emerging and being implemented to solve them. Sustainability isn't just about climate change and ocean plastics however, we often overlook the need to reconsider and deliver social issues which are a pillar of sustainability. In addition, when we look at economic systems we have to recognise that without alignment to sustainability outcomes then it will become increasingly difficult to live and do businesses on not only a planet suffering climate chaos but also impacted because of soil loss, ecosystem collapses and inequality.

Many of our programmes include sustainability issues, As we would expect the Faculty of Engineering and Science delivers many courses that are either focused on sustainability as an overall issue or deliver courses that are targeted on particular areas of sustainability. These are often distinct in their contributions to the Sustainable Development Goals. Courses, for example, by the NRI often focus on sustainability as a concept and teach in the specific areas that contribute to it. Our School of Pharmacy, for example, delivers teaching directly contributing to SDG 3 (Good Health and Well-Being). This faculty also actively promotes and uses Sulitest as a means of encouraging and supporting the sustainability literacy of students. Our Faculty of Health and Human Sciences directly supports SDG 4 in educating future health professionals including nurses, paramedics and midwives. Much of our teaching is not just focused on physical well-being but also mental well-being which is now becoming recognised as a critically important area to treat. Our teaching enables early years and primary teachers to graduate delivering quality education and also through their studies having a good grasp of sustainability. Annually we welcome students to the Avery Hill Community Edible Campus, for example, to learn about how natural spaces can become one of the most impactful learning environments capable of bringing many subjects to life in fun and inspiring ways.

At the Faculty of Liberal Arts and Sciences we graduate students who will work as surveyors, projects managers, architects and others in the built environment who will have an understanding of how sustainability relates to their work. Students studying law apply their work and learning in areas that contribute to many of the SDGs including SDG 16 (Peace, Justice and Strong Institutions), but also other areas where law can be used to right many of the wrongs that unfairly hold people back. These include SDG 5 (Gender Equality), SDG 8 (Decent Work and Economic Growth), SDG 10 (Reduced Inequalities), and many others including and importantly SDG 17 (Partnerships for the Goals).

For example, Dr Louise Hewitt runs the **Innocence Project London** where academics and students work with lawyers to re-examine cases where it is considered there has been a miscarriage of justice. This project was recognised by Green Gown judges and was a finalist in the Green Gown Awards in 2020.

Our Faculty of Business provides sustainability

in teaching in many subjects especially where it comes to business ethics, but also in subjects relating to systems, marketing, tourism and others. Andres Coca-Stefaniak, showcased later, includes sustainability as part of his teaching in tourism and it forms a very strong basis for much of his research work also. The Business School invites many experts in the sustainability field to provide guest lectures and seminars (for example the Big Picture series) for students to find our about how sustainability is considered by experts in the field.

## In Research

Greenwich is undertaking much research that has national and international impact. The Natural Resources Institute is recognised of global importance in helping tackle issues around food systems that improve nutrition, food loss, sustainable agricultural intensification that is helping to feed a growing global population while maintaining ecosystems services, conserving biodiversity and promoting social equity. Research excellence also covers fair economic systems, climate change and its impacts on agriculture on agriculture and natural resources, capacity strengthening for agricultural development and food security. Innovative research on equality and gender justice, governance, sustainable trade and responsible business and research specific to root and tuber crops or particular importance to meeting food needs of developing nations and incomes of farmers is also undertaken illustrating the breadth of work the NRI does. Examples of their work can be viewed through their **Annual Reports** and work and case studies included on their **website**. This work has led to the award of the Queens Anniversary Prize in recognition of the impact their work has had.

Increasingly we are undertaking research work that delivers Circular Economy outcomes and we are finding increasing amounts of this work across our faculties. Research including the harnessing of micro-algae that creates fuels and also helps sequestered carbon is being undertaken by a team in the Faculty of Science and Engineering. Research on the carbonation of materials in the construction industry is creating much interest in its ability to create carbon negative products from waste materials. Other work is engaging with food industries ensuring packaging can better protect foodstuffs from damage and deterioration in addition to ensuring packaging is lower impact and recyclable that contributes to circular economy thinking. Furthermore research on communities along the Indian Ocean is helping us better understand how to improve waste management practices and systems to help reduce and avoid the massive problem of ocean plastics. Here again circular thinking can create opportunities to develop sustainable communities that find more value in waste so that management systems become viable alternatives to dumping wastes in watercourses. Research is also being undertaken to ensure that not only the materials that circulate in the circular economy are considered, work is also being undertaken to ensure the health and safety of people working in the waste recycling industries are protected.

This is just a snapshot of the research we are doing. Much more is illustrated in the following pages that highlight our contributions to each of the UN Sustainable Development Goals. We plan to build on this work by encouraging more staff to reference their research and their teaching to the SDGs so that we can raise awareness of the Goals and also encourage greater collaboration within and between faculties and directorates. We are seeing increasing evidence that our staff and student communities are recognising the importance of sustainability and the University is keen to share this interest and work in this field. If you are planning or doing sustainability teaching and research please get in touch with sustainability@gre.ac.uk so we can provide any assistance you may need or help showcase the work you are doing.

**"To actively encourage and support the teaching of and research into sustainable development in the University"**

# Greenwich's Contributions to the Sustainable Development Goals

The university recognises the importance of the United Nations Sustainable Development Goals (SDGs) and our role in contributing to them.

This section provides more detail, illustrating examples of some of the work we are doing in service to the Goals. Please note that some of this work fits outside the 2019/20 time-frame of the overall Annual Sustainability Report.


The university provides subsidised transport and food to reduce financial burdens on our student and staff communities. Bursaries are offered to students to cover tuition costs and bursaries are offered to assist students covering transport costs.

We provide free support including workshops to the local community to encourage business development and mentor match refugees and migrants who want to start their own businesses. This is done through the **SIREE** Project (Social Integration of Refugees via Education and Self-employment) where we aim to highlight the positive contribution refugees can make to the economy to policy makers. **The Centre for Research on Employment and Work** (CREW) has conducted research on the impact of non-standard contracts on low paid workers for the Trades Union Congress (Living on the Edge Experiencing workplace insecurity in the UK, 2018) and for the Low Pay Commission (Non-Standard Contracts and the National Living Wage: A Report for the Low Pay Commission, 2017). The latter looked at the relationship between the National Living Wage and non-standard contracts and was quoted extensively in the Low Pay Commission's Response to Government on 'One-Sided Flexibility' (2018). CREW is currently leading a EU Social Dialogue project addressing the public sector Gender Pay Gap across Europe in the context of austerity policies and measures taken by social partners to address it.


The work undertaken particularly by the university's Natural Resources Institute has been recognised through the 2019 award of the Queen Anniversary Prize. This award was for the NRI's pest management programme looks specifically at four key areas, including blackfly transmitting 'river blindness'; rodents spreading disease and destroying crops and infrastructure; mosquitoes transmitting dangerous diseases including malaria, dengue and Zika; and insect pests threatening the horticulture industry. This is just one of the areas the university is working on that has real world impacts in reducing poverty, especially in developing countries. Other areas include research and practical applications in areas of food systems and improved nutrition.

SDG 2 highlights the multi-dimensional nature of food and nutrition security, encompassing the quantity of food available and issues of resilience, nutrient content and food safety, with targets incorporating both agriculture and nutrition, underlying the importance of food-based approaches in addressing nutritional challenges. Examples of our research in this area include exploring **gender-sensitive approaches to support nutritionally vulnerable population groups**, building information about diets in smallholder farming communities in low income countries to highlight nutritional challenges and guide programmes and policy, and developing the full nutritional potential of small pelagic fish.


The university has a large number of collaborations and partnerships in London and Kent with local health and social care organisations that deliver care and promote and support the public's health and well-being. These include NHS Trusts such as Oxleas NHS Trust, Bart's and the London NHS Trust, Lewisham & Greenwich NHS Trust, King's College Hospital NHS Trust, as well as other providers of health and well-being services, including among others Virgin Services, Priory Group, Bexley Women's Aid, Demelza. The university has students on placements in these organisations on health related

professional programmes, but staff also deliver a significant amount of continuing professional development courses to partners organisations, as well advising on and providing 'credit for learning' for in-house courses. We also have students on placements in local authority and non-statutory organisations for social work, promoting the well-being of service users, carers and families. Students work with diverse issues such as mental health, learning difficulties, physical disabilities, dementia, safeguarding children and adults and dual diagnosis.

The above work is underpinned and supported nu the **Institute for Lifecourse Development**. This is anchor resource where professionals from many different fields work closely together with researchers and stakeholders from public, charitable and voluntary organisations. Together we are developing effective and economically sustainable lifecourse solutions and tackle some of the most significant challenges society faces. An example of this includes how the ILS is partnering with the **Australian Child Maltreatment Study.**

Similarly in Counselling, we work with local organisations that aim to support public's health and well-being through listening, mentoring and befriending type placements as well as formal counselling placements in voluntary and NHS settings.

We have developed a training programme to help front-line professionals tackle the growing County Lines problem, whereby criminal gangs in London are sending young people into smaller market and coastal towns to sell Class A drugs. Professor Karen Cleaver of the Faculty of Education & Health, has led a project with the Metropolitan Police and a range of partners across statutory agencies to produce a training package which aims to raise awareness of County Lines. As well as awareness raising, the training helps participants develop an understanding of the relationship between vulnerability and becoming a perpetrator of crime and the potential consequences of this for the young person's mental health.

Our Early Years team undertake consultancy with various nurseries locally to improve the well-being of children. Staff act as a Trustee of a community nursery and members of the team run sessions both locally, and internationally, such as in Malaysia on confident children and managing behaviour.

The Students' Unions of the University both offer free sexual health advice to students through their advice services. Greenwich Students' Union has online resources signposting students to local services, as well as having information on how to access free chlamydia tests and morning after pill via our receptions at Greenwich and Avery Hill. Students can also access free condoms and period products at those receptions also. In Medway, Greenwich&Kent Students' Union have free condoms and period products available from their reception, and chlamydia testing kits available in all the toilets. The university's **Wellbeing Hub** has information on the university's employee assistance programme, and the **Access to Work Mental Health Support Service** is delivered by Remploy on behalf of Access to Work across England, Scotland and Wales.


The university is proud of its roots and its continuing role in supporting the local community to access excellent quality teaching and learning at our campuses. The university therefore has a student population that resembles the demographic make up of our local areas and we welcome to our campuses a wide diversity of students from many backgrounds. We are proud that a high proportion of our students are the first generation within their families to attend university. We actively encourage participation among under-represented groups in our teaching and learning. Our **Access and Participation Plan** highlights how we actively target students from disadvantaged backgrounds with our outreach work, ensuring it is fully inclusive for everyone.

For example the Faculty of Liberal Arts and Faculty of Engineering and science organise and host outreach events, targeting female students to engage in STEM (Science, Technology, Engineering and Maths) subjects. Events such as Celebrating Women in Maths and Women into Engineering are regularly run in collaboration with external organisations and national campaigns.

We offer access to university staff and students and the public to access many of our talks, often with relevance, interest and impact in sustainability.


The university measures and tracks women's application rates, entry rate and study completion rates. This information shapes the reporting tools that are created and annual reporting of the success and retention of female students. Our **Access and Participation Plan** provides a framework for ensuring we meet our gender equality responsibilities in our recruitment and teaching work.

The university offers women's access schemes including mentoring through the **Aurora** scheme that

encourages and supports women to become leaders at Greenwich and elsewhere.


The university has processes and systems in place to help ensure we manage the water we use. Our Environmental Management System provides our framework to make improvements and we have a water reduction target of 1% per year. The university does not irrigate its lawns and only irrigates certain landscape roofs at Stockwell Street, planters in Medway and the Community Edible Garden raised beds at Avery Hill. We provide free water at water fountains across the campuses in addition to providing free water for anyone to access at all of our catering outlets.


The university seeks to ensure operationally that it reduces the amount of energy it needs to use through the application of its **Carbon Management Plan**, for example through the application of its **Heating and Cooling Policy**.

Where we use electricity this is predominantly low carbon sourced with our supplier providing 100% of our power from zero carbon sources. Additional to this we utilise clean energy from our Stockwell Street and Avery Hill photovoltaic cells and have a Combined Heat and Power plant in Medway powered by refined used cooking oil.

The university knows the importance of reducing energy demand and this is reflected in our Corporate KPI. We have made investments in boiler, lighting and other power systems that reduce demand and have requirements to ensure our large new builds and refurbishment schemes have to BREEAM certifications that require high energy efficiency.

The university does not have any direct investments in fossil fuel companies, although as part of investment tracking portfolio's at any one time some of our short term investments may move into and out of oil fossil fuel companies. Our Ethical Investment Policy can be reviewed **here.**


The university recognises unions and labour rights with representation on relevant committees. Our **Equality, Diversity and Inclusion Strategy and Action Plan** aims to Deliver measurable equality and inclusion outcomes for both students and staff, promote inclusion, fairness and dignity at work and ensure we comply with legislative requirements. We have an Annual Statement of Compliance for the **Modern Slavery Act and adhere to our Anti-Slavery and Trafficking Policy.**

We have a policy on pay scale equity including a commitment to measurement and elimination of gender pay gaps, and policies and processes to avoid discriminatory practices can occur as illustrated in the documents on **this web page**. Processes for employees to appeal on employee rights and/or pay are in place if needed.

Our Equality, Diversity and Inclusivity Committee provides the forum for action within the university. We pro-actively ensure that we provide counselling and other direct support to students and staff in addition to ensuring access to buildings and learning and work needs. This can be seen though work undertaken by the **Student Well-being Service**.


The university's teaching and research contributes to the provision of graduates with skills that will improve the industries and infrastructure making them more resilient and sustainable. For example, integrating sustainability thinking into civil engineering, green chemistry, the application of novel processes and feedstock such as micro-algae, the application of sustainability and circular economy thinking with in the built environment and the improvement of food systems and the protection of foods in storage and transit and the handling of bulk goods means the university is actively encouraging improvement and innovation that will deliver sustainability outcomes. Work, for example, in carbonising construction materials is seen as a game changer in the construction industry that can now utilise waste materials, lock carbon dioxide into these materials and produce road surfaces, building blocks, cements and other materials that are carbon negative.


The university has an admissions and recruitment policies with **strategic application** which are non-discriminatory and provide support and programmes to support students and staff from under-represented groups. Work to recruit students from under-represented groups is fundamental to our to outreach and access delivery. We work closely with schools and colleges that have high proportions of students from areas of low higher education participation, BAME students, students with disability and children in care.

Our Equality, Diversity and Inclusivity Committee is representative of our student and staff make up and that reviews and ensures that the university meets its obligations. Institutionally we measure and track applications & admissions of under-represented (and potentially under-represented) groups including ethnic minorities, low income students, non-traditional students, women, LGBT students, disabled students amongst others. We have **systems** in place to help our communities reach their fullest potential at Greenwich and with one example being our **BAME Attainment Gap Project**. We have a **policy** to help protect students from bullying and harassment from staff members, students and third parties.

Our estates are designed and reviewed to ensure that we are able to maximise the accessibility for our users. As we have many protected buildings sometimes it is not possible to enable access to all students to all parts of the university. Where this happens the university ensures that modifications such as providing accessible rooms for those requiring learning and other work spaces. The university has a **Student Well-being Service** with staff available to review student needs and support these. Where **disabled students and students with medical conditions** require halls accommodation we prioritise students with disabilities when allocating places and have rooms and flats that are fully accessible and equipped for those with disabilities.


The university is fortunate to have inspiring campuses of historic, architectural and natural value. Our grounds and some internal areas are open free of charge to the public to enjoy. Public access to indoor spaces includes Medway library where local people have borrowing rights, in addition to exhibition and cafe spaces available on our campuses. We recognise that there is much academic and intellectual capital we can share and enable public access to many talks we hold through the year. In addition to this our Bathway Theatre and university choir put on performances that are open to the public.

Not only do we seek to help add to and improve the public realm for our local communities we seek to ensure we can reduce any impacts we may have on our neighbours. Examples of this include the extensive university inter-campus bus provision that ensures that we do not add to any local public bus passenger loads. Instead we provide a high capacity and regular bus network between our campuses. These services are also free or heavily subsidised helping reduce costs to our students and staff who need to use these services. Our provision of healthy and active travel alternatives and disincentives for private car use reduce the impacts of travel with the aim of improving mobility and the health of our staff and student communities. This is highlighted in our **Travel Plan**. How we design and build our estates also contributes to the sustainability of our cities, maximising space utility and making the spaces sustainable through for example the application of the BREEAM building standard, through our ISO14001 (2015) (Environmental Management System) and through improvements we have made, for example, the extensive landscape roofs integrated onto the Stockwell Street building which enabled us to gain a BREEAM innovation credit that illustrates best practice globally.

The university applies its teaching and research on making cities and communities sustainable. Work undertaken across our faculties focusing on the built environment, in FLAS, on health and education at FEHHS, science and engineering including the work undertaken by the NRI contributes greatly to our teaching and research output.


The quantity of products and services consumed by the university are significant, The university has a large non-staff spend that contributes to environmental issues such as climate change and other pollution in production and transportation stages. It can also impact on workers and communities particularly where regulations and enforcement is poor. To overcome this the university has polices and strategies that help us reduce and eliminate these potential impacts. We have, for example, policies on Modern Slavery, a Sustainable Procurement Policy

and also we have other more specific policies such as our Sustainable Food and Fairtrade policies that help ensure we meet strict goals relating to the food our caterers procure and serve. All policies can be found **here**.

We have a recycling rate of approximately 57% against an ambitious 70% target. One key measurement is the total amount of waste we generate which has been falling significantly for the past five or so years. Investments in technology and other processes has meant a shift away from the need to use paper although we are still some way away from being a paperless university. We have a Waste Strategy that provides clarity for waste generators across the university. For example, this has helped encourage on-going action within our catering outlets to encourage the reuse of hot drink containers, leading to the Queen Mary cafe becoming one of the UK's first totally disposable free cafés. Our work has also meant that food wastes have been reduced.

The university seeks to reduce the materials used and impacts of its estates work through the preference to reuse and re-purpose buildings. The redevelopment of the old Students' Union Cooper building and the reuse of modular buildings at Greenwich and Mansion site saved on the materials and embedded energy of the existing structures. The new library in Phase 1 of the Southwood site redevelopment is reusable and can relatively simply be deconstructed and moved to be rebuilt at a new location. The new modular built library constructed off site in a factory, reducing material wastage. These modular buildings eliminate waste and maximising the flexibility and life of the buildings.

An example of the research we undertake in this area includes how Greenwich leads on the **African Postharvest Losses Information System** (APHLIS) initiative. This was developed in response to demands for more accurate understanding of the quantity of staple cereals being lost at the different stages of the value chain in each sub-Saharan African country and in each province within them. This builds on what relevant data already exists in the scientific literature, and adds to it through careful tracking and measurement of what amounts of food are being lost to different causes, at each postharvest stage in typical food systems. This enables policy and investment decision-makers to better target their loss reduction interventions geographically, by value chain stage, and by crop.


The university has made great strides in reducing its carbon footprint. It met its HEFCE carbon target two years ahead of time and we exceeded our 2020 Carbon Management Plan target. As highlighted in SDG 7 we procure zero carbon electricity and generate electricity from two large photovoltaic systems at Avery Hill and Greenwich campuses.

Our academic work is recognised as important in contributing to help solve the climate crisis. Work undertaken for example by Dr. Maria Nikolaidi funded by the New Economics Foundation (NEF), the Network for Social Change and the ClimateWorks Foundation (INSPIRE network) in order to analyse financial policies that are conducive to de-carbonisation and to investigate how the European Central Bank could develop a climate-aligned monetary policy framework. Dr. Maria Nikolaidi has also participated in a panel of academics and finance experts that was commissioned by the Shadow Chancellor of the Exchequer, John McDonnell in 2019. The panel published a report that includes several recommendations through which the UK financial system could contribute to the transition to a low-carbon economy. The university carried out research and consultancy on contingency planning and responses to drought in Northern Kenya, Morocco and Mongolia, including early warning and responses by district-level governments, approx. 1997-2006. This included policy briefs on drought management, and highly-cited research papers on the specific topic of livestock marketing interventions in emergencies. However, this is not a current research focus.

The university participates in co-operative planning for climate change disasters, working with governments and international agencies such as the FAO, for example in **developing countries**.

The university has supported Professor John Morton over several years' work for the Intergovernmental Panel on Climate Change (Lead Author, Fourth Assessment Report; Expert Reviewer, Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation; coordinating Lead Author, Fifth Assessment Report; Lead Author, Special Report on Climate Change and Land, Chapter on "**Risk management and decision making in relation to sustainable development**"). While not directly a form of co-operative planning, the IPCC reports are a very important source of policy-relevant information on climate change, including on risks of and responses to disasters, for government worldwide. The university carried out research and consultancy on contingency planning and responses to drought in Northern

Kenya, Morocco and Mongolia, including early warning and responses by district level governments, approx. 1997-2006. This included policy briefs on drought management, and highly-cited research papers on the specific topic of livestock marketing interventions in emergencies. However, this is not a current research focus. Professor John Morton provided a briefing paper on the relation between climate change and livestock emergencies, and a significant amount of new text and editorial amendments, to support preparation of the second edition of the multi-donor Livestock Emergency Guidelines and Standards (2015).

We offer modules at both undergraduate and postgraduate level that relate to climate change. An example being Sustainable Futures looks at the economic, science and social aspects of working towards sustainability and considers communication and behaviour change necessary. Staff are also developing an undergraduate Climate Change Degree planned for launch in September 2021.


The university offers an Environmental Science undergraduate degree that provides education relating to freshwater ecosystems. Research and teaching has also been undertaken relating to coastal environments including the impacts of sargassum in the Caribbean. Other academic work covers the impacts of ship breaking in Bangladesh and the problem of plastics entering the Indian Ocean. The university operationally holds Marine Stewardship Council certification for all the fish served in its catering outlets. It also has policies and systems that protect and improve the aquatic environments including having and adhering to our Ecosystem Services Policy and Biodiversity Plan and a zero chemical grounds services position so we don't use artificial chemical inputs on our the paved and green spaces of our estates. Our Environmental Management System provide us with a clear strategy and the processes needed to reduce any discharges and keep any discharges within set limits. Chemicals are managed in ways whereby any wastes are taken off-site for specialist and safe disposal.


The ways we protect and manage our natural environment is covered by our Ecosystems Services Policy, Biodiversity Action Plan, Environmental Management System and through the processes and systems we have in place. On campus we have protected species including dormice, bats and birds of prey. We are considerate to our natural species when undertaking using projects and, for example, at our Stockwell Street building were able to create biodiversity gain through the transformation of what was concrete parking space into a three storey building with one of the most diverse and largest green roofed buildings in London (for an office/educational building). This building is ground-breaking as it won two BREEAM innovation credits one relating to the landscape roofs, the learning and information of which is now available to integrate into other building projects globally.


Greenwich has a Governing Body made up of independent and university representatives including elected student representatives. This and other governance groups such as the Finance Committee and other committees enable the effective management of the university and ensures the objectives of many of the SDGs are met through our operations, procedures, systems and actions. We have clear policies that provide the clarity of direction to ensure progress is maintained. We recognise core tenets of education and academic need including a commitment to academic freedom. We publish our **Annual Financial Statement** that illustrates our accountability and meets legal requirements. Our academic staff work on projects and initiatives that strengthen laws or provide opportunities to provide access to legal expertise in cases where a review of cases and evidence can lead to a review of the judgements and sentences. This includes in the latter case the Innocence Project led by Dr Louise Hewitt. Dr Williams has analysed disability discrimination at British Employment Tribunals. She analysed judgments and found that characteristics of claimants were associated to a number of factors leading to the failure of their cases: restrictive judicial decisions, complex legal tests, inequality of arms between claimant and employer and the stigma attached to claimants with mental impairments. Her publication was picked up by the

Law Commission for their report on law reform.


The expert knowledge of our academic community has supported national and local government including policy development delivering the SDGs. This includes work undertaken to better understand human emergency escape patterns including providing expert evidence to public enquiries such as **Grenfell**,

Academic staff in FEHHS are appointed to the Dementia Team of the World Health Organisation, as part of the **Department of Mental Health and Substance Abuse peer reviewer group** and **academics contributing to IPCC reports**. Professor Morton was Lead Author on the chapter on "Risk management and decision-making in relation to sustainable development" of the IPCC Special Report on Climate Change and Land, having been co-leader and rapporteur of the breakout group that drafted the content for the chapter at the Report's Scoping Meeting. The chapter, designed to be policy-relevant like all IPCC outputs, makes the SDGs and trade-offs between them central to its assessment of knowledge on decision-making in pursuit of climate adaptation and mitigation and sustainable land management, see for example Figure 7.7 and Table 7.6 on "Risks at various scales, levels of uncertainty and agreement in relation to trade-offs among SDGs and other goals.

The university is rightly proud of its contribution and values that our academics have been recognised through the **Queens Anniversary Prize.**

Importantly the university participates in international collaboration on gathering and measuring data for the SDGs. We have worked with UN Habitat (Global Land Tools Network /Global Land Indicator Initiative) over three assignments. The assignments involved NRI providing research and technical support to GLTN /GLII for developing conceptual and operational frameworks for global land monitoring indicators. We supported GLTN /GLII on 15 global land monitoring indicators as well as a specific SDG indicator 1.4.2 related to land tenure security. This was done consultatively working with the GLTN (Mr. Oumar Sylla, Unit Leader – Land and Global Land Tool Network, Everlyne Nairesiae, Coordinator Global Land Indicators Initiative (GLII); Robert Ndugwa, Head-Global Urban Observatory Unit, and Donatien Beguy, Human Settlement Officer in Research and Capacity Development Branch in UN Habitat and its platform partners such as World Bank, Africa Centre for Statistics (UN Economic Commission for Africa), an expert group involving representatives from civil society, academia, private sector, international organisations (Landesa, Land Policy Initiative for Africa (LPI); European Environment Agency; International Land Coalition (ILC); Millennium Challenge Corporation (MCC), Oxfam, USAID, University of Calgary, Knowledge Ltd, Lantmateriet etc. As part of this work, we also consulted /surveyed national statistical offices in the 17 countries. Cool Towns is a co-operation between 13 European partners aimed to counteract the negative effects of climate change and find attractive solutions that make cities climate-proof and robust so that heat stress is prevented or limited as much as possible.

The university has also been involved with international collaboration and research and developing international best practice on tackling the SDGs. On the causes of inequality and policies to tackle inequality we completed a project in 2018 funded by INET on "The Causes of Falling Wage Share and Prospects for Growth with Equality in a Globalised Economy." We shared the results at a large conference together with the TUC, OECD/ TUAC and think tank Foundation of European Progressive Studies at University of Greenwich. Our research on the effect of inequality on growth, and the role of wages on demand was used by the UN/ILO in G20 meetings in particular in 2015 in its international policy guidance providing the economic case for increasing the labour income share through combined policy measures. It changed the understanding of national and international trade unions about the impact of wages and trade unions on growth and macroeconomic stability and provided a policy simulation on the effect of increasing the labour income share and public investment to L20 to provide policy guidance to G20 in 2014. It provided input to the South Korean President's new policy document 'Economic Paradigm Shift' in 2017, which outlines Korea's general economic policy strategy. Ozlem Onaran was invited to speak at the Korea Development Institute (KDI), 11 October 2017 and Karl Polanyi Institute Asia, 12 October 2017.

# Estates and Facilities Directorate

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Every effort has been made to ensure that this document is as accurate as possible. However, the university reserves the right to discontinue any class or course, to alter any course or to amend without notice any other information detailed here.

## Part III. Measurement of Outcomes cont.

University of Greenwich Annual Sustainability Report 2019-2020 - https://docs.gre.ac.uk/rep/ef/annual-sustainability-report-2019-21

This is our time: University of Greenwich Strategy 2021- 2030
University of Greenwich Strategic Plan - https://docs.gre.ac.uk/rep/communications-and-recruitment/this-is-our-time-university-of-greenwich-strategy-2030

NRI Annual Review 2019-2020 - https://www.nri.org/publications/annual-reviews/42-annual-review-2019-2020/file

Mandatory training for staff which includes courses in Bribery Prevention; Data Protection; Equality and Diversity Essentials; Managing Diversity and Safeguarding against Extremism https://docs.gre.ac.uk/__data/assets/pdf_file/0012/133401/mandatory-and-essential-training-october-2021a.pdf

Anti-Slavery and Human trafficking statement - https://docs.gre.ac.uk/rep/vco/modern-slavery-statement

Anti-Bribery policy - https://docs.gre.ac.uk/rep/human-resources/anti-bribery-policy

Sustainability Policy - https://docs.gre.ac.uk/rep/ef/sustainability-policy

Sustainability strategy including our Sustainability Management Board - https://www.gre.ac.uk/sustain/strategy

Our sustainability work is extensive and we would like to share this with you. Visit our sustainability information and support hub to explore what we are doing, and to find information about how you can learn and help us all move towards our sustainable vision.

Sustainability Facebook page: https://en-gb.facebook.com/UoGSustainability/

Gender Pay Gap report - https://docs.gre.ac.uk/rep/human-resources/gender-pay-gap-report

Work of the BHRE - http://www.bhre.org/ and https://www.gre.ac.uk/las/research/bhre

Work of the NRI – www.nri.org
and https://www.nri.org/publications/annual-reviews/42-annual-review-2019-2020/file