

Executive Summary

Following the formation of BRIDGE Colombia, a bilateral science research network between Colombia and the UK, Professor Federica Di Palma was awarded £6.5 million by the UK Government's Global Challenges Research Fund- GCRF for the GROW Colombia project. GROW Colombia brings together a consortium of international partners to strengthen research capability in biological sciences, computational biology, and socio-economic research under a shared vision centred on biodiversity conservation as a means to achieve sustainability and peace in Colombia.

This collaborative, multidisciplinary, four-year initiative aligns with the ColombiaBio programme and seeks to achieve lasting biodiversity conservation impact by building the capacity of academics, government, civil society and the private sector to develop sustainably Colombia's agri-industry and bio-economy for the benefit of the Colombian people. Professor Federica Di Palma was recently honoured by the Government of Colombia with her appointment to the Misión de Sabios (International Mission of Experts). Federica is joining 42 other intellectuals tasked with recommending proposals in education, science, technology and innovation policy to inform a road map linked to the United Nations Sustainable Development Goals. This road map will be incorporated into Colombia's next National Development Plan, further strengthening Colombia's capacity for evidence-based policy making.

GROW Colombia partners and collaborators

- Earlham Institute's Director of Science, Prof Federica Di Palma as Principal Investigator.
- Partners in Colombia: University of Los Andes, International Center for Tropical Agriculture (CIAT), Humboldt Institute.
- Partners in UK: Natural History Museum, The Eden Project, University of Aberystwyth (Institute of Biological, Environmental and Rural Sciences - IBERS), University of East Anglia .
- International partner: University of Sydney.
- Collaborators: Colciencias, AGROSAVIA, Amazonic Institute of Scientific Research (SINCHI), Rosario University, The Marine and Coastal Research Institute (INVEMAR), Environmental Research Institute of the Pacific (IIAP).

2016

Colombian government:
Peace agreement



2016

Newton-Caldas fund:
Focus on bio-economy



2017

GCRF
GROW Colombia:



2018

Green Growth Strategy



2016

Colombia BIO:
National strategy around biodiversity



2017

BRIDGE Colombia
Network: **Making Peace with Nature**



2018

C3Biodiversidad:
Cyberinfrastructure Consortium



2019

Misión de Sabios
Policy impact



■ Themes

The GROW project has three overarching scientific programmes:

1. The natural diversity of organisms and ecosystems in Colombia: characterising and managing the genetic diversity of species, as well as understanding changes in biodiversity distribution and evolution with the long-term goal of preventing biodiversity loss.
2. The agricultural diversity of crop species in Colombia: developing the genetic diversity with a long-term goal of making farming practices more efficient and ecologically sensitive.
3. The socio-economic challenges and impacts associated with developing the bio-economy and conserving Colombia's biodiversity.

■ Natural diversity

The GROW Colombia Natural Diversity Programme is working to enhance Colombia's national biodiversity knowledge by characterising the quality of existing collections and fortifying them with new samples, data and analysis. The Programme is focused on two native species of national importance, the Andean bear and cocoa.

Research is underway to collect samples of hair, bones and faeces from the Andean bear to inform our understanding about the evolution of the species, its population genomics and its resilience to future threats such as climate change and disease. This research will enhance conservation strategies for the Andean bear and the paramo habitat which supports a huge diversity of flora and fauna and provides important freshwater resources. Related to this research is the Programme's capacity building work to train customs officers in the use of infield monitoring (metabarcoding and nanopore DNA analysis) to tackle the growing problem of international illegal wildlife trade.

The GROW Colombia Natural Diversity Programme is working in alignment with ColombiaBio to explore the diversity of cocoa. The CacaoBio expeditions, led by Universidad de los Andes and AGROSAVIA, are collecting wild cocoa relatives and soil samples in the Putumayo-Caquetá and Chocó regions. Researchers are analysing the samples to enhance Colombia's natural collections, discover more about current threats such as diseases and inform our understanding about the opportunities that cocoa wild relatives can provide. National and international botanic collections will be assessed to understand the genomics of cocoa related species for crop improvement and to enable policies and practices that simultaneously conserve biodiversity and boost sustainable cocoa production.

■ Agricultural diversity

The GROW Colombia project aims to help Colombian farmers achieve food security and improved nutrition whilst promoting sustainability. We are establishing breeding programmes for economically important crops and forages and researching best practice in sustainable land use.

Researchers are examining genetic resources and tools to improve crop production of tropical grass-forages, plantains, sugarcane and cocoa. Research is also underway to analyse resilience to cadmium uptake and effective disease management practices for cocoa, sugarcane and livestock production. We plan to use field metagenomics to monitor and forecast risks.

The Agricultural Diversity Programme is growing the capacity of Colombia's precision agriculture and digital genebanks and translating it into farming practice both in the field and in the supply chain.

■ Socio-economics of biodiversity

The GROW Colombia project aims to assess comprehensively the challenge and impacts associated with biodiversity. Analysts are working bilaterally to understand the values of Colombian biodiversity and ecosystem services, demonstrating their economic and social value and capturing those in recommendations for future policy making. Researchers will focus on cattle ranching, ecotourism and cocoa as examples of sustainably developing Colombia's bio-economy to deliver green growth and equitable prosperity, particularly in post conflict, rural communities.

Our research involves working closely with civil society groups and developing strategies to engage with stakeholders (including farmers and ex-combatants) and policy makers alike to create socio-economic opportunities in monitoring and conserving biodiversity. At national and regional levels, we are training ex-combatants to instigate biodiversity inventories and identify new ecotourism opportunities that genuinely advance conservation activity. We are analysing valuation frameworks to incentivise decision-makers to restore and protect native ecosystems and wildlife and to inform policy.

■ Capacity building activities completed

- 2018 International cyberinfrastructure workshop attended by nearly 50 researchers. The workshop saw the formation of the Consorcio Colombiano de Cyberinfraestructura para la Biodiversidad (C3Biodiversidad) and produced a White Paper to inform future government policy.
- The scientific journal paper was submitted to Public Library of Science Computational Biology in April 2019.
- 2018 Training event for wildlife crime fighters in how to use metagenomics to tackle international illegal trade in wildlife. More than 100 participants, including undergraduates and graduate students, university lecturers, civil servants and NGOs.
- 2018 GROW Colombia annual meeting in Cali: partners and collaborators reviewed progress and planned future activity and impact.
- 2019 GROW Colombia trained local cocoa producers in the Chocó region in maintaining records for production, sales and costs, and gathered basic information about cocoa supply chains in the area.

■ Policy impact so far

- 2017 participation in a diplomatic event at the Natural History Museum to celebrate the UK's support for "Doing Science with Colombia" with focus on Colombian biodiversity.
- 2017 participation in international policy workshop on Sustainable Development Goal Interactions: The Role of Environmental Science organised by the UK Natural Environment Research Council and the UK Global Challenges Research Fund.
- 2018 meetings with UK Parliamentarians (All Party Latin America Group and All Party Colombia Group) to discuss the GROW Colombia project. Policy discussion with the Chair of the Science and Technology Select Committee in Parliament.
- 2018 FIMA international environment trade fair in Bogotá: GROW project team took part in panel events, presentations and policy talks about integrative approaches to biodiversity conservation and achieving the Sustainable Development Goals in Colombia by 2030.
- 2018 field trip with British Ambassador to Colombia, Dr Peter Tibber, to identify the parameters and opportunities for ecotourism sector in the Colombian Amazon.
- 2018 participation in a workshop in Risaralda with environmental authorities and decision makers about implementing the statutory payment for ecosystem schemes and understanding financial mechanisms for biodiversity conservation.
- 2019 workshop funded by International Climate Fund to build theory of change for new UK investment in Colombian forests.
- 2019 policy discussion with UK's Shadow Treasury Minister about environmental economics in Colombia.
- 2019 meeting with the Colombian Ministry of Environment and CITES authority to inform Andean bear population genetics plans and opportunities to strengthen current conservation strategies.

■ Partnership consolidation achieved

- 2017-8 establishment of collaboration agreements between partners and recruitment to project team both in Colombia and in the UK.
- 2018 meeting with WWF Colombia to discuss potential collaboration and joint agendas.
- 2019 visit to 10 Colombian biological collections to assess Andean bear collections and discuss research linked to population genetics and conservation.

- 2019 appointment of Prof Federica Di Palma to Misión de Sabios for international science policy intelligence and advice.
- 2019 collaboration with Centre for Agriculture and Bioscience International /Sci.DevNet and University of Loughborough from PARAGUAS project (Newton Caldas fund) to run the media and science engagement training in Colombia.
- 2019 industry engagement with Catapult's Colco Programme to discuss joint objectives.
- 2019 engagement with Centre for Agriculture and Bioscience International to discuss joint objectives.
- 2019 participation in UN mission to Guaviare to prepare for ex-combatant reintegration workshops.

■ Planned activities in 2019

1. May 2019 science and development media engagement training for international group of scientists and journalists, Bogotá.
2. July 2019 microbial collections management and conservation training, Bogotá. In collaboration with Universidad de los Andes, AGROSAVIA, Corpogen, Universidad Javeriana and DSMZ from Germany.
3. July 2019 capacity building workshop for ex-combatants on biodiversity inventories and scientific ecotourism.
4. September 2019 workshop on biodiversity and ecosystem services valuation techniques valuation techniques, Bogotá.
5. September 2019 workshop on integrating omics-based technologies for the valorisation of Peruvian crop biodiversity, Arequipa, Peru, funded by the British Council.
6. September 2019 GROW profile (tbc) at Agrofuturo conference, Medellin.
7. September 2019 training event in assembling and analysing genomes, Santa Marta (tbc), funded by the American Genetics Association (AGA) and the European Society for the Study of Evolution.
8. October 2019 C3Biodiversidad meeting, Bogotá, funded by the Industry-Academia Partnership (IAPP) from the UK Royal Academy of Engineering.
9. October 2019 Software Carpentry workshop, Bogotá, funded by the Industry-Academia Partnership (IAPP) from the Royal Academy of Engineering.
10. November 2019 metagenomics workshop in Villa de Leyva.
11. November 2019 "Learning Outside the Classroom" day.
12. November 2019 public engagement in biodiversity workshop.
13. November 2019 capacity building workshop for ex-combatants on biodiversity inventories and scientific ecotourism.
14. November 2019 ancient DNA symposium.
15. November 2019 GROW Colombia annual meeting in the Amazon to assess impact and plan future activity.

■ Long-term impact:

By the end of the four-year project, GROW Colombia will have advanced Colombia's research skills, partnerships, and technological self-sufficiency by providing:

- At least 12 specialised training programmes across the three thematic areas.
- Five annual meetings bringing together academics, government, NGOs and industry.
- Numerous early career researcher retreats.
- A robust research exchange program for early career scientists.

The legacy of the GROW-Colombia project will include:

- Development of human capital.
- Adoption of new technologies and analytical capability.
- Generation of data, databases and novel approaches to biodiversity research.
- Promotion of education and community and social engagement.
- Evidence-based plans and policy recommendations.
- Analysis of ecosystem services and ecotourism opportunities.

