Nigerian Montane Forest Project

Montane Forest Conservation Initiative Nigeria

Annual Report 2024

Biological Sciences
Pūtaiao Koiora

Cover image: Hammasumo and Fatima collecting data in Ngel Nyaki forest.

Take a virtual tour to the research station via our website **canterbury.ac.nz/afromontane**

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Introduction

Anastasios (Tasso) Paul Leventis - Patron

Phil Hall (Chair)

John Adeyemi Adeleke

Danladi Umar

Jonathan Millard

Hazel Chapman

On behalf of the Nigerian Montane Forest Project (NMFP) I am delighted to present the 2024 Annual Report. Our theme this year is impact—and 2024 has seen significant real-world impact through our research, forest restoration and community engagement.

For example, our analysis of the effect of climate change on the phenology (the timing of leaf fall, new leaf, flowering and fruiting) of 95 tree species over the past 20 years in Ngel Nyaki forest show climate-driven mis-matches and decreased fruit production in many species. These findings have implications for montane forests across the Cameroon highlands and are vital information for conservation practitioners. Our restoration science is informing Africa Nature Investors (ANI) and Nigerian National Park Service (NPS) in their restoration plan for the montane forests of Gashaka Gumti National Park—the largest National Park in Nigeria. The NMFP is also partnering with ACReSAL in reforestation of government plantations.

Impact through education is evidenced by the number of our alumni now contributing to conservation/environmental education, science and policy in Nigeria and internationally. A recent example is Dr. Iveren Abiem, an alumni of both APLORI and NMFP and a lecturer at the University of Jos, who has been awarded a Charles Bullard Fellowship in forest science at Harvard University. Our impact in the community is increasing all the time. A recent collaboration with West African Export (Wafroex), initiated by our board member and financial officer Jonathan Millard has resulted in a new bee keepers cooperative and honeybee farm for the Mambilla communities.

I visited the field station in May and November this year, each visit being too short but action-packed. With our exceptional science coordinators and dedicated field staff I am more confident than ever that the project is delivering its mandate to our funders and supporters. I was able to report back directly our patron Tasso Leventis and board chair, Phil Hall while in the UK.

We extend our heartfelt gratitude to our funders, without whom our work would not be possible. We also express our sincere appreciation to our terrific board members for their unwavering support throughout the year. All of you make invaluable and unique contributions to the Project.

Thanks to Gabriel Dabo for producing a comprehensive draft of this report and to Matt Walters from the University of Canterbury for putting it together so beautifully.

Hazel Chapman
Executive *Director, Nigerian Montane Forest Project*

Our values

Mission Statement

To promote national and international commitment to the conservation of Nigeria's montane forests by inspiring excellence in research by postgraduate students and empowering local communities through employment and education.

Aims

1. To combine scientific research with education at both tertiary and local community level in order to develop long term sustainable management of Nigeria's montane forests.

2. To facilitate the involvement of national and international researchers in Nigerian montane forest research.

3. To involve the community in the management of montane forest ecosystems.

4. To work with the community in other ways, such as developing small businesses and working with schools to develop conservation awareness.

We are committed to biodiversity conservation through working hand in hand with local communities.

We actively pursue our four primary aims above, all of which can be linked to the United Nation's Sustainable Development Goals.

Our networks

Project Partners / Collaborators

Africa Nature Investors Foundation (ANI), Nigeria
A.P. Leventis Ornithological Research Institute (APLORI), Jos, Nigeria
Dr Andrew Hacket-Pain, University of Liverpool UK
Agro-Climatic Resilience in Semi-Arid Landscapes (ACReSAL), Nigeria
Dr Silvio Stivanello, University of Exeter, UK
Gombe State University (GSU), Nigeria
Nigerian Conservation Foundation (NCF), Nigeria
Nigerian Meteorological Institute (NIMET) Nigeria
Nigerian National Parks (NNP), Nigeria
Prof Pierre-Michel Forget, Natural History Museum, Paris, France
Royal Botanic Gardens, Kew, England
Smithsonian Tropical Research Institute-ForestGEO, USA
Taraba State University (TSU), Nigeria
University of Canterbury (UC), New Zealand
University of Exeter, United Kingdom
WAFROEX (West African Export)

Project Funders

Africa Finance Corporation (AFC)
A.G. Leventis Foundation
A.P. (Tasso) Leventis
Retired General T.Y. Danjuma
Stanbic IBTC Holdings PLC
Taraba State Government
University of Canterbury, NZ

Our forest

Ngel Nyaki is representative of the unique forests of the Cameroon highlands. They are restricted to steep slopes or along stream sides where they are protected from fire and grazing. While small in size, these forests are locally, nationally and globally important. They act as water towers, attracting and storing water. They sequester high amounts of carbon and provide other vital ecosystem services such as crop pollinators and a source of food for honey bees.

Despite its small size Ngel Nyaki forest is home to a population of the Endangered Nigeria-Cameroon chimpanzee subspecies, *Pan troglodytes ellioti* and harbours other threatened mammals such as the African golden cat *Caracal aurata*. IUCN Red Listed trees include *Eugenia gilgii, Millettia.conraui, Pouteria altissima* and *Dombeya ledermannii.*

Research

UNIQUE NIGERIAN BIODIVERSITY RESEARCH STATION

The team (field assistants and IT students) counting flowers, aborted fruits, whole fruits and damaged fruits that have fallen into the traps placed under the trees. Counts are made weekly. This is a major commitment and one of our most labour-intensive projects.

Reassessing masting in tropical forests: Extent and evolutionary drivers revealed through pan-tropical synthesis and local experiments.

For the optimum management of Nigeria's Afromontane forests it is essential that we understand how they are responding to climate change. For example, any disruption of seed production due to altered phenology (the timing and quantity of leaf production, leaf fall, flowering and fruiting) will affect forest regeneration with consequences for ecosystem stability. One strategy that plants use for ensuring recruitment into the next generation is mast flowering. Masting is when plants show highly variable and synchronised year-to-year fluctuations in flowering and seed production. By flowering and fruiting en-mass, plants increase their likelihood of i) effective pollination of flowers, ii) protection of seeds from predators, and iii) dispersal of seeds away from the parent plant. Until recently the idea of masting by most tropical forest species has been considered unlikely. However, better phenological data from across the tropics, as well as from our own Ngel Nyaki forest, is hinting at masting being potentially common. If it is, and if masting is disrupted by climate change, then this will have downstream effects on pollinators, seed eating animals and forest reproduction. It is thus vital we understand this potentially critical driver of forest functioning and community dynamics.

In collaboration with Dr Andrew Hacket-Pain of the University of Liverpool, UK, over the past year we have continued data collection on the flowering and fruiting of five tree species we suspect of mast seeding. To date we have counted almost 4,000 flowers and 6,000 fruits and already have a strong signal that at least one of these species produced vastly more fruit in 2024 than in the previous year. We will investigate the link between mass flowering events and the proportion of flower and seeds predated, as well as the number of recruiting seedlings. We will extend this research to measure the damage to seeds and fruits from pre-dispersal predators and monitor the fate of dispersed seeds to measure post-dispersal predation.

Seedling fate

Anthonotha noldeae is a tree species of great ecological importance within Ngel Nyaki forest. It is widespread and abundant across the forest and is a major food source for birds (petals and nectar), insects (pollen and nectar), primates (immature fruit) and rodents (mature seeds). 2024 saw a superabundance of seeds on the forest floor (see image). To monitor their fate and compare with future years (see section on masting above) we have set up four 1x1 m monitoring quadrats under 60 carefully selected *Anthonotha* trees in both the core and forest edge, to assess the fate of these seeds as they develop into seedlings. If our masting hypothesis is correct, 2024 should see more seedlings survive than in low seed years, because with predator satiation the seeds will give an opportunity to germinate and establish. We will continue on this experiment for several years to gain a better understanding of *Anthonotha* reproduction dynamics.

Top: **Anthonotha** ***seeds lying on the forest floor. In 'typical' years these would have almost all been removed by rodents such as the African Giant Pouched Rat*** **Cricetomys sp. nov.** ***and porcupine*** **Hystrix cristata.** ***Or seeds would also have been destroyed by insect seed predators.*** Lower: ***Six months later, tagged*** **Anthonotha** ***seedlings in one of the survey quadrats.***

ForestGEO liana species census

In 2023 Gabriel Dabo, one of our science coordinators received a Smithsonian ForestGEO research grant to determine the liana composition of our 20.28 ha ForestGEO Permanent Forest plot. During 2024 Gabriel and the Ngel Nyaki Smithsonian field-assistant team have concentrated on this task. They have identified tagged, measured, and mapped all rooted lianas >1 cm in diameter at breast height (DBH) in the plot. To date they have tagged over 10,000 individual lianas belonging to 39 species. These data will help inform how lianas are shaping forest ecosystems in an Afromontane environment and how they add to the overall woody plant biomass in West African montane forests.

Dr Moses Libalah,-a plant taxonomist and a lecturer at the University of Yaounde in Cameroon, is helping Gabriel with his liana identifications. Gabriel has also been included in a journal publication on liana diversity across the tropics led by Dr Stephen Schnitzer from Marquette University Wisconsin, USA.

The liana census team and other members of the Nigerian Montane Forest Project recognisning the start of the liana census during May 2024.

Forest regeneration research

Active regeneration plots census

The NMFP has been planting forest trees into degraded forest-edge grassland since 2006. This year we have quantified the results of our plantings; we have censused our regeneration plots for 2007, 2020, and 2022, assessing which species have survived the best and how fast they have grown post-planting. We are going to combine this information with biomass estimates to determine the amount of carbon sequestered by planted trees.

Preventing fires and stopping grazing in our regeneration plots has created its own problems. The grass in the plots changes species composition and the grass *Sporobolus pyramidalis* is replaced by >1 m tall *Hyparrhenia rufa*. When there is a fire, the tall *Hyparrhenia* burns hotter than the *Sporobolous* tussocks. Fires do not necessarily kill the seedlings/saplings because those which survive in the grasslands are all thick barked, re-sprouting, fire-resistant species. However, hot fire does more damage. Thus, we are re-thinking our restoration management strategy. In 2025 we are going to introduce early burning and limited grazing into our management.

Above: ***Abdulrahman, Istifanus Jesse, and Misa Zubairu, identifying and measuring a planted seedling in one of our regeneration sites. The aim is to measure survival and growth rates of different seedlings species.***

Right: ***This Anthonotha seedling has survived a fire and is beginning to re-sprout from the base. This picture, with Usman Abubakar as scale, was taken only 4 months after a major burn.***

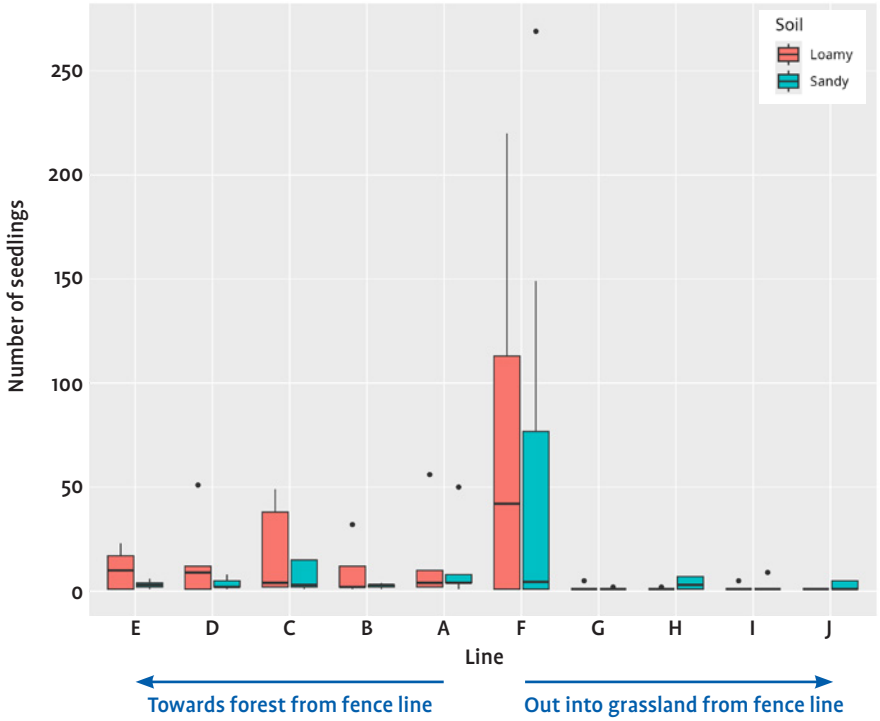
Saplings of grassland tree species whose seeds have been dispersed by birds sitting on fence posts and wire. This fence was first established in 2005 and has now been completely replaced by a row of trees. Of note is that after 20 years no forest tree species had survived.

The role of perches in reforestation

We have previously shown that at Ngel Nyaki birds do not carry seeds much further than 10 meters away from the forest edge—which limits passive reforestation efforts. However, isolated trees in the grassland attract grassland birds and thus act as foci for seedling establishment in grass as far as 130 m from the forest edge.

Fence lines also act as perches. During 2024 Istifanus Jesse and Usman Abubakar investigated the effects of perches on tree regeneration along a 10 km length of fence line established in 2005 to protect grassland from fire and cattle grazing. They found that the fence posts acted as perches for grassland birds and this resulted in seedling establishment under some conditions. Distance from forest edge and soil type played a role, but did not totally explain the results. More research is needed.

Assoc Prof Daniel Gerhard



On this graph along the x axis, E–J represent transects along which naturally dispersed seeds of tree species have germinated. Transect F, along the fence-line has posts which birds use as perches. Transects A–E are within the fenced-off grassland, protected from fire and grazing and run parallel to the fence in 10 m increments towards the forest edge. Transects G–J are outside of the fenced-off area, at 10 m increments into the grazed and burnt grassland. The y axis is the seedling count. The orange bars are on loamy (good) soils and the blue bars on sandy, shallow (poor) soils. Clearly the fence posts (perches) make a huge difference in speeding up natural regeneration.

Passive restoration

After 20 years of passive forest restoration of grassland spurs within Ngel Nyaki forest, in collaboration with Dr Hao Ran Lai and Anthony Gillis from UC, we have analysed the weekly seed count data from 150 seed traps and counts of seedlings established in the gaps over the past 20 years. We have also explored how the presence of isolated trees in the grassland hastens forest succession. Our data quantify the rate of forest succession and determine which seed traits are most important in seeds being dispersed. A major observation is how slow passive restoration is in these Afromontane systems and how regeneration is based almost entirely on grassland-forest edge, fire tolerant species.

Dr Hao Ran Lai

Anthony Gillis

Two sites which have undergone passive restoration. That is, they have been fenced-off from fire and grazing—but there have been no perches on these sites. Both sites have 30 seeds traps which are emptied on a weekly basis and all seeds in them identified and counted. The first image shows the sites in 2005 and the second in 2024. It is obvious that woody vegetation has become established over the years but also notable that the trees are mainly small, fire tolerant grassland species.

NMFP staff and researchers from the A. P. Leventis Ornithological Institute (APLORI) creating awareness about* Dombeya ledermannii *to the Mai Wuya community close to Ngel Nyaki forest.

Dombeya ledermannii project

In 2023 Thaddeus Pev Apezan with Simon Ojodomo and Glory Ozoji received funding from the Conservation Leadership Program to investigate the ecology and conservation of the critically endangered tree, *Dombeya ledermannii* in Nigeria.

Dombeya ledermannii is a rare plant species found only in Nigeria (on the Jos plateau and Mambilla plateau) and Cameroon (the Bamenda highlands), yet its ecology is poorly known. It is critically endangered due to habitat loss and over exploitation for fibre from the bark and thus requires urgent conservation intervention. *Dombeya ledermannii* (Dombeyaceae)

The *Dombeya* project, which was successfully completed earlier this year found through species distribution modelling that there is the potential for *D. ledermannii* to grow on the Obudu plateau, thereby expanding its known range. Additionally, surveys of the local communities indicated that people across the Mambilla plateau continue to use this plant for making ropes and spears, highlighting its cultural and practical significance which, with increasing human population pressure, has made the species vulnerable to extinction. Based on these findings the team spoke to communities explaining the natural value of the species and discussed conservation initiatives.

CONSERVATION LEADERSHIP PROGRAMME

Read more on their website

https://www.conservationleadershipprogramme.org/project/ecology-and-conservation-of-the-critically-endangered-dombeya-ledermannii-in-nigeria/

Quantifying ecosystem services

The ecosystem services project, funded by the Nigerian Tertiary Education Trust Fund (TETF) and lead by Dr Iveren Abiem, have made good progress with their work. A major aim has been to assess how the local communities perceive the forest as providing ecosystem services. The team has undertaken focus-group discussions, collecting information on the perception of communities on the ten most important services montane forests provide. Following on from this is a detailed assessments were made of which tree species are most useful in providing non-timber forest products (NTFPs), how much carbon the forest sequesters (carbon biomass) and water provisioning (the extent of water provision through rainfall and that gained through fog).

The Ecosystem Services team including Professor Ali from the University of Jos and NMFP staff with Zango community members during a visit to discuss ecosystem services and exchange knowledge on the value of forests to local communities.

The fog collector set up, moisture condenses on the netting and is captured in containers for measurement.

Students

With logistical support and science supervision from the NMFP, Ngel Nyaki forest reserve has become a research destination for students from across Nigeria and internationally.

PhD students

Schombi Obidah Schombi

Modibbo Adama University Yola
Third year

The status and determinants of medium and large-sized mammals in Ngel Nyaki Forest Reserve

Over the past three years his research has focused on understanding the population dynamics, distribution patterns, and ecological factors influencing such mammals within the reserve. This has been based on images from 15 camera traps deployed in 45 different locations and 15 line transects walked randomly across the reserve. While we are awaiting the data analysis and full thesis, Schombi has, among other things, confirmed the presence of several species not observed in Ngel Nyaki forest reserve for a while. These include the red river hog *Potamochoerus porcus*, Yellow backed duiker *Cephalophus silvicultor*, Aardvark *Orycteropus afer* and a mongoose. Illegal activities such cattle grazing as well as burning were also recorded during camera trapping.

Schombi sertting up a camera trap.

Awoku Gboyega

University of Canterbury, New Zealand
Final year

The insect pollinators of subsistence farmlands of the Mambilla Plateau

Gboyega and his field assistants have carried out substantial fieldwork across multiple sites on the plateau, he is now analysing his data alongside writing his thesis. We hope that Gboyega's work will inform new strategies that will improve the crop yield of local farmers.

Gboyega with several of the community elders at Yana forest during his surveys.

Eric Bemuh Febnteh

University of Bamenda, Cameroon
Completed

Eric has successfully defended his PhD thesis at the University of Bamenda, Cameroon. His research, titled "The Diversity and Regeneration Status of *Pleurotus* Species (Oyster Mushrooms) and Host Trees for Sustainable Management within the Etinde, Cameroon, and Ngel Nyaki Montane Forests". He identified four *Pleurotus* species (*P. pulmonarius, P. ostreatus, P. eryngii*, and *P. djamo*) in Ngel Nyaki forest. *Polyscias fulva hosted P. pulmonarius* and *P. ostreatus, Anthonotha noldeae* hosted *P. djamo*, and *Ficus lutea* hosted *P. eryngii*. His analysis also revealed a healthy natural regeneration levels of these species within Ngel Nyaki forest.

Eric (M), and his supervisors Prof. Mendi Grace Anjah (L), and Prof. Tonjock Rosemary Kinge (R) after his defense.

MSc students

Isaac Bawa

University of Nigeria Nsukka
Final year

Gastrointestinal parasites of tantalus monkeys

Isaac is waiting for his MSc exam at the University of Nigeria Nsukka. Over the past two years Isaac has been working on the gastro-intestinal parasites of tantalus monkeys in the forest fragments of Ngel Nyaki Forest Reserve. Issac has identified the presence of the protozoans *Entamoeba coli, Giardia lambliaand, Cryptosporidium* species.and the parasitic worms *Trichuris trichiuraand* and *Strongyloides stercoralis*, in monkeys across his sampling areas. Overall 78.2%of individuals were carrying parasites and this prevalence was not significantly different between fragments and seasons.

Isaac in the laboratory at the field station.

Bashir Mijinyawa

Ahmadu Bello University Zaria
Second year

Edge effects on seed survival within Ngel Nyaki Forest Reserve

Bashir, a botanist and a native of Yelwa village, our host community, is studying edge effects and their implications for forest tree seed survival within the Ngel Nyaki forest.

His research aims to uncover how the micro-climatic and ecological conditions at the forest edges influence seed viability, germination, and overall survival, as compared to the forest interior. He has designed and implemented cage experiments to protect seeds from potential predation and assess how external pressures like herbivory and physical barriers impact seed survival.

Camera traps have been another essential tool in his research, capturing the activity of seed predators, dispersers, or other wildlife interactions with the seeds.

In the laboratory, Bashir will investigate fungal infestations and other seed borne pathogens that could affect seed viability. By checking collected seeds for signs of fungal growth and decay, he aims to identify specific fungal species, their prevalence, and their potential impact on seed survival across different habitats within the reserve.

Bashir with his experimental cages ready for deployment into the forest.

Jemimah Amos

University of Jos (APLORI)
First year

Environmental affects on nocturnal bird species

Jemimah's research aims to investigate how environmental variables—specifically weather, elevation, and vegetation structure—influence the distribution of nocturnal bird species, with a particular focus on owls. She employed the use of acoustic song meters. Across the sampling period, the song meters detected six owl species; African wood owl, barn owl, African scoops owl, pearl-spotted owlet, greyish eagle owl, and the marsh owl.

Benhildah Antonio

University of Jos (APLORI)
First year

Conservation of raptors

Benhildah's project focused on enhancing raptor conservation within protected areas. She employed questionnaire surveys to gather data on people's perceptions of raptors and their willingness to support their conservation. Her research also examined how these attitudes vary between regions with high and low biodiversity. The results revealed greater support for raptor conservation in areas with higher biodiversity, highlighting the importance of conservation awareness and education in lower biodiversity zones. She recommended community-based outreach and education programs to improve public understanding and strengthen conservation efforts across all regions.

*We remain commited to **high quality** **training** at tertiary level to build capacity.*

Intern students

Intern students from Gombe State University and Taraba State University. From L-R. Shariff Muhammad, Muhammad Muhammad, Peculiar Ngandi, Giwa Rimamsiyang, Diana Keneth, Obed Daniel, Friday Maiva, Mummasen Genesis, Naphela Ciaiphas, Natuwa Godwin, Blessing Umar.

This year the project hosted 12 undergraduate students—six from each of Taraba State University and Gombe State University. The intern students were engaged in all of the research activities carried out by the NMFP, learning from various researchers and field assistants. The students are now well trained on how to collect and make sense of ecological data. After this training, each of the students undertook a 3-month research project of their choice.

Hassan Muhammad Shariff

Shariff conducted a comparative analysis of seed and soil treatment of *Harungana madagascariensis*, a plant noted for its ecological and medical importance in the Ngel Nyaki Forest Reserve.

Diana Keneth

Using field and questionnaire surveys, Diana evaluated the conservation status of five endangered plant species and the threats they face in the reserve.

Genesis Mummasen

Mummasen investigated the effect of various management practices on non-breeding winter migrant birds within and outside the Ngel Nyaki Forest Reserve.

Obed Daniel

Obed worked on the Propagation of endangered *Prunus africana* using different experimental treatments.

Natuwa Godiwin Maidoki

Natuwa investigated the diversity of lichen species in Ngel Nyaki Forest Reserve, as well as the ecological roles they play in the environment.

Muhammad A Muhammad

Muhammad worked on the population status and abundance of the ICUN endangered tree *Prunus africana* in the Ngel Nyaki Forest Reserve.

Blessing Umar, Giwa Rimamsiyang, Peculiar Ngandi, Friday Ayuba, and Naphela Ciaiphas

A dedicated cohort from the Botany Department of Taraba State University, collaboratively conducted a post-fire assessment of the grassland areas within the reserve affected by wildfire. Their project aimed to analyse the ecological impacts of fire on avian community structures.

Student field trip

We had the pleasure of hosting staff and students from the Forestry Department of Taraba State University for a three-day field trip to Ngel Nyaki Forest Reserve, led by Dr Yanni Julius (Dr Julius is amongst many that conducted their PhD research in the reserve), During their visit, the students learned about our various ongoing projects, they explored the reserve's rich fauna and flora, received practical training in research techniques and ecological survey methods and listened to a series of short lectures on scientific writing and experimental design by our science coordinators.

TSU Forestry department students during their field trip

Alumni achievements

Charles Bullard Fellowship in Forest Research at Harvard University

Iveren Abiem has been accepted as a Charles Bullard Fellow in Forest Research at Harvard University for 2025–2026 program session. This is a fellowship that will contribute to her professional growth as a forest ecologist. During her time at Harvard Forest, she will be studying seedling recruitment and growth using data from the seedling censuses in the Ngel Nyaki ForestGEO plot. Her primary collaborator at Harvard Forest will be Dr Jackie Matthes.

International Postgraduate Diploma in Environmental Management scholarship from UNEP/UNESCO/ BMUV

Ahmed Abdulrahaman has begun the programme hosted by the Centre for International Postgraduate Studies of Environmental Management (CIPSEM) at Technische Universität Dresden (TU Dresden). The course brings together environmental professionals from around the world to engage in advanced interdisciplinary learning on sustainable environmental governance, policy integration, and environmental management practices.

Workshops

ForestGEO analytical workshop

Dr Abiem Iveren, a principal investigator (PI) of our 20.28 ha ForestGEO long-term forest plot attended the 9 day 2024 ForestGEO analytical workshop in Yaoundé, Cameroon. Three mentors led eight participants through nine days of intensive project development and analysis. Over the course of the workshop, mentors had one-on-one sessions with participants to help them advance their projects, each of them working towards the ultimate goal of publishing individual manuscripts. Mentors provided guidance and feedback about project development and revision, data analysis, statistics, and coding. Ivy's data includes the second census of our Ngel Nyaki ForestGeo plot and she is asking how do demographic processes affect above-ground biomass in Ngel Nyaki forest?

Dr Iveren Abiem together with other participants of the ForestGEO 2024 analytical workshop. Dr David Kenfack (holding the camera) is also a principal investigator (PI) on our ForestGEO plot.

Gabriel, Usman, and other participants of the retreat. Thanks to Chris Newsom, back right, for inviting us to this workshop.

Hydrocarbon pollution remediation project (HYPREP) retreat

Gabriel and Usman represented the NMFP at a retreat based at The International Institute of Tropical Agriculture (IITA), organized by the Hydrocarbon Pollution Remediation Project. The retreat brought stakeholders with a reputation for degraded forest and landscape restoration from different parts of the country. Gabriel presented the work carried out by the NMFP over the years in the restoration of degraded Afromontane forest ecosystems.

Community initiatives

The local community underpins all our research and conservation work—we depend on their goodwill and cooperation. Thus, regular community engagement is extremely important to the Project.

Vine by Colleen Wilson from Noun Project (CC BY 3.0)

Educational empowerment

Our Science Coordinators and intern students play a vital role in educating primary and secondary school children in Yelwa and Maisamari villages. They teach a variety of subjects, including English, mathematics, biology, chemistry, physics, and basic science and technology. This initiative not only serves as a meaningful way to give back to the community but also strengthens the bonds between the NMFP and its host community, fostering collaboration and support.

One example, of many, as to how this has benefited Yelwa youth is the success of Bashir Mijinyawa who after attending school in Yelwa has gone on to gain a BSc at Taraba State University and is now in the final stages of his MSc with Bayero University Kano, with his field work at Ngel Nyaki.

Intern students together with the Principal, Mrs Patience, and students of the government secondary school in Yelwa.

Members of Ngel Nyaki Beekeepers Multipurpose cooperative

Ngel Nyaki bee keepers multipurpose cooperative

This year, in collaboration with West African Export, (Wafroex)—one of Nigeria's leading honey export companies—we trained six members of the Yelwa community in modern beekeeping and processing methods. Wafroex facilitated their training in Abuja, and upon returning to Yelwa, these trainees began sharing their knowledge with fellow community members.

The beekeepers have since formed a cooperative, establishing their office in Yelwa. The cooperative has created a honeybee farm, where all beekeepers can keep their hives in a safe environment. This co-operative will not only foster unity among the people but also improve their livelihoods through enhanced honey production.

Meeting with the Jauro and village elders in Yelwa to discuss Project/community relationships. In the foreground Misa, Hazel, the Jauro, Danladi, Usman and Alfred.

Our activities encourage participation by all.

Istifanus with Ngel Nyaki's football teams at the field station.

Football—a tool for achieving conservation goals

We have always supported sports activities in the communities around us, with both a junior and senior Ngel Nyaki football team. We provide football kits and host friendly matches, We have found this to be a successful way to reach the young population in the communities, we follow up with conservation education sessions to educate them about the shared roles that we all can play to protect Ngel Nyaki Forest Reserve.

New patrollers

Traditionally the NMFP has overseen the protection of the Ngel Nyaki forest about 30 Taraba State employees. From now on, we are re-visiting these roles and employing 10 new patrollers, paid for by us. This new patroller team will be led by the Jauro (village chief) of Yelwa community, ensuring that all community members comply with the set rules that govern the reserve as well as discouraging any illegal poaching.

The Jauro, Abubakar Bapetel (village head and lead patroller) next to Gabriel Dabo (left) and Istifanus Jesse (right), with Misa Zubairu on the far right. The Jauro leads a team of patrollers on a regular basis to help protect Ngel Nyaki from poaching.

Active partnerships

Forest restoration collaboration with Africa Nature Investors (ANI)

This year Hazel Chapman and Istifanus Jesse from the NMFP visited Gashaka Gumti National Park (GGNP) to collaborate with ANI on an investigation into the restoration potential for southern Gashaka Gumti National Park's montane forests. Working with Jan Fehse (Value for Nature Consulting) we observed the extent of montane forest in the southern section of the Park and observed the landscapes into which forest may regenerate. Key to the success of any regeneration program is the rate at which forest will re-establish. Moreover, if carbon credits are involved, then the amount of carbon sequestered is important as well. To determine this, Elisha Emmanuel (ANI) led a team from ANI to visit Ngel Nyaki and learn from our over-20 years experience on forest restoration. During this visit we collaborated on a study 'Biomass accumulation in passively regenerating montane forests in grasslands with exclusion of fire and grazing for 10 and 20 years in Ngel Nyaki, Mambila Plateau, Nigeria'. Based on ANI's protocol for measuring biomass in GGNP we measured biomass of planted trees, naturally regenerated trees, grass and soil in a series of research plots at Ngel Nyaki. From this work a manuscript is in preparation for publication.

View over Gashaka Gumti National Park showing burning of the grassland to promote grass growth for cattle feed. This is an ongoing issue and a threat to the survival of the forests and any regeneration attempts. Inset: Left, Elisha Emmanuel (ANI), Hammasumo Ibrahim (NMFP) and Jack Devlin (ANI). Right, Jan Fehse and Istifansu Jesse investigate a recently burnt area within GGNP.

ANI

*We continue to **strengthen and grow our partnerships**, locally, nationally and globally.*

17 PARTNERSHIPS FOR THE GOALS

ACReSAL and NMFP staff at Yelwa community

Agro-Climatic Resilience in Semi-Arid Landscapes (ACReSAL)

We received a visit from staff of ACReSAL, a World Bank-financed project designed to tackle the pressing issues of land degradation and climate change in 19 states of Northern Nigeria and the Federal Capital Territory (FCT). This partnership will result in the drilling of 20 boreholes in the communities neighbouring Ngel Nyaki Forest Reserve. This is timely as climate change is lowering the water table and some streams are drying up for longer periods than they traditionally did.

ACReSAL
Agro-Climatic Resilience in Semi-Arid Landscapes

Conservation and restoration

The Ngel Nyaki junior football team members helping move seedlings during the regeneration planting.

Regeneration activities

During 2024 over 4,000 seedlings of 13 tree species and 16,000 *Anthonotha* seeds have been planted in strategic locations across the reserve. We are grateful for the support members of the local communities who always come to assist during our restoration activities.

Endangered Plants Project

Our endangered plant project continues to gain momentum, with more endangered seedlings integrated into our forest restoration initiatives. Among the species successfully raised in our nursery are *Prunus africana, Khaya grandifoliola, Dombeya ledermannii*, and *Crotalaria bamendae*, all carefully collected by our field assistants. These efforts play a vital role in preserving biodiversity and enhancing ecosystem recovery within the reserve.

Our plant nursery with seedlings of endangered plants.

13 CLIMATE ACTION

20,000
seeds and seedlings
planted during 2024.

Outputs

Our work helps us understand and better ***protect Nigeria's unique montane biodiversity.***

Research papers

Papers published

- Garba, L.C., Titus, S.D., Allahnanan, E., Yusuf, S.O., Annah, K., David, D. L., & Yusuf, O.S. (2024) Assessment of beetles diversity and abundance in forest edge and grassland ecosystems of Ngel-Nyaki Forest Reserve. ***Nigerian Journal of Entomology***, **40**(2), 154–162. DOI: 10.36108/NJE/4202/04.0221
- Lai, H.R., Hill, T., Stivanello, S., & Chapman, H.M. (2024). Discordant changes in foliar and reproductive phenology of tropical dry-forest trees under increasing temperature and decreasing wet-season rainfall. ***bioRxiv***, 2024–03. DOI:10.1101/2024.03.24.585819
- Hacket-Pain, A., Adienge, A., Bogdziewicz, M., Bush, E. R., Chapman, H., Memiaghe, H. R., ... & Journé, V. (2024). Patterns of fruit production in tropical forests are shifting with negative outnumbering positive trends. ***EcoEvoRxiv***. DOI:/10.32942/X2404C
- Abdulrahaman, A. O., Chapman, H., Tariq, A., Elias, P., Areh, M. O., Abdullah, Z. O., & Soufan, W. (2024). Multi-temporal analysis of forest canopy cover in Ngel Nyaki Forest Reserve using the Sentinel-1 and Sentinel-2 data. ***African Geographical Review***, 1–19. DOI: 10.1080/19376812.2024.2441680
- Abwage, W.D. and Sale F.A (2024) Assessment of land uses and land cover change of Ngel Nyaki forest reserve, Nigeria. ***Journal of Research in Forestry, Wildlife & Environment*** Vol. 15(4). ISSN: 2141 – 1778
- Japheth, D. H., Ugbe, J. A., & Alfa, J. I. (2023). Alpha Diversity and Species Status of Uneven Forests in Eco-Zones of Taraba state, Nigeria, ***Journal of Bioresource Management***, 10 (3). ISSN: 2309-3854 online

Presentations

- **Gboyega Awoku** How the landscape affects crop pollinators of Mambila plateau subsistence farms. Annual Biology Conference University of Canterbury, New Zealand October 2024.
- **Gabriel Dabo** Lessons on reforestation from 20 years of research by the Nigerian Montane Forest Project. For the Hydrocarbon and Pollution Remediation Project Retreat. Calabar June 2024

Under revision

- Abiem I. & Chapman, H.M. Investigating plant-soil feedbacks in tropical montane forest trees. Under final revision for ***Journal of Tropical Ecology***.
- Hacket-Pain, A., Adienge, A., Bogdziewicz, M., Bush, E., Chapman, H.M., Memiaghe, H., Ofosu-B. , Bismark S., Akiko; Journé, V. Patterns of fruit production in tropical forests are shifting with negative outnumbering positive trends Under Revision for ***Global Ecology and Biography***.
- Lai, H.R., Hill, T., Stivanello, S., & Chapman, H.M. Changes in quantity and timing of foliar and reproductive phenology of tropical dry-forest trees under a warming and drying climate. Under final Revision for ***Journal of Ecology***.
- Arroyo-Lambaer D, Scheinberg L. A., Vindum J.V., Walter P., Tapondjou W.P,. Davidson, M.G., Chapman, H.M., Blackburn D. The amphibians and reptiles of Ngel Nyaki Forest Reserve on the Mambilla Plateau of eastern Nigeria. Under final revision for ***African Journal of Herpetology***.
- Schnitzer S. et al The search for champion lianas: The largest lianas on six continents. Under revision for ***Biotropica***.

Under preparation

- Abiem I.; Kenfack D.; Chapman H. M. Contributions of demographic processes to above-ground biomass in a West African montane forest. For J. Ecology
- Chapman H.M., Lai, H., A.J. Gillis. Passive forest restoration of West African Montane Forest: Two decades of fire and grazing exclusion yield increased savannah tree cover but limited recovery of shade-tolerant species. For Restoration Ecology
- Jessie I, Abubakar,U., Gerhard D., Chapman H.M. Ecological legacies of a boundary fence: Bird-dispersed seeds catalyse sapling growth in a fire-suppressed Afromontane grassland For African Journal of Ecology
- Fehse, J., Devlin, J., Barde, M., Chapman H. M. Biomass accumulation in passively regenerating montane forests in grasslands with exclusion of fire and grazing for 10 and 20 years in Ngel Nyaki, Mambila Plateau, Nigeria.

In this study, we demonstrate that forest fruit production is shifting across tropical sites, with negative species-level trends occurring four times more frequently than positive ones across a network of 17 sites. At two sites in west Africa, community-level fruit production has declined by 25%and 52% in recent decades.

By leveraging the expanding network of long-term monitoring, collaborative research has the potential to identify current trends in tropical fruit production and their drivers. This will enable robust predictions of future trends and advance our understanding of tropical forest vulnerability to environmental change.

trees by Yoyon Pujiyono from Noun Project (CC BY 3.0)

Our people

*We provide **long-term employment with training opportunities** for local communities.*


Abubakar Buwuro


Abubakar Musa


Alfred Christopher


Asiyatu Adamu


Augustine Johnson


Auwalu Sajo


Baba Peter


Bature Kato


Bobbo Zubairu


Enoch Zaccheus


Exodus Samuel


Fatima Adamu


Gabriel Dabo


Hammadu Yusuf


Hammasumo Ibrahim


Idris Musa

Idris Usman

Istifanus Jesse

Jacob Mathew

Jafaru Bapetel

Mahmadu Umar

Manu Abubakar

Miracle Jumlack

Misa Zubairu

Muhammed Usman

Peter Alexander

Rabi Buba

Rafiu Mustapha

Rita Fabdzir

Usman Abubakar

Usman Bashir

Yusuf Tongbuin

Nigerian Montane Forest Project
School of Biological Sciences:

T: +64 3 369 5140
E: hazel.chapman@canterbury.ac.nz

University of Canterbury
Te Whare Wānanga o Waitaha
Private Bag 4800
Christchurch 8140
New Zealand

www.canterbury.ac.nz/afromontane