# BAMENDA UNIVERSITY OF SCIENCE AND TECHNOLOGY

## Proceedings of the Congo Basin Symposium on Security of Biodiversity, Climate and Natural Resources in Yaoundé, November 15-18, 2023

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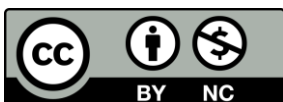
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## Forewords

**A Speech Presented by The Vice Chancellor of The Bamenda University of Science and Technology-BUST on the Opening of the First Congo Basin Frontiers of Science Symposium on Security of Biodiversity, Climate, and Natural Resources, Holding in Yaounde, from 15-18 November 2023**

- All protocol duly respected,

- The conference organizers,

- Representatives of partner institutions,

- Scholars and scientists in their different disciplines and ranks,

- Ladies and gentlemen

It is a great honor and delight for me to open this very important scientific jamboree. As we all know, and in spite of the contribution of science to biodiversity conservation, climate change mitigation and natural management, the world is still witnessing a downturn. Biodiversity loss, climate variability and change, and natural degradation are still widely recorded across the globe. The situation in sub Saharan Africa is very worrying, given the rapid population growth and its effects on biodiversity and natural resources, as more and more people depend on limited resources for livelihoods.

The Congo Basin is the largest carbon sink in the world, absorbing more carbon than the Amazon. It is fondly called the 'heart beat' or the 'lungs' of Africa, to illustrate it relevance for food security for indigenous populations, its capacity as carbon sink, and as a habitat for many endangered species.

Over 10,000 plant species are found in and around the Congo forest. It is a home to rare animal species such as the African forest elephant, pygmy hippopotamus, antelope, and chimpanzee, and is home to the endangered western lowland gorilla.

Unfortunately, in the last three decades or so, the Congo Basin forest has been subjected to an increase in vice practices such as poaching, logging and deforestation, which do not only threaten the future of wildlife and plant species, but also the forest's capacity to mitigate climate change, and enhance livelihoods in and around the forest. Given that about 40 million people from 10 countries directly depend on its forest resources for livelihoods, and given the global targets of reducing global warming to maximum of +1.5%, and Greenhouse Gases emission by 45% by 2030, it is just normal that reflections and research on biodiversity, climate change, resource management, and forest-adjacent livelihoods should prioritize the Congo Basin, which contributes immensely to these goals set in the Paris agreement.

This symposium provides a rare opportunity for scientists, scholars and practitioners to get together and reflect, exchange ideas and chat the way forward on the future of the Congo Basin forest, its resources, and its contribution to biodiversity, climate change and livelihoods. In the next three days, about 70 participants from 10 countries and 3

continents will be reflecting on these issues. It is expected that the Congo Basin network will emerge from this symposium as a Strategic institution in enhancing the security of biodiversity, climate and natural resource management driving a sustainable network of scientists in the Congo basin and in the diaspora.

I urge you to use this opportunity to optimize exchange of experiences and expand your networks with the goal of saving the Congo forest and its associated resources, and in this way, contributing to global concerns, as well as enhancing the livelihoods of affected communities. I also invite you to take time off to enjoy the Cameroonian hospitality, and all what goes with it.

May I take this opportunity to appreciate the **US office for naval research global, US Army DEVCOM Atlanta** and **TWAS Young Affiliate Network (TYAN)** who funded this important symposium in Cameroon. We hope they will be able to fund a follow up activity that may be relevant to consolidate the outcomes of the current exercise. I extend my special appreciation to the symposium organizers and the scientific committee for developing such a timely concept, and organizing everything so that the concept becomes a reality. May I also cease this opportunity to congratulate those of you who were retained for scientific presentations. I was made to understand that the process was extremely competitive.

Lastly, I would like to hail the collaboration that the Bamenda University of Science and Technology maintains with national and international universities and institutes, one of which has culminated in the successful organization of this symposium. Our doors are open for such collaborations, even with individual scientists and researchers.

That said, in my capacity as the Vice Chancellor of the Bamenda University of Science and Technology, Bamenda:

I DECLARE THE FIRST CONGO BASIN FRONTIERS OF SCIENCE SYMPOSIUM ON SECURITY OF BIODIVERSITY, CLIMATE, AND NATURAL RESOURCES, HOLDING IN YAOUNDE, FROM 15-18 NOVEMBER 2023, OPEN.

Long Live Research for Development,

Long Live International Cooperation,

Long Live Bamenda University of Science and Technology

**Prof.Dr. Mbangwana Paul Nka**
**Vice Chancellor**
**Bamenda University of Science and Technology (BUST)**

**A Speech Presented by the Chair of the Organizing Committee of the Congo Basin Frontiers of Science Symposium on Security of Biodiversity, Climate, and Natural Resources, Holding in Yaahot Hotel, Yaounde, from 15-18 November 2023**

- The Local Organizing Committee
- The Scientific Committee
- TWAS Young Affiliates Network (TYAN)
- Representatives of partner institutions,
- Invited Guests
- Scholars and scientists in their different disciplines and ranks,
- All protocol duly respected,
- Ladies and gentlemen

It gives me great pleasure to speak to you this morning, to welcome you most cordially at the official opening of the Congo Basin of Frontiers Symposium on Security of Biodiversity, Climate and Natural Resources holding in Yaahot hotel Yaounde,

This event is the culmination of an enormous collective effort which began in October 2022 during the first US-Africa Symposium on Science, Engineering and Mathematics which took place in Nairobi, Kenya. During that symposium I was a speaker for the Biodiversity Session and after the symposium, participants were encouraged to network and collaborate with others. I was fortunate to discuss and indicated my openness for collaboration with other participants. One of which is Prof. Forest Isbell in the University of Minnesota, USA. Immediately after the symposium, we started talking and I shared my thoughts with him about organizing a symposium in Cameroon, which he supported. I went further to develop a white paper concept as required by the call for application for funding. Other collaborators gave important comments for improvement.

I would like to take this opportunity to express my appreciation to Prof. Forest Isbell and Dr. Max Paoli who are unavoidably absent, and here present Dr. Eric Nana, Prof. Tofel Haman and Prof. Balgah Roland for all their comments and suggestions. Finally, the grant was awarded and another organization: the US academy of science, engineering and mathematics offered me a 4 weeks exchange visit to the university of Minnesota where Forest and I worked on the nature and content of the symposium.

Writing the white paper concept and being invited to submit full proposal is one thing but the most difficult and challenging part was to register through SAM.gov, fedconnect and submitting the proposal through grants.gov which was a daunting task with several sleepless nights. Thank you, Mr. Ndangho, for assisting with the registration process.

I will like to appreciate the funding organizations **US office for naval research global, US Army DEVCOM Atlanta** and **TWAS Young Affiliate Network (TYAN)** who funded this important symposium in Cameroon. Funding from TWAS-TYAN was through a TYAN International Thematic Workshop (TITO) application which Prof. Thomas dela Cruz and I submitted and it was approved. The result of which you have many TYAN members here from 5 different countries.

Ladies and Gentlemen,

Biodiversity, climate and natural resource are at risk : we are part of the problem, and part of the solution. Our water, food, medicines, clothes, shelter, energy... all these depend on healthy and vibrant ecosystems, no matter the progress in technology. Biodiversity is the foundation upon which we can build better. Yet, while there is a growing demand that biological diversity is a global and necessary asset of tremendous value to future generations. Number of species are still being significantly reduced by certain human activities, climate is changing in at alarming rate and natural resources are dwindling beyond imagination. During this symposium, we are reminded again that we humans are part of the solution to these invited problems.

Esteemed participants, let me express, in the name of the Local Organizing and the Scientific Committees, our most sincere wish that the discussion and agreements resulting from the three days will positively contribute to the consolidation of the security of biodiversity, climate and natural resources. The first two days will focus on oral and poster presentations in the three sessions of biodiversity security, climate security and natural resource security. Also, there will be a TYAN round-table event during the second day on biodiversity, climate and natural resource security. On the third day, take out time to visit the beautiful Ecopark in Yaounde to observe the biodiversity and natural resources. It should be noted that, plans are on the way to publish the symposium as a proceeding after peer reviewed.

Lastly, I would like to thank the collaborators and the collaboration with the Bamenda University of Science and Technology for hosting this symposium.

That said, in my capacity as the chair of the organizing committee of the symposium:

I WELCOME YOU ALL TO THE CONGO BASIN FRONTIERS OF SCIENCE SYMPOSIUM ON SECURITY OF BIODIVERSITY, CLIMATE, AND NATURAL RESOURCES, HOLDING IN YAAHOT HOTEL, YAOUNDE, FROM 15-18 NOVEMBER 2023. LEARN, COLLABORATE AND NETWORK AS MUCH AS POSSIBLE THESE THREE DAYS.

Long Live Bamenda University of Science and Technology,

Long Live International Cooperation,

Long Live the Republic of Cameroon

**Prof. Dr. Tonjock Rosemary Kinge**
**Chair of the Organizing Committee**
**Yaounde, 16th November 2023**

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# BIODIVERSITY SECURITY

## Initiating steps towards securing *Cylicomorpha solmsii* (URB.) URB, an endemic tree species of high potential in Cameroon

**Raissa Fon Na-ah[1,2], Nadine Ndabeh Ngwa[1], Liliane Ngoune Tandzi[3], Emmanuel Youmbi[1], Libert Brice Tonfack[1*]**

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### Introduction
*Cylicomorpha solmsii* (Urb.) Urb (Caricaceae), is an endemic plant to Cameroon, with high genetic and medicinal potentials. Its population is disappearing, and the species is near extinction because of its long generational time and endemism.

### Methodology
To initiate steps towards securing planning, we carried out a phenological study and revised the morphological descriptions of its vegetative and reproductive organs from wild individuals at the submontane forest of Eloumden, Cameroon. Secondly, to understand the dormancy status and germination requirements of *C. solmsii*, we evaluated seed germination under different environmental conditions; including light/darkness, seed pre-treatment [non-scarified (control) and scarified seeds, dried scarified seeds stored at 23 ± 3 °C and fresh scarified seeds stored at -20°C] and two different soil conditions [control or Parent soil from Eloumden and experimental field soil from Ngoa-Ekele].

### Findings
Results showed that C. solmsii develops as a soft-stemmed dicotyledonnous plant and grows indefinitely as an unbranched, woody-perennial, semi-deciduous tree with separate male and female individuals (dioecious) at maturity. Fruiting was observed throughout the year, the main fruiting season was July to Mid-September with an average production of 202 seeds per fruit. Physiological dormancy and darkness were identified as limiting factor in C. solmsii seeds germination. The highest percentage germination records of *C. solmsii* seeds was 29.69 %. Soil significantly affected seedling establishment of *C. solmsii*, with highest performance on sandy-loam soils (parent soil from Eloumden), with determined organic matter, ammonium and nitrate contents, within a precise pH range. However, no growth was observed on the soil from Ngoa-Ekele (clay-loam). Nonetheless, seedlings could thrive on clay-loam soils if supplemented with sand or vermiculate.

### Conclusion
This information will serve as a vital resource for future improvement of *C. solmsii* by seed restoration practitioners.

**Keywords:** *Cylicomorpha solmsii*, Morphological Characterization, Seed Germination, Light, Soil

# Fungal biodiversity in the paleotropics: lessons from the Philippines

## Thomas Edison E. dela Cruz

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## Introduction

The Philippines is one of the 18 mega-biodiverse countries in the world and is recognized for high species endemism. The country ranked fifth in the number of plant species and fourth in bird endemism. However, the Philippines is also a hotspot of biodiversity as its flora and fauna are greatly threatened by anthropogenic activities. At least 700 species of plants and animals are threatened, making the country as one of the top global conservation areas. While efforts have been made to document animal and plant biodiversity in the country, not much can be said of the so-called hidden biodiversity, the microbial world.

## Methodology

Field survey and literature review.

## Findings

Our checklist reported 806 novel species of microorganisms that were discovered as new to science from specimens collected in the Philippines. These are grouped as Archaea (n=12), Bacteria (n=28), lower fungi (n=12), higher fungi (n=177), protozoa (n=14), algae (n=285), and lichens (n=278). Looking closely at fungi particularly lichens, we reported 1,234 validated species names, distributed into 65 families and 229 genera. Biogeographic study showed majority of these species being distributed in major islands in the country, with some regions lacking any lichen survey. Our study with the fungus-like protists, the myxomycetes or slime molds, reported more than 150 species, with a third of these reported only in the last 15 years. Our strategies to document Philippine fungal biodiversity includes initial rapid survey leading to publications of species checklists, and then to extensive distribution and ecological studies. In this presentation, I will share the lessons learned from the strategies we employed to document Philippine fungal biodiversity, the knowledge gaps that need to be filled in, and the challenges faced by Filipino mycologists. The fungi of the Philippines were also studied for their applications in health (bioactivities), agriculture (biocontrol), and the environment (bioremediation). This talk will also include a discussion of the different fungal species we studied and the varied bioactivities that these microorganisms can offer.

## Conclusion

By highlighting these beneficial properties, we can promote the conservation of fungal biodiversity, thereby leading to the protection of their habitats.

# Importance of the drone technologies and ranger patrol data in preserving wildlife species in Benin protected areas

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## Introduction
Ensuring sustainable wildlife conservation requires a reduction in poaching within Protected Areas. The potential of using drones in anti-poaching efforts and identifying high-pressure areas and their underlying factors holds promise for effective wildlife management.

## Methodology
Our study involved an analysis of five years' worth of ranger patrol data from logbooks in the Pendjari Biosphere Reserve to map incidents of poaching.

## Findings
Our findings indicated a correlation between poaching events and environmental and anthropogenic variables through regression analysis. Notably, the study revealed that poaching is concentrated along the main river in the Pendjari National Park, with proximity to the river being the primary predictor of high poaching incidents. We recommend using these findings as a foundation for planning anti-poaching activities when incorporating drones into anti-poaching strategies. Additionally, we observed an increase in the number of poachers arrested during the three-month trial period. However, implementing drones in anti-poaching strategies in Benin's protected areas has yielded valuable insights, including challenges related to flight altitude, ranger expertise, cost, and power supply. Despite these limitations, effective poaching prevention necessitates extensive monitoring of vast protected areas, even with the current technological constraints.

## Conclusion
Protected area managers should prioritize efforts to prevent illegal intrusions and detect poachers, recognizing the significance of these tasks. Furthermore, machine learning represents the next technological frontier for advancing wildlife conservation efforts.

**Keywords:** drone usage, wildlife, anti-poaching strategies, protected areas

# Stand diversity and carbon stock of a tropical forest in the Deng Deng national park, Cameroon

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## Introduction

Tropical rainforests being the highest terrestrial carbon reservoir are crucial in maintaining about 70% of the world's plant and animal biodiversity.This study aimed to determine the tree species composition, structure, and carbon stocks of the Deng Deng National Park which is a semi-deciduous tropical forest (plots 1 and 2 and the transition zone to the savannah (plot 3).

## Methodology

Plots demarcation and enumeration followed standard protocols for permanent monitoring plots.

## Findings

The inventory of tree species ≥ 2 cm revealed a total of 5523 individuals of 64 species in 53 genera belonging to 26 families with plot 2 having the highest (2135 individuals/ha) and plot 3 the least (1291 individuals/ha). *Tabernaemontana crassa* was the most important tree species in the tropical forest and *Lecythis idatimon* in the savannah. Basal area was highest in the tropical forest and least in the savannah. The diameter distribution of trees in all forest types displayed a reverse J-pattern. Aboveground biomass was highest in the tropical forest ($530.2 \pm 66.4$ t·C/ha) and least in the savannah ($184.3 \pm 20.1$ t·C/ha). The carbon stock of the above-ground biomass was twice as much as that of the below ground biomass, soil organic matter and litter. The total carbon stock estimated in all pools was 278.75 t·C/ha.

## Conclusion

The study site was poor in plant diversity, biomass and carbon stock, indicating a disturbed site with the absence of large trees and undergoing natural regeneration. This underlines an urgent need for efficient restoration management practices.

**Keywords:** Diversity, Above Ground Biomass, Below Ground Biomass, Composition, and Diversity

# Macrofungi diversity and utilization by local communities from the province of Tshopo, Democratic Republic of The Congo

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## Introduction
Fungi constitute one of the most rich and diverse groups of organisms worldwide, providing diverse substances and services, especially food and income for numerous local communities. Diversity of fungi is however affected by host plant diversity and soil heterogeneity.

## Methodology
To give an overview of the macrofungi diversity of the Congo basin rainforests, fungal sampling was performed in plots placed within mixed and ectomycorrhizal monodominant forests of the Yangambi Biosphere reserve and Yoko reserve rainforests in the province of Tshopo. Original ethnomycological data from the communities living around the two main sites were also provided thanks to ethnomycological surveys undertaken.

## Findings
The results showed that *Gilbertiodendron dewevrei* dominated forest was the most species-rich forest stand (p-value<0.001). The results revealed also that wood decaying and terrestrial saprotrophic taxa mainly characterize mixed forests while the occurrence of ectomycorrhizal taxa depends especially on the presence of ectomycorrhizal trees. The study gave evidence that the observed species richness and functional diversity of macrofungi in a defined area (plots), is strongly influenced by vascular plants composition. Each chosen forest type is characterized by a specific floristic composition and showed a corresponding and fairly predictable mycological composition. Several ectomycorrhizal species showed preferences for particular forest stands. The ethnomycological surveys demonstrated that wild mushrooms are used either for food, medicine, in a recreational context or related to myths and beliefs.

## Conclusion
Wood-decaying taxa, i.e. saprotrophic species such as *Schizophyllum commune, Auricularia cornea, A. delicata, Marasmius buzungolo* and *Lentinus squarrosulus* are the most appreciated species for food while *Daldinia eschscholtzii* is the most important species for medicinal applications.

**Keywords:** Fungi diversity, ethnomycology, Tshopo, Democratic Republic of Congo

# Financial values of bushmeat and effects of anthropogenic activities on mammal species in Douala-Edea national park, Cameroon

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## Introduction
Bush meat has always been a lucrative activity among indigenous people in tropical rain forest areas. It provides a source of income to the local people that help them take care of their basic needs. However, this has caused a continuous threat to wildlife as the population increases especially in the African tropical rainforest as a result of anthropogenic activities, yet there is a lack of baseline data on the sustainability of these activities.

## Methodology
To provide basic data on income from bushmeat, anthropogenic activities, and the abundance of large mammals in the Douala-Edea (DENP) Littoral Region, Cameroon, questionnaires were administered to 336 respondents in 57 villages, and a 13.2 km transect was surveyed in July 2019, covering a total of 29 km.

## Findings
Bushmeat hunting provided income for 12.64% of respondents, with more than half of the respondents selling their bushmeat in local markets. Royal antelope (*Neotragus pygmaeus*) was the species of mammals sold at a higher price (14,250±1,173), and the least price (2,400±1447) sold was Tree Pangolin (*Phataginus tricuspis*). Amongst the anthropogenic activities observed (N = 138 signs), illegal logging (23.26 signs/km) was the most common, followed by hunting (10.18 signs/km), habitat degradation (9.29 signs/km), and the least activity was the gathering of Non-Timber Forest Products (0.92 signs/km). A total of eight mammal species were identified. The highest encounter rate was *Atherurus africanus* (23.36 sign/km), and the least was *Philantomba monticola* (0.05 sign/km). Signs of anthropogenic activities and wildlife were mostly found in the same area, indicating that wildlife is threatened.

## Conclusion
For such threats to be reversed and to recover a high population of wildlife species, an alternative source of income should be introduced to hunters, and existing wildlife law should be enforced to curb defaulters.

**Keywords:** Human activities, wildlife, money value, Douala Edea National Park, hunting, conservation

# Propagation of *Ternstroemia cameroonensis*: an approach towards the conservation of a critically endangered medicinal plant species in the Lebialem highlands, Cameroon

**Francoline Jong Nkemnkeng[1]\*, Mendi Grace Anjah[2], Walter Ndam Tacham[1], Christiana Ngyete Nyikob Mbogue[1], Victor-François Nguetsop[2]**

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## Introduction
This study was carried out to investigate the regeneration potential of *Ternstroemia cameroonensis* Cheek. a critically endangered medicinal plant in the Lebialem Highlands, Cameroon by seeds and stem cuttings.

## Methodology
Air dried seeds were subjected to abrasion with sand paper, soaked in hot water and 98% concentrated sulphuric acid at various duration. Seeds pre-treated with 98% concentrated sulphuric acid for 1 minute (T21), 3 minutes (T22) had the best latent period 43.6 and 41.25 days respectively. There was a significant difference in the germination percentage, with seed soaked in 98% concentrated sulphuric acid for 3 minutes (T22) having the highest germination percentage (20%) followed by those soaked in 98% concentrated sulphuric acid for 6 minutes (T23) with a germination percentage of 12.22%. Early growth performances of seedlings were not significant.

## Findings & Conclusion
All seeds subjected to abrasion with sand paper and those soaked in hot water at various durations failed to germinate. In addition, rooting of stem cuttings was significantly affected by the application of synthetic hormones as well as alternative sources. The best survival percentage of stem cuttings was in coconut water (CW) (28.7%) followed by IBA (22.75%). Stem cuttings with 50% leaf area had the best survival percentage (34.9%) compared to others. Low concentrations of IBA (0.5g/l and 0.2g/l) and soaking in CW for 4 h had the best performance.

**Keywords**: *Ternstroemia cameroonensis*, Seed pre-treatment, Rooting ability, Seedling, Stem cutting

# Assessing long-term effectiveness of management of protected areas in preserving biodiversity habitats: lessons learned from Benin

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## Introduction
Despite its geographical position in the Dahomey Gap, the Republic of Benin holds national natural landscapes (domanial forests and savannahs reserves) dedicated to the preservation of biodiversity and its habitats. But, the unbridled search for fertile agricultural land in the context of rapid demographic growth, challenges the management rules established in these protected areas. So, the landscape in these reserves' changes in quality and quantity over time. The *Trois Rivières* forest reserve (Northern Benin) and the Lama forest reserve (southern Benin) both protected areas, are not spared from this situation.

## Methodology
This study compares the landscape dynamics over several periods (from 1995 to 2023) against the management methods and rigor that prevail in these protected areas. Four landscape images (SPOT and Sentinel) were processed, and ground surveys helped to evaluate classification accuracy. Metrics of landscape ecology were also calculated.

## Findings
Data revealed that natural habitats (forest and savannah) are continually destroyed in the Trois Rivières forest reserve while the Lama forest reserve is being restored indeed, from the natural habitats that represented the landscape matrix of the Trois Rivière forest (more than 90% of the extent) in 1995, only 50% of the landscape struggled to be resilient. On the contrary in the Lama forest reserve, natural habitats that occupied 21% of the Lama forest, currently occupy 28%. The strict compliance with management rules in the Lama forest has therefore led to the conservation of natural wildlife habitats. Unfortunately, this management is not effective in the Trois Rivière forest. Agriculture, especially, cotton cultivation is the main cause of this habitat degradation.

## Conclusion
Forest restoration, retreat of agricultural settlers to the core of forest reserve, and re-zonation are major challenges to mitigate the negative effects of deforestation.

# Biophysical characterization of agroforestry systems in the Sudano-Guinean zone of Foumbot (West-Cameroon)

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## Introduction
Agroforestry systems (AFS) are part of the agrarian landscape in the locality of Foumbot West region of Cameroon. They are recognized as an alternative for biodiversity conservation and a means of satisfying the food needs of the population. Unfortunately, they are under pressure from intensive agriculture, which compromises the protection of biodiversity and the environment, hence the interest of this study.

## Methodology
The aim of this study was to contribute to biodiversity conservation and food security for the people of Foumbot. To achieve this, a participatory and reiterative method using questionnaire was administered to 81 farmers exploiting agroforestry systems which was spread over 4 villages. In 81 plots, floristic inventories were carried out and the dendrometric parameters of the trees were measured. The inventories and measured parameters were used to calculate structural parameters, ecological and diversity indices. Various statistical analyses were carried out.

## Findings
The results show that there are two cropping seasons within which agricultural activities are carried out annually in the zone, using mainly family labour and endogenous technical itineraries. A total of 46 species in 41 genera and 24 families were recorded. Musaceae, Fabaceae and Lauraceae were the most abundant tree families. The most ecologically important families were Fabaceae (22.25%) and Burseraceae (11.95%). Shannon diversity indices are highest in the AFS of Baïgom (1.33 bits) and Fochieya (1.08 bits). Average density in the locality is 415.75 individuals/ha. The average basal area is around 21.17 $m^2$/ha.

## Conclusion
A total of 32 vegetable crops were recorded, divided into 25 genera and 19 families. *Zea mays* and *Phaseolus vulgaris* are the most common species.

**Keywords***:* Agroforester, Agroforestry systems, Biodiversity, Conservation, Foumbot.

# Focus on the diversity of Inocybaceae (Agaricales, Fungi) in tropical Africa

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## Introduction
Over the past decade, Africa has recorded the highest annual rate of forest loss with 3.9 million hectares destroyed. This forest destruction causes the extinction of many species and at this rate of destruction, many species can go extinct and perhaps without being known. Whereas, despite the scientific community's efforts to estimate and catalog fungal diversity, worldwide only a small fraction (ca. 3%) of fungal diversity has been named and described.  In recent years, with the progress of science, mycology has undergone a rapid development.

## Methodology
Thus, since 2017, we have been interested to the diversity of Inocybaceae in Tropical Africa through the description and documentation of new species with an update on known species.

## Findings
The results show that in Africa, the diversity of Inocybaceae is about 80 species against 1,100 species in the world and the members of Inocybaceae are one of the most dominant in the soil of the woodlands and gallery forests after Russulaceae Lotsy. Nine new species are described and published in three genera like *Inocybe* (*I. beninensis, I. flavipes, and I. fuscobrunnea* and *I. pallidiangulata), Inosperma (I. africanum, I. bulbomarginatum, I. flavobrunneum, and I. macrocarpa)* and *Mallocybe (Mallocybe africana)*.

## Conclusion
We are convinced that there are still enough unknown Inocybaceae species and we must redouble our efforts in sampling and also the exploration of new habitats in Africa.

**Keywords:** Ectomycorrhizal fungi, molecular systematics, phylogeny, taxonomy, Topical Africa

# Assessment of the drivers of land use change in the Rumpi hills forests reserve of Ndian division, southwest Cameroon

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## Introduction

Protected areas serve two objectives, biodiversity conservation and securing of ecosystem services. But the recent expansion of human activities around the Rumpi hills forest reserve in this era of sustainable development goals is a call for concern.

## Methodology

This project examined land use and land cover change around the Rumpi hills forest reserve and their potential impact on the reserve's sustainability. A total of 250 household were surveyed across 13 communities in four selected sites around the reserve in addition to 11 focus group discussions. Landsat 7 ETM & Landsat 8 OLI images plus topographic maps were utilized to quantify land use and land over change.

## Findings

During the 14-year period, dense forest dropped to 90.2% while settlements increased from 744.6 to 2148.8 hectares in 2014. Also, farmlands increased by 18.25% or a change from 9400.4 to 11117.16 hectares. Over 98% and 85% of the respondents were engaged in agricultural activities and forest resources harvesting.

## Conclusion

Land and tree-based interventions that improve soil fertility should be promoted among small holder farmers to ensure the sustainability of protected areas of Cameroon.

**Keywords:** Farming communities, deforestation, remote sensing, land use change, protected areas, Cameroon

# Sustainable management of Muturu cattle for food security and livestock development in Nigeria

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The Nigerian Muturu cattle- a trypanotolerant variety of the indigenous West African shorthorn- was once widely distributed across the country and made significant contribution to animal protein supply until the 19th century. Today, Muturu cattle are considered endangered due to anthropogenic changes and their rapid replacement in Northern Nigeria with the much-preferred Zebu cattle. Muturu cattle were nearly decimated in the southeastern states during and after the civil war of 1967 to 1970 because they were slaughtered to feed the starving human population. In addition, the strong cultural and spiritual attachment as well as the deification of the animal has reduced the population of the Forest Muturu to between 25 000 to 40,000. The present situation calls for an urgent action to salvage this important genetic resource from extinction. The value of Muturu cattle should not only be treated in term of its nutritional merit but in the broader context of its adaptive genes for sustainable livelihood and economic sustainability of Nigerian rural dwellers. There is the need for conservation, improved breeding strategies and sustainable management of Muturu cattle to enhance protein supply for present and future generations. This can be achieved through sound policy framework and laws; National plan of action for *in situ* and *ex situ* conservation and management; Government-farmer partnership; Funding of research on Muturu cattle; and establishment of functional egg, sperm and embryo gene banks.

**Keywords:** Conservation; Gene bank; Food security; Muturu; Sustainability

# Potential monetary value of the ecosystem services of the Dja wildlife reserve: case of the timber supply and carbon storage

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## Introduction
The Dja Wildlife Reserve conceals enormous potentialities of biological resources and offers services which would boost local and national development, contributing to the sustainable financing of conservation activities.

## Methodology
The study aimed at evaluating the monetary value of timber supply and the Carbon sequestration potential in this protected area. All timbers (dbh≥10cm) were surveyed in 50 transects (2500x20m each). Data and statistical analyses were performed using TIAMA and R respectively. The monetary value of timber was derived from felling taxes, exit rights and annual forestry tax computed from the "Free On Board" prices and the Dja Wildlife Reserve's surface area.

## Findings
A total of 50 exploitable timbers with a potential of 5 011 059 stems corresponding to 26 633 798 m3 was surveyed. The carbon storage capacity was 209.97 tC/ha with the highest value in timbers (205.20 tC/ha). The monetary value of wood was about $845.52 million US (26.7million/yearly) and $1.94 billion for the CO2eq sequestration.

## Conclusion
The monetary value of timbers and carbon sequestration in the Dja Wildlife Reserve presents a better option for negotiation of payment of ecosystem services which can generate resources to boost sustainable management of the reserve and improve the well-being of local population.

**Keywords:** Dja Wildlife Reserve, Ecosystem services, monetary value, timber supply and carbon storage.

# Constraints facing agroforestry practices among farmers near the Deng Deng national park

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## Introduction & Methodology

This study was carried out to investigate the challenges associated with the practices of agroforestry among farmers in the periphery of the Deng Deng national park, Cameroon. Purposive and random sampling techniques were used to select sixty farmers from the study area. Data for the study was obtained through the use of structured questionnaire that were administered to the farmers. The data collected was analysed using descriptive statistics.

## Findings

The results obtained from the study revealed that men (80.0%) dominated agroforestry farming in the study area. Majority (77.5%) of the farmers were in their active working age group of between 25 and 60 years with about 50.0% of the farmers having primary education while 75.0% of the farmers had over 7 years of agroforestry farming experience. The study also revealed that the main agroforestry type is planting of trees on farmland. Fruit trees were the most grown tree species on farm land. The most planted fruit tree species were, *Citrus sinensis*, *Dacryodes edulis*, *Mangifera indica and Persea americana*. The main purpose for planting fruit trees was for consumption and sale to generate income (95%). The source of the planting materials for these fruit trees was collection from farmers` farms with few farmers (22.5%) buying improved seeds from established nurseries.

## Conclusion

The main challenges faced by these farmers were lack of improved planting materials, lack of training /sensitisation and lack of finances to pay labour, buy farm inputs and tools. The study therefore recommends government/private intervention in the supply of quality planting materials and training of farmers. Farmers are also encouraged to form cooperative society to enable them solve problems of lack of start –up capital as well as lack of credit facilities so that they can actively participate in agroforestry practice for food and income, combat environmental degradation and biodiversity loss.

**Keywords:** Agroforestry, challenges, farmers, fruit trees.

# Effect of soil provenances on seed germination and seedling growth of *Aframomum citratum* (Pereira) K. Schum

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## Introduction
Soil that is rich in organic matter means soil that is rich in physical and chemical properties and enhances plant growth and development.

## Methodology
The objective of this study was to investigate the effect of soil provenance on seed germination and seedling growth of *A. citratum*. Soil provenances were Buea, Dschang and Bamenda. These respective soil types were filled into 25 cm diameter polyethylene bags and pretreated with a systemic fungicide and nematicide prior to the sowing of 432 dried seeds and 432 fresh seeds of *A. citratum,* arranged in a Complete Randomized Design in a temperature-controlled glasshouse. Germination monitoring and data collection (germination percentage and germination speed) was done daily for six weeks. Early growth parameters (number of leaves, leaf surface area and height of seedlings) was measured weekly for eight weeks.

## Findings
Fresh seeds started germinating 2 months after sowing. Dried seeds treated with 50% diluted $H_2SO_4$ for 20 minutes, did not germinate. Soil types significantly affected the cumulative germination percentage and early growth ($p<0.05$). Highest germination percentage (58.33%) was produced in Bamenda soil, least in Sand (20%) but then, Buea soil produced healthiest seedlings.

## Conclusion
Germination of *A. citratum* seeds can be effectively realized best with the use of Bamenda soil, based on information from this research.

**Keywords:**  Germination, Seeds, Soil physiochemical properties, Zingiberaceae.

# Valorization and sustainable conservation of medicinal plants from Cameroon: determination of the significant parts of anti-COVID-19 medicinal plant and pre-formulation of an infant syrup

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## Introduction
In Africa, Improved Traditional Medication (ITM) has been promoted since 1970 and classified into four categories. The import-substitution policy under the "Made in Cameroon" label encourages local production. Globally, there is an urgent need for anti-COVID-19 drugs, especially for children. The mechanisms of action of SARS-CoV-2 can be attenuated by combination therapy of the parts of anti-COVID-19 medicinal plants. A plant has several parts whose therapeutic properties generally differ. From 2020 to 2022, the most cited anti-COVID-19 plants in the literature were *Allium sativum, Citrus limon, Cymbopogon citratus*, and *Zingiber officinale*. Unfortunately, a gap exists in the names of the significant parts of these plants such as the bark, leaves, roots, or flowers. In addition, the significant association of said plants and the majority of traditional preparation methods are not specified. The objective was to determine the significant parts of 4 anti-COVID plants, their significant association, and the majority traditional method of preparation allowing the pre-formulation of an infant anti-COVID ITM syrup.

## Methodology
An ethnomedicinal survey, ANOVA, and the pre-formulation protocol of a medicated syrup were used. Altogether, 180 informants from several ethnic groups participated.

## Findings
The bulb and rhizome parts for *A. sativum* and *Z. officinal* showed a significant difference ($P<0.05$) between plants. The leaves and fruits of *C. citratus* and *C. limon* showed a highly significant difference ($P<0.000$) between plants. The association of four significant plants and infusion, the majority traditional mode of preparation, allowed the preformulation of the infant syrup named COVID-Med, an ITM category 2.

## Conclusion
The bulbs (*A. sativum*), rhizomes (*Z. officinale*), leaves (*C. citratus*), and fruits (*C. limon*) were significant parts.

# Impact of altitude on spring macroinvertebrates and water quality in southwest region of Cameroon

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## Introduction
Climate change, along with the related increase in global temperature, has been reported to have diverse impacts on the physiology, fecundity, growth and biodiversity of animals. Species replacement patterns can be observed in response to climate change reflecting a latitudinal and altitudinal thermal gradient.

## Methodology
A powerful approach to predict how global warming will affect species distribution and abundance consists in studying their distribution along an altitudinal gradient. The impact of altitude on the biodiversity and water quality of 13 springs located from 82 to 1,189m a.s.l was evaluated along Mount Cameroon. Water for physicochemical analyses was directly collected at each site in 1,000 mL polyethylene bottles, without producing bubbles and were measured according to standard methods. The organisms were collected by passive direct filtration using a sieve (150 μm mesh size, 5 to 8 cm diameter) for one to two hours and the spring water was later filtered at the source.

## Findings
The results of the physicochemical variables showed low temperature levels (19.50 ± 2.09 ℃), high turbidity (13.0±7.17 FTU), an acceptable mineralisation level (324.95 ± 260.0 μS/cm), with high amounts of phosphates (0.83±0.47 mg/L). We observed a strong seasonal effect, with a decrease in temperature and nutrient content during the dry season whereas pH and dissolved oxygen increased. A total of 10,265 organisms, distributed into 56 families, were collected. They mostly included insects (47.8%), followed by Arachnida (34.8%). Only two stygobite taxa were recorded namely Darwinulidae and Stenasellidae. Total biodiversity slightly decreased with altitude, especially during the dry season. Despite lower temperature and more oxygen at higher altitudes, diversity, including EPT did not increase.

## Conclusion
Therefore, African fauna are less sensitive to rising temperature than the faunas of other areas of the world. The springs were of good chemical and ecological quality whatever the altitude.

**Keywords:** Biodiversity, elevation gradient; macroinvertebrate; temperature.

# Assessment of antifungal and antibacterial potential of some commonly wood-eaten fungi species of Cameroon

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## Introduction
Besides higher plants that have been used for millenaries by peoples of diverse origins in the traditional pharmacopoeia to cure multiple human pathologies, numerous mushrooms species are also known to be used in traditional medicine in some parts of the world.

## Methodology
Thus, for the valorization of Cameroon's biodiversity, the intended objective of this work is the assessment of the antifungal and antibacterial potential of hexane and chloroform crude extracts of ten commonly wood-eaten fungi: *Coriolopsis telfarii, Coriolopsis polyzona, Perenniporia detritus, Ganoderma aplanatum, Ganoderma resinaceum, Ganoderma resinaceum* form *camerounensis, Ganoderma sp., Phellinus senex, P. gilvus, P. extensus* on 11 strains of bacteria of which five gram-positive (*Bacillus subtilis, Enterococcus faecalis, Staphylococcus epidermidis, Staphylococcus aureus, Mycobacterium smegmatis*) and six gram-negative (*Enterobacter cloacae, Proteus vulgaris, Klebsiella oxytoca, Klebsiella aerogenes, Proteus mirabilis, Escherichia coli*), and three strains of human pathogenic fungi *Candida albicans, Aspergillus fumigatus* and *Aspergillus ochraceus*. The assessment was based on the Minimum Inhibitory Concentration (MIC) determined by the microdilution method.

## Findings
Results recorded show overall variable activity of crude extracts ranging from powerful inhibitors (MIC of 0.39 and 0.52 mg/ml) to medium inhibitors (MIC of 0.78 and 1.30 mg/ml) against on pathogenic fungi and weak inhibitors against all strains of bacteria with MIC of 6.25 and 12.5 mg/mL.

## Conclusion
These results demonstrate the great wealth of tropical biodiversity as a reservoir of natural substances with therapeutic potential.

**Keywords:** Wood-eaten fungi, Antifungal, antibacterial potential, crude extracts, Minimum Inhibitory Concentration (MIC).

# Heterogeneity and structural analyses of trees in an evergreen lowland forest, Congo

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## Introduction
Floristic inventory and diversity assessments are necessary to understand the present diversity status and conservation of forest biodiversity. Studying the variation height-diameter woody provides insight into the general characteristics of the trees diversity pattern. This study mainly focuses on aimed to assess the effectiveness of trees diversity and structure in two study sites.

## Methodology
The study was conducted at Ipendja evergreen lowland moist forest in northern Republic of Congo. The sampling design was systematic consisted of parallel transect 1 or 2 km part, and divided into consecutive rectangular plots, each 5000m2 (25 x 200 m, i.e. 0.5 ha). Within eight plots censuses, all trees with a DBH ≥ 10 cm were identified and measured. A total of 1340 trees has been recorded belonged 145 species and 36 families (n = 607 and n = 733, respectively in Mokelimwaekili and Sombo sites).

## Findings
The results show that the leading botanical families were Sapotaceae follows by Euphorbiaceae, Meliaceae, Caesalpiniaceae, Sterculiaceae, Annonaceae and Rubiaceae. The most representative species were C. mildbraedii, S. kamerunensis and P. oliveri, i.e. 62.06%, 30.34% and 28.27% respectively, demonstrated that they were the leading dominant species of this forest ecosystem. Shannon index were 4.29 bits for Mokelimwaekili and 4.22 bits for Sombo. While Pielou's evenness index was between 0.88 and 0.90, respectively for the Mokelimwaekili and Sombo sites. The similarity coefficient for Jaccard was 62% and 58% for Sorensen.

## Conclusion
There are highlight variations in tree diversity indices across sites and plots in Ipendja forest.

**Keywords:** Trees, Forest, Structural Analysis, Heterogeneity

# *Paxilloboletus* Gen. Nov., a new lamellate Bolete genus from tropical Africa

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## Introduction
Boletes are ectomycorrhizal fungi (EcM) belonging to the order Boletales (Basidiomycota, Fungi). The study of African boletes has long attracted the attention of African and foreign mycologists. However, the few studies carried out on African boletes have been limited to only morphological and anatomical descriptions without addressing the molecular and ecological aspects that the present study aims to investigate in order to ensure better taxonomic and molecular resolution in order to describe new taxa.

## Methodology
Specimens have been collected in several tropical African countries (Benin, Burkina Faso, Mali, Guinea, Ivory Coast, Democratic Republic of Congo, Tanzania, Togo, Zambia and Zimbabwe). We used a combination of morphological characters, anatomy and molecular data to discriminate taxa.

## Findings & Conclusion
A new genus of lamellar boletes *Paxilloboletus* gen. nov represented by two new species from tropical Africa, *Paxilloboletus africanus* sp. nov. and *Paxilloboletus latisporus* sp. nov. Although the new taxa strongly resemble the genus *Paxillus* (Paxillaceae), they lack curly septa and form a distinct generic clade within the Boletaceae phylogeny. The new species are very similar, distinguishable from each other only by the shape of their spores. Descriptions and illustrations of the new genus and two new species are given, along with comments on the ecology, distribution, and morphological differences with other lamellae Boletaceae.

**Keywords:** Boletaceae, Africa, lamellar hymenophore, morphology, phylogeny, taxonomy.

# Antibacterial activity of methanol extract and fractions from stem bark of *Bridelia micrantha* (Hochst.) Baill. (Phyllanthaceae)

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## Introduction
The use of traditional medicine in developed as well as developing countries as basis for the treatment of many ailments has been in existence for thousands of years. Many investigations showed that many plant species identified in Cameroon contain active ingredients with significant antibacterial activity.

## Methodology
*Bridelia micrantha*, a plant used in traditional Cameroonian medicine was studied, in order to confirm the antibacterial properties of its barks and to study the effect of fractionation on the antibacterial activity of their methanol extract. The crude extract was obtained by maceration of the bark powder in methanol. The extract was then partitioned in $CH_2Cl_2/CH_3OH/H_2O$ (2/2/1) (v/v). The methylene chloride phase was fractionated by adsorption chromatography and nine fractions ($F_1$ to $F_9$) were obtained. The fraction $F_6$ was also fractionated and eight sub-fractions ($F'_1$ to $F'_8$) were obtained. The antibacterial activities of the extract, fractions, sub-fractions were determined by the broth micro-dilution method. The chemical composition of the active fractions was established using HPLC.

## Findings
The methanol extract of the bark of *B. micrantha* showed moderate activity on most strains tested with a MIC of 512 µg/mL. The fraction $F_6$ had strong activity on all bacterial strains tested with MICs of 128 and 256 µg/mL, making it the most active. Three sub-fractions $F'_3$, $F'_4$ and $F'_5$, had a strong antibacterial activity on all the twenty bacterial strains tested with MICs varying between 32 and 256 µg/mL. The chemical analysis of the $F_6$ fraction and of the $F'_3$, $F'_4$ and $F'_5$ sub-fractions revealed the presence of compounds belonging to several classes of secondary metabolites.

## Conclusion
The results indicate that the methanol extract of *B. micrantha* bark possesses antibacterial activity which can be enhanced by fractionation, the subfractions $F'_4$ and $F'_5$ being the most active.

**Keywords**: *Bridelia micrantha,* methanol extract, fractionation, antibacterial activity.

# Altitudinal baseline and stress-induced glucose change in western mountain greenbul (*Arizelocichla tephrolaema*) and African thrush (*Turdus pelios*) in a tropical environment

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## Introduction

Biodiversity conservation is crucial for the survival of all species because species depend on each other to survive, and the extinction of one species could result in the extinction of all the others. Unfortunately, the rate of biodiversity loss is rapidly rising nowadays. In fact, there are several causes for the massive mass extinction of biodiversity that the planet is currently going through, including intense agriculture, habitat loss, pollution, and climate change. In tropical regions, afropasserine extinction is increasing dramatically, and little is known about their physiological adjustments to climatic variation, particularly for species that live in forests and experience extreme temperatures in their habitat. Western Mountain Greenbul and African Thrush are resident passerines of sub-Saharan Africa found in Mt. Cameroon over a 2km altitudinal gradient.

## Methodology

The present study examined basal and stress-induced change in glucose levels in relation to altitude, body mass, and sex in both species. Birds were captured in Mt. Cameroun at low (350 m) and high (2300 m) altitudes during the dry season in seven consecutive years (2013–2019). After capture, blood glucose was measured immediately (G0) and after stressing the animal for 30 minutes (G30). The variation between G0 and G30 was considered the change (G30-G0). To prevent resampling, the bird was then sexed, weighted, and ringed before being released.

## Findings

The findings showed that G0 is higher in African Thrushes that live at low altitudes than at high altitudes. In Western Mountain Greenbul, we noticed that individuals living at high altitudes were heavier than those living at low altitudes. Additionally, body mass was negatively correlated with G0 in the same bird. Finally, there was a significant positive correlation between G0 and G30-0 in the Western Mountain Greenbul.

## Conclusion

These results demonstrated that altitudinal variations in blood glucose levels in Afrotropical passerines is species-dependent.

**Keywords:** Altitude, Stress Induced, African thrush, Tropical region

# GIS evaluation and assessment of habitat degradation on Red Colobus diversity in Cross River national park, Nigeria

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## Introduction
Preuss's Red colobus species are critically endangered and its population trend keeps decreasing according to the IUCN Red List of threatened species. Their natural range is limited to the Cross River National Park Oban Division in Nigeria. Preuss's Red Colobus spends most of its time in the upper canopy of the rainforest. Habitat degradation is one of the significant threats facing this species.

## Methodology
This study assessed habitat degradation in the Oban Division of the Cross River National Park, Nigeria and its impact on Preuss's Red Colobus Diversity. Habitat degradation was examined using the Land Use Land Cover Change of the study area derived from the Landsat imageries of 2000, 2010, and 2020.

## Findings
The LULC analysis revealed that 2020 had the highest built–up area (165.68 Km square) compared to 2000 when the built-up area was 43.86 km2. Forest was highly dense in 2000 (3002.90 Km square) compared to 2020 (2598.77 Km square). This study also emphasizes the critical importance of preserving and restoring the habitat of Preuss's red colobus and underscores the potential of GIS technology in monitoring and mitigating the impact of habitat degradation on endangered species in protected areas. The study concluded that there is a continuous loss of forest in the study area and this has a negative effect on the diversity of Preuss's Red Colobus Species in the study area.

## Conclusion
There is, therefore, a need to educate, re–educate the locals on the importance of biodiversity conservation and encourage the governments to provide the locals with a means of livelihood that does not jeopardize the conservation of biodiversity.

**Keywords:** Colobus, Conservation, Degredation, Endangered, Forest

# Simultaneously achieving economic growth and sustainable environmental management, case of palm oil plantation expansion or creation in Cameroon

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Cameroon is the world's twelfth and Africa's third largest producer of palm oil according to 2020 estimates. Over the last decades palm oil has increasingly been used as ingredient in processed food and non-edible products (detergents and cosmetics), and more recently in biodiesel production. As the global demand for palm oil is more than the supply, governments of developing and emerging countries in all tropical regions increasingly promote oil palm cultivation as a major contributor to poverty alleviation, as well as food and energy independence. There has been a steady and consistent growth rate for palm oil production in Cameroon since 2013 till date. In 2020 Cameroon had a total palm oil production of 465, 000MT and a growth rate of 10.71%. Expansion of palm plantation is mostly driven by multinational corporations and economic actors who seek to benefits and diversification of their financial investments. The creation and/or expansion of palm oil plantations poses a serious problem on the loss of biodiversity (rare, endemic and IUCN red-list species) and loss of High Carbon Stock forests. Inasmuch as Cameroon wants to conserve and protect the environment, she also wants to develop and become emergent by 2035. Recently under pressure from several non-governmental environmental organizations, many retailers and consumer goods factories have committed to eliminating deforestation from their supply chains and source sustainable palm oil. This means their suppliers must also remove deforestation from their operation. This is where the High Conservation Value (HCV) and High Carbon Stock (HCS) approaches come in. HCV and HCS approaches are tools that farmers and companies can use to plan agricultural expansion/creation in a responsible way. These work alongside complementary procedures such as respect for customary rights, legal requirements and free, prior and informed consent, thus there is need for the participation of local communities.

**Keywords:** Palm plantation, High Carbon Stock, High Conservation Value, Cameroon

# Tree species phenology and diversity for conservation in the chimpanzee forest habitat Nigeria

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## Introduction
Life cycle changes occurring in tree species and their diversity is important since they serve as food to wild animals. Animals might starve to death or migrate thereby affecting conservation activities and wellbeing of people depending on the park and conservation projects for a means of livelihood.

## Methodology
An experiment was conducted to examine the phenology and diversity of tree species in the Chimpazee forest for better conservation strategy. An 8 km transect with tagged trees was monitored for phenological activities of leafing, flowering, fruiting and leaf shedding for 3 months. Shannon-Wiener's Diversity Index (SWDI) to determine tree species diversity and ANOVA to compare the phenological data among the months of study were employed.

## Findings
SWDI was 4.115. A total of 867 individual trees consisting of 127 species from 45 families with 4 unidentified tree species indicated that *Anogeissus leiocarpus* (7.04%) is the highest in number, followed by *Trichilia martineani* (6.34%) and *Crossopteryx febrifuga* (5.65%). Euphorbiaceae (17.42%) was the highest, followed by Combretaceae (9.80%) and Caesalpinoideae (8.65%). The rest each with 0.12 % were the least families. 0.12% tree species were leafing, 3.92%, 2.19% and 1.73% flowering in June, July and August respectively while 3.92%, 7.27% and 7.96% were fruiting in June, July and August. None was shedding leaves.

## Conclusion
Phenological data reveals significant differences in fruiting and flowering ($P<0.05$), Phenology and tree species diversity enhances conservation strategies.

**Keywords:** Tree species, Phenology, Diversity; Conservation, Chimpanzee forest

# Spotting high disease-risk species in the bushmeat trade in Central Africa in a bid to de-escalates the risk of the next pandemic

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## Introduction
The spread of the Covid-19 pandemic from a wild meat market in Wuhan, China led to an unprecendented global health crisis that infected more than 756 million people and killed over 6.8 million. This served as a wake-up call to the risk of slaughtering wildlife for meat (known as bushmeat) and selling in unregulated markets. Millions of people around the world consume bushmeat and areas reported to have the highest levels of consumption are West & Central Africa, and Southeast Asia, with the highest being Central Africa (> 5 million-tons yearly). Understanding which bushmeat species pose the highest disease-risk to humans is of primordial importance to improve zoonotic spillover surveillance.

## Methodology
To this end, this study made an inventory of species sold as bushmeat, through direct observations in local markets in Cameroon and the Democratic Republic of Congo, and an online search of literature in Web of Science, PubMed and Google Scholar. These species were then cross-referenced in a bipartite network analysis with model data (from Cary Institute) of species predicted to be suitable hosts for deadly pathogens such as SARS-CoV-2, betacoronaviruses and filoviruses (e.g., Ebola).

## Findings & Conclusion
Results show that bushmeat species presenting the highest disease-risk (level 5) are also those traded locally in highest numbers. Local governments should regulate bushmeat markets and sensitise actors in the bushmeat trade of the dangers of their activity.

**Keywords:** Central Africa, bushmeat, disease-risk, pandemic.

# Montane grassland resources drive Gorilla (*Gorilla gorilla*) nesting behaviour in the Ebo forest, littoral region, Cameroon

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## Introduction

Great apes show strong attachment to their nesting sites, which provide them with substantial survival elements. Their nesting behaviors are influenced by geographical and ecological variables including habitat type, slope and sometimes anthropogenic pressures. There is a small little-known gorilla population in the Ebo forest in the Littoral Region, Cameroon.

## Methodology

This study aimed to assess environmental variables that influences Ebo gorillas' (Gorilla *gorilla*) nesting behavior in relation to nesting site selection, nest types, and nesting materials. We collected data from January 2013 to November 2017 along 1077.5 km recce, using the marked nest counting method. Information collected included nesting site's GPS coordinate, group size, nest age, environmental variables (vegetation type, undergrowth, canopy, visibility, slope and altitude). Then, we used the binomial generalized linear models (GLM) (logit link function) to test the influence of environmental variables on the nesting sites selection.

## Findings

We recorded an encounter rate of 0.16 nesting sites per km, with an average number of four nests per gorilla group. The mean nest diameter was $90.33 \pm 23.92$ cm (n = 640, range 25 - 199 cm). Ebo gorillas preferred nesting sites at high altitudes located in grassland areas with open canopy, ligneous undergrowth composition, and very close visibility. They used more than 281 plant species as materials for nesting, with Marantaceae and Zingiberaceae species being the most common material used. Terrestrial herbaceous nests were the most common nest type (55%). During the dry season, gorillas visited the mature forest habitat more and mostly constructed arboreal nests. Finally, reuse of nesting sites was minimal (16%), and re-visitation intervals ranged from 3 days to 33 months.

## Conclusion

Our study is the first systematic investigation of gorilla nesting behavior within the Ebo forest, constituting therefore an important starting point for the long-term conservation planning for this population.

**Keywords:** Ebo forest; Gorilla; Nesting Site; Nest Type; Abundance

# Breaking barriers, empowering change: a critical analysis of gender inequalities and women's working conditions in biodiversity conservation

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## Introduction
Gender inequalities have been recognized as a urge issue across various sectors, and the field of biodiversity conservation in particular. This abstract presents a critical analysis of gender disparities and the working conditions experienced by women in the context of biodiversity conservation.

## Methodology
The study aims to target multiples challenges faced by women in this field and explore potential strategies for promoting gender equality.

## Findings
The analysis highlights that women's participation in biodiversity conservation is often hindered by deeply entrenched societal, discriminatory practices, and unequal power dynamics. Women frequently encounter obstacles at multiple levels, including cultural, institutional, and interpersonal. These barriers manifest in various forms, such as limited access to leadership position and decision-making roles, unequal employment opportunities, wage gaps. Moreover, women in conservation often face precarious working conditions, including inadequate safety measures, limited access to training and professional development opportunities, and insufficient support for work-life balance. These challenges not only undermine women's well-being and career advancement but also impact the effectiveness and sustainability of conservation efforts as a whole. To address these issues, the study suggests several strategies for promoting gender equality and improving women's working conditions in conservation.

## Conclusion
These includes: advocating and awareness campaign to address inequalities, policies and practices promoting women's leadership and representation, supporting networks and mentorship, targeted capacity-building programs, and creating safe and supportive work environments.

**Keywords:** Women rights in Conservation, gender inequalities, women's working conditions, Gender Based Violence, gender equality promotion.

# Phenotypic characteristics of domestic cavy (*Cavia porcellus*) populations in South-Eastern Katanga, DRC

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## Introduction
Domestic cavy is among emerging non-conventional livestock species the one with evident interest in Sub-Saharan Africa and DRC specifically.

## Methodology
Phenotypic characterization of genetic types reared in Southeast Katanga region was performed to contribute to cavy breeding programme development. A survey based on non-probabilistic snowball approach was used; thus, cavy keepers gave information on animal origins and location of other cavy keepers to avoid sampling of cavies from same direct parents. Qualitative and metric data were collected on 551 mature cavies in six locations having sub-populations; in a given farm, 2 individuals were sampled in case of strong visible polymorphism. Descriptive univariate and multivariate analyses (PCA and HCA) and also inferential analyses (ANOVA) were performed.

## Findings
Findings showed that data collecting sites had significant effects on recorded parameters (p<0.05), except head length and chest girth. Globally, cavies from South East Katanga had black eyes (93.28%) with erected ears (50.82%) or dropping ears (49.18%); there is absence of belt (51.91%) and presence of frosting (68.06%) ; majority had elongated head (55.35%). Results show that the average weight of cavies in the region is 566.44±158.22g. Multivariate analysis gave 3 domestic cavies' morphotypes, which were, morphotype 1 (light live weight), morphotype 2 (mean live weight) and morphotype 3 (heavy live weight). These current results show a wide diversity of cavy morphotypes with interesting growth performance which could be useful for improvement through classical methods.

## Conclusion
All these will be necessary for the development of the value chain and the sustainable management of native cavies' resources for meat production.

**Key words:** Phenotype, Polymorphism, Cavy, South-East Katanga, DRC

# Nesting ecology of chimpanzee (*Pan troglodytes*) in the Yoko council forest, Centre Cameroon: assessing nest characteristics and decay rate

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## Introduction
Sustainable management of wildlife species requires reliable knowledge of their ecology.

## Methodology
This study, conducted in the Yoko Council Forest (YCF), aimed to assess nesting ecology of the chimpanzee in this area. The retrospective method was used to study the degradation of animal indices.

## Findings
We identified nests of four age classes with different frequencies of occurrence: fresh, recent, old and very old nests. We also found that in YCF, chimpanzee's nests on 24 different species of trees especially in Marantaceae forests (92.16%), rarely in swampy forests (7.84%), and high canopy closure (>75%), with mean nest height of 15.1 m. The mean nest decay rate estimated using a logistic regression analysis was 77.53 days corresponding to a rate of degradation of 0.0123 per day for a choice of the probability of survival of 0.5.

## Conclusion
Moreover, the results suggested that the type of undergrowth vegetation type (UVTy) and the nest position (NP) were good predictors for the age of nests encounter in the study area.

**Keywords**: Decay rate, Yoko Council Forest, fresh nest, retrospective method.

# Centripetal dynamics of forest degradation in the landscape of Kahuzi-Biega national park, Eastern DRC

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## Introduction
Kahuzi Biega National Park (KBNP) is a protected area (PA) known for its vast areas of primary and secondary forest and home to thousands of species of flora and fauna. It is threatened by various anthropogenic pressures (poaching, forest clearing, bushfire, timber cutting and the spread of Sericostachys scandens.

## Methodology
This led us to carry out this study to analyze the impact of these pressures on primary forest degradation in the PNKB landscape. The study considered the PNKB and a 15Km buffer zone around it and used several types of data including Landsat images, built-up areas, roads, rivers, elevation data, populations, agricultural areas, and fires.

## Findings
The result obtained shows that the KBNP landscape is undergoing significant changes in its forest composition, mainly due to the expansion of agricultural areas, built-up areas, and fire use. Comparative analysis of the extent of degradation from the interior to the exterior highlights the importance of the presence of this PA in reducing degradation. The main concern, therefore, remains the increase in pressure from outside to inside the Park, making it vulnerable.

## Conclusion
The actions to be taken must therefore focus on limiting pressure around the park by promoting sustainable farming methods and improving management.

**Keywords:** Dynamics, Forest, Degradation, Landscape

# Domestication of wild mushrooms from the Abongfen gallery forest of Kedjom-Keku, Northwest Region of Cameroon

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## Introduction
Abongfen forest has a rich biodiversity of wild mushroom available mostly during the rainy seasons.

## Methodology
This study aims to carry out ex-situ conservation through domestication of selected wild mushroom species to secure from extinction and to make it available throughout the year. Some mushrooms collected from their wild habitats were cultured to obtain pure cultures, mother spawn and subsequently domesticated. Substrates used were sawdust (50%) mixed with corncobs (50%); palm cones (100%) and beans straw (100%): all supplemented with the same quantity of rice brand (10%) and quick lime. Each mushroom species was cultivated in a completely randomized design with four treatments and eight replicates. The substrates were ground in an electric mill to smaller sizes (1-3cm long) and soak over the night in tap water. Excess water was allowed to drain to about 65% moisture content. Each portion was thoroughly mixed on a clean cemented floor using a clean spade. 2.0kg of each composition was filled into polypropylene bags of 25 x 15cm size and sterilized in drum at 121°C for 4hours. After cooling each bag was inoculated with 2-3 table spoonful of spawn. The inoculated bags were incubated at room temperature 25°C (±2) and the spawn run was observed until fully colonized. The days of colonization, primordial initiation and harvesting were noted. The fruit bodies on each bag was counted and weighed (in kg) after harvesting to determine the yield. Pleurotus sajor-cajo and Laetiporus sulphureus colonized the substrate but only the former grow; the later did not produce fruit bodies.

## Findings
Mycelial colonization and growth were best in palm cones (12.68cm). The mean diameter of pileus (22.0 ± 2.3 cm) and average number of fruiting bodies (4.5± 1.2).

## Conclusion
Wild edible mushrooms need to be domesticated to ensure availability for food, medicine and as a source of income.

**Keywords**: Biodiversity, Conservation, Domestication, wild edible mushroom, Spawn

# Effect of anthropogenic disturbance on tree species diversity, abundance and composition in the Bafut-Ngemba forest reserve, Northwest region, Cameroon

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## Introduction
The Bafut-Ngemba Forest Reserve is characterized by anthropogenic activities like logging, clearing, farming, and cattle rearing.

## Methodology
To evaluate the impact of human-induced disturbances on the biodiversity of the ecosystem, data on tree species identification and the number of stems per species were collected from an undisturbed and a disturbed forest fragment using transects. A total of 78 stems belonging to 20 species were encountered in the study area.

## Findings
Eighteen (18) species were encountered on the undisturbed site as against 5 on the disturbed. Shannon-Wiener and Simpson diversity indices were higher for the undisturbed (2.81, 0.94) than disturbed (1.45, 0.72) fragments. The values of both indices from the undisturbed site approximated to those of the study area. The undisturbed site recorded a Margalef species richness index of 9.04 as opposed to 5.74 for the disturbed site. *Quercus suber*, *Eribotrya japonica* and *Moringa oleifera* were the most represented species (5 stems/plot) at the undisturbed site while the most populous in the disturbed was *Eucalyptus grandis* (10 stems/plot). The species with the least number of stems on the undisturbed and disturbed sites were *Prunus serotina*/*Coccoloba pubescens* (1 stem/plot) and *Albizia julibrissin* (2 stems/plot), respectively. Overall, the most represented species in the study area was *Eucalyptus grandis*, which like *Roystonea regia*, was found exclusively on the disturbed site. It was inferred from Sørensen's similarity coefficient (20.69 %) that the two fragments were not similar.

## Conclusion
The findings of this study necessitate the putting in place of mitigation measures and safeguards against a further decline in the tree flora of the ecosystem under imminent socio-economic challenges associated with an impending increase in human population.

**Keywords:** Biodiversity indices, Forest disturbance, Tree flora, Bafut-Ngemba Forest Reserve.

# Declining lion (*Panthera leo leo*) and prey populations in Waza national park, Far North Cameroon

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## Introduction
Waza National Park (Waza NP) is one of the four national parks hosting lions in Cameroon. Disturbing observations of illegal activities in the park led to a field survey in 2021.

## Methodology
The main objective of this survey was: to assess the current status of the park and its large mammals, including lions and their prey to formulate recommendations for reconsidering the management of the park for improving its conservation status. The lion population was sampled through calling stations while distance sampling was used for other mammals. A systematic positioning of transects was adopted to provide better coverage of the park and to permit easy navigation. A total of 78 equidistant and parallel 3-km transects were walked covering a total distance of 234 km, making a sampling effort of 15% of the entire park.

## Findings
No lion responded to the call-ups. Results on transect and off-transect observations confirmed the presence of 22 medium to large mammal species in Waza NP. Western kob (*Kobus kob spp. kob*) was the most frequently encountered species (4.7 kob per km), with an estimated 8259 (6160-11,074) individuals. The second most abundant large mammal species encountered in Waza NP was the korrigum (*Damaliscus lunatus ssp korrigum*) with 1091 (795-1496) individuals. Encounters of the red-fronted gazelle (*Eudorcas rufifrons*), roan antelope (*Hippotragus equinus*) and common duiker (*Sylvicarpa grimmia*) were very low. The transect survey revealed alarming levels of human intrusions into the park. The encounter rate of human activities was 3.3 encounters per km covered in the park, pastoralism topping the list with 2.1. These findings reveal an alarming degrading situation in Waza NP. The populations of lion and their prey are facing a downward trend. Based on these findings, we conclude that if no intervention is made, several species such as the lion, roan antelope, red-fronted gazelle, could become locally extinct in the coming decade.

## Conclusion
In view of the current trends, we predict that without drastic interventions, Waza NP and its rich biodiversity, the best example of a formally protected savannah ecosystem in the Far North region of Cameroon, will be lost to future generations. To reverse the current downtrend, we propose a radical increase in funding and operations. The government should involve a competent private partner to restore Waza NP and its wildlife.

**Keywords:** Biodiversity, Population, Conservation, Waza

# CLIMATE SECURITY

## Climate change induced extreme weather events and the recurrence of farmer-herder conflicts in Cameroon: what adaptive and mitigative role can nature-based solutions play?

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### Introduction
Farmers and herders are among the most adversely impacted by climate change as they depend on natural resources that are highly vulnerable to climate change. As climate change induced extreme weather events become the norm, the scarcity of these resources makes competition for their use among farmers and herders stiff which creates a fertile ground for conflicts. So far, limited research has been carried out to understand this situation.

### Methodology
This study which is carried out in Cameroon's Western Highlands examines how climate change induced extreme weather events drive farmer-herder conflicts and the adaptive and mitigative role Nature-based Solutions (NbS) can play. The study employs a qualitative and quantitative approach made up of household surveys (360), key/expert informant interviews (40) and focus group discussions (06).

### Findings
Findings reveal that recurrent extreme weather events are precipitating the dwindling of water resources, loss of pastures, loss of soil fertility, frequent wildfires, increase in pests and diseases and more invasive species, all of which increase competition over limited resources, fueling farmer-herder conflicts. Farmers and herders reported that they have been in more conflictual situations in the past 15 years owing to recurrent extreme weather events. NbS were being practiced/adopted by 65% of farmers and 30% of herders. A negative relationship was found to exist between the practice/adoption of NbS (agrosylvicultural, sylvipastoral and agrosylvipastoral systems, conservation agriculture, tree planting, apiculture, integrated watershed management practices) and the occurrence of farmer-herder conflicts. This indicates that NbS through their ecosystem services enhance the adaptive and mitigative capacity of farmers and herders which contributes towards reducing conflictual situations.

### Conclusion
Thus, the study recommends the putting in place of a favourable policy framework that encourages the adoption/practice of NbS among farmers and herders as this will contribute enormously in reducing farmer-herder conflicts in the Western Highlands in particular and Cameroon in general.

**Keywords:** Climate change; farmer-herder conflicts; Western Highlands agroecological zone; Nature-based Solutions; Adaptation; Mitigation; Cameroon

# Improving food-nutrition security outcomes through the adoption of climate-smart practices: evidence from small holder farmers

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## Introduction
Climate change threatens African nations' economic development, agriculture, food and nutrition security (FNS). Specifically, South Africa's agri-food system is highly vulnerable to the negative effects of climate change due to its dependence on climate sensitive livelihoods. Emerging evidence suggests that the adoption of climate smart agriculture practices (CSAP) can help farmers adapt to climate change impacts, increase farm productivity, income and FNS outcomes.

## Methodology
This study examines the factors that influence farmers' decisions to adopt practices CSAP and how adoption affects FNS in rural South Africa, using an endogenous switching regression approach to account for selectivity bias. Dataset of rural farmers in South Africa (SA) during the 2022/2023 production season was used to analyze factors influencing farmers' decisions to adopt practices CSAP.

## Findings
The results show that farmers' decisions to adopt practices CSAP influences their FNS-measured in terms of farm revenues (FR), household dietary diversity scores (HDDS), and household food insecurity access scores (HFIAS). Additionally, access to extension advisory services and adoption of CSAP positively and significantly impacts FNS among others. Therefore, policy efforts that seek to strengthening and improve farmers access to extension services and climate change sensitization delivery could enhance the adoption of CSAP in SA.

## Conclusion
These findings may be beneficial to the implementation of the government's flagship program on FNS in South Africa and can be employed as part of efforts to achieve the UN's SDG 2 - to end hunger, and promote sustainable agriculture.

# Predicting fungal species distribution and abundance responses to climate change, a case of stinking milk-cap mushroom in West Africa

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## Introduction
Current predictions on species responses to climate change strongly rely on projecting altered environmental conditions on species distributions. However, it is increasingly acknowledged that climate change also influences species interactions. Comprehensive and accurate knowledge of species niches and distribution is essential for effective conservation efforts.

## Methodology
The present study aims at (1) modelling the current distribution of *Lactifluus foetens* and (2) predicting the effect of climate change on its future distribution. The presence records of the species were mined from GBIF online database and current and futures (2040-2080) bioclimate covariates were downloaded from WordClim in 30 seconds spatial resolution. Ensemble Small Modelling (ESM) was implemented using Maxent Philips (Max.P), Generalized Linear Model (GLM), Artificial Neural Network (ANN), and Gradient Booting Machine (GBM) under flexsdm R package.

## Findings
AOO and EOO based only on known occurrences are respectively 16 $km^2$ and 4610.34 $km^2$ when the model predicted a minimal area of 9426.09 $km^2$ which would experience a decrease of 87.8% in the context of the scenarios SSP2.4.5 and SSP5.8.5 of the Global Circulation Model (GCM) HadGEM3-GC3.1 by 2070s. The suitable habitats of the species are distributed in small windows of the Guineo-sudanian region in Benin but the Guinean and Guineo-sudanian regions in Togo and only a small fraction of these habitats is within national protected areas.

## Conclusion
These results provide enough evidence to range *L. foetens* in "Endangered" threat status class according to criteria A3a, B1 and B2 and suggest the emergency actions for the species conservation since the existing protected areas do not cover the potential current distribution areas.

**Keywords:** Climate change; Conservation status; Ensemble Small Modelling; *Lactifluus foetens*; Species distribution modelling

# Mangroves for climate change adaptation and mitigation at the coast of Cameroon: current state of research and future pathways

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## Introduction
Mangroves provide vital ecosystem services in over 118 tropical and subtropical countries, covering over 15 million hectares. These ecosystems are under threat from anthropogenic activities (urbanization, pollution, fish smoking) leading to a decline in the total area covered by 20% in the past four decades. Within the Congo Basin sub-region, Cameroon is one of the most endowed with mangroves along the Atlantic Coast.

## Methodology
Although mangrove ecosystems are vital for climate change adaptation and mitigation (CCAM), limited research has been done so far to shed light on this. It is against this background that this paper examines the contribution of mangroves to CCAM in Cameroon, with emphasis on the current state of research and future empirical research pathways. The paper is based on an in-depth review of relevant literature.

## Findings
Findings reveal that mangroves play an important role in climate change adaptation within Cameroon's coastal communities through the provision of food, shelter, fuelwood, medicines, wood and non-wood forest products, and income. Regarding climate change mitigation, mangroves contribute enormously towards carbon sequestration and micro-climate buffering. Research on mangroves and their contribution to CCAM is currently scanty. Future empirical research pathways to better uncover the contribution of mangroves to CCAM in Cameroon are: undertaking research to assess mangrove ecosystem services and their contribution to CCAM; undertaking research on valuation of mangrove environmental services for payments of ecosystem services which foster conservation and CCAM; carrying out research assessing nature-based solutions for mangrove conservation to improve the contribution of mangroves to CCAM; and undertaking research assessing the importance of ecotourism and environmental education in fostering mangroves' contribution to CCAM.

## Conclusion
Thus, mangroves are vital for CCAM, but more must be done to protect and conserve them through favorable governance and policy frameworks.

**Keywords**: adaptation, climate change, mangroves, mitigation, vulnerability

# Comprehending the diverse roles of soil organic matter in the cereal – *Striga hermonthica* interaction

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## Introduction

The problem of the parasitic weed striga (*Striga hermonthica*) has worsened for African farmers, in conjunction with degrading soil fertility. An analysis of the striga problem showed that scientists, policy makers and farmers conceptualise striga differently. Whether striga is viewed as a weed or a symptom of degraded soils raises fundamental questions that must be tackled.

## Methodology

This study seeks to understand how organic matter inputs affect nutrient dynamics, sorghum production and striga abundance.

## Findings

Surveys in northern Cameroon showed that striga infestation increased over the past two decades. Reduced access to fertiliser and manure hampered options to improve soil fertility. Yields from farmers' fields did not correlate with striga incidence, confirming farmers' prioritisation of soil fertility, weeds, and labour as production constraints, rather than striga. Whether and how soil fertility improvement, through organic matter, enhances agricultural productivity and reduces striga, was investigated in field experiments. Organic matter amendments significantly depressed striga seed survival, with the strongest effect achieved at higher quality; presumably due to higher microbial activity. Organic matter enhanced soil water retention and soil temperature but without effects on striga seed survival. The effect of organic matter amendments was directly related to N mineralisation, both for better cereal growth and reduced striga survival. Increasing N-fertilisation increased sorghum, root-nitrogen mass concentration; which resulted to lower striga seed germination. In a broader framework of the research findings, the ultimate solution for farm productivity for Africa is in sustainable farm intensification by investing in soil fertility. A new conceptual model is proposed, indicating how changes in both cereal yield and striga infestation over time co-vary with changes in soil fertility.

## Conclusion

The implication of this model is that recovery of soil fertility should be the priority. The challenge to agronomists remains to consider how to make farm intensification rewarding and affordable for resource-poor farmers.

**Keywords**: *Striga hermonthica, Sorghum bicolor*, soil fertility, organic matter, N-mineralization, farmers' constraints.

# Factors influencing coping strategies for drought-affected households in Northern Cameroon

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## Introduction
The recent escalation of natural disasters globally has stimulated a burgeoning of theoretical and empirical scholarship on the subject. While the disaster management discourses in high income countries largely focus on resilience and adaptation, developing countries are still grappling with vulnerability and coping issues. This trend has been frequently attributed to the failure of formal (state and market) disaster management institutions in many developing countries. Formality failure provides justification for including informality in the disaster narrative in developing countries.

## Methodology
This contribution explores determinants for adopting formal or informal risk management strategies with regard to droughts in Cameroon, using a random sample of 1208 drought-affected Cameroonian households. Data is based on a structured questionnaire developed following the World Bank's Social Risk Management Framework. Quantitative data are supplemented by 64 in-depth interviews and 17 focus group discussions.

## Findings
A larger proportion of the sample depended on informal than formal strategies to cope with drought effects (78 percent and 22 percent respectively). Binary logistic regression analysis revealed that the age of the household head and perceived severity positively and significantly influenced these decisions (p = 0.001). Due to distrust of state management as a result of previous corruption experiences, victims only appropriated state support when survival was a priority or informality was insufficient for coping.

## Conclusion
We conclude with the need to progressively include informality into the coping package, at least for the studied drought-affected Cameroonian households.

**Keywords:** Coping Strategies; Drought-affected Households; Northern Cameroon; Social Risk Management Framework

# Do concurrent adoptions of climate-smart agricultural practices impact productivity and welfare outcomes? Empirical evidence from rural Nigeria

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## Introduction
Challenges posed by climate change to rural farmers' productivity and welfare can be addressed through climate-smart agriculture (CSA), which is becoming widely recognized as a sustainable solution.

## Methodology
The study investigates the impact of the joint adoption of CSA specifically, drought-tolerant-maize varieties (DTMVs) and organic manure (OM) on rural farmers' productivity and welfare outcomes in Nigeria. A multistage sampling technique was adopted to select 770 rural farmers across 50 villages in Nigeria. Data were analyzed through; propensity score matching (PSM) to establish the link between CSA adoption (DTMVS and OM) and outcome variables (productivity and welfare); Multinominal endogenous switching regression Model was used to correct the selectivity bias (adoption and non-adoption categories) heterogeneity.

## Findings
PSM revealed a significant influence of adopting DTMVs and OM in isolation and combination on outcome variables. However, the largest impact on productivity and welfare outcomes was attained when DTMVs and OM were jointly adopted. The joint adopters saw a 31% boost in their productivity, which is higher than the 12% and 9% increases in productivity that were shown as a consequence of individual adoption of DTMVs and OM, respectively. Per capita total households' expenditure for joint adopters of DTMVs and OM is about 9% higher than DTMVs adopters only, and 8% higher than OM adopters only. From the findings, access to extension training, wealth indicators, and access to credit significantly impact the joint adoption of DTMVs and OM.

## Conclusion
The study concluded that the adoption of CSA significantly increases rural farmers' productivity and welfare; however, the returns are greatest for joint adopters of DTMVs and OM, which indicates it is an optimal strategy. Therefore, government and major stakeholders should promote the adoption of CSA to ensure agricultural sustainability in rural communities; this will help farmers resist climate-related threats and improve their households' welfare status.

**Keywords:** Adoption, Climate-smart, Productivity, Sustainability, Welfare

# Innovative metal–phenolic nanocomposite sorbent: a groundbreaking solution for arsenic-free drinking water - synthesis and characterization approaches

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## Introduction
Arsenic (As) is one of the most concerning contaminants that has become the biggest challenge in drinking water in several countries.

## Methodology
To address this challenge, the sequestration of arsenic by Adsorption in solid media has been extensively investigated. Here, a sorbent system based on a polyphenolic network with physical cross-linking using tannic acid and $Zr^{IV}$ ions is investigated for high binding, which is in the form of metal sequestration. The derived solvent system of nano adsorbent molecules was characterized using x-ray diffraction analysis (XRD), energy dispersive x-ray spectroscopic (EDS) and Fourier transform infrared (FTIR) spectroscopic techniques. Adsorption of As was studied under varying governing factors such as pH, adsorbent dosage, and metal ion concentration, and the effects of changing these parameters were documented. Maximum adsorption was observed at solution pH-7, 1 $gL^{-1}$, and 20 $mgL^{-1}$ metal ion concentration with removal efficiency reaching up to 95% in 90 minutes. Adsorption isotherm and kinetics were studied to deduce the mechanism of adsorption as homogeneous monolayer chemisorption and were best fitted by the Langmuir isotherm model and pseudo-second-order kinetics.

## Findings & Conclusion
Considering the extent of As contamination in the groundwater and the associated health risk to the population, our work provides insides into the nanostructure-dependent capability for As adsorption applications.

**Keywords:** Arsenic, Pollution, Nanocomposite Sorbent, Drinking water

# Extreme climatic indicators and vegetation change: their spatial-temporal relationship and possible causes of change

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## Introduction
Climate extremes have a significant impact on vegetation. However, little is known about vegetation response to climatic extremes in Bangladesh.

## Methodology
The association of Normalized Difference Vegetation Index (NDVI) with nine extreme precipitation and temperature indices was evaluated to identify the nexus between vegetation and climatic extremes and their associations in Bangladesh for the period 1986–2017. Moreover, detrended fluctuation analysis (DFA) and Morlet wavelet analysis (MWA) were employed to evaluate the possible future trends and decipher the existing periodic cycles, respectively in the time series of NDVI and climate extremes. Besides, atmospheric variables of ECMWF ERA5 were used to examine the casual circulation mechanism responsible for climatic extremes of Bangladesh.

## Findings
The results revealed that the monthly NDVI is positively associated with extreme rainfall with spatiotemporal heterogeneity. Warm temperature indices showed a significant negative association with NDVI on the seasonal scale, while precipitation and cold temperature extremes showed a positive association with yearly NDVI. The DEA revealed a continuous increase in temperature extreme in the future, while no change in precipitation extremes. NDVI also revealed a significant association with extreme temperature indices with a time lag of one month and with precipitation extreme without time lag. Spatial analysis indicated insensitivity of marshy vegetation type to climate extremes in winter. The study revealed that elevated summer geopotential height, no visible anticyclonic center, reduced high cloud cover, and low solar radiation with higher humidity contributed to climatic extremes in Bangladesh.

## Conclusion
The nexus between NDVI and climatic extremes established in this study indicated that increasing warm temperature extremes due to global warming might have severe implications on Bangladesh's ecology and the environment in the future.

**Keywords:** Climate, Vegetation, Change, Relationship, Causes

# Farmers' perception of climate uncertainties and adaptation strategies in the swampy areas of South Kivu

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## Introduction
Smallholder farming vulnerability to climate change results from its direct dependence on climatic factors (rainfalls, temperatures, solar radiation). In the DR Congo, where 3/4 of the population depends on this type of agriculture, the combined effects of climate change and COVID-19 have been added to existing structural issues (example persistent insecurity, impassable agricultural feeder roads) to exacerbate threats to livelihoods of rural and periurban communities.

## Methodology
Farmers 'interviews within swamps of South Kivu reveal that the disruption of climatic elements such as rainfall and temperature patterns upsets farmers' endogenous knowledge of the climate.

## Findings
These farmers experience heavy and short rainfall (76%), rising temperatures and a dry season likely long. Results from the binary logistic regression show that the appearance of new pests and the irregularity in rainfall patterns increase significantly farmers' conviction of climate change in the study area. Perceived impacts of climate change that farmers fear include the decline of soil fertility, decreasing yields, crops failure due to floods. Farmers' adaptation strategies include the cleaning up streams, mulching as well as the application of manure, crop diversification and use of chemical pesticides that is currently farmers preferred option to control pests.

## Conclusion
This paper provides valuable information that can guide policy makers as well as those involved in agricultural development to define a program that aims at strengthening farmers capacity to adapt to climate change by formulating new strategies based on existing local knowledge.

**Keywords:** Farmers, Perception, Climate, Adaptation, Swampy Areas

# Characteristics and peasant perceptions of climate change in an equatorial climate with bimodal rainfall: the case of Lekié (Centre-Cameroon)

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## Introduction
Climate change is a major concern for the entire international community. This article analyzes characteristics and farmers' perceptions of climate change (rainfall and temperature) in an equatorial environment with bimodal rainfall in Cameroon, particularly in the Lekié department, central region.

## Methodology
The methodological approach of this work is a mixed one, combining quantitative and qualitative techniques. The first, based on climatic information and direct surveys of farmers, enabled us to evaluate the evolution of these two climatic parameters from 1981 to 2021 and to obtain descriptive statistics on the population studied. The second was used to decipher farmers' perceptions of climate change in this locality. This approach has produced a number of results, both in terms of climate and farmers' perceptions of it.

## Findings
Indeed, rainfall trends are marked by strong inter-annual variability between rainy and dry periods, with a Standardized Precipitation Index varying between 2.38 and -1.99. In addition, the Lekié department experienced an average 2% decrease in rainfall over the study period. Temperatures, meanwhile, rose by an average of 1.2°C per decade. Faced with changes in certain quantifiable climate parameters, farmers' perceptions are divided between divine causality and human activity, on this phenomenon they describe "climate theatre".

## Conclusion
In this situation, it would be advisable to set up local communication mechanisms on the evolution of climatic elements and, above all, to train farmers in strategies for adapting to this new reality within the framework of agricultural extension.

**Keywords:** Climate change, rainfall, temperatures, perceptions, farmers, Lekié

# Agricultural adaptation to climate change: communities' knowledge and expertise according to convention 20031

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## Abstract

Climate change reduces access to drinking water and increases the risk of drought, resulting in a drastic drop in agricultural yield. Climate change has negatives impacts on the cultural heritage of many peoples. Global warming of more than 2.5°C could also threaten around 20 to 30% of animal and plant species with extinction, with a negative impact on the way of life of communities. To cope with these impacts, communities, groups and individuals develop their knowledge, know-how and cultural practices to adapt to difficult situations due to climate change. This study, carried out as part of the promotion and popularization of community agricultural practices, makes it possible to promote the richness of African cultural heritage in the agricultural field for sustainable food security. This publication highlights some of the practices across Africa.

**Keywords:** Climate change, Intangible Cultural Heritage, Adaptation, Agricultural

# Cocoa and coffee agroforests in Cameroon's humid savannah and climate regulation

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## Introduction

In the humid savannahs of West Cameroon, agroforests based on cocoa and coffee cultivation occupy an important place in the agricultural landscape, but their potential for mitigating and adapting to climate change is still little recognized. Yet REDD++ recognizes agroforestry as a climate-smart agricultural practice.

## Methodology

It was therefore necessary to assess the potential of these agrosystems in mitigating climate change. The non-destructive method of estimating biomass using allometric equations was used in 82 plots (60x40 m) spread across three agroforestry types (cocoa, coffee and mixed/cocoa-coffee) and three altitudes (400-800 m, 800-1200 m and 1200-1600 m) to estimate carbon stocks in living trees, dead wood and soil. Using SPSS v.23, the Tukey test (5%) was used for means separation. Carbon stocks ranged from 177.57±35.71 tC/ha in cocoa agroforestry systems to 182.96±53.51 tC/ha in mixed agroforestry systems. Ecological values varied between cocoa-based agroforestry systems (1938072.80± 389768.59 FCFA/ha) and mixed agroforestry systems (1996953.36±584065.02 FCFA/ha.

## Findings

These results show that the introduction of coffee and, even better, cocoa trees, despite their low value in the humid savannahs of Cameroon, is a great opportunity for carbon sequestration, in the sense that coffee and cocoa production contribute to carbon sequestration rather than emission. These types of farming practices should be strongly encouraged as models in these savannah regions for coping with climate change, and taken into account in REDD+ for the Payments for Ecosystem Services.

## Conclusion

This would further motivate producers to expand their plots. Similar studies should be extended to other agroforests in the humid savannahs of Central Africa, to accurately reflect their contribution to climate regulation.

**Keywords:** Biomass, climate change, REDD+, Carbone stocks, Ecologic value.

# NATURAL RESOURCE SECURITY

## Appropriation of the Nagoya protocol in Cameroon and the issue around access and benefit sharing, and collaborative research

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The implementation of SDG 15 of the 2030 Agenda for protecting life on Earth with emphasis on the conservation of biological diversity cannot be adequately measured. Biological diversity is of considerable importance to the lives of people in the socio-economic, scientific, and medicinal domains. In its effort in implementing this Agenda, Cameroon endowed with enormous biological diversity took to resolved through the ratification of the Convention of Biological Diversity (CBD) in 1994 to sustainably manage its biological resources. From 2010 to 2021, Cameroon has enacted the law that governs access to genetic resources, their derivatives, associated traditional knowledge, and the fair and equitable sharing of the benefits arising from their utilization. Interestingly, only two genetic resources (Mondia whitei and Echinops giganteus) have been identified in the huge biodiversity in Cameroon. Cameroon taking as an example in the sub-region and considering that standards are becoming compulsory, and protocols/laws are now ratified/enacted in several other countries, the following ambiguities are obvious: (i)How do we enhance the legal certainty and ensure transparency on procedures for ABS in diverse communities including the traditional ones? (ii)How could we use genetic resources along the value chain, including through international compliance in the context of collaborative research? (iii)How could we address issues around the ABS policy (Intellectual property/patent/research integrity/partnerships/bio-trade)? To address these questions, stakeholders' conversation is necessary among scientists, policymakers, resource persons for ethics and regulation, community leaders and representatives to develop smart and strategic solutions for an equitable access and benefit sharing and protection of our biodiversity. In ensuring that stakeholders don't miss concepts' understanding in the implementation of the SDGs 2030 Agenda, we propose to discuss the topic during the Congo Basin Frontiers of Science Symposium. Participants will be provided with take home messages for action on the Nagoya Protocol–Strategies for better appropriation in Africa and Cameroon, capacity building in collaborative research, stakeholders engagement including traditional practitioners and Community Protocols.

**Keywords**: Biological diversity. Nagoya Protocol, Access and benefit sharing, stakeholders, collaborative research.

# Current trends of edible lepidoptera in Cameroon forest region: key actions towards sustainability

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## Introduction
Lepidoptera are highly sensitive insects that are commonly used as bio-indicators of environmental health. As well as playing a vital role in pollinating trees, they are an important part of the food web for a wide range of wildlife, including other insects, frogs, toads, lizards, bats and birds. More than 500 species of these Lepidoptera are also consumed by human populations. Because of their high nutritional value, they are increasingly promoted as a potential solution to global food insecurity and poverty alleviation. However, the large quantities consumed and commercialised to date are largely the result of wild collection in natural environments, which increases the risk of their overexploitation.

## Methodology
The aim of this study was to assess the risk faced by these Lepidoptera and to simulate their population trends following climatic conditions, in order to propose solutions for their sustainable management. The study was conducted in the Congo Basin forest zone of Cameroon. The diversity of edible caterpillars was assessed after their collection in the forest. The importance of their exploitation was assessed during a market survey with caterpillar traders. Their host trees were assessed as well as their various uses. The MaxEnt distribution modelling approach was used to predict potential habitat suitability under the current climate scenario.

## Findings
Fifteen species of edible Lepidoptera were identified feeding on more than 20 different host trees. The five most traded species were found on highly exploited host trees. Moreover, the increasing rate of degradation of the Congo Basin forest, which is the most suitable habitat of these Lepidoptera under the current and future climatic scenario, aggravates the vulnerability of these insects.

## Conclusion
Proposals for the sustainable use of these insects are discussed.

**Keywords:** Edible Lepidoptera, sustainable management, forest, Food systems, Ecology

# Microplastics in environment: recent developments in occurrence, characteristics, risk assessment and sustainable management scenarios

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## Introduction
MPs have been the subject of numerous analyses, including several adverse assessments; however, most of these studies have focused on their presence in coastal environments. Substantial research works have been carried out in Bangladesh. However, studies on MPs in the estuarine and coastal ecosystems of Bangladesh are very limited.

## Methodology
We conducted the first study on the abundance, distribution, characteristics, and risk assessment of microplastics in the sediment of Karnaphuli River estuary, and Kuakata sea beach in Bangladesh. Microplastic particles were extracted from sediments of 30 stations along the estuary from Karnaphuli River and 24 surface sediment samples were collected from the intertidal zone of the sea beach, Kuakata by density separation and then enumerated and characterized using a stereomicroscope and Fourier Transform Infrared (FT-IR) spectroscopy.

## Findings
In the collected sediment of the Karnaphuli River estuary, the number of MPs varied from 22.29 to 59.5, and in Kuakata it was 232 to 284 items kg−1 of dry weight. The mean abundance was higher in the downstream and left banks of the estuary, whereas the predominant shape, color, and size of MPs were films (35%), white (19%), and 1–5 mm (30.38%), respectively in Karnaphuli River. In Kuakata sea beach, most of the MPs observed were colored (60%), and the rest were transparent (40%). Major polymer types were polyethylene terephthalate, polystyrene, polyethylene, cellulose, and nylon.

## Conclusion
The single value index, PLI, clearly demonstrated that all sampling sites were considerably polluted with microplastics (PLI> 1).

**Keywords:** Microplastic, Coastal Ecosystem, Pollution, FTIR, Stereomicroscope

# Investigation of ground water vulnerability to pollution using the drastic model in Bamenda iii municipality, North West Cameroon

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## Introduction

Knowledge of the vulnerability status of aquifer systems to pollution in areas where ground water is greatly dependent upon for domestic activities is of utmost importance for human well-being. Potable water supply in Bamenda III Municipality (North West Cameroon) is inadequate and unreliable. Consequently, compelling its inhabitants to rely on subsurface water for domestic chores, including drinking that requires the highest quality of water. Unfortunately, anthropogenic activities around the ground water sources render them vulnerable to pollution from diffused pollutants, which may pose a threat to water quality and human health.

## Methodology

This present study aimed at investigating the vulnerability of 20 dug-wells and boreholes in five neighbourhoods in Bamenda III Municipality in order to demarcate zones that are susceptible to pollution and would require particular attention to conserve ground water quality. Invesigations were carried out with the use of Geographical Information System and Overlay Index Method (DRASTIC). Data was analysed with the aid of R-user interphase, Statistical Package for Social Science (SPSS) version 24.0, and ArcGIS desktop version 10.7.

## Findings

The findings revealed that the DRASTIC Vulnerability Index of ground water in Bamenda III ranked between 116 and 186 thereby, classifying the aquifer systems into three vulnerability zones thus; very high vulnerability, high vulnerability and moderate vulnerability to pollution. It was noticed that 20% of the study area falls in the zone of very high vulnerability, 60% in high vulnerability whereas another 20% is in moderate vulnerability zone. Nitrate concentration in groundwater ranged from 38.9 mg/L to 236.8 mg/L.

## Conclusion

The drastic Vulnerability Index values showed a moderate positive correlation with nitrate concentrations as the correlation coefficient was 0.54 at 10% confidence interval. It was therefore recommended that farmers in areas with very high DRASTIC Vulnerability Index should make use of natural manure, instead of utilizing nitrogen-based fertilizers.

**Keywords:** Vulnerability assessment, DRASTIC method, potable water supply, ground water, Bamenda III Municipality

# Ethnomycology: diversity and utilization of medicinal mushrooms in the Philippines

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## Introduction

Mushrooms are fungi large enough to be seen with the naked eye, and they currently exist throughout the world with over 22,000 described species. Many studies have shown that numerous different species of mushrooms can be found in the Philippines wherein species are identified to genus and species level. For years, mushrooms have been used by humans for culinary purposes due to their rich nutritional content. However, they could also be utilized to treat a variety of health concerns.

## Methodology

In the present study, information on the macrofungal diversity and identification of species was found to be limited since the areas considered covers only particular areas in Central Luzon.  A total of 189 species of macrofungi have been documented and classified under 32 families from different regions in Central Luzon.

## Findings

Among the recorded families, Polyporaceae had the greatest number of recorded species. The species in this family are known as wood-rotters, and they commonly inhabit mountainous and other forested areas. A compilation of various macrofungi possessing antimicrobial property revealed that the most tested extracts against different bacteria are *Ganoderma applanatum*, *Ganoderma lucidum* and Polyporus sp. which showed antimicrobial activity against five pathogenic bacteria. The most used macrofungal extract is the ethanol extract. Also, a synthesis on the different macrofungal bioactivities of wild and exotic macrofungi aside from antimicrobial activity were found to be antioxidant, antidiabetic, teratogenic, anticancer, cytotoxic, thrombolytic and scavenging activities.

## Conclusion

It is noteworthy that they contain teratogenic and cytotoxic substances that can be harmful when taken in high dosage and/or beneficial to living organisms due to their medicinal benefits.

# The contribution of raphia (*Raphia* sp) in non-timber forest products harvesting to the Widikum people of North West Cameroon

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## Introduction
The study evaluated the importance of Raphia palm and its sustainability among other non-timber forest products (NTFPs), to the livelihood of the Widikum communities of North West Cameroon.

## Methodology
Questionnaires were administered to a total of 240 respondents randomly selected from four clans in Widikum Subdivision.

## Findings
Results indicate that Raphia wine harvesting showed significant gender preference for male against female, thought to be due to the technical and risky nature involved in the harvesting process. Almost all male respondents (97%) listed Raphia as most preferred NTFP species compared to females (11%). Males also listed *Garcinia kola* and *Cola acuminata* respectively as second and third preferred species. While the most preferred species for females were *Ricinodendron heudoletii* and *Afrostyrax kamerunensis* respectively with 50% and 30%. The main reason for collecting NTFPs by both sexes was for income generation. Among the four clans, Ambelle recorded the highest number of raphia planted in the past five years (310 ±185). Results further show that 75% of the wine harvesters could not estimate the age of their Raphia, which may be detrimental to the sustainability of future wine production, since aging negatively impacts production. All Raphia wine producers adopted a common procedure for wine production by perforating a single incision on an identified mature Raphia inflorescence during the entire wine harvesting process. However, a majority of wine harvesters (64%) indicated that irregular incision could easily kill the Raphia. Further, Raphia propagation was seen to be based on indigenous knowledge of transplanting free-growing seedlings identified from preferred parent Raphia. Finally it was found that monthly average income from Raphia wine producers was superior to the others relying on other NTFPs in all four clans.

## Conclusion
There may be need for improved propagation techniques for raphia palm similar to those used for oil palm (*Elaeis guineensis*).

**Keywords:** Contribution, Raphia, Non-Timber Forest Products, Harvesting.

# Controlled mycorrhization, an alternative to chemicals inputs for sustainable agriculture

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## Introduction

The overuse of synthetic pesticides in agriculture is strongly linked to the destruction of natural resources and ecosystems. Indeed, the application of pesticides coupled with inadequate agricultural practices is leading to land and biodiversity degradation. To support sustainable production in agricultural systems, better management of biodiversity is essential. This can be achieved using mycorrhizal fungi, via controlled mycorrhization, considered as an agroecological potential and recognized as a support for ecosystem services for crops. This alternative considers a range of techniques which optimizes symbiosis through processes of isolation, cultivation, selection, multiplication, inoculation and monitoring of a fungus in the soil.

## Methodology

The aim of this present investigation is to offer crop producers vigorous, healthy plants with good yields, while preserving the health and diversity of our ecosystems. Two experimental trial applications were carried out on tomatoes and onions.

## Findings

The results confirm the ecological engineering of controlled mycorrhization. After application of a biofertilizer enriched with mycorrhizal fungi of the genus *Glomus*, onion bulb yield increased up to15.07 t/ha compared to the neutral control which recorded 6.09 t/ha bulb yield. Similarly, the application of mycorrhization on tomato nurseries produced vigorous seedlings that could be replanted within 3 weeks. The beneficial effects of mycorrhization thus contribute to numerous ecosystem services crucial to the sustainability of agrosystems.

## Conclusion

The development of biofertilizer formulations enriched with mycorrhizal fungi is an alternative to synthetic chemical inputs and can contribute to the development of sustainable agriculture.

**Keywords**: Chemical inputs, Biodiversity, Controlled mycorrhization, Sustainable agriculture

# Safe-guarding coffee genetic resources in Uganda through strategic partnerships: case studies at NACORI

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## Introduction
Robusta coffee (*Coffea canephora* Pierre ex A. Froehner) and Arabica coffee are the most globally traded coffee species. Of these species, Arabica is the top-most traded and Robusta is sought after for its high genetic diversity. In Uganda alone, two distinct subgroups of Robusta coffee have been reported to have a relatively higher tolerance to drought and high temperature, making them suitable genetic resources. However, the "Global conservation strategy for coffee genetic resources" report of 2017 which assessed the security of the global coffee conservation systems; including Uganda, highlighted significant gaps and opportunities that could be implemented to safe-guard these vital genetic resources. These include capacity, regulatory frameworks for genetic resource exchange, collaborative networks and conservation entities. Institutes need help gaining the knowledge, capacity, data, and deep analytics to understand, manage and disclose the biodiversity-related risks they face.

## Methodology
Therefore, this report will discuss the manner in which National Coffee Research Institute (NACORI) of Uganda has formulated strategic local and foreign partnerships to address the aforementioned conservation gaps. Case studies will be discussed to highlight the pivotal partnerships with universities, government agencies, and foreign entities.

## Findings & Conclusion
The discussions will also highlight the success stories from these partnerships which encompass capacity building (through North-South knowledge and skills-exchange), material transfer agreements (MTAs) and MOUs that safeguard the interests of conservationists, researchers and communities alike.

**Keywords**: Safe-guarding, Coffee Genetic Resources, Partnerships, Conservation

# Towards a better understanding of land grabbing in the semi-mechanized gold mining sector in Cameroon

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## Introduction
Cameroon aims to be an emerging country by 2035. To achieve this goal, one of the government's strategies is to create facilities for foreign direct investment in the agro-industrial, logging and mining sectors. The stakes of artisanal, semi-mechanized gold mining in East region of Cameroon have become very high. The recent development of conflicts between semi-mechanized operators and local artisans/farmers in the East of the country, which led in several cases to the death of men, is undeniable proof that land issues are becoming increasingly important in view of the stakes involved in this sector.

## Methodology
This article provides a better understanding of the mechanisms by which mining companies allocate and access land. The paper draws on primary data collected using two methods, namely semi-structured interviews and Focus Group Discussion in addition to some secondary sources, notably the 2016 mining code and the terms of reference relating to the artisanal exploitation of precious mineral substances in Cameroon.

## Findings
Drawing on these data, the document highlights that mining in the East region of Cameroon has reduced people's access to their land. Illegal land access practices by mining companies are leading to land grabbing and dispossession.

## Conclusion
Land in this part of the country has lost its socio-economic value and has become a major driver of social injustice and marginalization.

**Keywords:** mining, land governance, land grabbing, dispossession, impacts

# Analysis of the pangolin (*Smutsia sp*) consumption sector in the Moungo zone – Cameroon

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## Introduction

Pangolin species (*Smutsia* sp) has been included on the CITES convention list for several years due to the risks linked to its overexploitation.

## Methodology

In order to characterize the exploitation of pangolin hunting/poaching in Cameroon, data were collected between May and July 2017. Among others, the objectives were to assess the origins, the profile of the sellers and evaluating the quantities of meat and Pangolin scales sold in Moungo.

## Findings

It emerged from the observations that 24 villages in Moungo spread across 5 districts were involved pangolin exploitation. The weekly harvest per hunter was 9 and 28 units of all ages, i.e. an average annual harvest of 4,212 pangolins for an average monetary value of 37,065,600 FCFA (74,131.2$US). The species identified were *Smutsia tetradactyla* (long-tailed pangolin) and *Smutsia tricuspis* (small pangolin with tricuspid scales). The levies and sales costs do not depend on the localities the calculated chi-square tests are lower than the theoretical ones ($x2$ calculated (20.0) < $x2$theoretical (26.30); $x2$ calculated (15.0) < $x2$ theoretical (21.03). Collectors can achieve an average turnover of 58,968,000 FCFA (117,936$US) per year for an average profit of 21,902,400 FCFA (43,804.8$US) per year. All these explained the higher cost tendency of pangolin meat in restaurants in Moungo Division. In fact, a 300g piece of pangolin meat (10 to 15 pieces per pangolin depending on size) costs CFA Francs 3,000 (US$6) and can be cooked to order. Thus, a restaurant tenant sells a pangolin for more than CFA Francs 30,000 (US$60). Beyond the meat offered by restaurateurs, they also sell pangolin scales for Chinese demanding market. Thus, the kilogram would cost CFA Francs 9,500 (19$US) and this quantity is obtained by stripping four (04) pangolin carcasses (*tricuspis* or *tetradactyla*), i.e. 1,053 pangolins for 263.250kg/year of scales for a cost of CFA Francs 2,500,875 (US$5001.75).

## Conclusion

These observations suggest the urgency of implementing sustainable management of pangolins and awareness of its status in Moungo communities, with a view to its conservation.

**Key words:** Pangolin, meat, scales, marketing, conservation, Cameroon.

# Implications of sustainable management on security of natural resources

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## Introduction
Natural resource management is aimed at conserving resources in an efficient manner and avoiding their misuse for individual purposes. This involves the management of interaction between people and natural landscapes. It is a coalition of water management, land use planning, biodiversity conservation, and the future sustainability of industries such as agriculture, fisheries, forestry, mining and tourism.

## Methodology
This review explains the importance of Sustainable management in ensuring natural resource security.

## Findings
Sustainable management is the management of natural resources like animals, coal, land, soil, trees, water, etc., in a way to ensure there is a continuous flow and equitable availability of products and services provided by these natural resources for current and future generations. This is essential for human well-being as Sustainable Management aims at achieving a healthy balance between economic, social, and environmental factors. People's livelihoods depend on the productivity and health of landscapes, and proper conservation and usage of the land play a major role in maintaining its productivity and health. Natural resource depletion could be a potential threat on a global level, and overexploitation of resources ultimately threatens the livelihoods and well-being of the people who depend on these resources. Therefore, it is essential that immediate actions are required to conserve and manage natural resources for sustainable development.

## Conclusion
Although achieving both environmental and social progress without undermining economic objectives is a major challenge in natural resource management, this review looks into the integration of the three dimensions of sustainability through tenure security, environmental protection, food security and economic development.

**Keywords:** Natural Resources, Management, Sustainability, Implications

# Reconciling livelihoods enhancement with environmental protection: the case of Tali 1 Communty, South West Region of Cameroon

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## Introduction
Cocoa production is the second largest cause of agriculture-driven deforestation and forest degradation in Cameroon, with the country being ranked fifth globally as a cocoa producer. The Southwest Region, particularly the Tali community, is heavily involved in cocoa farming, where average farm sizes range from 3 to 10 hectares. Despite the negative impacts of cocoa cultivation, such as deforestation, water shortages, climate change and food insecurity, and due to high levels of unemployment, more youths are cutting down the forest for cocoa production, which has a high international demand.

## Methodology
Through focus group discussions, questionnaire administration, and interviews targeting 450 farmers aged 25 to 50, who each own at least two cocoa farms, we aimed to understand why farmers persist in cocoa farming despite its associated economic and environmental problems.

## Findings
The results revealed that 70% of farmers were aware of these issues but viewed cocoa production as their only viable means of generating enough income to support their families. The survey findings further showed that 95% of farmers believed that owning multiple farms without trees was essential for maximizing sunlight and profitability. To address deforestation and improve livelihoods in this region and Cameroon as a whole, we recommend the implementation of agroforestry practices and the establishment of farmer cooperatives to enhance market power for their products.

## Conclusion
These measures aim to promote sustainable cocoa production, reduce deforestation, and improve living conditions for farmers in the Tali community and beyond.

**Keywords:** Deforestation, Agroforestry, Cocoa, Mono Crops, Livelihoods, Cooperatives.

# Deforestation and its effects on livelihood patterns of forest fringe communities in northern Sierra Leone

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## Introduction
This research focused on deforestation and its effects on livelihood patterns of forest fringe communities in northern Sierra Leone. This research focused on three objectives. Identify the major causes of deforestation in the study area; identify the sources of livelihood for forest communities, and to assess the effects/impacts of deforestation on the livelihood of the people in the study area.

## Methodology
The study adopted the case study research design in undertaking this systematic inquiry. This was adopted to help acquire knowledge on the current situation of the phenomenon under consideration. Both primary and secondary data were collected and used for the study. The study employed both qualitative and quantitative data-gathering techniques to collect the necessary data and was analyzed in great depth to determine their implications for changing forest cover and livelihood patterns in the study area. The respondents for the study comprised farmers, the meteorological agency, the forestry department, and timber traders.

## Findings
The study showed that the farmers in the study area are largely engaged in the cultivation of food crops which are mainly subsistence in nature such as rice and groundnut. It was realized that the farmers practice mixed cropping with slash and burn as the predominant land preparation method. The study showed that deforestation has affected crop production in the areas of delayed commencement of planting seasons, pest and disease infestation, level and quality of crop yields, and reduction in the income levels of farmers.

## Conclusion
The study recommended among other things, the continuous education and sensitization of farmers, strengthening of the public institution stakeholders, and promotion of active research that will ensure a decline in deforestation.

**Keywords:** Deforestation, Effects, Livelihood, Communities

# Ecofriendly use of orange peel and cypress ash to project common bean against the infestation of *Acanthoscelides obtectus* and to preserve seed viability

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## Introduction

Common bean *Phaseolus vulgaris* is highly attacked during storage by *Acanthoscelides obtectus* which reduces seeds quantity, quality and germination rate. Due to the hazards of synthetic chemicals to humans and the environment, there is a need to promote the application of phytochemicals.

## Methodology

Orange peel powder, cypress leaf ash and their mixture were assessed against *A. obtectus* and to determine their influence on seed germination. Four concentrations (5, 10, 20 and 30 g/kg) of the botanicals were applied.

## Findings

Analysis of essential oil extracted from *C. sinensis* revealed limonene as the main volatile (90.77%). Orange peel powder was less effective against *A. obtectus* with 12.5 % mortality at the content of 30 g/kg within 5 days post exposure. Cypress ash and its combination with orange peel powder recorded 98% and 86% mortality respectively within the same period. The tested formulations were effective in inhibiting $F_1$ progeny thereby leading to less grain damage and weight loss. In addition, there was no significant effect of botanicals on stored seeds about the germination rate.

## Conclusion

Both plant products could be a major component for the protection of beans against *A. obtectus* attacks because it is easy to wash the treated seeds to remove residue of botanicals.

**Keywords**: Botanicals, bioactivity, *Acanthoscelides obtectus*, common beans, germination

# Abundance and diversity of *pleurotus* species and host trees for sustainable management in montane forests

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## Introduction

Abundance and diversity of *Pleurotus* species (Oyster mushroom) and host trees for sustainable management in montane forests was conducted with the view to examine how abundant and diverse are *Pleurotus* species and their host trees in montane forests of Etinde and Ngel-Nyaki in Cameroon and Nigeria respectively.

## Methodology

A preliminary survey across the montane forests was carried out using opportunistic sampling protocol. Shannon-Weiner Diversity Index (SWDI) was used to determined *Pleurotus* and host trees diversity.

## Findings

Shannon-Wienner Diversity Index for Pleurotus species for Etinde was 0.87 and 1.15 for Ngel- Nyaki while for host trees, Etinde was 1.30; Ngel-Nyaki was 0.74. *Pleurotus* species richness at Etinde was 0.032 and 0.026 at Ngel-Nyaki while for host trees was 0.006 for Etinde and 0.0125 for Ngel-Nyaki. Species evenness for Pleurotus species and host trees was also calculated. Sorensen's similarity coefficient for *Pleurotus* species was 22.22% and host trees, 0.00%. The *Pleurotus* species observed at Etinde montane forest were: *Pleurotus djamor*, *P. djamor var. roseus*, and *P. tuber-regium* with *Lophira alata*, *Deibollia onanae*, *Chrysopyhllum sp* and *Anthocleista vogelii* being host trees while at Ngel-Nyaki montane forest, they were *P. pulmonarius*, *P. ostreatus*, *P. djamor* and *P. eryngii* while host trees were *Polyschias fulva*, *Anthonata noldeae,* and *Ficus lutea* respectively. *Pleurotus* species serves as a source of food and income for many locals as well as urban dwellers. Host trees of Pleurotus species play a very important role in the survival of Pleurotus species as without them, the survival or existence of *Pleurotus* species will be compromised. The host trees also serve as medicine, fuelwood, food and fight on global warming.

## Conclusion

The governments of Cameroon and that of Nigeria including conservation societies are called upon to collaborate with local communities in order to improve on the conservation of biodiversity especially *Pleurotus* species and it's host trees.

**Keywords**: Abundance, Diversity, *Pleurotus* species, Host trees, Sustainable management, Montane forests.

# Typology and perceptions of fishers towards the effect of mining on the fish yield and diversity in Mwenga territory, South Kivu

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## Introduction
In South Kivu province, Eastern DR Congo, more than a quarter of active mines are located nearby strictly protected ecosystems. Knowledge of the perception of local communities of the impacts of mining on the diversity of fish, could greatly contribute to fostering a better relationship between these two parties and thus preserve the environment and its biodiversity.

## Methodology
This study established the typology of fishers and examined their perception of the effect of mining activities on the fish yield and diversity in Mwenga territory. In order to determine fishers' perception towards the effect of mining on the fish yield and diversity a cross-sectional survey was conducted among 75 fishers randomly selected across Mwenga territory. Data were collected using a structured questionnaire. While collecting the survey data, water quality parameters were collected at three different monitoring sites along the Zalya River, one of the main rivers stretching along the Mwenga territory.

## Findings
The multiple component analysis revealed the presence of 3 clusters of fishers. Variables that better explain the diversity of fishers of Mwenga territory included the education level, the secondary activity conducted by fishers and the chiefdom of origin. The obtained Total Dissolved Solid, Nitrate, dissolved oxygen, and alkalinity values for Zalya rivers were within the acceptable and desirable ranges for fish in natural ecosystems. Overall, the local community has experienced negative effect of mining on the water quality, fish and human health.

## Conclusion
The main drivers of fishers' perception included the education level and the number of years of experience in fishing. Future studies can assess the impact of mining on groundwater, sediments, flora and air. In addition, future researches can aim at developing and promoting local community mechanism of resilience towards mining threats on the fish yield and diversity affecting fishers' household livelihood.

**Keywords:** Typology, Perception, Fisheries, Yield, Diversity

# Telemetry-base data for informed anti-poaching strategies and foster the conservation of endangered, white-bellied pangolins in the Lama forest reserve, Benin

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## Introduction
Understanding the spatial distribution and activity patterns of endangered species is a prerequisite for enlightened combat against poaching. Such data are of paramount importance to design adapted anti-poaching strategies for the white-bellied pangolin, threatened by unprecedented harvesting in a hunting hotspot such as the Lama Forest Reserve (LFR).

## Methodology
To fill the gap of ecological data on pangolins in LFR, we conducted surveys using radiotracking technique to (i) estimate the size of the home range of the white-bellied pangolin, (ii) assess its spatiotemporal activity, (iii) determine the habitat characteristics predicting the species occurrence and (iv) characterize the dormitory trees of the species. Two adult white-bellied pangolins including a male and a female were tracked in the core zone of LFR using 2 VHF tags of 100 g each during 30 and 60 days respectively. Data on daily GPS position, characteristics of the selected tree species (species, total and bole height, dbh, crown diameter, presence of liana, buttress, and cavity on the tree) were collected for each collared individual and analyzed using QGIS 3.28.1 and R 4.3.1.

## Findings
Home range size was estimated at 14.52 ha and 13.13 ha for the male and female respectively. The daily travel distance of the male was estimated to be 217 m while the female was 74 m. The female spends more time on the same dormitory tree, twice on scale than the male. The preferred habitat of the white-bellied pangolin was a moist semi-deciduous forest with trees that had cavities. The dormitory trees of the species were randomly distributed.

## Conclusion
This pioneering study provides reserve managers with relevant ecological data essential to develop new strategies for targeted anti-poaching efforts toward effective conservation of white-bellied pangolin, which is at risk of being poached to extinction to supply local and international trade within the focal forest reserve.

**Keywords:** Telemetry, Anti-Poaching, Conservation, Pangolins

# Evaluation of the coccidiocidal effects of *Vernonia amygdalina* and *Aloe vera* aqueous extracts on poultry in Bambili, North West, Cameroon

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## Introduction
Avian coccidiosis is an enteric parasitic disease caused by multiple species of the genus Eimeria. Diarrhoea, which may become bloody in severe cases, is the primary symptom. Farm poultry production systems are recently challenged with the concept of "clean, green, ethical" which promotes limited use of drugs, chemicals and hormones for poultry welfare. Substituting synthetic drugs with plant-based supplements such as *Vernonia amygdalina* and *Aloe vera* could ensure healthier food for the human population.

## Methodology
This study is aimed at evaluating the use of these plant extracts in controlling chicken coccidiosis. Chicks gotten from different poultry farms in Bambili, were infected by inoculating oocysts in their water. The chicks were placed in 24 separate cages, infection was confirmed by observing for blood in faeces, followed by stool microscopy. Plant extracts were gotten by decoction and maceration extraction methods and administered at different concentrations (100mg/l, 200mg/l, 300mg/l and 400mg/l) to treat coccidiosis in 66 infected chicks. Chicks were weighed to check for weight gain and feed conversion ratio and growth performance. Different periods were used to observe the effect of the extracts. Blood was collected from the chicks two weeks after inoculation of oocysts to see how these extracts could be beneficial to some haematological parameters.

## Findings
Results from this study showed that concentration of 200mg/l was observed to be the most effective dosage followed by 400mg/l. Also, the extracts showed some significant effect on the growth performance and on haematological parameters.

## Conclusion
Conclusively, *A. vera* and *V. amygdalina* are not only beneficial for improvement of chicken growth but they also show some effects on haematological parameters and seem to be a good natural alternative for treatment of coccidiosis in chicken.

**Keywords:** Coccidiosis, *Eimeria*, bloody diarrhoea, Aloe vera, *Vernonia amygdalina,* plant extract, chicken

# Who benefits and who pays for forest conservation and restoration? (and how?)

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While the importance of conserving ecosystems for sustainable development is widely recognized, it is increasingly evident that despite delivering global benefits, conservation often comes at local cost. Despite well-intentioned policies, some of the poorest people on the planet are still bearing the cost of forest conservation. Global restoration priority setting risks repeating mistakes of conservation by favouring high biodiversity and high poverty areas with low opportunity costs. Areas with the highest restoration potential also significantly overlap with areas of weak rule of law, and unrecognized and contested land tenure. There is a risk that this might lead to project failure, as well as significant welfare and human rights concerns. This is likely to be a bigger problem than currently recognized and without important efforts to resolve local tenure issues and meet social safeguards, forest conservation and restoration in developing countries might jeopardize, rather than contribute to, sustainable development goals.

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# SYMPOSIUM AGENDA 2023

**CONGO BASIN FRONTIERS OF SCIENCE SYMPOSIUM ON SECURITY OF BIODIVERSITY, CLIMATE, AND NATURAL RESOURCES**
**Nov. 15 – 18, 2023**

**YAAHOT HOTEL**
**YAOUNDE, CAMEROON**

| | |
|---|---|
| 15:00-18:00: | **Wednesday 15th November 2023**<br>**Arrival and Registration** |
| | **Thursday 16th November, 2023** |
| 8:00 – 10:15 | Meeting Start: Registration<br><br>*Opening Ceremony*<br>Welcome from Bamenda University of Science and Technology<br><br>Opening remarks/Symposium Objectives<br>Symposium Overview from the Committee Chair: **Prof. Tonjock Rosemary Kinge and Prof. Forest Isbell**<br><br>**Who's here and why:**<br>Acknowledging those present, Reviewing the knowledge, talent and expertise in the room: **MC Prof. Valerie Makoge**<br><br>**Getting to know each other: Exchange of pleasantries**<br>**GROUP PICTURE** |
| 10:15 -10:45 | Coffee Break |
| 10:45 – 13:00 | **Session 1: Biodiversity Security**<br><br>**Session Chairs:**<br>**Dr. Eric D. Nana**, Research Associate, Department of Biology, the University of Oxford , United Kingdom<br> **Dr. Nzweundji Justine Germo,** Deputy Director of Research, Valorization and Innovation at the Institute of Medical Research and Medicinal Plants Studies (IMPM), Cameroon<br><br>**Keynote talk on Biodiversity Security: Dr. Pricelia Tumenta,** Department of Forestry, University of Dschang, Cameroon<br><br>**Presenter 1:** Prof Libert Brice Tonfack, University of Yaounde 1, Cameroon<br>**Presenter 2:** Prof. Thomas Edison  dela Cruz, University of Santo Tomas, Philippines<br>**Presenter 3:** Prof. Chabi Djagoun, University of Abomey Calavi, Benin<br>**Presenter 4:** Dr. Seraphine Ebenye Mokake, University of Douala, Cameroon<br>**Presenter 5:** Dr. Héritier Milenge Kamalebo, Institut Supérieur Pédagogique (ISP) de Bukavu, DRC<br>**Presenter 6:** Dr. Sylvie Fonkwo, Department of Zoology, University of Bamenda, Cameroon |

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|---|---|
| | **Presenter 7:** Dr. Nkemnkeng Francoline, Department of Plant Sciences, University of Bamenda<br>**Presenter 8:** Prof. Sêwanoudé Scholastique Mireille TOYI, University of Abomey Calavi, Benin<br>**Presenter 9:** Dr. Dong Etchike Alex Bruno, University of Dschang, Cameroon |
| 13:00- 14:00 | Lunch |
| **14:00- 15:00** | **Session 1: Biodiversity Security Continue**<br><br>**Presenter 10:** Dr. Lougbegnon Hyppolite AIGNON, University of Parakou, Benin<br>**Presenter 11:** Dr. Beckline Mukete, Center for forests and climate change, Agrosystems Group, Tiko, Cameroon<br>**Presenter 12:** Prof. Timothy Rotimi, University of Ilorin, Nigeria<br><br>**Panel discussion** |
| 15:00- 17:30 | **Session 2: Climate Security**<br>**Session Chairs:**<br>**Prof. Tofel Haman**, Global Academy of Agriculture and Food Systems, University of Edinburgh, United Kingdom<br>**Prof. Thomas Edison DeLa Cruz**, University of Santo Tomas, Philippines<br><br>**Keynote talk on Climate Security: Dr Max Paoli**, Programme Coordinator The World Academy of Sciences, Italy<br>**Presenter 1:** Dr. Princely Awazi Nyong, University of Bamenda, Cameroon<br>**Presenter 2:** Dr. Abiodun Olusola Omotayo, North West University, South Africa<br>**Presenter 3:** Dr. Olou Armel Boris, Botanic Garden Meise, Belguim<br>**Presenter 4:** Dr. Suiven John Paul Tume, University of Bamenda, Cameroon<br>**Presenter 5:** Dr. Gideon Che Ayongwa, Bamenda University of Science and Technology, Cameroon<br>**Presenter 6:** Dr. Theobald Mue Nji, University of Buea / Bamenda University of Science and Technology, Cameroon<br><br>**Panel discussion** |
| 17.30-18.30 | **Coffee break/ Poster Session and networking on biodiversity security BD_PO01 to BD_PO22** |
| **Friday 17th November, 2023** ||
| 8:00- 9.30 | Meeting Start<br><br>Opening remarks/ Announcements/Recap of previous day<br><br>**Presentation on funding, collaboration and grant opportunities** |

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| **9.30 – 12:30** | <div align="center">**Session 3: Natural Resource Security**</div><br>**Session Chairs:**<br>**Prof. Jude Kimengsi**, University of Bamenda, Cameroon<br>**Prof. Mendi Grace Anjah**, University of Bamenda, Cameroon<br><br>**Keynote talk on Natural Resource Security by Prof. Fantong Wilson Yetoh**, *Chief Research Officer (Directeur de Recherche) at the Institute of Geological and Mining Research (IRGM)-Cameroon*<br><br>**Presenter 1:** Prof. Marceline Djuidje Ngounoue, University of Yaounde 1, Cameroon<br>**Presenter 2:** Prof. Félix Meutchieye, University of Dschang, Cameroon<br>**Presenter 3:** Dr. Tasrina Rabia Choudhury, Bangladesh Atomic Energy Commission, Bangladesh<br>**Presenter 4:** Prof. Alice Magha, University of Bamenda, Cameroon<br>**Presenter 5:** Prof. Angeles M. De Leon, Central Luzon State University, Philippines<br>**Presenter 6:** Dr. Gideon Che Ayongwa, Bamenda University of Science and Technology<br>**Presenter 7:** Prof. Kadidia Koita, Université Joseph KI-ZERBO, Quagadougou, Burkina Faso<br>**Presenter 8:** Dr. Daphne Nyachaki Bitalo, National Coffee Research Institute, Uganda<br><br>**Panel discussion** |
| 12:30-13.00 | **Coffee Break** |
| 13:00-13:30 PM | Presentation on TWAS Young Affiliates **(Prof. Bolanle Ojokoh)** |
| 13:30 - 14:30 | Lunch |
| 14:30-16:30 | Roundtable discussion on biodiversity, climate and natural resource security (TYAN Event by Prof. Thomas dela Cruz, Dr. Tasrina Rabia, Prof. Chabi D., Prof. Bolanle Ojokoh, Dr. Daphne Nyachaki Bitalo and Dr. Eric D. Nana<br>**Moderator:** Prof. Tonjock Rosemary |
| 16:30-16:45 | **Announcements** |
| 16:45-17:45 | **Coffee Break**/<br>Poster session and networking on climate and natural resource security<br>**CS_PO01 to CS_PO07 and NR_PO01 to NR_PO11** |
| <div align="center">**Saturday 18th November, 2023**</div> ||
| 8:00-12:30pm | Excursion/fieldtrip to **Eco Park Yaounde** |
| 13:00-14:00 | **Lunch/departure** |
| <div align="center">**END**</div> ||

# COMMITTEE CHAIRS

## Prof. Tonjock Rosemary Kinge

Tonjock Rosemary Kinge is the Chair and an Associate Professor of Mycology, Phytopathology and Biodiversity in the Department of Plant Sciences, Faculty of Science in the University of Bamenda, Cameroon. Her research is focused on, mushroom cultivation, ethnomycology, fungi diversity, molecular phylogenetic study, mycobiome analysis, biocontrol of fungi diseases, biodiversity conservation, Climate change and multidisciplinary. Rosemary is a member of the Cameroon Academy of Young Scientists where she is the technical and logistic secretary. She is an Affiliate of the African Academy of Sciences and an executive committee member of TWAS Young Affiliate Network. Also, Rosemary is a fellow of the African Science Leadership Programme. She is a TWAS-CAS postgraduate fellow and a postdoctoral fellow from the University of The Free State Bloemfontein, South Africa. She is a Fulbright scholar from the University of Florida, USA from 2017-2018. Rosemary is a George Foster Alexander von Humboldt Experienced research fellow from the University of Bayreuth in Germany. She is a next Einstein and British Society for Plant Pathology ambassador in Cameroon. Rosemary is the coordinator for the western zone for Cameroonian Professional Research Oriented Women Network (CaPROWN). She is an editor for *Conservation Letters* and reviewer for many journals. She has published over 40 articles in international peer-reviewed journals. Rosemary has trained many Master holders and PhD students and is passionate in mentoring girls and early female career researchers in STEM fields.

## Prof. Forest Isbell

Forest Isbell is an Associate Professor in the Department of Ecology, Evolution, and Behavior and is the Associate Director of Cedar Creek Ecosystem Science Reserve at the Institute on the Environment at the University of Minnesota. He also serves on the editorial boards of *Ecology Letters and Oecologia*. The Isbell lab investigates how changes in biodiversity alter ecosystem functioning, stability, and services. We also study how global environmental changes (e.g., habitat loss and fragmentation, nutrient enrichment, climate change, exotic species invasions) are driving changes in biodiversity and ecosystems. Most of our studies consider plant diversity in grasslands and forests, but we have also reintroduced bison to an oak savanna.

# BIOGRAPHY OF KEYNOTE SPEAKERS

## Dr. Pricelia Tumenta

Pricelia Tumenta is a Lecturer in the Department of Forestry, University of Dschang, Cameroon. She holds a PhD in Conservation Biology and has been involved in teaching, research, wildlife conservation and protected areas management for over 15 years. She is a trained wildlife professional with experience in monitoring, wildlife mapping and community-based mapping approaches. Her research focuses on ecology and conservation of the African lion as well as factors threatening its survival. She uses technology such as GPS Satellite collars and radio telemetry to study lions. Recent research includes assessing human-lion conflict to find strategies that promote healthy

coexistence between humans and wildlife. She is a grantee of National Geographic Big Cat Initiative, WWF INNO the Netherlands, Leo Foundation in collaboration with Lion Recovery Fund for research and conservation of the African lion. She has equally received grants for conference and capacity building from WWF Education for Nature, The African Network of Scientific Technological Institutions and the Operating Unit of the United Nations University Institute for Natural Resources in Africa. She is a SilvaCarbon mentor, a program of the US government to enhance capacity of some selected countries in carbon monitoring.  She is an active member of the African Lion Working Group; IUCN SSC CAT Specialist Group, Cameroon Professional Research Oriented Women Network and the Society for Conservation Biology.

## Dr. Max Paoli

Max Paoli, with a B.Sc. Hons. in Biochemistry and a D.Phil. in Chemistry, worked in the area of protein structure and molecular recognition for almost 20 years. His research work took him from York, UK, to laboratories in New Zealand and the US, including the Harvard Medical School. With academic positions in Australia and in the UK, he was also a BBSRC David Phillips Research Fellow at the University of Cambridge, UK. Max and his group solved the structures of several protein-ligand complexes and published research articles in peer-reviewed international journals.  He taught both entry level and advanced university courses, and supervised PhD and MSc students. He was a course convener in Australia where he developed a lecture series on proteomics. In Cambridge, he was a tutor at St. John's College. Max Paoli works at The World Academy of Sciences (TWAS), a Unit of UNESCO, serving as Programme Coordinator.  He oversees the activities of the Academy, such as the PhD and Postdoctoral Fellowships, Research Grants, Exchanges, Prizes. In addition, he delivers regular lectures and presentations on various topics related to sustainability, environmental ethics, sustainable development and education for a sustainable future.

## Prof. Fantong Wilson Yetoh

Prof. Fantong Wilson Yetoh is a Cameroonian, born in Nwa, North West Region of Cameroon. Academically, he holds a Ph.D in Hydrogeology from the University of Toyama-Japan. Professionally, he is a Chief Research Officer (*Directeur de Recherche*) at the Institute of Geological and Mining Research (IRGM)-Cameroon, with more than 50 peer reviewed articles that address groundwater recharge mechanisms, chemistry/quality for drinking, agriculture, health, climate change and mineral exploration, and has supervised 37 M.Sc, 07 PhDs, with 05 academic awards.  Within the framework of a German-based programme called *InWent* and the Japan program of Science and Technology Research Partnership for Sustainable Development (SATREPS), he also became an expert in Integrated Water Resources Management and Disaster Risk Reduction. In the scientific community, he is a fellow of the Cameroon Academy of Sciences, Laison Professor of the University of Toyama in Japan, a member of the International Association of Hydrogeologists, Chair of the Scientific and Technical Committee of Global Water Partnership-Cameroon, Coordinator of the Scientific Committee of the Lake Monoun Project, and part-time Lecturer at the University of Buea (Cameroon). Administratively, he is a Chief of Service in the Scientific Policy and Planning Division at the Ministry of Scientific Research and Innovation (MINRESI).  From 2017-2022, he has been a scientific coordinator of nine (09) projects sponsored by the Federal Ministry for Economic Cooperation and Development - BMZ-Germany, SWISS Development Cooperation Agency, Global Water Partnership - Central Africa, African Development Bank and the Prime Ministry Office in Cameroon.

# BIOGRAPHY OF SESSION CHAIRS
# BIODIVERSITY SECURITY

## Dr. Eric Djomo Nana

Dr. Eric Djomo Nana is a Conservation Biologist from Cameroon with a PhD in Ecology from Charles University in Prague, in the Czech Republic. His current research interests are centred around solving the problematic cocktail of biodiversity loss on the one side and vulnerability, poverty, exclusion from resources, financial interests and drivers of illegal wildlife use on the other side. Currently, he works for the University of Oxford in the U.K as a Research Associate in the Department of Biology. He also holds a position in Cameroon as a Senior Researcher at the Institute of Agricultural Research for Development (IRAD). In his research, he uses scenario-based interviews to model interventions that could elicit behaviour change of urban wild meat trade actors in Central Africa. He also coordinates a project that will reintroduce over three years at least 5000 young trees of the Endangered African zebrawood (*Microberlinia bisulcata*) in Cameroon's proposed Ebo forest National Park. He is an Adjunct Professor at the Higher Institute of Environmental Sciences/University of Yaoundé I in Cameroon, and a consultant for the Congo Basin Institute (CBI), a multi-institutional research platform created by the University of California in Los Angeles to bring together universities, industries, and governments to work together for enhanced solutions to environmental problems in Central Africa. He is the current of President of Cameroon's Chapter of the Society for Conservation Biology, an Affiliate of the African Academy of Sciences and The World Academy of Sciences.

## Dr. Nzweundji Justine Germo

She is a Plant Biotechnologist and Deputy Director of Research, Valorization and Innovation at the Institute of Medical Research and Medicinal Plants Studies (IMPM) in Cameroon. In 2022 she received UMAPS fellowship at the University of Michigan. She received the prestigious fellowship Unesco-l'Oréal for her PhD research in US at Tropical Research and Educational Center, University of Florida in 2011 and at Alabama A&M University in 2013. She received many grants and prizes and in 2015 the prize of the best junior researcher of IMPM. Since 2017, she is a member of the steering committee of the Africa chapter of INGSA (International Network for Government Science Africa). In 2018, she received a postdoctoral research fellow at Geisenheim Hoschule University in Germany through TWAS-DFG. She is fellow of the African Science Leadership Programme of Future Africa at the University of Pretoria, South Africa. She is actually the President of the Cameroon Academy of Young Scientists and member of the Global Young Academy. She is a global Steering Committee member of UNESCO Open Science. She recently received the Female Science Talents fellowship of the Falling Walls Foundation.

# CLIMATE SECURITY

## Prof. Tofel Haman Katamssadan

Prof. Tofel Haman Katamssadan is an Associate Professor of Agricultural Entomology and Head of Department of Phytosanitary Protection at the University of Bertoua, Cameroon. Currently, he is a visiting scientist at the Global Academy of Agriculture and Food Systems of the University of Edinburgh, UK. He obtained his PhD in Entomology from the University of Ngaoundere. His research focuses on the development of botanical formulations, which are eco-friendly, for the protection of stored products and cultivated crops. He has been involved in supervising Master and PhD theses. Tofel Haman is a member of several scientific organizations notably the Cameroon Bioscience Society (CBS) where he is the Vice president, the Cameroon Academy of young Scientists (CAYS), the Royal Entomological Society (RES). He is an alumnus of German Academic Exchange Service (DAAD).

## Prof. Dr. rer. nat. Thomas Edison E. dela Cruz, FPAM

Dr. Thomas Edison E. dela Cruz holds the rank of Professor 5, the highest academic rank at the University of Santo Tomas. Following completion of his doctorate study in 2006, he established the Fungal Biodiversity, Ecogenomics and Systematics-metabolomics (FBeS) group at the Research Center for the Natural and Applied Sciences in UST. His research focuses on the identification and biodiscovery of fungi including lichens and the fungus-like protists, slime molds (or myxomycetes), in under-explored microhabitats in tropical ecosystems through a polyphasic approach of morphocultural, physiological and phylogenetic methods and the understanding of their biodiversity, ecological patterns, and interactions. He also conducts research on fungal natural products for drug discovery and novel agro-chemicals. He has a strong interest in ethnomycology and microbiology education, particularly on developing innovative teaching tools and active learning strategies. Dr. dela Cruz completed his Doctor of Natural Sciences (Dr. Rer. Nat.) at the Technical University Braunschweig in Germany and his BSc Microbiology and MSc Biological Sciences degrees at the University of Santo Tomas. He holds a Diploma in Science Teaching at UP Open University. He serves as Philippine Representative to the Asian Mycology Association and is a fellow of the Philippine Academy of Microbiology and the Global Young Academy.

# NATURAL RESOURCE SECURITY

## Prof. Jude Kimengsi

Jude Kimengsi is Research Fellow at the *Technische Universit*ät Dresden (Germany), and an Associate Professor in Environmental Geography at the University of Bamenda, Cameroon. Prior to this, Jude Kimengsi was Senior Lecturer/Researcher and Head of Department of Geography and Environmental Studies and Director of Research at the Catholic University of Cameroon. From 2012 to 2015, he was Consultant on Sustainable Development and Coordinator of Research, Consultancy and Publications Division at the Pan African Institute for Development – West Africa (PAID-WA). Jude is a Fellow of the Global Young Academy (GYA), Affiliate Fellow of the African Academy of Sciences, and a pioneer Fellow of the Cameroon Academy of Young Scientists (CAYS). He has several publications on linked issues of natural

resources and conflict transformation, climate and environmental planning. He has served as consultant with the Islamic Development Bank (IsDB) and GP-IRDP on rural development and resource planning, and WWF Cameroon and Germany on conservation, livelihoods and development. Jude Kimengsi was Expert Reviewer of the First Order Draft (FOD) Contribution to the Intergovernmental Panel on Climate Change (IPCC's) Sixth Assessment Report. He is a Board Member of the Global Environmental Non-Migration Network. Currently, Jude serves as Associate Editor for Springer *Nature* (*Social Sciences*), Associate Editor of Frontiers in Natural Resource Management and Editor of *Scientific African* (Elsevier). Under the University of Cologne, he has been serving as DAAD/DIES Expert on research grant proposal writing, where he has intervened in several African countries including South Africa, Namibia, Senegal, Ethiopia, Tanzania, Togo, Nigeria and DRC.

## Prof. Mendi Grace Anjah

Mendi Grace Anjah is an Associate Professor in Forest Silviculture and Biology. She holds a PhD in Forest Resources Management from the University of Ibadan. She has been teaching and carrying out research activities both at the Universities of Dschang and The University of Bamenda, all in Cameroon. Her academic expanse has seen her occupying several positions especially in the University of Bamenda as the Vice Dean of the Faculty of Science from 2013 to 2018, and from 2018 to present date, the Deputy Director of the College of Technology, COLTECH. As a staff member, she has been actively involved in drawing up, participating and revising academic programs in the areas of Forestry and Plant Biology, having had a BSc Honours in Botany. In 2018, her appointment as a Deputy Director coincided with the creation of the Department of Forestry and Wildlife of COLTECH where she contributed in developing the program in Forestry. Within the Framework of the RUFORUM Project she participated in Curriculum Revision in 2022. She's credited with more than fifty scientific publications, supervised close to 3 PhD with more than 10 on-going, about thirty MSc Theses, DIPET 1 and 11 dissertations and several BSc Theses. She was the Cameroonian lead researcher in an AFORNET project where Postgraduate students were sponsored subsequently obtaining MSc degrees. She is the President of "CIASMANA', member of AFF and MORFO, partners with RETAFOR and ERASMUS collaboration with the Department of Forestry and Management of Environment and Natural Resources, Orestiada, DUTH Greece.