PLANNING CONSERVATION ACTION FOR GHANA'S THREATENED TREE SPECIES

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Acknowledgments

Many people contributed to the completion of this report. Their time and contributions are acknowledged here:

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A full list of workshop participants is provided in Appendix I of this document and all are thanked for their valuable contributions.

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Acronyms and Abbreviations

(BGCI)	Botanic Gardens Conservation International
(CPSG)	Conservation Planning Specialist Group
(CSIR-INSTI)	Council for Scientific and Industrial Research – Institute for Scientific and Technological Information
(CSIR-FORIG)	Council for Scientific and Industrial Research – Forestry Research Institute of Ghana
(CSIR-PGRRI)	Council for Scientific and Industrial Research – Plant Genetic Resources Research Institute
(CREMA)	Community Resource Management Area
(CSOs)	Civil Society Organisations
(DA)	District Assembly
(FC)	Forestry Commission
(FSD)	Forest Service Division
(GWS)	Ghana Wildlife Society
(INEC)	Institute of Nature and Environmental Conservation
(IUCN)	International Union for Conservation of Nature
(KNUST)	Kwame Nkrumah University of Science and Technology
(NTSC)	National Tree Seed Centre
(NGO)	Non-Government Organisation
(SSC)	Species Survival Commission
(WD)	Wildlife Division

Placodiscus bancoensis

CONTENTS

Gilbertiodendron splendidum

EXECUTIVE SUMMARY

Monocyclanthus vignei

Ghana has a wealth of native tree diversity, with more than 900 native tree species, three of which are endemic to the country. Endemics include charismatic species such as the tree *Talbotiella gentii*.

More than ten percent (120) of Ghana's native tree species are threatened with extinction. There is an urgent need for well-planned conservation action underpinned by current, reliable information on the distribution, habitat, population status, key sites and major threats for threatened species, to ensure that none of Ghana's tree species becomes extinct.

From 10-13th of October 2022, Botanic Gardens Conservation International (BGCI), IUCN SSC Conservation Planning Specialist Group (CPSG) and CSIR-Forestry Research Institute of Ghana (CSIR-FORIG) hosted a four-day workshop to effectively plan conservation action for Ghana's threatened tree species, with a particular focus on endemic and near-endemic species. Planning contributors who attended the workshop included representation from 17 organisations including government, NGOs, and academic institutions.

This report summarises the achievements of the conservation planning workshop, including the development of a national Vision and Goals.

1. INTRODUCTION

1.1 Tree diversity of Ghana

The forests of Ghana are a part of the globally unique Guinea Forest of West Africa Biodiversity Hotspot. Found within one of the two subregions which make up the hotspot, the 'Upper Guinea Forests' subregion stretches from Guinea in the west, through Sierra Leone, Liberia, Côte d'Ivoire, Ghana, Togo and into Benin in the east. The Guinean Forests are home to exceptional levels of biodiversity and are one of the eight biodiversity hotspots found within Africa and Madagascar (Carr et *al*. 2015). Approximately 9,000 species of vascular plants are believed to occur in the hotspot, with 1,800 endemic to the region (Mittermeier et *al*. 2004). Within Ghana there is a diversity of forested ecosystems with seven main forest types being described; Wet Evergreen, Moist Evergreen, Upland Evergreen, Moist Semi-deciduous, Dry Semi-deciduous, Southern Marginal and South-East Outlier (see Figure 1) (Hall and Swaine 1981). Additionally, a

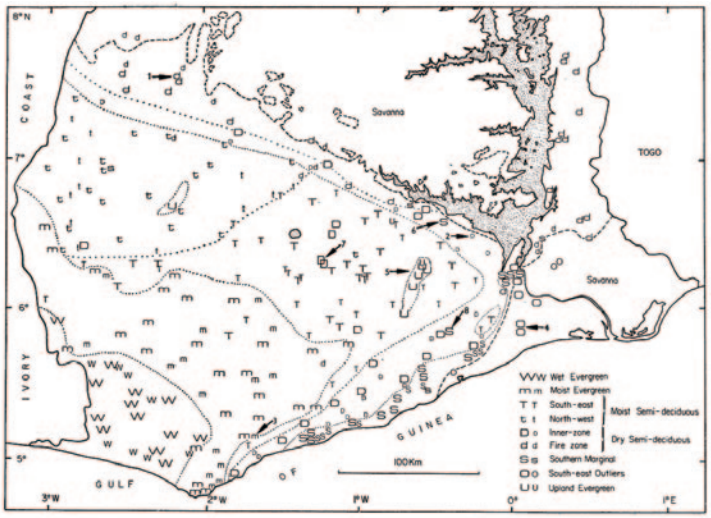


Figure 1. Hall and Swaine's forest zone classification system (Hall and Swaine 1981)

Savannah zone occupies a significant portion of northern Ghana and also extends further south to the east coast (Ghana Forestry Commission 2021).

Talbotiella gentii

Ghana has a wealth of native tree diversity. There are more than 900 native tree species, three of which are endemic to the country. Endemic species include the charismatic *Talbotiella gentii*, an evergreen timber tree only occurring in tiny stands in rocky areas of dry forest. Many of Ghana's native trees are excellent timber species and the timber industry is an important component of the country's economy. In 2019, international exports of wood were worth approximately US $196,500,000 (WITS 2022).

1.2 Conservation status of Ghana's trees

Of the 906 tree species native to Ghana, 725 have been assessed using the IUCN Red List of Threatened Species categories and criteria. The IUCN SSC West African Plant Red List Authority (WAPRLA) is mandated to carry out conservation assessments for West African plants. Over 120 tree species have been assessed as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) (see Figure 2).

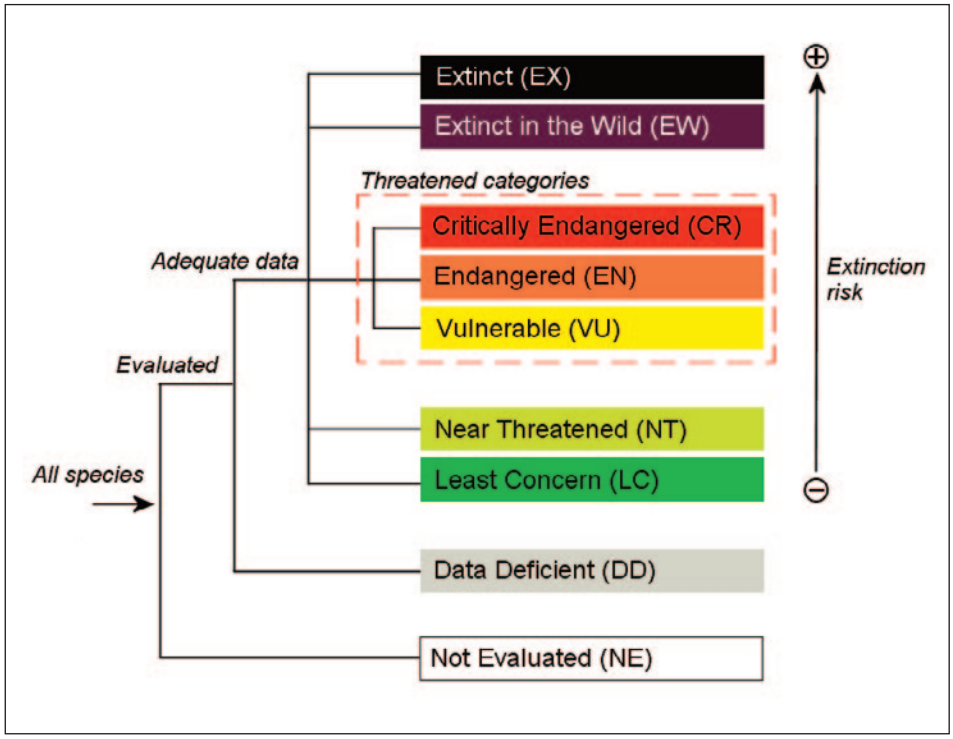


Figure 2. IUCN Red List of Threatened Species categories

Pericopsis elata

Due to the high concentration of threatened tree species present in the country, there is an urgent need for well-planned conservation action underpinned by current, reliable information on the distribution, habitat, populations, key sites and major threats, to ensure that none of Ghana's tree species becomes extinct.

Cola boxiana

Ghana has a total forest cover of 7,964,000 ha of which 275,000 ha is plantations (FAO 2020). Its biological diversity is being preserved in the 280 Forest Reserves, which make up approximately 11% of the total land area of the country. There are also 18 Wildlife Protected Areas which cover 5.5% of the total land area. The network of procted areas (see Figure 3) captures the diversity of different ecosystems in the country. Additionally, parts of 29 existing Forest Reserves have been designated as Globally Significant Biodiversity Areas (GSBAs) covering 117,322 ha.

Forest Reserves are delineated into production, protection, conversion and research areas. Timber production areas make up almost 45% of the total area within Forest Reserves (Oduro *et al.* 2012). In 1995, 84% of the Forest Reserves were considered at least partially degraded (Hawthorne and Abu-Juam 1995). Although forest loss in Ghana is likely to have occurred for centuries because of shifting agriculture, it accelerated to new heights in the 1900s. It is estimated that one-third of Ghana's forest was lost between 1955 and 1972 (Hall 1987). The majority of significant forested areas only persist within Forest Reserves. However, there are still isolated, very small patches of forest persisting outside of Forest Reserves often preserved due to their religious and cultural importance. These patches are often known as sacred groves they are not as well researched as Forest Reserves and some are degraded (Nganso et *al.* 2012).

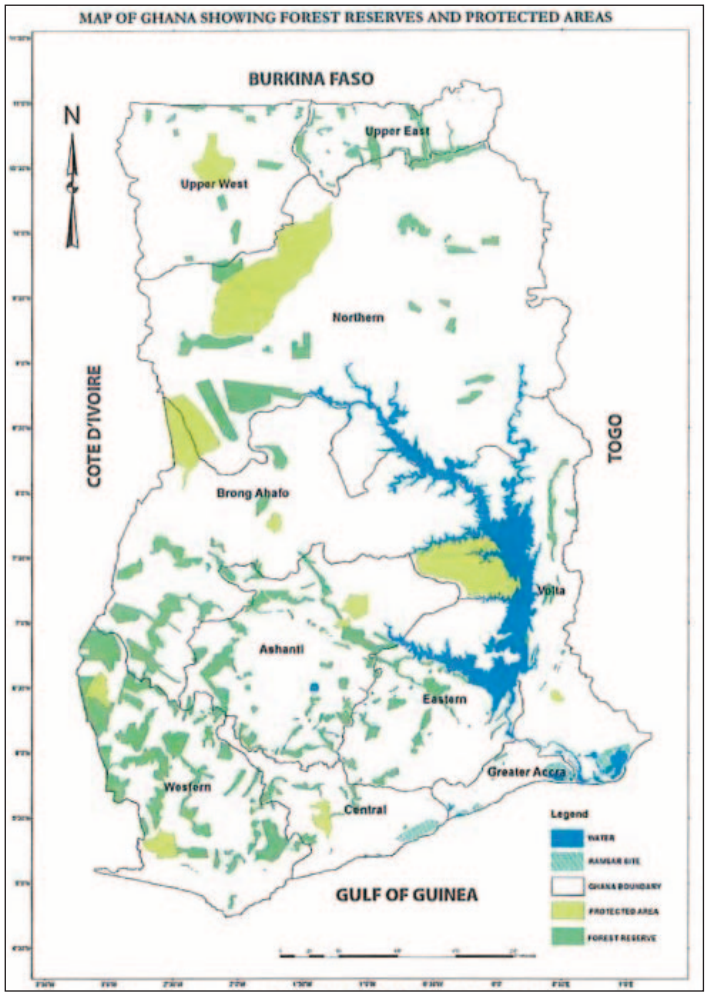


Figure 3. Forest Reserves and protected areas of Ghana

1.3 Scope of the project and process

In October 2022, BGCI and the CPSG hosted a four-day conservation planning workshop in collaboration with the CSIR-FORIG to effectively plan conservation action for Ghana's threatened trees. The focus of the workshop was on planning actions for thirty-eight endemic or near-endemic tree species of Ghana (species list can be found in Appendix I).

The workshop was attended by 45 participants (participant list can be found in Appendix II), with representation from a variety of organisations including government, NGOs, and academic institutions. During this workshop the conservation planning process was introduced and context for the process given. A series of presentations on Ghana's tree diversity and current conservation actions for threatened trees were delivered. A visioning exercise followed which resulted in a qualitative description of what successful recovery of Ghana's threatened trees would look like. After the session, participants' contributions were translated into a set of measurable goals, which were subsequently reviewed by participants as part of the planning process.

Before the workshop baseline information was collected for key elements of the pathway to recovery for each of the target species. Integrated conservation approaches require a broad base of information on the whole recovery pathway to ensure conservation problems are fully understood and a wide range of complementary actions are identified and undertaken (Oldfield and Newton 2012).

Baseline information was gathered on the following factors:

- IUCN Red List category (i.e. risk of extinction)
- Distribution (both globally and within Ghana) and presence within protected areas
- Ecology
- Threats
- Propagation protocol
- Presence within *ex situ* collections
- Conservation actions taking place *in situ*
- Use within restoration and/or agroforestry activities
- Local communities engaged in conservation
- Capacity gaps for effective conservation; and
- Stakeholders active in conservation.


Suregada ivorensis

Aubregrinia taiensis (CSIR-FORIG)

Four working groups were established based upon sections of the recovery pathway. These were 1. Distribution and ecology, 2. Propagation and *ex situ* conservation, 3. Restoration and agroforestry and 4. *In situ* management and community engagement. Each working group discussed the following points:

- Review baseline information for each target species and fill in any missing information
- Causes and impacts of major issues to conservation
- Agreement on priority strategies to mitigate issues

Synsepalum aubrevillei

- Agreement on what existing conservation opportunities could be mobilized for targeted groups and on what kinds of further action or planning should be initiated; and
- Agreement on who will take the next steps towards progressing these recommendations.

A separate session was also held on which tools are needed to maintain momentum, reduce duplication of effort and build and sustain partnerships for the identified conservation actions from each working group.

A post-workshop survey was carried out and the main findings were as follows:

- In general, overall satisfaction with the workshop was high (average score 6.05 out of 7)
- Participants were generally positive about the approach to multi-species planning and the process by which this was done
- Participants found the time too short to evaluate the information available
- Participants were confident that important gaps in knowledge to effectively conserve the target species were identified
- Additional stakeholders could have been present to provide greater understanding of some of the issues raised
- Several participants expressed interest in follow-up meetings, ideally face-to-face and at least once every five years.

2. CONSERVATION STRATEGY

2.1 Our vision

By 2050, Ghana's threatened trees and their habitats are mapped, monitored, protected and restored through coordinated data-driven action with local communities and other key stakeholders.

2.2 Our goals

These eight goals outline the broad operational themes for conservation activity for Ghana's threatened trees over the next 30 years.

Goal 1:
Distribution of all the threatened trees are mapped

Goal 2:
Ecology, population and phenology information on threatened trees is known, monitored and freely available

Goal 3:
Propagation protocols of threatened trees are documented and available

Goal 4:
Genetically representative *ex situ* collections for threatened trees are established

Goal 5:
Restoration of landscapes using native and threatened trees

Goal 6:
Threatened trees with socio-economic value are used within agroforestry systems

Goal 7:
Threatened trees are protected and managed *in situ*

Goal 8:
Local communities are engaged and empowered to conserve their threatened trees

3. RECOVERY PATHWAY

3.1 Distribution and ecology (including phenology)

Ghana's forests are relatively well known compared to other countries in West Africa. Hall and Swaine undertook a national botanical survey of Ghana's forests in the 1970s (1971-1975), which led to the publication of their now widely used classification of the country's forest zones (see Figure 1). The Ghana Forest Inventory Project was then implemented between October 1985 and March 1989, and followed by the Forest Inventory and Management Project between 1989 and 1991. These projects completed a systematic forest inventory of 127 Forest Reserves, sampling them systematically in a 2 x 2 km grid with one ha plots at grid intersections. In total, 2,505 one ha plots were inventoried and all trees ≥ 30 cm dbh were identified over the entire plot. The Forest Inventory and Management project was able to inform sustainable yield policies for the country's timber species and provide evidence to support reducing over-exploitation of certain timber species.

The High Forest Biodiversity Conservation Project (HFBCP) set up in 1999, built upon the knowledge from earlier surveys enabling the identification and establishment of a system for the protection of 29 Globally Significant Biodiversity Areas (GSBAs) in all tropical forest biomes in Ghana. A major achievement of this work is that legal logging is no longer permitted to take place within GSBAs and they are managed by the Forestry Commission for the protection of their biodiversity rather than their timber productivity. An additional output of HFBCP was the development of a field guide for non-specialists of Ghana's forest trees, designed to enable local people to identify forest flora (Hawthorne and Gyakari 2006). Unfortunately, this guide is no longer in print and not freely available online.

Lecaniodiscus punctatus

OBJECTIVE 1: Build and enhance capacity for threatened tree species identification and building ecological knowledge

RATIONALE

There is a significant capacity gap in the country at all levels (including Forest Reserve staff, students and local communities) where very few individuals can accurately identify Ghana's threatened tree species. Practical training on identification is targeted towards those species with commercial value, and is not available for all tree species (including those that are threatened). Due to the lack of in-country taxonomic training, Ghanaians now have to travel abroad to other botanical institutions to learn these skills and even then, detailed field identification knowledge is limited.

Stock surveys are completed by the Forestry Commission to calculate how much a compartment within a Forest Reserve can be sustainably harvested from legal logging. Threatened species require a special permit to be harvested and thus have additional protection. However, with many threatened tree species which cannot be accurately identified they risk being inadvertently included within legal logging allowances. Training is needed for Forest Reserve staff to identify threatened species known or suspected to fall within their jurisdiction.

Misidentification of tree species has been highlighted as an obstacle to the effective conservation of certain tree species. For example, the Critically Endangered *Aubregrinia taiensis* is often misidentified with *Chrysophylum* species. Providing identification training to relevant stakeholders and the development of identification guides has helped to overcome this problem. Although identification materials have been developed for Ghanaian trees (e.g. Hawthorne and Gyakari 2006), they need to be updated and refined for different areas. Additionally, with mobile phones now widely used and new technology now available which could be utilised to support the identification of threatened species.

New intensive surveys, especially in hotspot regions, can be integrated with opportunities for intensive learning of identification skills.

Aubregrinia taiensis which is often misidentified with *Chrysophylum species (CSIR-FORIG)*

CONSERVATION ACTIONS 2023-2030	ACTION LEAD & COLLABORATORS
1.1 Identification materials are developed • 1.1.1 Collate existing information e.g. photos and herbarium specimen data • 1.1.2 Develop easy to use guide materials with photo identification tools	• **University of Oxford (LEAD)** • Universities • National Herbarium • CSOs • CSIR-FORIG • Forestry Commission
1.2 Identification training sessions are developed and held • 1.2.1 Develop content for tree identification course, ensuring that a broad range of species are included such as look-a-likes and more common tree species • 1.2.2 Hold identification courses which are adapted to specific audiences and contexts • 1.2.3 Involve trainee botanists in ongoing (longer term) botanic surveys as required field identification skills take years to develop and can become redundant due to staff promotion to desk duties or retirement	• **CSIR-FORIG (LEAD)** • **Forestry Commission (LEAD)** • **National Herbarium (LEAD)** • CSOs • Communities • Universities
1.3 Optimise the use of identification apps • 1.3.1 Run a feasibility study on optimising existing identification apps for Ghana, such as Plant@net and iNaturalist, and then ensure all available data is cleaned and uploaded • 1.3.2 Hold a capacity building workshop to train relevant stakeholders to optimise the use of identification apps specific to Ghana	• **CSIR-FORIG/INSTI (LEAD)** • Forestry Commission • CSO • Universities

INDICATORS OF SUCCESS:

1.1 Easy to use identification materials developed for all of the 38 eight target species

1.2.1 Hold at least 5 identification courses annually
1.2.2 At least 20 trainee botanist are mentored in threatened tree identification

1.3. A suitable identification app is selected, populated with available data and used by relevant stakeholders

Chrysophyllum azaguieanum

Synsepalum ntimii

OBJECTIVE 2: Increase knowledge and understanding of threatened tree species, and all data is accessible to inform conservation action

2.1 Tree surveys completed in selected hotspots areas

Although several national botanical surveys of the country have taken place in the last 50 years, these have halted in recent years. The existing knowledge of location and ecology is very limited: For instance the number of 1 km, even 10 km squares, within forests that have ever been sampled for the whole flora is a tiny fraction of the total forest area. However, the threats to Ghana's forest have continued. It is common for records of threatened trees to be from more than 50 years ago. The Endangered endemic tree *Millettia irvinei*, for example, has not been collected since 1967. The knowledge of threatened tree species distribution at a finer scale is therefore not consistent and vital information needed for their effective conservation is not known (e.g. where mother trees are found within a given Forest Reserve). Tree surveys are needed to check known species distributions, confirm additional suspected occurrences and facilitate future conservation actions. Tree surveys would most sensibly be part of all-species surveys, not least because tree communities will only thrive if their ecosystem is protected and understood. Additionally, most members of populations of rare trees are generally immature and integrated with smaller stature species in the lower storeys.

Long term botanic surveys provide the most efficient platform for training the new generation of field botanists required for many of the other objectives in this conservation action plan to be successful.

CONSERVATION ACTIONS 2023-2030

- 2.1.1 New botanical survey teams need to be established and operate across the forest zone almost continuously, a platform for collaboration and learning between governmental, NGO and local community botanists together.
- 2.1.2 Priority areas are identified and local stakeholders are trained to partake in surveys where relevant
- 2.1.3 Within priority areas, individual trees should be georeferenced and mature individuals tagged

ACTION LEAD & COLLABORATORS

- **CSIR-FORIG (LEAD)**
- **Forestry Commission (LEAD)**
- **National Herbarium (LEAD)**
- CSOs
- Communities
- Universities

INDICATORS OF SUCCESS:

2.1 Botanical survey teams set up and at least 15 priority areas are surveyed, with individual trees georeferenced and mature individuals tagged

2.2 Phenology of threatened trees is monitored and used to inform practitioners

If the optimal time for seed collection is not known it will not be possible to collect enough seed for banking or to produce sufficient planting material for effective restoration. For instance, natural regeneration of the endangered African teak (*Pericopsis elata*) in the wild is nearly impossible (Nils et *al.* 2012), this is because, the species has recalcitrant seeds and requires pre-sowing treatment to break its dormancy. Effective propagation of *P. elata* therefore requires seed collection at optimal times. INEC Ghana in collaboration with Ghana's National Tree Seed Center (NTSC) with funding from Fondation Franklinia have successfully studied the phenology of *P. elata* (Amponsah et *al*., in print).

Climate change is also posing an additional challenge as it is significantly affecting the phenological patterns of many species. An active monitoring system is therefore needed to track phenology and to understand the impact of climate change. This is important to make sure limited resources are not being wasted by collecting seed at the wrong time. Currently, Ghana's NTSC monitors 23 species. A large-scale increase in phenology monitoring is needed in Ghana.

Another important area of research which could be utilised and would in the long-term likely be more cost effective is drone and/or satellite based phenological monitoring. Mapping of flowering phenology has been achieved using data acquired from drones (e.g. Neumann et *al*. 2020) and/or satellites. Research into understanding these patterns for Ghana's species is an exciting area of possible future research. Such an initiative would also greatly facilitate the development of a national database localising and monitoring of individual large individual trees of key species.

CONSERVATION ACTIONS 2023-2030

- 2.2.1 Locate, tag and record the phenological state of threatened trees through the establishment of a network of monitors utilising citizen science
- 2.2.2 Develop technology to recognize individual species and their phenological states at crown level from drone/satellite imagery
- 2.2.3 Use knowledge of phenology to create a useful and easy to use guides for practitioners

ACTION LEAD & COLLABORATORS

- **CSIR-FORIG (LEAD)**
- Oxford University
- Cambridge University
- Exeter University
- A Rocha Ghana
- INEC
- KNUST
- GWS
- Communities
- Forestry Commission

INDICATORS OF SUCCESS:

2.2.1 Phenology monitored and recorded for all 38 target species

2.2.2 Easy to use phenology charts produced and shared for all 38 target species

2.3 Understanding of plant-pollinator interactions and the role of wildlife in dispersal increased

The application of large scale spraying of pesticides, degradation of habitats, hunting and poaching is likely to be negatively impacting plant-pollinator interactions and dispersal agents. Knowledge of plant-pollination interactions and dispersal agents is key for effective restoration and enhancing natural regeneration. In particular, pinpointing the critical agents which pollinate or disperse the target species is needed. If pollinators and/or dispersers do not occur within the restoration area, there will be limited dispersal and regeneration and less resilient restored ecosystems will be a result. Therefore it is necessary to research these vital relationships in areas where they are less likely to be disrupted. This research can then be used to inform appropriate restoration actions to restore these relationships as much as possible.

CONSERVATION ACTIONS 2023-2030

- 2.3.1 Research projects completed at multiple scales to increase understanding of pollinator and dispersal agents (including for any newly discovered tree species)
- 2.3.2 Research results published to inform conservation actions

ACTION LEAD & COLLABORATORS

- **CSIR-FORIG (LEAD)**
- Oxford University
- Cambridge University
- Exeter University
- A Rocha Ghana
- INEC
- KNUST
- GWS
- Communities
- Forestry Commission

INDICATORS OF SUCCESS:

2.3 At least 10 research projects completed and results published on pollinator and dispersal agents of the 38 target species

Tapura ivorensis

Placodiscus oblongifolius

2.4 Distribution and ecological data is made accessible on a biodiversity information portal

Biological data held within Ghana is disjointed, with different institutions responsible for different areas of research. This means research is not always easily available to conservation practitioners for the implementation of evidence based conservation action. A platform with longevity is needed to ensure that those who need it can easily access accurate and cleaned information. Additionally, information needs to be routinely uploaded by those working on threatened species to ensure that it is as up to date as possible (e.g. climate change is causing rapid changes to species' phenology).

CONSERVATION ACTIONS 2023-2030

- 2.4.1 Evaluate and select a suitable platform for use within Ghana (ensuring long-term sustainability of upkeep is taken into account)
- 2.4.2 All available data (e.g. taxonomy, localities, species photos, phenology and propagation protocols) is collated, cleaned and uploaded
- 2.4.3. Train relevant stakeholders to collect and upload their data

ACTION LEAD & COLLABORATORS

- **A Rocha Ghana (LEAD)**
- CSIR-INSTI
- CSIR-FORIG National Tree Seed Centre
- Oxford University
- BGCI
- Forestry Commission-RMSC
- CSOs

INDICATORS OF SUCCESS:

2.4 A platform for data sharing identified, populated and accessed by atleast 5,000 users

Gilbertiodendron splendidum

3.2 Propagation and *ex situ* collections

Ex situ conservation is the conservation and management of samples of living organisms outside of their natural habitat. It can be in a number of different forms such as whole plants, seed, pollen, vegetative propagules, tissue or cell cultures. Which ex *situ* approach is the most appropriate will be dependent on the resources and capacity available, the characteristics of the target species and the context of the conservation problem needed to be addressed (Oldfield and Newton 2012). *Ex situ* conservation is particularly important for species with a small number of individuals or known from a single / small number of sites.

Growing saplings of threatened trees at NTSC (CSIR-FORIG)

Cola umbratilis

Ex situ planting of *Aubregrinia taiensis* (CSIR-FORIG)

Ghana has a National Tree Seed Centre (NTSC), which operates under CSIR-FORIG whose mandate is to ensure the sustainable supply of high quality germplasm and planting materials for reforestation projects, plantation development and research purposes. In this capacity, the NTSC provides a number of important services including production and supply of seeds and seedlings, tree seed research (e.g. storage physiology and germination improvement), documentation of seed sources, tree seed testing and training. Additionally, CSIR-Plant Genetic Resources Research Institute (PGRRI) holds the national gene bank and is mandated to collect and conserve the plant genetic resources of Ghana. It has a field gene bank which conserves recalcitrant germplasm under field conditions, including a tree crop conservation area for both indigenous and exotic tree crops. For threatened tree species which have agroforestry potential, it is important to ensure they are represented in the gene bank's collection.

OBJECTIVE 3: Expand and improve facilities for *ex situ* conservation of threatened tree species

RATIONALE

In addition to the facilities held within CSIR-FORIG and CSIR-PGRRI, Ghana also has five botanic gardens which have varying levels of capacity to conserve threatened tree species. For example, Legon Botanical Gardens, is located in the heart of Accra at the University of Ghana. Until recently the botanical garden has predominately been managed for recreational purposes rather than for conservation of plant species, although the Department of Botany plans to place more emphasis on the conservation of biodiversity going forwards. The African Network of Botanic Gardens has recently been revived and could be used as a source of expertise to build capacity of Ghana's botanic gardens in the future.

Seven of the target species are currently held in ex *situ* collections, however, the remaining 80% are not. It is of utmost importance that genetically diverse collections are made as a matter of urgency. Without the security of ex *situ* collections, if a wild population disappears, there is no backup available to return the species to the wild and the taxa will become extinct.

CONSERVATION ACTIONS 2023-2030

- 3.1 Needs assessment completed identifying what facilities and equipment are required
- 3.2 Establish MOUs with partners to share facilities
- 3.3 Raise funds to purchase equipment not available at any of the partner institutions

ACTION LEAD & COLLABORATORS

- **CSIR-FORIG(LEAD)**
- **CSIR-PGRRI (LEAD)**
- Botanic gardens
- Universities
- Forestry Commission

INDICATORS OF SUCCESS:

3.1 Fully equip at least 5 partners with the facilities to conserve threatened tree species

3.2 At least 10 MOUs are established to facilitate the sharing of resources

Chrysophyllum azaguieanum

Croton aubrevillei

OBJECTIVE 4: Increase the diversity and quantity of seed available for threatened species

RATIONALE

There are currently 17 tree species available for purchase at the NTSC, 88% of which are native but only one species is from the workshop priority list. The majority of the species are of commercial interest to fulfil customer demand. Although it is possible to put in a request for a species of interest, it may take time for a request to be fulfilled, as the species may need to be located, monitored and collected from the field.

As a result of the limited diversity and quantity of seed available for threatened species, there is a risk that a limited number of species will be used for restoration projects, reducing the benefits to biodiversity. It will be necessary to work with partners to increase the understanding of the benefits of planting a diversity of species which will in turn help to drive demand for threatened species.

CONSERVATION ACTIONS 2023-2030

- 4.1 Develop a guide for effective seed collection
- 4.2 Build capacity for citizen science seed collection (community members and other local stakeholders) through training in seed spotting, seed collection and awareness creation
- 4.3 Use a network of volunteer tree spotters to develop seed collection calendars

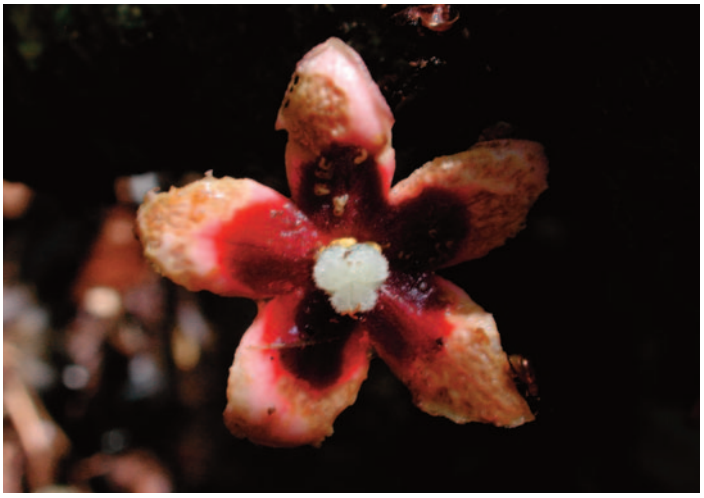
ACTION LEAD & COLLABORATORS

- **CSIR-FORIG (LEAD)**
- Forestry Commission
- National Herbarium
- CSOs
- Communities

INDICATORS OF SUCCESS:

4.1 Train at least 50 local community members annually to collect seed from the 38 target species

4.2 38 seed collection calenders developed and published



Cola umbratilis

Hymenostegia gracilipes

OBJECTIVE 5: Expand knowledge of seed handling, storage behaviour, propagation and planting out

RATIONALE

Different trees produce seeds that require varying conditions for germination and optimum seedling growth. If a propagation protocol is not available, it is necessary to design experiments to determine optimum growing medium, temperature, moisture and light requirements. Species which produce recalcitrant seeds will lose their viability quickly and are not suitable for long-term storage. As a result they need to be sown as soon as they are collected and cleaned. Other species have orthodox seeds which can be stored over a much longer period and it is possible to calculate sowing dates based on the optimal conditions (e.g. the rainy season) for planting out. Only four of the target species are recorded as having a propagation protocol. These propagation protocols need to be published externally. Developing propagation protocols and then ensuring they are freely available is an important step to facilitating the number of native species which can be grown in nurseries.

CONSERVATION ACTIONS 2023-2030

- 5.1.1 Develop protocols for processing and storage
- 5.2.1 Develop protocols for seed propagation techniques
- 5.2.2 Develop macro/micro vegetative propagation techniques
- 5.2.3 Develop management practices for monoculture plantation, mixed plantation, agroforestry, enrichment planting, *ex situ* collections and urban green spaces

ACTION LEAD & COLLABORATORS

- **CSIR-FORIG (LEAD)**
- **CSIR-PGRRI (LEAD)**
- Botanic gardens
- Universities
- Forestry Commission

INDICATORS OF SUCCESS:

5.1 Develop and share processing, storage and seed propagation protocols for the 38 target species

5.2 Develop and share planting strategies for the target 38 species with other native tree species

Pavetta sonjae

Phyllanthus profusus

3.3 Restoration and agroforestry

Ghana has pledged to restore an ambitious 2 million hectares of its fragmented and degraded forestlands by 2030 in support of the AFR100 and the Bonn Challenge. In 2004, a National Working Group on Forest Landscape developed a National Plan of Action on Forest Landscape Restoration. Ten guiding principles for Forest Restoration in Ghana were subsequently published (Blay 2006).

In a global analysis, Ghana was identified as having 10.5 million hectares as being suitable for restoration. It was calculated that each hectare of restored forest would create between US$2,250 and US$13,000 in direct economic benefits for local and national economies in a 20-year period (Maginnis and Verdone 2014). Historically, restoration efforts in Ghana have focused on the development of plantations which use a low diversity of species and often predominately include exotic species such as *Tectona grandis* and *Cedrela odorata*. Although the demand for native species as a source of timber has not decreased they have not been prioritised over perceived economically superior exotic species (Luukkanen 2006).

In Ghana, access to land can be difficult with problems with land tenure and multiple registrations (Foli 2018). Additionally, fragmented land use systems can make restoring at the landscape scale challenging as land parcels can be very small and disconnected.

OBJECTIVE 6: Design a best practice planting strategy which ensures slow-growing native species can thrive

RATIONALE

A number of different restoration approaches can be used to restore destroyed or degraded forests, with the most appropriate being dependent on seed sources and dispersers being present at or near to the restoration site. For example, if large tree species which disperse seeds no longer persist within a degraded forest, only through planting large-seeded climax forest tree species will it be possible to restore secondary forest into climax forest.

The framework species approach can be used when remnants of the target forest type persist within a few kilometres of the restoration site to be able to act as a source of seed. Rare and threatened species are often unlikely to be recruited into restoration sites naturally, as they may have lost their dispersers and/or their seed source is low. Therefore, including such species into the planting mix can help ensure their conservation. The selection of species to include in a framework restoration planting mix requires nursery and field experiments to confirm whether they are suitable and the mix can be improved after each cycle.

If the restoration site is far from a remnant climax forest, it will be likely that seed sources or seed dispersers will not be present in the landscape. In this situation, it will be necessary to plant many more of the target climax forest species to capture some of the original species richness. However, this approach is much more time consuming and costly. The restoration approach used will therefore also depend on the resources and capacity available in the restoration project.

A good example of native restoration is one currently undertaken by INEC Ghana in collaboration with FORIG and support from Fondation Franklinia which is using only native trees predominantly *Pericopsis elata*, and other native threatened species including, *Cola reticulata*, *Cola boxiana*, *Khaya ivorensis*, *Khaya anthotheca*, *Aubregrinia taiensis*, *Terminalia superba*, *Nauclea diderrichii*, *Mansonia altissima*, *Talbotiella gentii* and many others at Afram Headwaters Forest Reserve and Asenayo Forest Reserve.

CONSERVATION ACTIONS 2023-2030	ACTION LEAD & COLLABORATORS
• 6.1 Research the ecological guilds of target species in a mix • 6.2 Research into seed sources and trials in to develop planting strategies in different land-use types (e.g. on and off Forest Reserves) • 6.3 Establish nurseries to grow seedlings in the different forest zones • 6.4 Identify and map suitable sites to restore • 6.5 Engage with local communities • 6.6 Implement *in situ* and *ex situ* restoration programmes and integrate into adjoining land uses • 6.7 Monitor and evaluate restoration activities	• **CSIR-FORIG (LEAD)** • Forestry Commission • CSIR-PGRRI • Universities • NGOs • CSOs • Communities • Traditional Authorities

INDICATORS OF SUCCESS:

6.1 Species mix and planting strategies developed for at least 10 priority areas

6.2 At least 50 community nurseries established next to at least 10 priority areas

6.3 At least 25% of degraded land restored with native species in at least 10 priority areas

Lecaniodiscus punctatus

OBJECTIVE 7: Decrease the incidence of wild fire in the savannah and dry, transitional and semi-deciduous forest zones

RATIONALE

The savannah and dry, transitional and semi-deciduous forest zones of Ghana are highly susceptible to frequent forest fires. For example, much of the habitat of the Critically Endangered *Talbotiella gentii* has been lost to fire since the 1970s (Dompreh et *al.* 2011). The boundary between northern savannah woodland and southern high forest used to be more distinct, however wildfires have converted northern parts of high forest into semi-forest and savannah.

The persistence of forest fires presents a huge challenge to restoring these areas. They increase the mortality of tree species which are not fire tolerant and also suppress natural regeneration. Most fires are caused by human activities and are linked to livelihoods (e.g. farming, hunting and charcoal production). Burning of the land is tied to traditional farming systems. Effective fire management therefore needs to take a number of approaches including prevention, pre-suppression and suppression (Agyemang et *al.* 2015).

CONSERVATION ACTIONS 2023-2030

Talbotiella gentii, much of it's habitat has been lost to fire since the 1970s

- 7.1 Establish an early warning fire systems (e.g. fire index applications, radio phones and drones etc.)
- 7.2 Establish fire belts (e.g. green belts by incorporating non-invasive exotic species while exploring the use of suitable native species)
- 7.3 Raising awareness of the importance of fire conscience decisions
- 7.4 Use fire as a management tool for vegetation control in savannah (e.g. early burning to avoid intense fires)

ACTION LEAD & COLLABORATORS

- **Ghana National Fire Service (LEAD)**
- **University of Energy and Natural Resources (LEAD)**
- **Forestry Commission (LEAD)**
- Meteorological Service
- FORM Ghana
- Fire volunteer squads
- Ministry of Food and Agriculture
- CSIR-FORIG
- Local communities
- CBOs
- NGOs

INDICATORS OF SUCCESS:

7.1 At least 10 community members next to dry forest fragments trained in fire prevention and control techniques and provided with equipment

7.2 Fire belts established next to all dry forest fragments

7.3 Dry forest loss by fire reduced by 50% (compared to baseline levels)

OBJECTIVE 8: To enhance resilience of threatened species to climate change within restoration programmes

RATIONALE

Climate change is changing the seasonal timings and extremes of global temperature and precipitation patterns. Many restoration practitioners follow the "local is best" rule for sourcing seed, based on the assumption that ecotypes are genetically adapted to their local environment. However, with climate change already causing rising temperatures and rainfall to be erratic in Ghana, local adaptations risk being outpaced by climate change (GoG 2012). Therefore, trying to match adaptations of source populations with the current and/or future restoration site is becoming increasingly important (Vitt et *al*. 2022).

Another important action to increase the adaptability of a restored site to a changing climate is to ensure the diversity in the number of species being planted. The more species which are present at a restoration site, the more likely that a proportion of them will be able to tolerate the future climate change (Elliott et *al*. 2013).

CONSERVATION ACTIONS 2023-2030

- 8.1 Improve planting material through climate smart sourcing
- 8.2 Ensure a diverse selection of suitable species (e.g. of an appropriate guild) are planted at a restoration site
- 8.3 Modelling the impact of climate change on the target species to support decision making
- 8.4 Enhance integrated water and nutrient management practice (e.g. use of hydrogel, treegator etc.)

ACTION LEAD & COLLABORATORS

- **CSIR-FORIG (LEAD)**
- Forestry Commission
- CSIR-PGRRI
- Universities
- NGOs
- CSOs

INDICATORS OF SUCCESS (compared to baseline levels):

Looking for mature individuals of *Aubregrinia taiensis* (CSIR-FORIG)

8.1 Increase the amount of climate smart material available for restoration projects by 50%

8.2 Increase diversity of species being planted in restoration projects by 50%

8.3 Model the impact of climate change for the 38 target species

8.4 Increase uptake of water and nutrient management by restoration practitioners by 50%

OBJECTIVE 9: To decrease the incidence of grazing

RATIONALE

In Northern Ghana livestock is a major source of income, with favourable climatic conditions and a large area of grazing land providing natural forage (DIA 2014). However, livestock can pose a threat to successful restoration projects as newly planted saplings can suffer from high mortality as a result of cattle trampling and grazing. A high density of cattle can also suppress natural regeneration.

Tensions between farmers and herders in the region mean that it is vital that an effective stakeholder dialogue is established to ensure that restoration activities do not heighten existing conflicts. Carefully considered approaches will therefore be needed.

CONSERVATION ACTIONS 2023-2030

- 9.1 Liaise with traditional leaders and landowners to define grazing areas. e.g. grazing corridors
- 9.2 Provide alternative feed and water sources away from target sites
- 9.3 Ranching and/or intensive management of livestock
- 9.4 Engage livestock owners and herdsmen to adopt entrepreneurship skills
- 9.5 Create a stakeholder dialogue platform to engage livestock owners and herdsmen

ACTION LEAD & COLLABORATORS

- **Forestry Commission (LEAD)**
- **Ministry of Food and Agriculture (LEAD)**
- **Savanna Agricultural Research Institute (LEAD)**
- **Animal Research Institute (LEAD)**
- Religious leaders
- Livestock owners and herdsmen

INDICATORS OF SUCCESS (compared to baseline levels):

9.1 Support identification of grazing areas next to at least 10 priority areas

9.2 Reduce incidence of grazing by 50% in at least 10 priority areas

Sericanthe toupetou

Schumanniophyton problematicum

Placodiscus oblongifolius

OBJECTIVE 10: To reduce the negative impact of pests and diseases

RATIONALE

Pests can cause a serious problem in restoration projects. There is a negative association amongst some Ghanaians that native species are more susceptible to pests and diseases compared to exotic species. In many cases, this is due to a lack of research and guidance available for their management. For example, African Mahoganies such as *Khaya senegalensis*, are vulnerable to attack by the pest *Hypsipyla robusta*. However through research, measures have been developed to reduce their impact and a manual has been published to guide planting efforts (Opuni-Frimpong et *al*. 2016). It is necessary to monitor each species' susceptibility to pests and diseases and develop appropriate management systems.

Khaya senegalensis (CSIR-FORIG)

CONSERVATION ACTIONS 2023-2030

- 10.1 Identify specific pathogens and pest negatively impacting native species
- 10.2 Research causative mechanisms
- 10.3 Develop appropriate management

ACTION LEAD & COLLABORATORS

- **CSIR-FORIG (LEAD)**
- **Forestry Commission (LEAD)**
- **Ministry of Food and Agriculture (LEAD)**
- **Savanna Agricultural Research Institute (LEAD)**
- **Animal Research Institute (LEAD)**
- Universities
- Traditional and religious leaders
- Fringe communities

INDICATORS OF SUCCESS (compared to baseline levels):

10.1 At least 10 research projects completed and results published on pathogens and pests impacting the 38 target species

10.2 Guidance materials provided to restoration practitioner on how to manage native species and demand increased by 50%

3.4 *In situ* management and community engagement

To ensure the long-term survival of a species it is necessary to prioritise the conservation of viable populations in their native habitat. *In situ* conservation most commonly takes the form of protection of an area. The majority of Ghana's remaining forest is now found in the 280 Forest Reserves which make up approximately 11% of the total land area of the country. The network of protected areas captures the diversity of different ecosystems in the country. Additionally, 29 areas of forest have been designated as Globally Significant Biodiversity Areas (GSBAs) within the forest reserve network, covering 117,322 ha. Protected areas are unfortunately not completely devoid of threats and are being degraded by poaching, bush fires and conversion of land to farming or grazing. Protected area management is also hindered by lack of staffing, infrastructure and resources (UICN/PACO 2010).

Sapling of *Aubregrinia taiensis* (CSIR-FORIG)

Placodiscus bancoensis

In 2022, it was estimated that 44.7% of Ghana's labour force was engaged in agricultural activities (Oxford Business Group 2022). Within the forest zone, tree crops are particularly favoured with cocoa, oil palm, coffee and rubber all being planted, and with increasing interest in new, indigenous tree crops such as Allanblackia. Ghana is the second most globally important producer and exporter of cocoa after Cote D'Ivoire (Ferreira et *al*. 2022). More than 10% of Ghanaians live in the Forest Reserve fringes (Acheampong et *al*. 2019). The Government of Ghana has adopted an innovative approach to sustainable resource management. Acknowledging that a major underlying factor of deforestation and forest degradation is lack of ownership and say in the management of the country's forest resources. The Community Resource Management Area (CREMA) concept, devolves management powers of natural resources to groups of communities. During the process of CREMA creation, the group of communities will agree on a management regime of a common area, which forms a constitution guiding the resource governance and management activities. The majority of existing CREMAs link a number of protected areas and Forest Reserves, creating a corridor to benefit wildlife.

OBJECTIVE 11: Threatened tree species are protected *in situ*

RATIONALE

Threatened species often have their own individual challenges. This may be as a result of the species' ecology (e.g. poor natural regeneration and dispersal) and/or specific human threats (e.g. targeted for timber). It is therefore necessary to have an understanding of a species biology and the specific threats. For example, the Critically Endangered tree *Aubregrinia taiensis* are targeted for timber. As a part of conservation action to protect the species, individuals which have been identified are labelled and a dialogue is started with local communities to highlight the importance of their conservation.

CONSERVATION ACTIONS 2023-2030

- 11.1 When threatened tree species is found it should be protected by the following actions:
  - Signage highlighting it's a threatened species
  - Seed collection for ex *situ* collections and future *in situ* planting
  - Tagged so it can be tracked for regular monitoring
  - Education and awareness about the importance of the species should be carried out to engage support
- 11.2 Identification of specific threats to threatened species and actions taken to minimise them
- 11.3 Develop a national database, helped by remote sensing and ground surveys, of locations of large individual trees especially of rarer, threatened trees

ACTION LEAD & COLLABORATORS

- **Forestry Commission (LEAD)**
- CSIR-FORIG
- CSOs
- National Herbarium
- Universities
- Local communities

INDICATORS OF SUCCESS:

11.1 Ensure the 38 target species are not included in production forest quotas

11.2 Threats identified for at least 10 priority areas and actions to mitigate them developed and implemented

Drypetes singroboensis

Placodiscus attenuatus

Monocyclanthus vignei

Hunteria ghanensis

OBJECTIVE 12: Adopt agricultural best practices and post-forest management

RATIONALE

Within Ghana, population growth has increased the demand for food, including high valued products such as meat, dairy and vegetables. To produce meat and dairy products, a large amount of grain is needed to feed cattle. There is an increased demand for fertile forest land for agricultural purposes and this has resulted in continued encroachment on forest lands. There is a perception that protected areas are a land bank for farmers to increase their agricultural productivity. In the Ashanti region between 1986 and 2015, expansion of annual crop farms and tree crops caused 78% of the forest loss (Acheampong *et al*. 2019).

The preparation of forest land for farming results in the clearing of tree species which may include threatened species and prevents regeneration. This problem is exacerbated by unsustainable farming practices (e.g. slash and burn). Additionally, farmlands are losing their fertility leading to lower yields. It has been found that farms in Reserves have not been utilising modern technology to improve yield and thus output. Farmers will need support to improve yields through training and financial aid, which will help to reduce agricultural expansion (Acheampong *et al*. 2019).

Although traditionally cocoa trees were planted in partially cleared forest with remaining forest trees providing shade, in recent years there has been a shift towards greater forest clearance with little or no shade maintained (Asare *et al*. 2014). Sensitisation with farmers and supporting the certification process will help to lead to the adoption of sustainable biodiversity friendly practices.

CONSERVATION ACTIONS 2023-2030	ACTION LEAD & COLLABORATORS
• 12.1 Capacity building of farmers on conservation agriculture, agroforestry practices for food crops and cash crops like cocoa, on post-harvest management to reduce yield loss improve quality	• **Civil Society Organisation/ Non-Governmental organisation (LEAD)** • Ministry of Food and Agriculture; Council for Scientific and Industrial Research (CSIR) • Academic Institutions • Farmer based Organisations • Cocobod
• 12.2 Dissemination and capitalisation of best practices at all scales through guideline development, cross learning, workshops, success stories, among others	• **Civil Society Organisation/ Non-Governmental organisation (LEAD)** • Resource Management Support Centre (RMSC)
• 12.3 Sensitisation campaigns on the importance of native species in agroforestry, diversification, environmental stability and yield improvement	• **Civil Society Organisation/ Non-Governmental organisation (LEAD)** • CREMA • Private sector • Farmer based organisation • Media (radio, paper, web)
• 12.4 Support certification process	• **Rainforest Alliance (LEAD)** • **Organic (LEAD)** • Private sector • Civil Society Organisation/ Non-Governmental organisation • Farmer-based organisations/cooperatives • Certification bodies

INDICATORS OF SUCCESS (compared to baseline levels):

12.1 25% increase in the number of people adopting best tree conservation practices at 10 priority areas

12.2 Maintenance of forest cover at 10 priority areas

12.3 25% increase of farmers who have certified their agricultural practices at 10 priority areas

OBJECTIVE 13: Improved law enforcement against illegal logging

RATIONALE

Timber product harvesting (e.g. charcoal production, logging and fuel wood) is resulting in the loss of native species. There are several causes of timber harvesting:

- **There is a large international demand for timber products.** Foreign direct investment and foreign exchange from the exportation of timber products is an important source of income.
- **Cheap source of energy**. Many Ghanaians depend on firewood and charcoal for household energy. Additionally, there is a high cost of alternative sources of household energy such as LPG.
- **Increase in demand for building materials**. There is an increase in construction of houses and most people prefer to use wood for roofing, furniture and fittings.
- **Poor law enforcement and a low understanding of regulations**. There is low capacity and inadequate financial, material, and human resources to effectively enforce regulations.

Strict law enforcement of environment laws is needed to regulate illegal logging.

CONSERVATION ACTIONS 2023-2030	ACTION LEAD & COLLABORATORS
• 13.1 Formation of community-based conservation task force	• **CSOs (LEAD)** • CREMAs • Traditional leaders/chiefs • WD
• 13.2 Capacity building of the patrollers on the task force on: – tree recognition and identification (especially endangered species) – use of SMART/GPS tools – conflict management – basic knowledge of lumber laws/regulation (recognition of legit lumber permit)	• **FSD (LEAD)** • **WD (LEAD)** • CSOs • Task forces • District Security (DISEC)
• 13.3 Support the conservation task forces with equipment	• **CSOs (LEAD)** • FC • DA
• 13.4 Implement a scheme for incentives to the patrollers on the task force (e.g. insurance, allowance)	• **CSOs (LEAD)** • CREMAs
• 13.5 Disseminate information on the outcomes of the law enforcement to communities and stakeholders	• **Task force (LEAD)**

CONSERVATION ACTIONS 2023-2030 (cont'd)	ACTION LEAD & COLLABORATORS (cont'd)
• 13.6 Collaboration with Forestry Commission and other security agencies for enforcement actions. Define a process (e.g. enforcement plan, MoUs)	• **CSOs (LEAD)** • FC • DA • DISEC • Police
• 13.7 Identify an area where law enforcement is working well to use as a pilot and organise peer-to-peer trainings and exchange visits	• **CSOs (LEAD)** • Task force • FC
• 13.8 Advocate for a better policy scheme to provide legal back-up to the CREMAs and strengthen law enforcement in conservation in general (not only within PA) to implement all international treaties signed by Ghana	• **CSOs (LEAD)**
• 13.9 Ensure the prosecution scheme is fulfilled for all offenders reported to the FC/Police	• **Task force (LEAD)** • **FSD (LEAD)** • WD • CSOs

INDICATORS OF SUCCESS (compared to baseline levels):

13.1 50% more equipment is confiscated in 10 priority areas

13.2 50% more patrols in 10 priority areas

13.3 25% increase in 10 priority areas patrolled

13.4 25% increase in the number of arrests for illegal activities in 10 priority areas

13.5 50% increase in the number of cases reported in 10 priority areas

13.6 50% increase in the number of prosecutions in 10 priority areas

Afrostyrax lepidophyllus

Trichosypha cavalliensis

OBJECTIVE 14: Enhance sustainable alternative livelihoods

RATIONALE

Alternative livelihoods are used to describe interventions which are implemented to reduce the impact of environmentally damaging activities. It is important that the activities being promoted are developed using a bottom-up approach to ensure that they will have suitable buy-in from communities. A review of alternative livelihoods being made available to communities engaged in mining in Ghana, found that many projects did not adequately consult with recipient communities and the activities being promoted were unpopular with the target groups (Hilson and Banchirigah 2009). Key factors to consider within communities when establishing successful sustainable livelihoods are the leadership skills, group dynamics, transparency, gender considerations and whether it is possible to integrate them into the regional development agenda (e.g. linking up with the District Assembly) (Nutakor *et al*. 2014).

CONSERVATION ACTIONS 2023-2030	ACTION LEAD & COLLABORATORS
• 4.1 Build capacity on technical aspects (production, post-harvest management, processing and quality), on business skills (financial, marketing and recording) on livelihood alternatives (e.g. nursery establishment, bee-keeping...)	• **CSO's (LEAD)** • DA • CSIR-FORIG • MoFA
• 14.2 Provide start-up resources (equipment, seed funding...)	• **CSO's (LEAD)** • DA
• 14.3 Establish long-term partnerships with relevant stakeholders	• **CSO's (LEAD)** • MoFA • Private companies • DA
• 14.4 Ensure linkages with a ready market	• **CSO's (LEAD)** • Private sector
• 14.5 Develop a benefit-sharing mechanism	• **CSO's (LEAD)** • FC • DA • Traditional leaders

INDICATORS OF SUCCESS (compared to baseline levels):

14.1 Number of people participating in sustainable alternative livelihood approaches increased by 50%

14.2 25 people trained in sustainable alternative livelihood approaches annually in 10 priority areas

Synsepalum aubrevillei

Suregada ivorensis

OBJECTIVE 15: : Key stakeholders have increased awareness and a sense of responsibility for Ghana's threatened trees

RATIONALE

Raising awareness of the importance of native trees will require the delivery of dynamic and complementary activities. A key element will be increasing the appreciation of indigenous knowledge, which is at risk in some areas of "dying out". A neglect of traditional cultural practices has been identified as one of the reasons behind increasing rates of deforestation and degradation of the environment in some areas of Ghana (Asante et *al*. 2017). There are traditional Ghanaian folk songs, which include native plants and animals, which could be played in schools to help children learn about Ghana's native flora and fauna. It is also important to facilitate links with elders who are the repositories of traditional ecological knowledge. Adom et al. (2022) suggests setting aside a specific day and time each month for young people to interact with the elders in their community on traditional ecological knowledge.

CONSERVATION ACTIONS 2023-2030	ACTION LEAD & COLLABORATORS
• 15.1 Respect community entry protocol by starting the discussion with the leaders/chiefs to get the buy-in	• **CSOs (LEAD)** • Traditional authorities • Communities
• 15.2 Create interfaces for traditional/indigenous knowledge sharing	• **CSOs (LEAD)** • Herbalists • Traditional authorities • DA
• 15.3 Develop community engagement with activities such as community durbars, information centres, movie screening/drama and debate, competitions, tree discovery events	• **CSOs (LEAD)** • FC • DA • Traditional authorities • CREMAs

CONSERVATION ACTIONS 2023-2030 (cont'd)	ACTION LEAD & COLLABORATORS (cont'd)
• 15.4 Engage the media at the local, regional and national levels (e.g. urban radio programs, social media, TV)	• **CSOs (LEAD)** • Media houses • FC
• 15.5 Develop IEC (Information, Education and Communication) materials (e.g. billboards, posters)	• **CSOs (LEAD)** • FC • DA
• 15.6 Educate the youth: school conservation campaigns (e.g. clubs, competitions and debates) and influence the curriculum in junior high school and senior high school to cover biodiversity-linked subjects.	• **CSOs (LEAD)** • FC • DA • Traditional authorities
• 15.7 Develop conservation evangelism by collaborating with influential churches and mosques	• **CSOs (LEAD)** • FC • Churches • Religious group leaders • Mosques

INDICATORS OF SUCCESS (compared to baseline levels):

15.1 At least one school club formed next to 10 priority areas

15.2 Twenty events held annually for communities living in/adjacent to 10 priority areas

15.3 50% increase in the number of people reached next to 10 priority areas

15.4 25% people with a changed mindset next to 10 priority areas

Pavetta sonjae

Aubregrinia taiensis

4. NEXT STEPS

4.1 Coordinating and tracking action

A session was held focusing on determining which steps are needed in order to ensure the effective implementation of the identified actions. To maintain momentum, reduce duplication of effort, build and sustain partnerships and collaborations the following tools were highlighted as being needed:

- Active coordination and centralised reporting system
- Platform to access information on Ghana's trees and provide networking opportunities
- CREMA framework used to engage communities in tree conservation
- Regular national workshops to present and share knowledge, outputs and outcomes
- Reach out to additional stakeholders (including Nature and Development Foundation, Environmental Protection Agency, Forest Watch Ghana, EcoRestore, Form International, Ghana Timber Millers Organisation, Ghana Institute of Foresters, Ministry of Food and Agriculture, tree spotters, community groups and traditional herbalists)
- Early organisation of (and commitment of staff to) a multi-institutional botanic survey team, as a platform for collaboration, training, seed collecting and field data collection.

There was a general consensus that future work will need to focus on the submission of collaborative funding applications to address priority actions identified during the workshops, as detailed in this report. Through collaborative action on multiple species it will be possible to utilise and expand the resources and expertise held within the country to conserve its threatened tree species.

Placodiscus bancoensis

Octolobus spectabilis

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APPENDIX I

Priority species list

Family	Taxon	Author	Global distribution
Anacardiaceae	*Trichoscypha cavalliensis*	Aubrév. & Pellegr.	Côte d'Ivoire; Ghana; Liberia
Annonaceae	*Monocyclanthus vignei*	Keay	Ghana; Liberia
Apocynaceae	*Hunteria ghanensis*	J.B.Hall & Leeuwenb.	Côte d'Ivoire; Ghana
Burseraceae	*Commiphora dalzielii*	Hutch.	Ghana
Chrysobalanaceae	*Dactyladenia dinklagei*	(Engl.) Prance & F.White	Côte d'Ivoire; Ghana; Liberia
Dichapetalaceae	*Tapura ivorensis*	Breteler	Côte d'Ivoire; Ghana
Ebenaceae	*Diospyros barteri*	Hiern	Ghana; Nigeria; Cameroon?; Gabon?
Euphorbiaceae	*Croton aubrevillei*	J.Léonard	Cameroon; Côte d'Ivoire; Ghana
Euphorbiaceae	*Suregada ivorensis*	(Aubrév. & Pellegr.) J.Léonard	Cameroon?; Côte d'Ivoire; Ghana
Fabaceae	*Gilbertiodendron splendidum*	(A.Chev. ex Hutch. & Dalziel) J.Léonard	Côte d'Ivoire; Ghana; Sierra Leone; Liberia
Fabaceae	*Hymenostegia gracilipes*	Hutch. & Dalziel	Côte d'Ivoire; Ghana; Liberia
Fabaceae	*Millettia irvinei*	Hutch. & Dalziel	Ghana
Fabaceae	*Talbotiella gentii*	Hutch. & Greenway	Ghana
Fabaceae	*Pericopsis elata*	(Harms) Meeuwen	Cameroon; Central African Republic; Congo; Gambia; Ghana; Nigeria; DRC; Côte d'Ivoire
Huaceae	*Afrostyrax lepidophyllus*	Mildbr.	Cameroon; Gabon; Ghana
Malvaceae	*Cola reticulata*	A.Chev.	Guinea; Liberia; Côte d'Ivoire; Ghana
Malvaceae	*Cola boxiana*	Brenan & Keay	Ghana; Liberia; Côte d'Ivoire (now extinct); Sierra Leone?
Malvaceae	*Cola umbratilis*	Brenan & Keay	Côte d'Ivoire?; Ghana
Malvaceae	*Octolobus angustatus*	Hutch.	Ghana; Nigeria
Meliaceae	*Turraea ghanensis*	J.B.Hall	Côte d'Ivoire; Ghana
Phyllanthaceae	*Phyllanthus profusus*	N.E.Br.	Ghana; Guinea; Liberia; Sierra Leone
Putranjivaceae	*Drypetes singroboensis*	Aké Assi	Côte d'Ivoire; Ghana; Gabon?
Rubiaceae	*Coffea togoensis*	A.Chev.	Benin; Ghana; Togo
Rubiaceae	*Pavetta mollissima*	Hutch. & Dalziel	Ghana; Côte d'Ivoire; Liberia?
Rubiaceae	*Pavetta sonjae*	W.D.Hawth.	Ghana; Liberia
Rubiaceae	*Robynsia glabrata*	Hutch.	Côte d'Ivoire; Ghana; Nigeria
Rubiaceae	*Schumanniophyton problematicum*	(A.Chev.) Aubrév.	Côte d'Ivoire; Ghana; Sierra Leone
Rubiaceae	*Sericanthe toupetou*	(Aubrév. & Pellegr.) Robbr.	Côte d'Ivoire; Ghana; Liberia
Rubiaceae	*Tarenna agnata*	Cheek & Lopez Poveda	Côte d'Ivoire; Ghana
Rutaceae	*Aeglopsis mangenotii* (?prob. syn of *A. chevalieri*)	A.Chev.	Côte d'Ivoire; Ghana?
Sapindaceae	*Lecaniodiscus punctatus*	J.B.Hall	Cameroon; Ghana
Sapindaceae	*Placodiscus attenuatus*	J.B. Hall	Côte d'Ivoire; Ghana; Liberia
Sapindaceae	*Placodiscus bancoensis*	Aubrev. & Pellegr.	Côte d'Ivoire; Ghana
Sapindaceae	*Placodiscus bracteosus*	J.B.Hall	Côte d'Ivoire; Ghana
Sapindaceae	*Placodiscus oblongifolius*	J.B.Hall	Côte d'Ivoire; Ghana; Liberia; Sierra Leone
Sapotaceae	*Aubregrinia taiensis*	(Aubrév. & Pellegr.) Heine	Côte d'Ivoire; Ghana
Sapotaceae	*Gambeya azaguieana*	(J.Miège) Aubrév. & Pellegr.	Côte d'Ivoire; Ghana; Liberia
Sapotaceae	*Synsepalum aubrevillei*	(Pellegr.) Aubrév. & Pellegr.	Côte d'Ivoire; Ghana; Liberia?
Sapotaceae	*Synsepalum ntimii*	W.D.Hawth.	Côte d'Ivoire?; Ghana; Liberia

? - *presence uncertain*

APPENDIX II

Participants from "Planning conservation action for Ghana's Threatened Trees" workshops, 10-14th October 2022

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