

Enhancing multifunctionality at different scales in biosphere reserves through NTFP domestication in agroforestry

BIOSPHERE RESERVES & MULTIFUNCTIONALITY

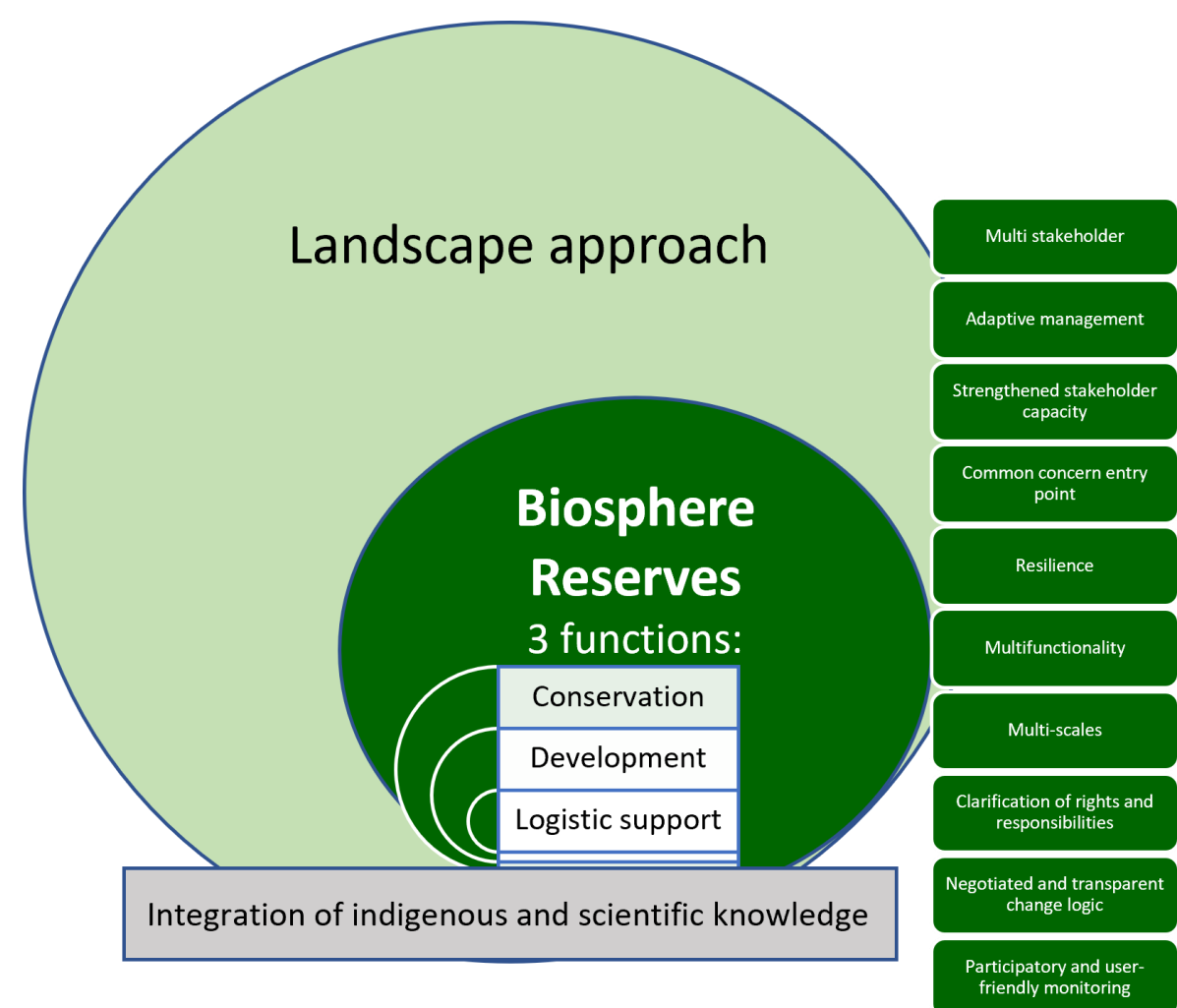


Figure 1: Overlapping concepts of landscape approach, multifunctionality and how this translates in the biosphere reserve concept, inspired by Reed et al., 2020; UNESCO, 2025, 2020)

- Biosphere Reserves (BR) are a framework that operationalizes multifunctional landscapes, combining biodiversity conservation and sustainable regional development with a living lab approach
- BRs operate across scales and sectors, they can strengthen collaboration among diverse actors and institutions, enabling coordinated, landscape-level interventions that mitigate biodiversity loss and enhance ecological resilience (Become Consortia, 2025)
- Due to the complexities of the framework, BRs encounter many challenges in implementation (Barraclough et al., 2023)

Study aim: explore the potential of non-timber forest products domestication for enhancing biosphere reserves' functions in Lake Bosomtwe Biosphere Reserve and identify priority species

Study site:

Lake Bosomtwe Biosphere Reserve (LBRR) in Ghana is a mosaic landscape covering almost 29,000 ha in Ashanti region that needs higher tree-cover and diversity for increased ecological resilience and income diversification for local farmers

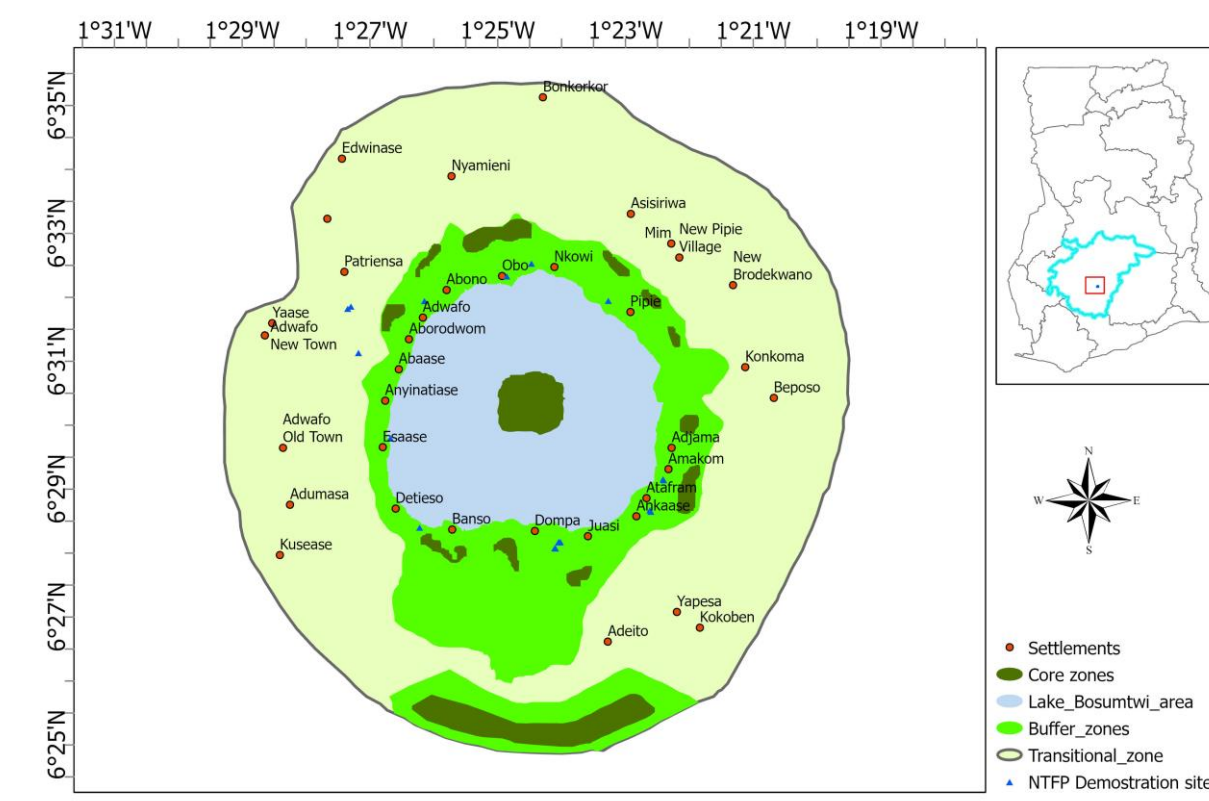
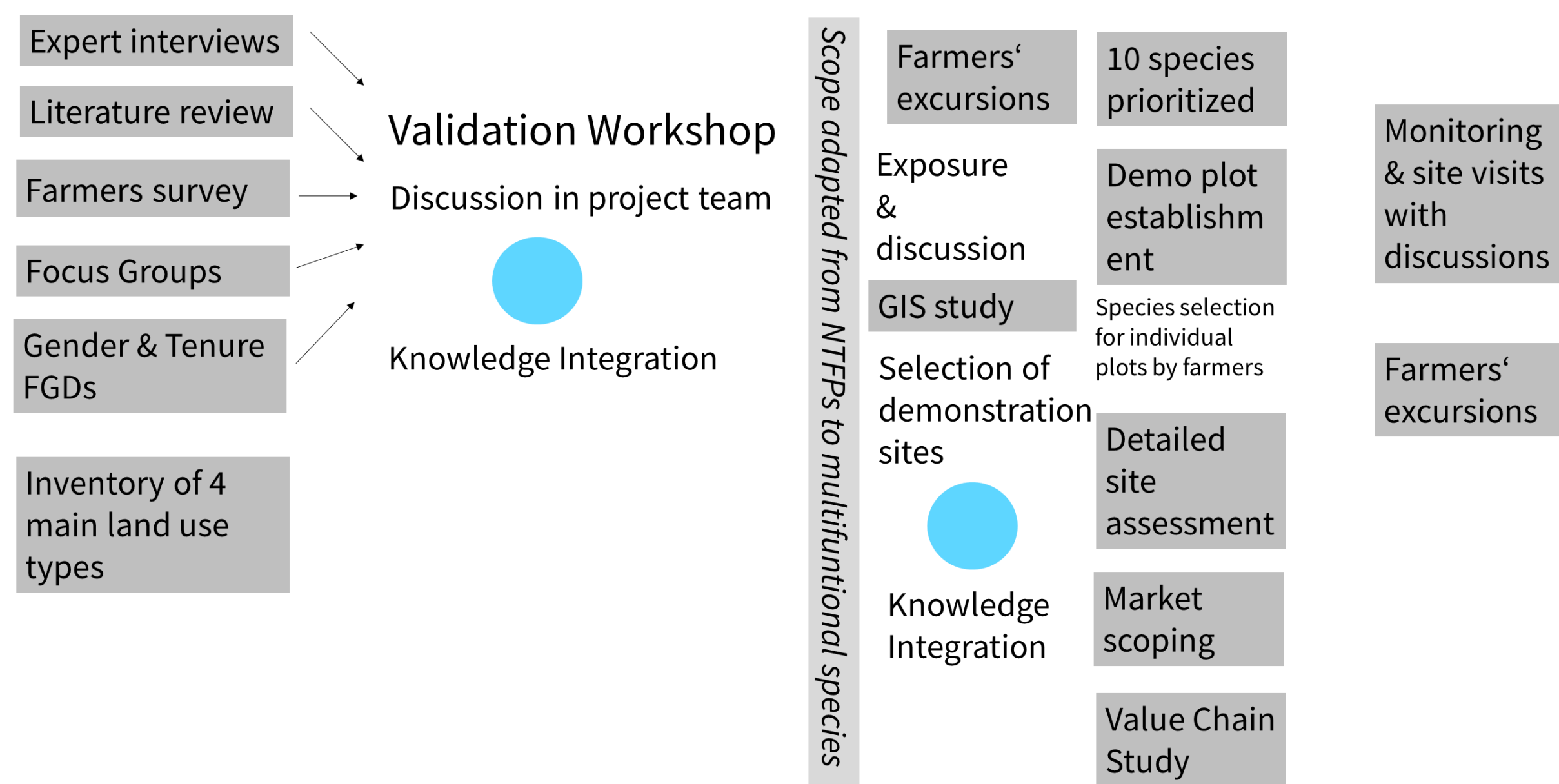


Figure 2: Map of Lake Bosomtwe Biosphere Reserve with zonation and location of NTFP demonstration plots; Map by Mary Antwi

METHODOLOGY

Species prioritization Process



- This study was designed as a transdisciplinary process integrating diverse knowledge systems of local communities, scientists, practitioners and managers to support BRs in achieving multifunctional landscapes.
- It combined participatory research and co-production for prioritizing suitable species with cultivation trials on demonstration plots of local farmers

Criteria for species prioritization:

- Species preferred by farmers Species have traits that farmers look for
- Species has high market value or high market demand
- Species is rare / has conservation status according to IUCN or national law/policy AND is used or demanded by consumers/farmers
- Agro-ecological suitability
- Germplasm availability

RESULTS

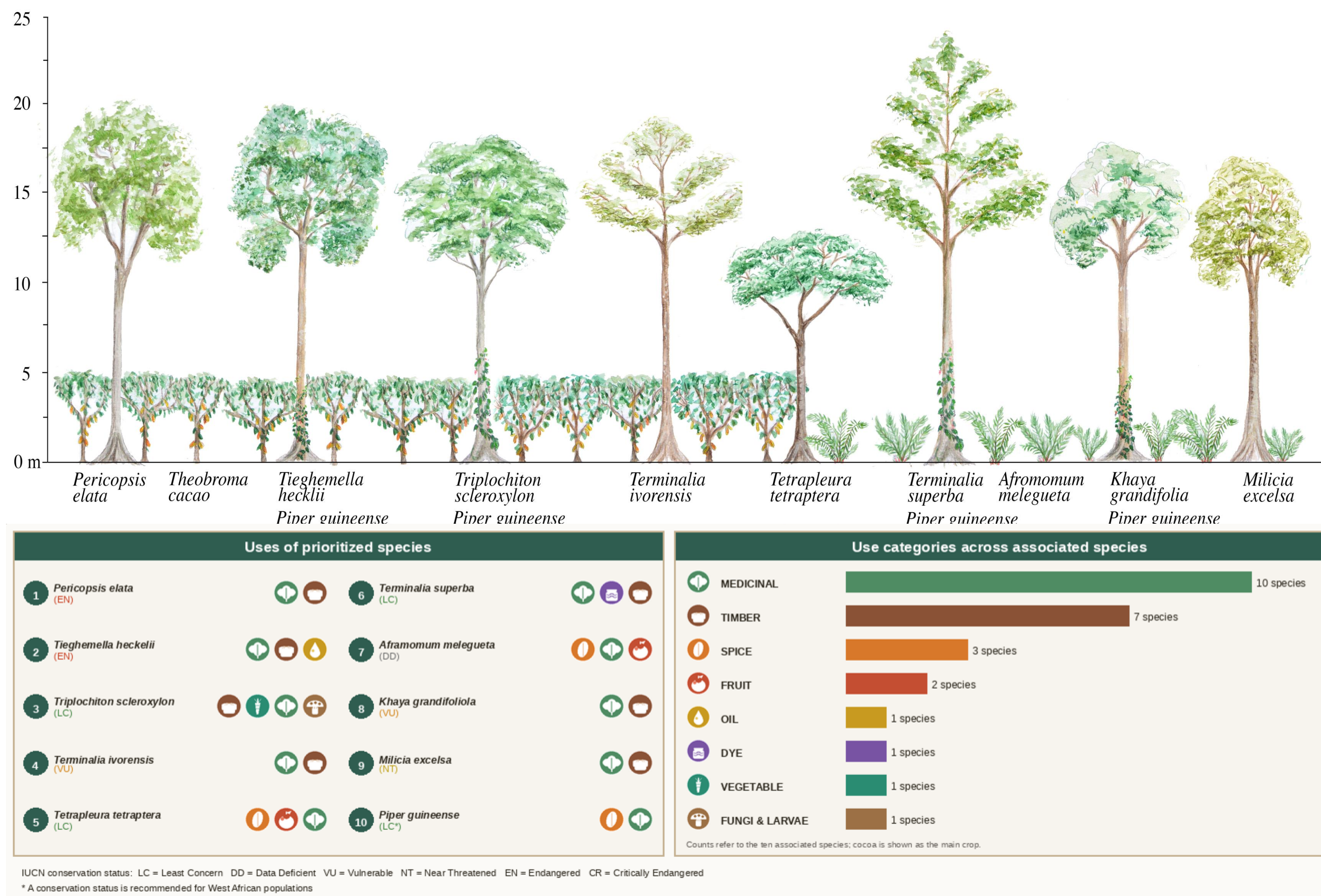


Figure 3: The 10 prioritized species in an agroforestry system approx. 10 ys after planting & their uses. Image by Lena Heberlein, Infographic created with SciSpace AI.

- Selected species are a combination farmers' top priority species (*Khaya grandifoliola* (VU) *Milicia excelsa* (NT) *Terminalia ivorensis* (VU), as well as highly endangered species (*Pericopsis elata* (EN)
- combined local with scientific/conservation perspective, while keeping the emphasis on local priorities

Table 1: Multifunctionality enhancement at different scales

BR function	Farm/household scales	Landscape scale
Conservation function	Contributes to species conservation: 5species with IUCN conservation status intergated Contributes to cultural heritage conservation by reviving traditional practices of NTFP processing and use, such as of <i>Tieghemella hecklii</i> fruits	Tree based restoration in farms rebuilds canopy cover, structural diversity, and habitat connectivity in the landscape
Development function	Diversifies cocoa dependent incomes; introduces high value spices, fruits, and timber species; improves resilience to cocoa price volatility; works towards nature-positive value-chain development	Demonstration farms are distributed across the biosphere reserve → landscape level effect
Logistic support function	Demonstration farms become learning sites for agroforestry, species domestication, and value chain innovation;	Integrates farmer knowledge with research= scientific with local knowledge Involvement of research institutes and students from German and Ghanaian Universities supported transfer of knowledge across scales

References:

- Barraclough, A.D., Reed, M.G., Coetzer, K., Price, M.F., Schultz, L., Moreira-Muñoz, A., Måren, I., 2023. Global knowledge-action networks at the frontlines of sustainability: Insights from five decades of science for action in UNESCO's World Network of biosphere reserves. *People Nat.* 5, 1430–1444. <https://doi.org/10.1002/pan3.10515>
- Reed, J., Ros-Tonen, M., Sunderland, T.C.H., 2020. Operationalizing integrated landscape approaches in the tropics. *Center for International Forestry Research (CIFOR)*. <https://doi.org/10.17528/cifor/007800>
- UNESCO, 2025. Hangzhou Strategic Action Plan for the UNESCO's Man and the Biosphere (MAB) programme and World Network of Biosphere Reserves (2026-2035).
- UNESCO, 2020. Statutory framework of the World Network of Biosphere Reserves. <https://unesdoc.unesco.org/ark:/48223/pf0000373378>

DISCUSSION & CONCLUSION

- NTFP domestication can support all BR functions: conservation, development and logistic support and delivers multifunctionality at farm as well as at landscape scale
- Key lesson: Focusing mainly on conservation and livelihood aspects generates stakeholder motivation and visible benefits within project timeframe, but sustainable, landscape-scale impacts require parallel investment in governance. Both dimensions are important
- More focus on using species prioritization process for involving local people in resource & BR governance, which requires enhancing capacities of local CBOs & strengthening their role

CONTACT