

Ecosystem restoration in Rwanda – ways forward

Position paper, April 2025



Rwanda’s green economy and development strategy recognizes the need for large-scale ecosystem restoration. This position paper summarizes the insights of a diverse group of stakeholders from science and practice who work on restoration in Rwanda. Drawing on scientific evidence and practical experience, we offer seven concrete recommendations for the development and implementation of new and existing policies.

Many of the findings we refer to stem from our own data. They are new and have not been published so far. These findings should not have to wait for official research publication processes before informing restoration practice in Rwanda. In addition to sharing our own research outcomes, we provide a list of open-access publications related to each recommendation for further reading on the last page. Not all of these publications are our own work, and not all focus on Rwanda. Nevertheless, they inspired us and offer valuable perspectives also relevant for the Rwandan context.

We urge government institutions involved in restoration to consider these recommendations. Rwanda’s track record of ecosystem restoration is impressive, but there is room for further improvement. Further improvement, in turn, will lead to more effective and more efficient achievement of the government’s goals articulated in the green economy strategy – ultimately boosting livelihoods, the economy and the state of the Rwandan environment.

Recommendation 1: Efforts to use native species in restoration must be greatly increased

Restoration planting efforts continue to be dominated by introduced species. The vast majority of trees in restored landscapes is comprised of just a handful of introduced species. More native species, and many more individuals of native species must be used in all types of small-scale to large-scale planting efforts to make them ecologically sustainable in the long run.

Recent science shows that native trees are valuable for biodiversity while introduced species have very little ecological value. Recent science also shows that, contrary to a widely held opinion, communities do value native species as long as they are aware of the benefits associated with them. Valuable traditional knowledge of the benefits of native species is being lost as these species disappear from the landscape. Focusing primarily on introduced species for tree planting initiatives represents lost opportunities to gain from the multiple benefits offered by native trees. Hence, there is an urgent need to act now and substantially upscale efforts to use native species in restoration.

Doing so will require investing in and greatly upscaling operations to generate native tree seedlings, including quality seed acquisition and nurseries. In addition, barriers limiting the use of native species must be understood and addressed. Ultimately, restoration success will hinge on good planning, ready availability of enough seedlings, trained seed collectors, and government leadership.

Recommendation 2: Homegardens must be included in restoration strategies because they are pivotal for both nutrition and biodiversity

Homegardens – the areas surrounding family homes which are used for livelihood activities – are greatly underrecognized in a restoration context and require further attention by researchers, practitioners and government agencies. Homegardens are central elements of sustainable nutrition because they harbour diverse food plants that are rich in vitamins and micronutrients. Moreover, recent science has shown that the diversity of native species of woody vegetation is substantially higher in homegardens than in the surrounding agricultural mosaic. As such, homegardens are important strongholds of native tree diversity in the landscape and could be valuable sources of seeds for future restoration activities. The high diversity of native species in homegardens also proves that native species are evidently valued by local communities to the extent that they are actively maintained and propagated around the house.

Homegardens must therefore be considered in restoration planning and practice – as sources of nutrition, as sources of native biodiversity, and as important islands of biodiversity within an otherwise impoverished landscape.

Recommendation 3: Science can help to guide the development of a sustainable corridor from Nyungwe NP to Gishwati-Mukura NP and Volcanoes NP

Many restoration initiatives are currently underway throughout the country. Some of us have been involved especially in research and practice related to Rwanda's Western Province. Here, there is an exceptional opportunity to connect remaining near-natural areas through large-scale restoration initiatives. The Rwandan government has long recognized the need to connect Nyungwe National Park via Gishwati-Mukura National Park to the Volcanoes National Park. However, a viable strategy to turn this vision into reality appears elusive to date.

Science can help to guide the development of a new corridor that works for both biodiversity and people. Cutting edge science includes spatially explicit models of how different types of species move through the landscape; assessments of human-wildlife conflicts that may arise as more wildlife enters the agricultural mosaic; and projections of how climate change may impact future land use viability.

One avenue that could be worth investigating is the viability of smallholder shade coffee production that meets voluntary sustainability standards (e.g. fair-trade certification). Recent empirical work in Rwanda demonstrated win-win-win outcomes for gender equality, livelihoods and biodiversity for certified smallholder shade coffee production systems. Moreover, recent science suggests that the high elevations between Gishwati and Mukura forests will become increasingly suitable from a climatic perspective for growing coffee in the future. A high diversity of native trees can be used in the overstorey of shade coffee systems – far beyond what is currently practiced in Rwanda. Native, smallholder-owned shade coffee plantations thus could be extremely valuable stepping stones for biodiversity; and could be integral parts of the long-envisioned north-south corridor in the west of the country.

Using the best available science, it therefore seems plausible that both people and biodiversity can gain in sustainable ways in the long term. A carefully planned north-south corridor drawing on the best available science through the west of Rwanda could become a globally notable conservation flagship project.

Recommendation 4: Short-term and long-term considerations are needed to enhance livelihoods and nutrition

A common argument for why introduced species are favoured in restoration plantings is that communities require immediate returns. While this logic is sound on the surface, a more careful appraisal suggests that short-term and long-term considerations must be carefully balanced. Combinations of species that deliver short-term gains and long-term gains therefore should be used more frequently in restoration plantings, rather than focusing solely on those offering short-term gains.

Restoration can benefit livelihoods both directly (e.g. through fruit trees that offer valuable nutrition) or indirectly (e.g. through timber that can be sold). Short-term and long-term gains, and direct and indirect benefits to livelihoods should be combined in restoration activities via diverse combinations of native species. Moreover, affordable insurance schemes can help to safeguard livelihoods in a context of environmental and climatic uncertainty.

Recommendation 5: Genuine community involvement is important at all stages of restoration, from planning to monitoring.

Community participation is widely agreed to be important, but the extent of participation can vary greatly. Genuine participation means co-creating restoration plans, activities and monitoring with local communities. This requires going beyond simply surveying communities, gathering data, and then informing community members about the restoration plans and activities. Only genuine participation can generate sustainable and long-term benefits for both livelihoods and ecosystems.

Local needs and local knowledge must be respected and understood before implementing restoration. Communities must be valued and included in all steps of restoration. While this takes time, results are usually more durable. Local champions – community members who are especially knowledgeable about native species, native ecosystems and their links to livelihoods – can play particularly valuable roles within the community.

Recommendation 6: The best available science must be used to evaluate restoration policy and practice

Restoration includes many stakeholders: local communities, practitioners, policymakers, and scientists. These stakeholders must work together throughout iterative cycles of restoration activities, systematically and collaboratively assessing, adjusting and improving restoration policy and practice.

Science plays a vital role in this context because of its established standards to separate commonly held assertions from arguments that are based on evidence. International standards of best practice for restoration should also be applied in Rwanda – ecological restoration, for example, should routinely involve ongoing monitoring against both degraded and target reference conditions. Science-led monitoring for years and decades into the future thus should be a central component of restoration practice and must be deeply embedded into restoration activities from the outset. Local communities and existing initiatives such as community birding groups can be involved in these monitoring activities.

A particularly promising avenue for integrative restoration planning and practice is the development of living laboratories. Living laboratories (or ‘labs’) can be planned at relatively small scales (e.g. the district level). They bring together committed stakeholders (community, practice, science and government) in a true partnership where restoration can be planned, carried out and monitored collaboratively in iterative cycles. Living labs are currently being trialled in the Western Province where diverse restoration stakeholders come together to co-create knowledge and test different restoration methods; they could be a model system for restoration elsewhere in Rwanda.

Recommendation 7: A shift in mindsets is required to move away from simple metrics of ‘trees planted’ to a culture of collectively growing ecosystems that will benefit people and biodiversity

Rwanda’s restoration ambitions are high. Reporting against the Bonn Challenge, for example, requires measuring how many hectares have been replanted. Yet, while the number of trees planted, or the hectares receiving restoration treatment are logical first approximations of restoration activity, they fall short of being reliable indicators of restoration success.

Areas restored are likely not fully restored to a forest but rather ‘repaired’ in part via activities such as terracing or agroforestry planting. Similarly, the number of trees planted does not say anything about the survival rate of those trees or their diversity, including the number of native individuals and number of native species, nor the functioning of that forest ecosystem and its ability to deliver services to local communities.

Instead of reporting overly simplistic numbers of restoration success, a shift in mindsets is needed: from simply planting more trees to growing healthy ecosystems all the way to maturity. This requires working with communities, as well as monitoring and critically assessing long-term restoration success in comparison to previously defined reference states or ‘goals’. Restoration goals may be both of an ecological nature (e.g. how many species of conservation concern occur in restored sites relative to degraded sites and relative to native ecosystems?) as well as of a social nature (e.g. have the livelihoods of people who participated in restoration projects improved in significant ways?). True long-term success will hinge on recognising the long-term social-ecological journey that ecosystem restoration ultimately entails: this is far more challenging than just planting trees, but also far more rewarding if it succeeds.

Further readings:

Recommendation 1: Brancalion, P. H., Hua, F., Joyce, F. H., Antonelli, A., & Holl, K. D. (2025). Moving biodiversity from an afterthought to a key outcome of forest restoration. *Nature Reviews Biodiversity*, 1-14. <https://doi.org/10.1038/s44358-025-00032-1>

Recommendation 2: Sharma, R., Mina, U., & Kumar, B. M. (2022). Homegarden agroforestry systems in achievement of Sustainable Development Goals. A review. *Agronomy for Sustainable Development*, 42(3), 44. <https://doi.org/10.1007/s13593-022-00781-9>

Recommendation 3: Bohn, S., Wollni, M., & Paz, B. (2024). Cultivating change: Exploring the link between certification, dietary quality and women's empowerment among coffee farmers in Rwanda (No. 9). Sustainable Food Discussion Paper. <https://www.econstor.eu/handle/10419/301249>

Recommendation 4: Frietsch, M., Loos, J., Löhr, K., Sieber, S., & Fischer, J. (2023). Future-proofing ecosystem restoration through enhancing adaptive capacity. *Communications Biology*, 6(1), 377. <https://doi.org/10.1038/s42003-023-04736-y>

Recommendation 5: Löfqvist, S., Kleinschroth, F., Bey, A., De Bremond, A., DeFries, R., Dong, J., ... & Garrett, R. D. (2023). How social considerations improve the equity and effectiveness of ecosystem restoration. *BioScience*, 73(2), 134-148. <https://doi.org/10.1093/biosci/biac099>

Recommendation 6: Frietsch, M., Fischer, J., Kaplin, B. A., & Martín-López, B. (2024). The relevance of international restoration principles for ecosystem restoration practice in Rwanda. *Restoration Ecology*, 32(3), e14085. <https://doi.org/10.1111/rec.14085>

Recommendation 7: Gann, G. D., McDonald, T., Walder, B., Aronson, J., Nelson, C. R., Jonson, J., ... & Dixon, K. (2019). International principles and standards for the practice of ecological restoration. *Restoration Ecology*, 27(1), 1-46. <https://doi.org/10.1111/rec.13035>

This position statement arose from a workshop that took place in Kigali in February 2025 involving representatives of the organizations shown above: Abubakar Nshimuyumukiza (Rubavu District), Alexis Kiramira (Rutsiro District), Athanase Mukuralinda (ICRAF), Bernadette Arakwiye (WRI), Beth Kaplin, Cecile Kayitanirwa (RWCA), Diogene Tuyizere (RWCA), Donath Nkurikiyimana (Gorilla Fund), Dula Duguma (Leuphana), Ezechiel Turikunkiko (RDB), Gracie Bachmann (WCS, ELTI), Ildephonse Munyarugero (Gorilla Fund), Innocent Harelimana (Rubavu District), Innocent Kamayirese (Rutsiro District), Jean Damascene Bariyanga (UofR), Jean Nduwamungu (UofR), Joern Fischer (Leuphana), Marina Frietsch (Leuphana), Myriam Mujawamariya (UofR), Peter Ntaganda (WRI), Pierre Nshimyumuremyi (One Acre Fund), Ping Sun (Leuphana), Safari Claude (WCI), Shema Serge (WCI), Susanne Vögele (Göttingen University), Venuste Nsengimana (UofR), Verene Nyiramvuyekure (Leuphana), Vincent Karemera (ARECO), William Apollinaire (ZALF).

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