CIFOR-ICRAF
COUNTRY PROFILE
Rwanda

2024

About Rwanda

Landlocked in the Great Lakes region of East and Central Africa, Rwanda is remarkable for its high population density, small land area per household, and hilly topography. With 571 people per square kilometre, it has the highest population density in Africa and the fifth-highest in the world. It is the test case for using every inch of land intentionally.

Over 77% of agricultural households farm on less than 0.5 ha, according to Rwanda's Agricultural Household Survey (2020), and 81.25% of the country's land surface is devoted to farming, says the World Bank. The main food crops are beans, sweet potatoes, and maize. The predominant agricultural exports are coffee and tea.

Rwanda is also elevated, with an average altitude of 1,598 metres above sea level. Only in the drier eastern part of the country does it drop to just below 1,000 metres. Trees are vital to stabilizing its slopes, but very often 'progressive terracing' for 20%—50% slopes and 'radical terracing' for even more extreme ones are the only ways to farm: trees are vital for both.

Given the pressures, the focus has long been on finding 'niches' for trees, such as newly created terraces; growing crops more vertically; and using nitrogen-fixing trees for dry season fodder and soil health. Farms are strained by soil erosion, the removal of nutrients, and no fallow.

"The people have to plant every season," explained one Rwandan farmer. Notable achievements in the last 30 years include a rise in Rwanda's human development indicator from 0.25 in 1990 to almost 0.6 in 2021, and 2.3 more years of schooling, according to the Food and Agriculture Organization of the United Nations.

Rwanda is committed to restoring 2 million hectares – 76% of its total land area by 2030 – and protecting its forests. Mountain gorilla numbers have increased from 320 in the early 1990s to 604 today.

A farmer cultivates on an extreme slope, a challenge across Rwanda. The trees are *Eucalyptus sp.* and *Alnus acuminata*, and some have been radically pruned for firewood and to allow light to reach the maize. Photo by Miyuki Iiyama/CIFOR-ICRAF/JIRCAS

CIFOR-ICRAF in Rwanda

ICRAF opened its office in Rwanda in 1988. Since then, it has tested and promoted agroforestry with nearly 50 multipurpose fast-growing tree species suitable for the country's 12 agroecological zones and assisted smallholder farmers to apply agroforestry for better outcomes.

CIFOR-ICRAF supports many Rwandan plans, including its Green Growth Strategy; National Strategy for Transformation; Vision 2050; the Integrated Water Resources Management (IWRM) programme; the Strategic Plan for Agriculture Transformation (SPAT); and the 'Three fruit trees per household' campaign.

CIFOR-ICRAF also works closely with the Ministry of Environment, the champion

> " The integration of agroforestry into crop production can contribute significantly. "
>
> *– Ministry of Agriculture and Animal Resources, Rwanda*

of the country's Agroforestry Strategy and Action Plan 2018–2027. "In Rwanda, agroforestry is recognized as a nature-inspired solution to socioecological, economic, and climate change-related challenges," says Mieke Bourne, who led CIFOR-ICRAF's Regreening project.

Regreening's baseline in 2018 in Rwanda was a lightbulb moment. The country emerged as an outlier at both ends of the scale. In the other countries, farms had more indigenous trees than exotic ones. By contrast, in Rwanda, farms had more exotics – on average 2.2 against just 0.44 native trees per farm, a strong signal that tree diversity needs a boost.

On the plus side, the 10-year projected return for tree products was found to be highest for Rwanda at EUR 4,140, followed by Kenya (EUR 1,385). Rwanda was also exceptional in being the only country where tree products made up a significant share of projected farm returns.

CIFOR-ICRAF has trialled incentives for tree planting (Rwandan farmers weigh trade-offs carefully); established Rural

Research Centres; promoted on-farm tree management, such as pruning, to maximize benefits to crops; and developed tree-based value chains to increase opportunities for women and youth. Under two current projects, it is building seed and seedling systems for high quality germplasm and more tree diversity to plant.

> " Essentially, all agricultural land in Rwanda is suitable for some kind of agroforestry. "
>
> *– Athanase Mukuralinda*
> *CIFOR-ICRAF's representative for Rwanda*

Quick guide

- Seven current projects
- 14 staff, three with PhDs
- Supported 10 PhD candidates and 120 MSc students since 1988

Results on the ground

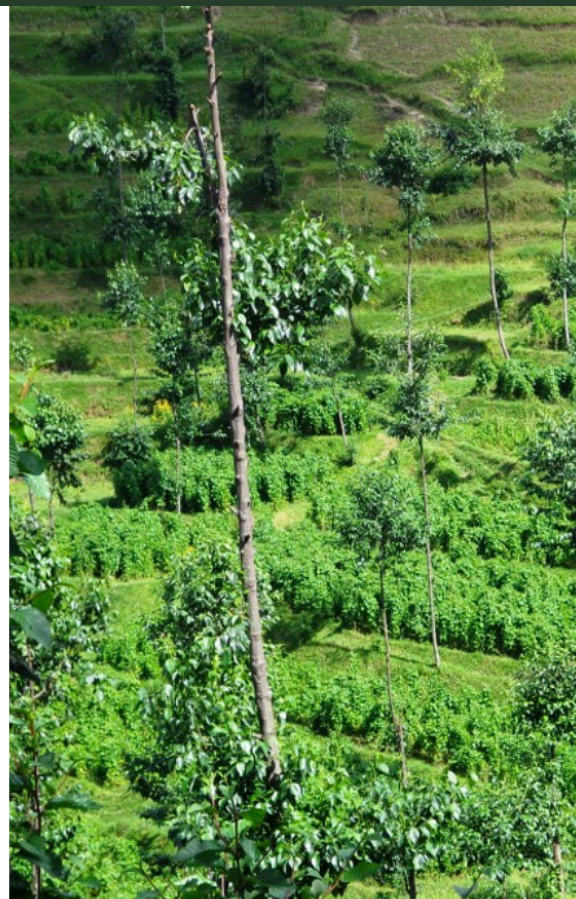- With funds from the African Development Bank (AfDB), 328,915 trees planted in 2022–2024 by 1,054 people on 1,657 ha: 70% were surviving after six months, shrubs more than fruit and native upper story trees.
- Under Regreening, app users totalled 36,000, trees planted more than 4 million, and new nurseries and fruit tree producer groups 127.
- Under Transforming Eastern Province through Adaptation (TREPA), 16 model forage plots have integrated drought-resilient tree, grass, and herbaceous fodder species: 8,256 casual jobs have been created.

Major achievements

- Informed Rwanda Agroforestry Strategy and Action Plan.
- Influenced establishment of Agroforestry Task Force in 2022. https://regreeningafrica. org/wp-content/uploads/2023/08/Regreening-Outcome-storyRwanda_2023.pdf
- Generated fundamental knowledge about agroforestry, including that adoption is highest where population is densest and farm sizes smallest. https://www.profor.info/sites/profor.info/files/TakingToScaleRwanda_low.pdf
- Led introduction of tree tomatoes, which show high production potential and helped thousands of farmers to increase incomes while improving nutrition. "Given the rapid adoption, there is a need to explore the possibility of value addition to make the sector even more profitable and sustainable," says one document. https://apps.worldagroforestry.org/downloads/Publications/PDFS/ PO19049.pdf
- Showed that stakes increase yield of climbing beans from 0.7 tonne to to 2.5 tonnes/ha. Eleven species investigated for strength and durability included *Senna spectabilis, Vernonia amygdalina, Gliricidia sepium, Leucaena diversifolia* and *Acacia angustissima*. https://apps.worldagroforestry.org/downloads/Publications/PDFS/PB21018.pdf
- Established tree models for progressive terraces and introduced fertilizer trees – which make an essential contribution to soil health, particularly organic carbon – into bench terraces.
- Partnered with government to build Rwanda Soil Information Services (RwaSIS). In eastern Rwanda, CIFOR-ICRAF's Land Degradation Surveillance Framework was used to map erosion hotspots. Rainfall erosivity contributes to about 80% of soil loss.

L-R: Athanase Mukuralinda with community members in their nursery. The senior scientist has over 20 years' experience and a PhD in agroforestry from Makerere University. Photo by Gilbert Ndziye/CIFOR-ICRAF. Grass strips, contour bunds and trees reduce erosion on this sloping land. Photo by Miyuki Ilyama/CIFOR-ICRAF/JIRCAS

On a 'rollout' day under the Terrafund project, community members collect seedlings. Photo by Gilbert Ndziye/CIFOR-ICRAF

Select projects

Funded by the African Development Bank, **Promoting climate-smart agriculture for improved rural livelihoods and climate resiliency in the climate vulnerable Eastern Province of Rwanda** (2021–2024) is jointly implemented by CIFOR-ICRAF, Rwanda Agriculture and Animal Resources Development Board, and the Center of Excellence in Biodiversity and Natural Resource Management (CoEB) at the University of Rwanda. "We are also emphasizing gender transformation and reducing farmer-wildlife conflict around Akagera National Park," says CoEB's Beth Kaplin. "Besides trees, drought-resistant crops, and training on composting to reduce chemicals, we give farmers smartphones so they can predict rain."

Funded by the Green Climate Fund, **Transforming Eastern Province through Adaptation (TREPA)** (2021–2027) is led by the International Union for Conservation of Nature with CIFOR-ICRAF, Rwanda Forestry Authority, Ministry of Environment, Enabel, Cordaid, and World Vision. It aims to transition Rwanda's driest and sole savanna region from widespread degradation to positive change with 75,000 smallholder farmers shifting from fragile to sustainable livelihoods. Approaches include economic incentives to build value chains of climate-resilient agricultural and tree products. Among other packages, CIFOR-ICRAF leads "Diversified agroforestry" and "Climate-resilient silvopasture". The latter promotes rotational grazing and biological control of termites. In 2024, native tree species will be planted on 18,000 ha, including roadsides. https://www.iucn.org/ blog/202311/ trepa-project-plant-over18000-ha-native-species-during-2023- 2024-tree-planting-season

Funded by Terrafund, **Trees for landscape restoration in Rwanda** (2022–2026) aims to energize tree growing for rural development and ecosystem restoration. Working with communities to grow 340,000 trees of one exotic species (*Mangifera indica* or mango) and three indigenous ones (*Pterygota mildbraeidii*, *Maesopsis eminnii*, and *Markhamia lutea*), it is also disseminating knowledge on tree management, installing infrastructure for tree growing, and using simple robust tree planting monitoring tools. "Population density and growth, scarcity of land and the need for wood for cooking are driving overexploitation of trees/shrub resources," says CIFOR-ICRAF's Sammy Carsan.

Funded by Germany's International Climate Initiative (IKI), **Right tree, right place – Seed project (RTRP-Seed): Supplying high-quality seeds and seedlings of native tree species to scale up landscape restoration in sub-Saharan Africa** (2024–2030) is tackling the widespread use of exotic trees and inferior-quality tree planting material. With national and international partners, it focuses on key areas of tree seed and seedling sector development: an enabling environment (right policies and institutional relationships); capacity in native tree species seed supply; and new business models for tree nurseries supplying native tree seedlings, among them links to restoration projects. https://www.cifor-icraf.org/rtrp-seed/

Also funded by Germany's IKI, **Trees on farms for biodiversity** (2024–2030) addresses Aichi Target 7: sustainably managed agricultural areas. Its premise is that increasing the number of trees and tree species improves farm productivity and biodiversity in agricultural landscapes. In Rwanda, partners include IUCN, UFZ-Helmholtz and national bodies. "Trees on farms offer the potential of connectivity," says CIFOR-CRAF's Elisée Bahati Ntawuhiganayo. "Our Gishwati study found more than 60 tree species in cropland, double what we found in plantations, and triple what we found in pastureland. Bird species increased with tree species." https://treesonfarmsforbiodiversity. com/rwanda/

> " Trees on farms offer the potential of connectivity. "
>
> – *Elisée Bahati Ntawuhiganayo,*
> *Biodiversity specialist, IKI project*

Hedgerows of *Calliandra calothyrsus*: the woody stakes this shrub produces can be used to support beans or as firewood. Photo by Miyuki Iiyama/ CIFOR-ICRAF/JIRCAS

L-R: A farmer inspects a *Grevillea robusta*, an Australian tree. "There are perceptions that indigenous trees grow slowly. Demonstrations are very useful to counter such long-held myths," says CIFOR-ICRAF's Sammy Carsan. Photo by Cathy Watson/CIFOR-ICRAF. Women assist an indigenous tree to regenerate. "We have to think about how we engage women. A five-day training in Kigali won't work," says CIFOR-ICRAF's Stepha McMullin. Photo by Kelvin Trautman/CIFOR-ICRAF

Resources

Farming with trees for soil fertility, moisture retention and crop productivity improvement: Perceptions from farmers in Rwanda, 2023, showed agroforestry to be a sustainable land management practice with multiple ecosystem benefits. With trees, farmers reported higher yields of potato, maize, and beans on farms in the humid region, and beans in the semi-arid region. Yet agroforestry is not being embraced as expected. There is need to address the lack of seedlings; competition between trees and crops; droughts; and termites. https://www.ciforicraf.org/knowledge/publication/35326/

Trees on smallholder farms and forest restoration are critical for Rwanda to achieve net zero emissions, 2024, mapped woody plants with a crown area larger than 3m2 nationwide using aerial images from 2008 and 2019. The authors found that the number of trees in agroforestry landscapes increased from 77.7m in 2008 to 105m in 2019, a shift from 59 trees/ha to 80 trees/ha. The carbon benefits from new farm trees were six times lower than gains from restoration of degraded forest. The overall C sink of the new farmland trees was 0.13 Megagrams of Carbon per hectare per year compared to 0.76 Megagrams of Carbon per hectare per year for degraded forest restoration, according to researchers from the universities of Copenhagen and Rwanda, CIFOR-ICRAF, Rwanda Forest Authority, Rwanda Space Agency, and IUCN. https://www.nature. com/articles/s43247-024-01278-x

Taking to scale tree-based systems in Rwanda to enhance food security, restore degraded land, improve resilience to climate change and sequester carbon, 2016, a 46-page report from CIFOR-ICRAF and World Bank's Program on Forests (PROFOR), it notes that "eucalyptus is by far the most common tree planted in Rwanda" and maps agroforestry practices in each of the country's six land uses, identifying five forms: farm woodlots, contour hedgerows, scattered trees in crop fields, home gardens, and boundary planted trees. "Proximity to extension services, history of past interventions, and availability of tree seeds and seedlings were found to be important drivers to accelerate the adoption of agroforestry at a much greater scale," it concludes. https://www.profor.info/sites/ profor.info/files/TakingToScaleRwanda_ low.pdf

CIFOR-ICRAF ambition in Rwanda

"Our ambition is to do the research that responds to the country's constraints," says Athanase Mukuralinda, CIFOR-ICRAF's representative for Rwanda.

This includes research on how agroecological principles can reduce pesticide use, and how planting a tree can influence biodiversity, crop production, food and nutrition security, and water balance. The CIFOR-ICRAF team aims to find answers to the question, "When you plant a tree what happens between incoming rain and outgoing evapotranspiration?"

CIFOR-ICRAF's ambition is to promote the adoption of agroforestry at scale, to contribute to making Rwanda's forests well managed for biodiversity, and to increase tree cover as well as soil organic matter.

> " I want our programme to grow. "
>
> *– Athanase Mukuralinda*
> *CIFOR-ICRAF's representative for Rwanda*

CIFOR-ICRAF
The Center for International Forestry Research and World Agroforestry (CIFOR-ICRAF) harnesses the power of trees, forests and agroforestry landscapes to address the most pressing global challenges of our time – biodiversity loss, climate change, food security, livelihoods and inequity. CIFOR and ICRAF are CGIAR Research Centers.

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