The urgent need to conserve and use trees

AFR100 and AUDA-NEPAD are partnering with CIFOR-ICRAF to strengthen the national tree seed supply required for successful implementation of AFR100.

CIFOR-ICRAF has the expertise and tools to conserve threatened tree species and ensure investments in tree-planting efforts actually take root.

With decades of expertise in 30 countries on the conservation and use of trees, CIFOR-ICRAF-supported genebanks supply the raw genetic material for more effective tree planting to deliver better-tailored products and services matched to needs. Our Nairobi-based Genetic Resources Unit is one of the world's largest tropical tree seed collections used to improve tree planting, and our tree 'field' genebanks contain dozens more species.

From African orphan crops to food portfolios to Rural Resource Centres, CIFOR-ICRAF is supporting more diversified farms and diets, while creating more climate-resilient livelihoods. It has long been recognized that one of the best ways to conserve critical tree species is to encourage their sustainable use.

Supporting seedbanks, contributing to the development of partnership platforms and decision-support tools, facilitating efforts to build national capacity in seed supply, and promoting the collection of indigenous species and community tree conservation, will all support smallholder tree growers and help conserve critical tree species – before they are lost.

Trees are vanishing

Globally, millions of people depend on tree products – nutritious fruit and nuts, timber, fuel, medicine and animal fodder – for food and income. Trees mitigate climate change through carbon sequestration, address biodiversity losses, protect watersheds and enhance soil health. Yet deforestation, invasive pests and diseases, and climate change are pushing 30 percent of the world's tree species to the brink.[1]

The more tree resources are lost, the less able humanity becomes to mitigate and adapt to the interconnected crises that threaten the climate, biodiversity and our food systems.

From the Bonn Challenge to the African Great Green Wall, forest landscape restoration and broader tree planting initiatives are ramping up, as recognition grows of the potential of nature-based solutions for global crises. But in the rush to get trees into the ground, many saplings struggle to survive, especially in this era of shifting weather patterns and other environmental stresses.

This is why investments need to be backed by science and development.

We estimate that investing a mere 5% more (of the seedling cost) in tree seed supply, in a campaign to plant a broader range of higher quality, locally adapted indigenous tree seed sources, would be enough to enhance the restoration of 20% of the AFR100 target area to the extent of generating over 5 billion USD of extra income for tree growers while at the same time increasing carbon sequestration and soil conservation.[2]

30%
of tree species are threatened with extinction

Investing
5%
more in seed supply covering

20M HA
would generate

>5B USD
of extra income for tree growers under AFR100

1 BGCI (2021). State of the World's Trees. BGCI, Richmond, UK. https://www.bgci.org/our-work/networks/gta/
2 Lillesø J-PB, Dawson IK, Graudal L and Jamnadass R. 2021. Quality seed for tree planting: Supporting more effective agroforestry and forest landscape restoration by learning from crop Integrated Seed System Development. ICRAF Policy Brief 54. Nairobi: World Agroforestry. https://www.worldagroforestry.org/publication/quality-seed-tree-planting-supporting-more-effective-agroforestry-and-forest-landscape

CIFOR-ICRAF is conserving critical tree species

For many tree species, the difficulties of conservation are compounded by the simple fact that we don't fully understand their biologies. Work is urgently needed to conserve trees and create pathways for their sustainable use. This requires much more than just preserving a single example of each species. Most tree species need other trees to set good-quality seed for the next generation. And there is enormous genetic diversity within each species – variation that allows them to grow well in multiple locations, to adapt to climate change, and to have multiple functions. This variation also provides the scope to genetically improve (select or breed) trees to further optimize their use.

The potential benefits of carefully considering tree genetic variation are huge: more effective provision of tree products and ecosystem services, higher fruit production, greater timber yields, and increased soil protection to name a few.[3] Higher survival rates in restoration programmes is a key factor in making restoration practices affordable to local communities – whose involvement is required to ensure success. Tree conservation efforts need to capture the genetic diversity within tree species as well as the species themselves.

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3 See., e.g., Roshetko JM, Dawson IK, Urquiola J, Lasco RD, Leimona B, Weber JC, Bozzano M, Lillesø J-PB, Graudal L and Jamnadass R. 2018. To what extent are genetic resources considered in environmental service provision? A case study based on trees and carbon sequestration. Climate and Development 10:755–768. https://doi.org/10.1080/17565529.2017.1334620

We conserve trees to support their effective use

In our work (see Box 1 and Figure 1), we explore how to integrate tree conservation and tree use to sustain and improve the livelihoods and environments of smallholder tree growers, as well as the global environment. We support tree planting and management based on a solid foundation of knowledge on how to store seed without it losing viability, how to propagate trees, and how to collect, develop and supply quality planting materials; and we spend time fully considering the impacts and requirements of forest loss and climate change on these activities. Our work on conservation aims to enable the sustainable use of trees in both their natural habitats and in agroforestry landscapes.

Seeds from our tree 'seed' genebank, maintained by the CIFOR-ICRAF Genetic Resources Unit based in Nairobi, were the first trees to be duplicated for storage in the Svalbard Global Seed Vault. The Unit contains 195 tree species and is one of the world's largest tropical tree seed collections that is being actively used to improve tree planting (rather than being in a passive state, focusing only on conservation). Its seed dispatches are crucial for scientists to carry out research on the trees, and also for the multiplication of seeds that can be distributed to growers to meet the massive tree planting targets of development projects.

Our 'field' genebanks also contain a wide range of tree species, 81 in all. These stands, maintained with national partners at 49 sites in 18 countries, often contain trees suitable for smallholder agroforestry whose seed is not easy to store. Thus, the trees must be kept 'live'.

Our 'field' genebanks contain

81 tree species

These stands are maintained with national partners at

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in

18 countries

In total, we help conserve

>17,000

accessions (different entries in the genebanks) of trees

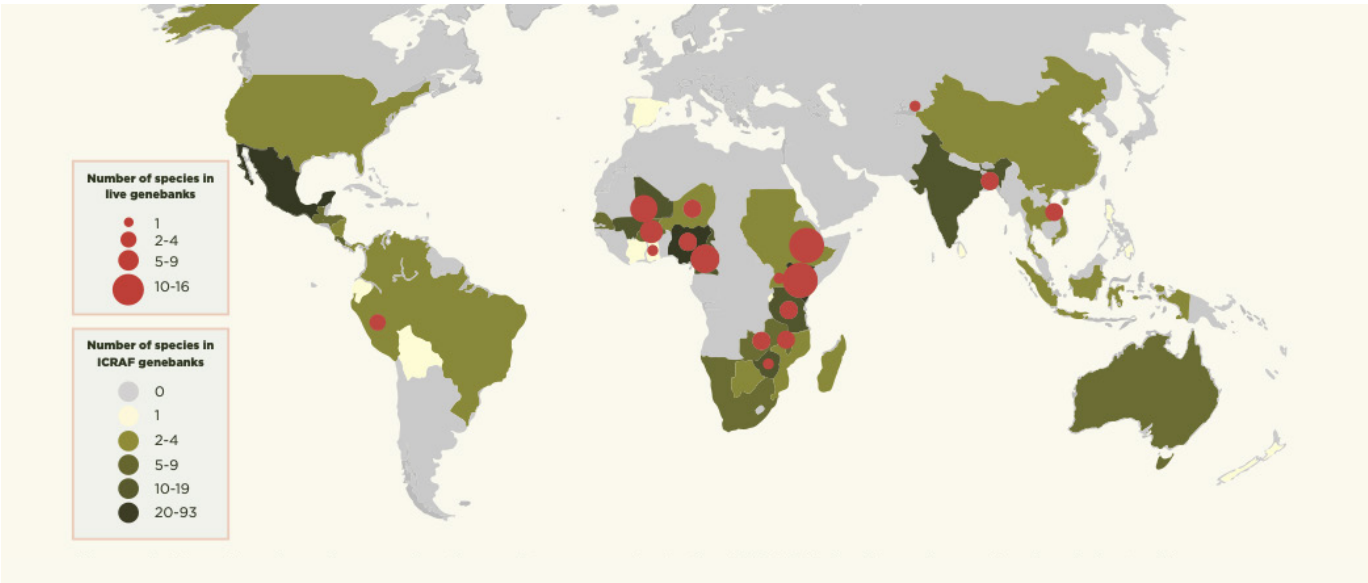

Figure 1. Map showing where collections of tree species in the CIFOR-ICRAF Nairobi seed genebank originated (green shading) and where field genebanks are located (red circles).

These genebanks crucially fulfil multiple purposes; they serve not only as conservation stands but also enable us to characterize and better use genetic variation found within tree species, and directly supply quality seeds and cuttings for major tree planting initiatives.

In total, we help conserve over 17,000 accessions (different entries in the genebanks) of trees, including much genetic variation in individual species. We also organize new collections of priority trees to support their conservation for landscape restoration and wider tree-planting goals. And we develop the decision-support tools that are needed by planners and tree growers to decide what trees to plant where for specific environments and particular purposes. This work considers both the current-day environments in which the trees are being planted and the future climatic conditions when the trees' products and services will come to fruition. Our tools to conserve trees and link with use include databases, apps, guidelines and statistical methods in the Global Tree Knowledge Platform and the Resources for Tree Planting Platform.

Food tree portfolios have been developed for

17 locations

in East Africa, and the approach is now being adopted more widely.

Through the portfolio programme in East Africa we have helped

1,800 smallholder households

access a wide range of food tree species and train

6,000 farmers

in food tree cultivation and use

Box 1. Case studies for tree conservation and use

CIFOR-ICRAF seed and field conservation-to-use activities support better outcomes for livelihoods and the environment. They provide the raw genetic materials for expanding effective, diversified tree planting as well as material for tree selection and genetic improvement to deliver better-tailored products and services matched to needs.

Our field genebank collections include breeding seedling orchards that conserve the trees, evaluate genetic variation and supply locally adapted seeds. Our recent Provision of Adequate Tree Seed Portfolios (PATSPO) project – which was requested by the Ethiopian Government as a crucial resource for supporting Ethiopia's ambitious forest landscape restoration targets – has over 30 breeding seedling orchards. The tree species grown in the orchards were prioritized by local communities and by the Ethiopian Government to meet livelihood needs and restore biodiversity in degraded lands.

Our conserved germplasm is used for the genetic improvement of under-researched nutritious tree foods to support more healthful African diets. This is the purpose of the African Orphan Crops Consortium, which works on 101 plant species in total, of which around half are tree foods. The genetic improvement of these crops, based on their collection, conservation and evaluation, supports diverse and resilient food systems. The African Plant Breeders Academy is the pathway by which the genetic improvement of these orphan crops reaches impact through eventually being deployed in farmers' fields.

The implementation of 'Food tree portfolios' to diversify food systems is supported by the starter germplasm that we provide. These portfolios are composed of mixes of naturalized and indigenous trees that complement the particular nutritional needs of local communities. Portfolios have been developed for 17 locations in East Africa, and the approach is now being adopted more widely. Projects in Kenya, Uganda and Ethiopia that implement the approach have so far reached 1,800 smallholder households with a wide range of food tree species, and 6,000 farmers have been trained in food tree cultivation and use.

Our Rural Resource Centres make use of diverse fruit trees maintained in our regional field genebanks to improve tree seedling distribution and link producers to tree product markets in Central and West Africa. The approach – which diversifies farms, supports livelihoods and improves resilience to climate shocks – also reduces pressure on, and thus helps conserve natural forests, by providing alternative product supplies for foods once harvested only from forests.

Join us
Opportunities to work together

The urgency is real for new investments in the conservation of tree species and their genetic resources, and in the pathways of their conservation-to-use. Without investments now, much will be irrecoverably lost and benefits once attainable through tree planting will become unachievable. Private-sector investment is needed to innovate and scale up the effective conservation and use of trees, while public-sector support is required to underpin long-term tree conservation action and basic research.

We see particular opportunities to work with public and private investors and other partners to undertake the following (see Table 1 for specific costs):

Meet the immediate funding needs of the CIFOR-ICRAF Genetic Resources Unit. The CIFOR-ICRAF Genetic Resources Unit requires support now to staff and fund essential operations to continue ongoing tree seed and seedling supply work, and maintain its seed and field genebanks. This support is required because of CIFOR-ICRAF's decision to follow a different pathway from the 'One CGIAR' initiative, which means that it will no longer receive the kind of bespoke genebank funding granted other CGIAR centres. The Global Crop Trust continue to support our genebank, currently with about 20% of the requirements to run the genebank. Additional transitional support would amount to USD 700,000 per year over the next 2-3 years.

Further develop our Genetic Resources Unit to facilitate tree conservation and use globally. We have built a team experienced in the practical procedures of tree conservation (seed storage and pre-treatment, germination and viability testing, etc.) and in the methods needed to properly choose tree planting material for use, targeted to specific locations and purposes. Further investments in our Genetic Resources Unit will allow us to grow our capacity to network with and support others in these tasks, including national genebanks and regional restoration initiatives. In particular, we can, if further funded, offer support to others in measuring the investment potential of conserving and then using high-quality tree seeds for planting and in the development of 'climate-smart' tree-planting options. In addition, investments will support the maintenance, development, evaluation and availability over the long term of our seed and field genebanks, using up-to-date, upgraded procedures. Funding of USD 500,000 a year would support us to carry out these activities.

Establish a partnership platform to scale up tropical tree conservation and quality planting. This platform would be developed in partnership with the coordinators, funders and implementers of major restoration and conservation initiatives. It would disseminate experiences in effective practice in tree seed supply and conservation through integrated approaches that impact livelihoods and landscapes positively, considering global challenges including climate change. The platform would also test options in the field for the best models that combine effective support for tree planting with effective conservation. The platform would offer guidance in topics including climate-smart seed production, seed sourcing and tree planting and management. The development and implementation of such a platform with stakeholders would cost approximately USD 3 million over a 5-year period.

Create open-access decision-support tools for effective tree planting/growing action. This would support a continued programme of work to develop and make available basic information on trees (expressed as maps and apps), as well as developing other resources that support effective tree planting and conservation, based on users' expressed requirements. Required maps include species-specific climate atlases that support climate-smart tree planting and conservation. One much-needed app is a costing tool to calculate where returns on investment in quality tree seed supply can be maximized based on location, purpose of planting and source of seed. The cost of the above specific maps or the app would be around USD 1 million and each would require about 2 years to create (both costed, consecutively, over a total of 4 years, in Table 1 below). These tools would support the partnership platform above.

Develop new approaches to establish, fund and monitor community tree conservation and use. This would support and incentivize growers to undertake the growth, conservation and evaluation of trees of significance as seed sources for wider planting. The focus will be on conserving trees that are particularly significant as sources of seed for future planting by local communities to support context-specific, well-adapted restoration practices. New digital platforms will be required that can raise funds from investors and disperse them to growers to support the work. The development, initial implementation, trial grower funding and monitoring of performance of tools would cost USD 2 million over a 5-year period.

Undertake essential collection and evaluation of tree seed for conservation and use. To scale up the conservation and use of indigenous tree species, individual species need to be collected and brought into seed and field genebanks. The budget for undertaking a regional (cross-country) collection of each prioritized species, to evaluate the germplasm, and to bring it into genebanks, is USD 300,000, spread over a 3-year period.

Build national capacity and infrastructure in tree seed supply. The establishment of breeding seedling orchards of a broader range of appropriately prioritized species is required, and these orchards must be linked with a functioning delivery infrastructure. We have an opportunity to learn from the Provision of Adequate Tree Seed Portfolios project (see Box 1) to implement breeding seedling orchards and deliver efficient delivery networks at a larger scale in Africa and globally. Budgets for each country for intervention would, for an initial investment phase of 5 years, range from USD 2 million to USD 10 million depending on the scale of national restoration targets and the current status of the tree seed sector.

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Table 1. Opportunities to work together: costing of activities

Activity (cost in thousands of USD)	Year 1	Year 2	Year 3	Year 4	Year 5	Total (across 5 years)
1. Meet the immediate funding needs of the ICRAF Genetic Resources Unit	700	700	700	-	-	2,100
2. Further develop the ICRAF Genetic Resources Unit to facilitate tree conservation and use globally	500	500	500	500	500	2,500
3. Establish a partnership platform to scale up tropical tree conservation and quality planting	250	750	1,000	500	500	3,000
4. Create open-access decision-support tools for effective tree planting/growing action	500	500	500	500	-	2,000
5. Develop new approaches to establish, fund and monitor community tree conservation and use	250	250	500	500	500	2,000
6. Undertake essential collections and evaluations of tree seed for conservation and use (per species)	100	100	100	-	-	300
7. Build national capacity and infrastructure in tree seed supply (for one country with mid-sized restoration targets)	300	700	1,000	1,500	1,500	5,000
8. As 7 for the whole of AFR100, currently 33 countries, excluding ongoing and planned investments in 5 countries supported by different donors (NICFI, GCF and IKI)	1,000	20,000	40,000	60,000	60,000	181,000

Our team

The CIFOR-ICRAF 'Trees team' is active across the tropics. Information on members of the team can be found here. The team is led by Ramni Jamnadass and Lars Graudal who are both driven by the urgent necessity of improving the livelihoods of smallholder farmers through effective tree planting.

Contact

To understand how to work with us to support more effective tree planting, please email or call:

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