

Briefing

Forests; Biodiversity

Key findings from IIED research and action for the Belize government and biodiversity decision-makers



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Key points

Belize can deliver forest landscape restoration (FLR) targets, such as the National Landscape Restoration Strategy 2022–2030 and Belize's Bonn Challenge Pledge, if smallholder farmers plant useful native agroforestry species.

Smallholder demand in Belize for knowledge on agroforestry species cultivation is being met by the Belize Botanic Gardens, through a Darwin Initiative 'planting baskets' innovation project.

Broadening links between botanical gardens and smallholder farmer organisations to grow 150+ species of native agroforestry tree and crop species requires stable FLR finance mechanisms.

Pathways to scale up FLR include networking botanic gardens that serve farmers, federating farmer organisations committed to agroforestry and building green economy coalitions to shape enabling policies for agrobiodiverse businesses.

Agrobiodiversity booms as botanic gardens serve farmers

Advancing agrobiodiversity within smallholder farmer agroforestry systems can help deliver a range of benefits, from diversified incomes and greater productivity to carbon storage and flood management. The approach is central to Belize's National Agriculture and Food Policy 2015–2030, National Agroforestry Strategy 2022 and National Landscape Restoration Strategy 2022–2030. A Darwin Initiative innovation project has strengthened the Belize Botanic Gardens (BBG) to serve smallholder farmers, building botanical knowledge, developing plant propagation skills, installing agroforestry demonstrator plots and upgrading climate resilience capabilities, promoting uptake via national TV and online. Participating farmers are being incorporated into a national restoration tracking system for agroforestry and other climate-smart restoration activities to substantiate Belize's Bonn Challenge¹ of restoring 130,000 hectares of degraded lands by 2030, while also teaching technical experts how to facilitate sustainable smallholder agroforestry systems.

The agrobiodiversity challenge

Advancing on-farm agrobiodiversity is becoming critical.² The push towards cheap food through mechanised industrial-scale farming has left the world dependent on just three species of crops for half of all its plant-based calories: rice, wheat and maize.³ With climate variability and extreme events accelerating, this lack of diversity makes food production precarious. Ecologically it is disastrous. Nutritionally it is impoverished. Socially it is inequitable, as scale efficiencies, mechanisation, chemical inputs and misdirected subsidies exclude smallholder farmers on whose land most of the world's remaining agrobiodiversity lies. Upscaling diverse alternative models found in smallholder agroforestry systems that mix trees, crops and livestock (see Figure 1) is now critical. Doing so can support diversified incomes, greater

productivity, nutritional health, climate resilience, carbon storage, biodiversity conservation, erosion control, soil fertility, water infiltration, flood management and pest control.

Smallholder farmers are the stewards of the world's agrobiodiversity.⁴ Their agroforestry systems also produce more food per unit area (34% of the world's food from 25% of its land area).⁵ As agricultural landscapes now greatly exceed in size the remaining areas of natural forest, the ecology of these systems (for biodiversity conservation) and their capacity to store carbon (for climate change mitigation) and generate income (for poverty reduction) must remain intact for humans to prosper. The integration of more native plants and animals for food, fuel, medicines and cosmetics within agroforestry systems helps conserve biodiversity (see Figure 2).

The planting baskets project complements national policies in Belize

Knowledge on the use of native tree and crop species has declined. Despite their stewardship of agrobiodiversity, general shifts towards monocultures, mechanisation and chemical inputs mean that smallholders are losing traditional knowledge. Responses to a baseline survey of 20 smallholder farmers in Belize shows

a desire to diversify crops, with preference for certain native crops, fruit and timber trees.

Belize's mixed Mayan, Mestizo, Creole, Garifuna

and European (for example, British and Mennonite) heritage provides an interesting context for restoration of agrobiodiversity. While the term 'restoration' is new to Belize, the concept has been practiced in many of these mixed cultures to support their livelihoods. Its definition varies from culture to culture and there are questions about the sustainability of some traditional farming practices. For example, the Mayan milpa system involves planting several complementary crops together – primarily squash, maize and beans. In this intercropping system, maize serves as a support for the squash vines to grow upward, the squash leaves provide ground cover, which reduces moisture loss and weed growth, and the adjacent beans fix nitrogen into the soil and provide other nutrients. On the one hand, this approach helps limit soil degradation and avoids the need for artificial fertilisers and pesticides; on the other, to establish a milpa

system the land is usually burnt before planting, which can be unsustainable if uncontrolled.

Some cultural communities in Belize are more receptive than others when it comes to modifying traditional farming methods for both productivity and sustainability. While traditional milpa farming practices are changing over time, allowing for more restorative and climate-smart practices to be used on smallholder farms, such as incorporating trees, others like the Mennonite mechanised farming system view tree cover or forested land as wasted land. Despite these differences, one notion remains constant across cultures: all land is useful land and it takes a concerted effort to ensure that it is being used sustainably.

'Planting baskets' for smallholder farmers

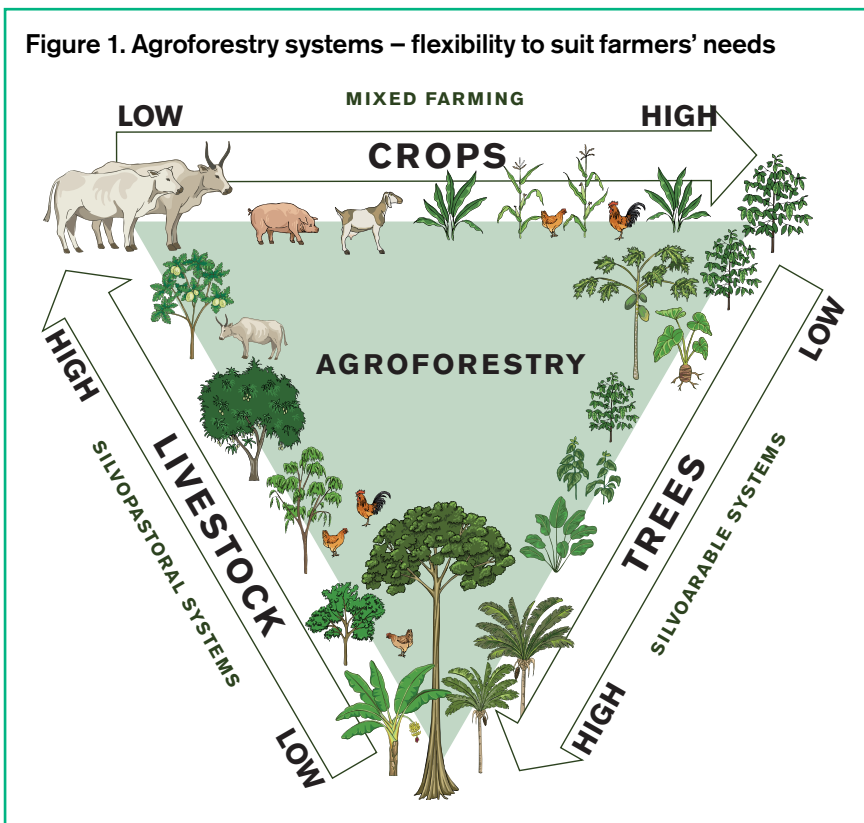
In April 2023, a Darwin Initiative innovation project, managed by the University of Edinburgh and supported by IIED and the Royal Botanical Gardens of Edinburgh (RBGE), began working with BBG and agricultural technical colleges in Belize to help the country's smallholder farmers restore landscape biodiversity and enhance climate-resilient livelihoods. The project provided smallholder farmers with the plants, training and support needed to grow a wider variety of native species, inspired by BBG's 'Gardens to Go', which offered landless families a basket of easy-to-grow seedlings during the COVID-19 pandemic, to help them meet their basic nutritional needs.

The project aimed to:

- broaden botanical knowledge,
- develop native plant propagation skills,
- establish agroforestry demonstrator plots,
- enhance climate resilience capabilities, and
- promote biodiversity restoration practices.

Broadening botanical knowledge: at the project's outset, each individual farmer tended to grow only a few main crops, despite them collectively representing more than 30 different varieties (see Figure 3). Only a few staff at BBG and Ya'axche Conservation (an NGO in Southern Belize) had seed collection and propagation skills across a wide variety of native crops, fruit and timber tree species; and there were very few examples of established setups from which students and farmers could learn.⁶

Early consultations designed by IIED and RBGE provided insights into what plants were appealing locally for diversifying food and income to build resilience. From a list of around 150 native plants assessed by BBG, RBGE and IIED as having biodiversity and livelihood benefits, project partners selected and successfully propagated

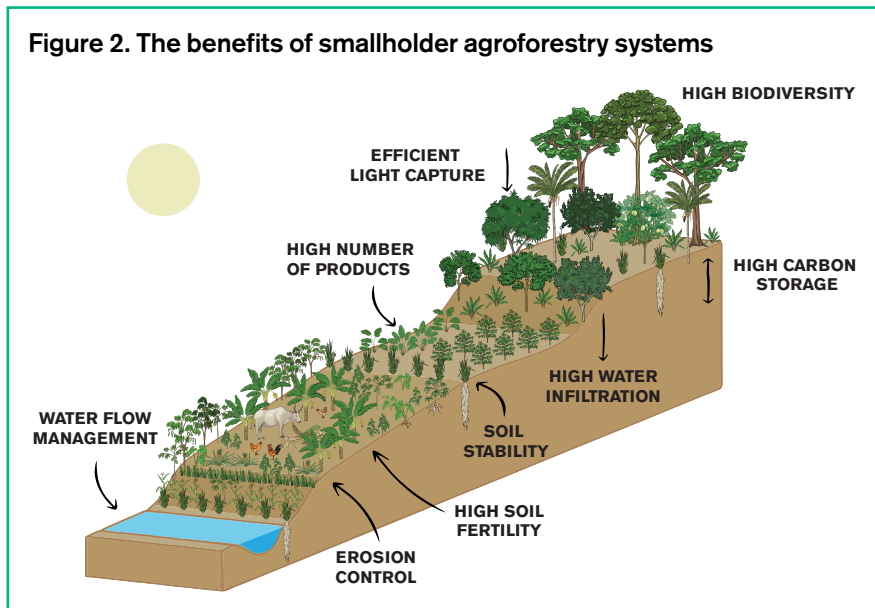


more than 40 target species for agroforestry trials. Another 30 native species were added in the project's second year. Plant identification training with stakeholders from organisations across Belize widened understanding of useful plants to collect and grow.

Developing native plant propagation skills: the project provided a total of 105 person-days of seed collection training and horticultural training to 75 men and 30 women, who then undertook seed collection missions with educators and forest rangers. Resultant seed stocks were used in the BBG propagation trials.

Establishing agroforestry demonstrator plots: the project set up an agroforestry demonstrator plot in the BBG and provided 19 smallholder demonstration farms with up to 50 plants each, tailored to different types of agroforestry model. These demonstration farms showed how different combinations of more than 150 possible plant species – emergent hardwoods, upper-canopy fruit trees, middle-canopy fruit trees, dwarf shrubs, vines, crops and root crops – could be designed, emphasising particular cash crops, livestock or a broader mix of subsistence foods, depending on the farmers' preference. For 15 (mainly female-headed) households who had less land, the project provided 'Gardens to Go', for raised beds of 3 metres x 1 metre, and additional training from BBG. The BBG demonstrator plot proved popular and demand for agroforestry demonstrator plots also came from Galen University, Mopan Technical College, Friends for Conservation and Development and even the UK High Commission.

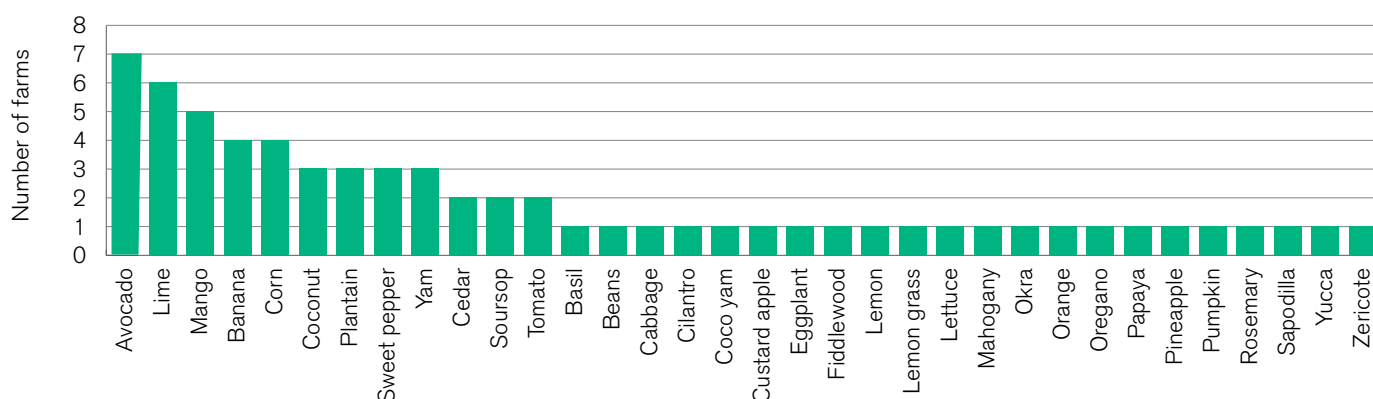
Enhancing climate resilience capabilities: when the project began, there had been few successful attempts to help smallholders adopt more diverse planting and growing (the exceptions being a small group of smallholders practising 'slash and mulch' cultivation based on Inga tree intercropping in Toledo and nascent projects in



the Belize River Valley and the Maya Forest Corridor). IIED led resilience-focused training on 'Making a business of agroforestry' and subsequently 'Agroforestry business marketing and labelling'. Sessions included local agroforestry entrepreneurs presenting insights from their own success stories, to help build confidence.

Promoting biodiversity restoration practices: at the project outset, Ya'axche Conservation had promoted an example of community cacao growing within one forest reserve as the single agreed community use of land for agroforestry within a government-protected area in Belize. The Forest Department had established a National Restoration Taskforce, but this had met only once since its inception (and not at all in the three years before the project began). Coordination meetings between agriculture and forestry authorities on the then-draft 2022 Agroforestry Strategy and the National Landscape Restoration Strategy 2022–2030 had been scarce. The project convened two workshops in the capital city, Belmopan, in February 2024 and February

Figure 3. Types of crop cultivated across 20 smallholder farms in Cayo district, Belize, at the start of the project



2025. The workshops brought together 20 key stakeholders, including representatives from three government departments (including both agriculture and forestry) and ten NGOs and academic institutions with active agroforestry and climate-resilience projects across Belize. An important outcome was to agree to rejuvenate the taskforce.

The project used different communications channels to promote and broaden engagement in biodiversity practices. It contributed to a ten-part television series, 'The Garden Show', which was broadcast nationally and covered many elements of agroforestry and biodiversity conservation to encourage uptake of new agroforestry pilots. Social media outputs, blogs on both RBGE and IIED websites and press releases coordinated by the UK High Commission, have been picked up by local media, shared widely on social media and featured as a world news story on the UK government's website, www.gov.uk.

Putting supportive national policies into practice

The planting baskets project complements several national policies in Belize.

The National Agriculture and Food Policy 2015–2030⁷ puts diversified smallholder agroforestry centre-stage. The policy aims "to engender a conducive environment for the development of an agriculture and food sector that is competitive, diversified and sustainable, enhances food security and nutrition, and contributes to the achievement of the socio-economic development goals of Belize."

The Agroforestry Strategy 2022⁸ aims to "mainstream the use of agroforestry systems that are productive, competitive, and adoptable by small, medium and large farmers, producers and land users, in order to enhance food and nutrition security, conserve natural resources (ie, lands, forests, biodiversity and water), improve the environment, and strengthen the resilience of the agricultural sector to climate change." In particular, the project's efforts could help to achieve objective 4 on agroforestry alternatives to traditional shifting cultivation; and objective 6 on market-driven approaches to products from agroforestry systems.

The National Landscape Restoration Strategy 2022–2030⁹ aims to improve "human well-being, local livelihoods, biodiversity and ecosystem services [...] via the regeneration and restoration of at least 130,000 hectares of Belize's degraded soils, forests, and agricultural landscapes." Achieving that objective will require engaging smallholder farmers who occupy the land. Efforts to foster links between botanical gardens and smallholder farmers to enrich the agrobiodiversity of smallholder agroforestry systems are especially relevant to the 2030 ambitions on improving local livelihoods (objective 2); implementing regenerative agricultural practices (objective 4) and silvopastoral systems (objective 5); raising awareness of and educating the public about landscape restoration (objective 7); putting in place a funding mechanism for forest and agro-landscape restoration (objective 8); and normalising regenerative practices to strengthen food sovereignty (objective 9).

The government of Belize plans to engage private landholders and smallholder farmers to implement silvoarable, silvopastoral and mixed agroforestry systems (see Figure 1) for higher productivity and efficient land use, using best-practice examples both within Belize and the wider region (for example, neighbouring Guatemala). Once established, these demonstration plots will be accounted within a national landscape restoration reporting tool. This will provide data for the Bonn Challenge pledge and Belize's Nationally Determined Contributions under the United Nations Framework Convention on Climate Change. The government aims to devise an incentives programme to encourage even smallholder farmers to incorporate their lands into restoration projects/programmes, ensuring sustainability of restorative actions that maintain in perpetuity ecosystem services for the people of Belize. The popularity and success of the planting baskets project suggests that supporting botanical gardens to help smallholder farmers to plant diverse native trees and food species could be a good place to start.

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FIND OUT MORE

Our work on agroforestry in Belize was undertaken as part of the upscaling innovative 'planting baskets' project run with partners. Find out more about our work on localising forest-climate action at www.iied.org/collection/localising-forest-climate-action

Notes

¹ The Bonn Challenge is a global goal to restore a total of 150 million hectares of degraded and deforested landscapes by 2020 and 350 million hectares by 2030. It is led by the International Union for Conservation of Nature. / ² Macqueen, D (2024) Advancing agrobiodiversity: why organisations of smallholders and Indigenous Peoples are vital. IIED, London. / ³ Frison, EA and IPES Food (2016) From uniformity to diversity: a paradigm shift from industrial agriculture to diversified agroecological systems. International Panel of Experts on Sustainable Food Systems, Louvain-la-Neuve, Belgium. / ⁴ Rist, S, Bonanomi, E, Giger, M, Hett, C, Scharrer, B, Jacobi, J and Lannen, A (2020) Variety is the source of life: agrobiodiversity benefits, challenges, and needs. Swiss Academy of Sciences (SCNAT), Bern. / ⁵ Ricciardi, V, Ramankutty, N, Mehrabi, Z, Jarvis, L and Chookolingo, B (2018) How much of the world's food do smallholders produce? *Global Food Security*, 17(1), pp.64–72. doi:10.1016/j.gfs.2018.05.002; Ricciardi, V, Mehrabi, Z, Wittman, H, James, D and Ramankutty, N (2021) Higher yields and more biodiversity on smaller farms, *Nature Sustainability*, 4, pp.651–657. doi:10.1038/s41893-021-00699-2. / ⁶ Save in Toledo district, supported by Ya'axche Conservation. / ⁷ MOA (2015) National agriculture and food policy of Belize, 2015 to 2030. Ministry of Agriculture, Belmopan. / ⁸ Belize Ministry of Sustainable Development, Climate Change and Disaster Risk Management (MSDCCRM) (2020, draft) Belize National Agroforestry Strategy, Belmopan. / ⁹ Belize Forest Department, MSDCCRM (2022) National landscape restoration strategy for Belize. Belmopan.

