Agroforestry uptake

Tactics that smallholder farmers use to overcome barriers to adoption

Duncan Macqueen and Elaine Springgay

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Forest and Farm Facility

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About the authors
Duncan Macqueen, senior researcher, IIED
Elaine Springgay, agroforestry officer, FAO
Corresponding author: Duncan Macqueen, duncan.macqueen@iied.org

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International Institute for Environment and Development
44 Southampton Buildings, London WC2A 1AP, UK
Tel: +44 (0)20 3463 7399
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Cover photos: A traditional agroforestry system of the Ikalahan people in the Philippines (left); a woman dairy farmer in Nepal (top right); mixed coffee agroforestry of FEDECOVERA in Guatemala (bottom right). Photo credits: Duncan Macqueen/IIED

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Abbreviations

APEOSAE Federation	Association of Small Organic Agricultural Exporters of the Southern Ecuadorian Amazon (Asociación de Pequeños Exportadores Agropecuarios Orgánicos del Sur de la Amazonía Ecuatoriana), Ecuador
ASOCAFÉ	Coffee Growers Association of Taipiplaya (Asociación de Caficultores de Taipiplaya), Bolivia
CDCAN	Central Dairy Cooperative Association Limited Nepal
CFUG	Community forest user group
CIAPEC	Comprehensive Agricultural Cooperative of Organic Producers (Cooperativa Integral Agrícola de Productores Ecológicos), Bolivia
CIFOR-ICRAF	Center for International Forestry Research and World Agroforestry (formerly the International Council for Research in Agroforestry)
CLAC	Latin American and Caribbean Network of Fair Trade Small Producers and Workers
DBG	Direct beneficiary grant
EMAPA	Food Production Support Company (Empresa de Apoyo a la Producción de Alimentos), Bolivia
EUDR	European Union Deforestation Regulation
FAO	Food and Agriculture Organization of the United Nations
FECAFEB	Federation of Bolivian Coffee Growers and Exporters (Federación de Caficultores Exportadores de Bolivia)
FEKRITAMA	Confederation of Malagasy Farmers (Fivondronamben' ny Tantsaha Malagasy), Madagascar
FFF	Forest and Farm Facility
FITAFA	Union of Agricultural Producers of Atsinanana (Fikambanan'ny Fikambanan'ny Tantsaha Faritra Atsinanana), Madagascar
IUCN	International Union for Conservation of Nature
MAGAP	Ministry of Agriculture, Livestock, Aquaculture and Fisheries (Ministerio de Agricultura, Ganadería, Acuacultura y Pesca), Ecuador

MVIWAMA	Manyara Region Network of Farmers and Pastoralists Groups (Mtandao wa Vikundi vya Wakulima na Wafugaji wa Mkoa wa Manyara), Tanzania
MVIWATA	Tanzania Farmers' Association Network (Mtandao wa Vikundi vya Wakulima Tanzania)
NGO	Nongovernmental organisation
ProAmazonía	Comprehensive Amazonian Programme for Forest Conservation and Sustainable Production (Programa Integral Amazónico de Conservación de Bosques y Producción Sostenible)
SACCO	Savings and credit cooperative organisation
Setidevi	Setidevi Dairy Producers Cooperative Society Limited, Nepal
USDA	United States Department of Agriculture
VNFU	Viet Nam Farmers' Union

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FFF surveys of knowledge needs in land and natural resources from 41 smallholder farmer organisations in six countries carried out in 2018 identified two top priority research needs: (1) climate-resilience information and options; and (2) diversified climate-smart agroforestry options. By 2022, the FFF programme had assembled case studies and guidance on the first of these priorities, climate resilience, spread in a peer-to-peer learning event in Viet Nam (see www.iied.org/20311iied and www.iied.org/21211g). Diversification for climate resilience emerged as a priority, but the question of how to advance agrobiodiversity was raised. So, in 2023 further work was commissioned resulting in guidance on how smallholder farmer organisations can advance agrobiodiversity for climate resilience, with another peer-to-peer learning event in Nepal (see www.iied.org/22251iied and www.iied.org/22451g). From that event it became clear that agroforestry was a vital strategy, allowing the integration of trees, crops and livestock to advance agrobiodiversity and climate resilience, but with well-known barriers to uptake.

Now in 2025, the FFF is seeking to understand how to overcome the barriers to wider agroforestry uptake, which directly responds to the second identified priority knowledge need of forest and farm producers: how to increase adoption of 'diversified climate-smart agroforestry'. The knowledge co-production process used by FFF involves drawing on local insights from across the world of the most innovative smallholder farmer organisations that have encouraged the adoption of agroforestry systems. These are woven together with the latest academic insights on agroforestry adoption — to provide smallholder farm organisations with the latest thinking and best practice in promoting agroforestry.

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Summary

Agroforestry is an integrated solution to three global challenges: poverty, social inequality and hunger; biodiversity and agrobiodiversity loss; and climate change adaptation and mitigation. Since smallholder farmers, Indigenous Peoples and other local communities are most impacted by these challenges, it is appropriate that agroforestry uptake as a solution requires their collective agency. Large-scale mechanisation does not easily fit with agroforestry, and so the world must look to smallholders to deliver an integrated solution that improves local food and income, restores nature, and both adapts to and helps to mitigate climate change. Greater agroforestry uptake by smallholders provides that integrated solution. This report targets an audience of smallholder farmer organisations and their technical support partners (plus academic institutions) with original new research showing how eight barriers to agroforestry adoption can be overcome.

Agroforestry can be defined as land-management practices that incorporate woody perennials (such as trees, shrubs, palms and bamboos) with crops and/or animal husbandry. Agroforestry is as old as agriculture itself and as flexible a solution as the innumerable economically useful trees, crops and animals that can be incorporated within it. Agroforestry systems can be classified by structure, by which components are mixed. For example, trees with crops are called agrosilvicultural systems. Trees with animals are called silvopastoral systems. Trees with both crops and animals are called agrosilvopastoral systems. But there are almost limitless variations of what actual species are mixed, how they are arranged spatially or over time, and what the main purpose of the system is (such as for food, fodder, fuelwood, soil or wind protection).

The nature and benefits of these different systems are the focus of Section 1. Agroforestry systems offer several benefits compared with single-crop alternatives. Agroforestry systems:

- Produce higher numbers of products (giving ecological and economic resilience)
- Are efficient at capturing light and resources (increasing overall biomass productivity and carbon storage)
- Offer ways of improving soil (fixing nitrogen, reducing erosion through contoured tree planting or increasing fertility through mulching)
- Improve water infiltration and manage runoff (mitigating increasingly extreme weather events), and
- Their diverse components can contribute to climate adaptation and mitigation and enhance biodiversity conservation.

Whether agroforestry systems are economically competitive or not depends on how well components are designed, managed, marketed and sold — but especially in the tropics, where light and growth are strong, and where systems are deliberately structured to minimise negative interactions and optimise positive synergies, many smallholder farmer organisations are finding them highly competitive.

Agroforestry system design is all important, and more a combination of art and science due to the high number of variables whose interactions can be studied over time. Systems can be thought of as being composed of a number of, but not necessarily all of, ten structural elements: emergent timber species, upper canopy fruit and timber species, middle canopy fruit and timber species, dwarf trees and shrubs, basic crops, root crops, vine crops, understory shade crops, livestock and fodder species. Examples are presented in the report of the types of species that can be found in each structural element from African, Asian and Latin American contexts.

Beyond these main structural elements, agroforestry systems can also provide shelter for many smaller animals, including both vertebrates (small mammals, birds, reptiles, amphibians and even fish) and invertebrates (especially arthropods such as insects). These smaller animals are often critical for pollination and seed dispersal, but can also contribute important products, such as honey and wax production by bees.

Although only emerging as a specific term in 1973, agroforestry has had a long history, which is summarised briefly in Section 2. Since its emergence, agroforestry has seen various promotional emphases: for food security, then for timber and later for environmental service provision, and now circling back to food and nutritional security in a changing climate.

Despite widespread consensus that agroforestry can provide an integrated solution to global challenges, and despite substantial islands of positive adoption (such as home gardens in many tropical countries), no sweeping agroforestry transition has yet taken place. Scientific reviews as to why point to eight main barriers to smallholder farmer adoption of agroforestry:

- Limited awareness of agroforestry benefits
- High upfront costs in many systems
- Additional labour requirements (especially for weeding and pruning)
- System complexity and lack of extension support
- Limited access to seed and seedlings of diverse components
- Lack of secure land tenure, space and scale to aggregate sufficient product to access markets
- Disabling policies and institutional support, and
- Lack of market information, pricing, return on investment data, and logistics.

Isolated individual smallholder farmers rarely can overcome this suite of barriers. But working together in diverse smallholder farmer organisations can provide a solution. Many examples are emerging worldwide of groups overcoming these barriers to upscale agroforestry systems.

The Forest and Farm Facility (FFF) commissioned this report to better understand useful tactics to increase agroforestry adoption. Operating since 2012, FFF has provided direct finance and technical support to strengthen organisations of smallholder farmers to pursue climate-resilient landscapes and improved livelihoods. Many have adopted and upscaled agroforestry systems on route to delivering positive impacts on landscapes and livelihoods. Seven case studies were commissioned to investigate what tactics these farmer organisations from diverse agroforestry systems were using to increase agroforestry uptake. Section 3 provides a summary of these case studies.

Despite their diversity, each smallholder farmer organisation has developed tactics to overcome each of the eight main barriers to agroforestry adoption, resulting in expanding and increasingly profitable agroforestry systems. For each case study, a description is given of their organisations, their agroforestry system and their strategy to promote agroforestry uptake.

Insights from the case studies and literature reviewed are presented in Section 4. They reveal eight main elements and 23 tactics that together form a comprehensive strategy to increase agroforestry uptake. While not every smallholder farmer organisation has adopted the same tactics, each has deployed at least one tactic to overcome each of the eight main barriers to agroforestry adoption. The main elements of this strategy and the tactics include the following:

1. Sharing experience to promote agroforestry benefits

- Facilitating agroforestry awareness-raising sessions
- Managing farmers' exchanges to see successful agroforestry models

2. Mobilising finance to bridge upfront agroforestry installation cost gaps

- Securing project linkages to fund initial adoption costs
- Setting up savings and credit cooperative organisations (SACCOs) to fund adoption
- Accessing government funds to support agroforestry adoption

3. Developing incentives or tactics to offset additional labour demands

- Minimising or subsidising additional labour costs through project training and finance
- Setting up competitions for high performers to incentivise additional labour

4. Building capacity for complex agroforestry system management

- Running or facilitating external experts to run technical training courses
- Promoting traditional knowledge transfers from experienced farmers
- Encouraging external farmer exchanges to learn new approaches

5. Providing agroforestry system species components

- Procuring seed through new partnerships and establishing community seed banks
- Developing the technical skills and facilities for tree seedling nurseries
- Running farmer seed fairs and other exchange mechanisms

6. Cooperating between members to secure tenure and achieve landscape scale

- Encouraging local farmer group formation to ease collective sales of products
- Mobilising collective community responsibilities in communal areas

7. Combining advocacy voice to shape enabling policies

- Fighting to secure tenure and tree rights for members
- Working with government to improve access to finance and to provide incentives
- Collaborating to access markets, including payments for ecosystem services (PES) markets

8. Joining forces to share knowledge, add value and access new agroforestry markets

- Research on markets and prices for unusual crops or products — especially from trees
- Procuring aggregation, processing and packaging facilities
- Participating in or running market-linking events
- Developing standards and approaches to shared certification and labelling
- Investing together in brand development that highlights agroforestry benefits
- Agreeing market development partnerships with like-minded business partners

Recommendations

First, the case studies all present clear evidence of the economically competitive nature of diverse agroforestry systems, especially when nutritional and environmental benefits are added in, and so smallholder farmer organisations should continue with helping members to upscale agroforestry adoption.

Second, the many benefits of agroforestry adoption represent an opportunity for smallholder farm organisations and technical support partners to broadcast these benefits and join forces with external donors keen to tackle priorities such as poverty, social inequality and hunger; biodiversity and agrobiodiversity loss; and climate change adaptation and mitigation in an integrated way.

Third, the pursuit of sustainable agroforestry business models is an achievable agenda and by staying the course, smallholder farmer organisations can often attract enabling investments from governments or donors, and private-sector partnerships such as with buyers and investors.

A final recommendation is for development donors. A useful role for willing donor partners is to find ways of channelling enabling investment directly to such smallholder farmer organisations to undertake the strategy described above until their systems start to attract private-sector investment. This is not about bringing in external experts but supporting smallholder farmer organisations to be the main agents of change. In other words, donors should invest in co-developing solution-based, farmer-centred agroforestry systems, with sustainable business models that will attract much-needed private-sector investment.

Guatemalan farmer in an agroforestry plot. Photo: Duncan Macqueen

1

Introduction to the importance of agroforestry

1.1 The rationale and audience for this report

This report sets out to explain what agroforestry is and what its benefits are. It then presents original new research documenting a set of tactics that can be used to overcome barriers to agroforestry uptake. Its audience is primarily organisations of smallholder farmers and their technical support partners, although it will also be of interest to academic institutions promoting agroforestry. It targets them with this information to hasten the spread of agroforestry versus monocropping. The rationale is that agroforestry provides significant benefits to smallholder farmers vis-à-vis monocrops once established, and that barriers to agroforestry uptake can be overcome to deliver those benefits. As an approach to agriculture, however, agroforestry also has planetary benefits that are important for global public goods, and indeed for human survival.

Agriculture is the world's largest land use, and how it is done matters. Of a total global land surface area of 149 million km², the total agricultural area stands at 48 million km² (46%), most of which is devoted to livestock (37 million km²). As deforestation continues, agriculture now exceeds the area of remaining forests which stands at 40 million km² (38%) (Potapov et al., 2022). Within agricultural land use, monocropping of crops, trees and livestock has become widespread (Araya, 2023). Climate change poses an increasing challenge to food security built on monocropping and it is widely recognised that diversification must become an increasing priority if the world is to maintain climate resilience (Macqueen, 2021).

Agricultural expansion has gone hand in hand with an alarming loss of agrobiodiversity. Of the 6,190 breeds of mammals domesticated historically for food and agriculture, 559 have become extinct (over 9%), and at least 1,000 more are threatened (IPBES, 2019). Of 7,000 plant species cultivated historically for food, just 80 now make a major contribution to global food supply (Romanelli et al., 2015) and just nine contribute 66% of total global crop production (sugarcane, maize, rice, wheat, potatoes, soybeans, oil palm, sugar beet and cassava) (FAO, 2019). Half of all plant-based calories come from only three species: rice, maize and wheat (Frison and IPES-Food, 2016). Monocropping at this scale presents a huge risk to food security.

Most of the world's remaining agrobiodiversity lies in smallholder farms or the territories of Indigenous Peoples (Macqueen, 2024). Approximately 1.5 billion smallholders make up about 85% of the world's farms. Farms under two hectares globally produce 30–34% of food supply on 24% of gross agricultural area (Ricciardi et al., 2018) but if one includes larger family farms, the figure rises to 80% of global food supply (Lowder et al., 2021). Smaller-scale farms orient more of their production towards food, with farms of less than five hectares producing 70% of the calories in the regions where they predominate (Samberg et al., 2016). Smallholders are also the unsung giants of climate and nature investment, collectively investing US$368 billion annually on necessary climate adaptation which includes diversifying the species and varieties planted (Hou Jones and Sorsby, 2023).

Underpinning smallholder productivity, agrobiodiversity and centrality to food supplies lies agroforestry, an approach to farming that mixes crop, tree and livestock species in agroforestry systems. But these mixed farming systems are not easy to manage. In 2018, the FFF, which commissioned this report, surveyed the knowledge needs of 41 smallholder farmer organisations from six countries (Forest and Farm Facility, 2023). According to the farmers surveyed, 'how to set up diversified climate-smart agroforestry options' was the second-highest knowledge need after 'how to build climate resilience'. As a result, the FFF knowledge coproduction team has now turned its attention to understanding how to overcome the barriers to wider agroforestry uptake — which is the subject of this report.

1.2 Smallholder producers at the forefront of global challenges

The scale and interconnectedness of global challenges is growing, as is the need for integrated social, environmental and economic solutions. Key challenges include:

- **Poverty, social inequality and hunger** (and the integrity of sociopolitical systems in the face of migration and conflict)
- **Biodiversity and agrobiodiversity loss** (and the functioning of ecosystems in the face of increasing land degradation), and
- **Climate change adaptation and mitigation** (and the resilience of rural livelihoods in the face of extreme events, shifting weather patterns and growing unpredictability).

Smallholder farmers, Indigenous Peoples and other local community groups are at the frontline of each of these global challenges. Women, youth and ethnic minorities often suffer most. The FFF — which commissioned this report — believes that any solution must be found in the collective knowledge, scale and interconnectedness of smallholder farmer organisations, Indigenous Peoples and other local community groups: those who occupy the land. It is they who frequently maintain agroforestry within their traditional practices, rather than industrial agriculture. Their agroforestry systems are in view here.

1.2.1 Reducing poverty, social inequalities and hunger

Reducing poverty, social inequalities and hunger are key concerns for smallholder farmers (those occupying less than ten hectares of land) in the tropics and subtropics. For many of these farmers, crop yields are limited by social and economic constraints rather than by biology. They often cannot afford larger fields, or the high-yielding varieties and chemical-based inputs that form the mainstay of short-term profitability, but longer-term unsustainability of industrialised temperate agriculture. Unless an alternative can be found, growing populations will face falling incomes, environmental degradation, social disintegration and migration (see Leakey, 2024). Climate change accelerates that process (Macqueen, 2024).

With limited access to chemical or technological solutions, lower-cost agroforestry systems offer some of the most viable production routes to reducing poverty, social inequalities and hunger, as well as to restoring soil fertility and ecosystem services. Using the same production area, agroforestry can increase production through stratification and/or allowing for multiple harvest seasons. Collective action is vital, since organisation provides the scale to access markets, and the unified voice to shape policies. Evidence hints that a collective investment in agroforestry can work. For example, smallholders generally mix more crops and trees to deliver productivity per unit area that is typically

high, supplying 34% of the world's food from 24% of the agricultural area, rising to 80% of the world's food if you include larger family farmers (Ricciardi et al., 2018; 2021). Moreover, a recent boom in social organisation indicates that smallholders are increasingly working together to restore their social and economic prospects (Pretty et al., 2020).

1.2.2 Conserving biodiversity and agrobiodiversity

Conserving biodiversity and agrobiodiversity are often undertaken by Indigenous Peoples and other local community groups (da Silva et al., 2025) and smallholder farmers (Macqueen, 2024). Exact figures on the contribution of these groups to biodiversity conservation remain elusive (Corrigan et al., 2018; Fernández-Llamazares et al., 2024). Nevertheless, in studying global distributions of 35,687 utilised plant species, correlations have been found between utilised and total plant diversity, with Indigenous Peoples' lands known to harbour a disproportionately high diversity of utilised plants (Pironon et al., 2024). It is estimated that agroforestry systems can contain 50–80% of the diversity of natural forests (Udawatta et al., 2019). This higher biodiversity includes above- and below-ground flora and fauna, many of which (such as pollinators, soil organisms and mycorrhizae) can increase agricultural productivity. A global meta-analysis found that restored agroecosystems, such as agroforestry systems, increase overall species diversity by an average of 68% and the supply of ecosystem services by 42% (Barral et al., 2015; FAO, 2022). For smallholder farmers, their investments often involve the establishment of diverse agroforestry systems that afford them diversified income, greater productivity, nutritional health, climate resilience, erosion control, soil fertility, water infiltration, flood management and better pest control. Smallholder systems are not an insignificant land use. Collectively, the 1.5 billion smallholder forest and farm producers also constitute the world's largest private sector, generating up to US$1.29 trillion annually (Verdone, 2018).

1.2.3 Climate change adaptation and mitigation

Climate change adaptation and mitigation are also central to the capabilities of smallholder farmers, Indigenous Peoples and other local community groups through tree growing and soil management that increases terrestrial carbon stores. Nearly one third of the world's trees grow outside the 4 billion hectares of closed-canopy forests (Crowther et al., 2015). For example, more than 43% of the world's agricultural land already has more than 10% tree cover (Zomer et al., 2016) but there is considerable scope to increase that percentage under restoration efforts, especially in Latin America, Southeast Asia, and West and Central Africa (Zomer et al., 2022).

While there are some urban trees, the majority of trees outside forests grow in diverse land-use management systems that integrate trees with crops or pasture: agroforestry. The importance of agroforestry to climate change adaptation and mitigation is evident in the significant number of countries that mention agroforestry as a solution to international

commitments: 40% of non-Annex I countries[1] propose agroforestry as a solution and 50% of 73 developing countries identify agroforestry as a means of combatting deforestation in their REDD+[2] strategies (Rosenstock et al., 2019; FAO, 2022). Diversification on farm is a mainstay of the estimated US$368 billion spent annually by smallholder farmers as the unsung giants of forced climate adaptation investment (Hou Jones and Sorsby, 2023). To put this in context, unavoidable climate change impacts are leading smallholder farmers collectively to spend more than 66 times the combined sum of all international climate finance destined for small-scale agrifood systems, estimated to be in the order of US$5.53 billion (CLIC, 2023).

1.3 The potential of agroforestry

Agroforestry refers to land-management practices that deliberately integrate woody perennials (such as trees, shrubs, palms and bamboo) with crops and/or animal husbandry (Leakey, 1996; FAO, no date). Agroforestry is as old as agriculture itself (Nair et al., 2021a). Its potential has attracted increasing attention over the last 30 years primarily as a means for sustaining agricultural productivity in marginal lands. It is also seen as a solution to some of the problems of industrial agriculture, such as secondary salinisation due to waterlogging, or contamination of water resources due to use of excess nitrogen fertilisers and pesticides (Dagar and Tewari, 2016).

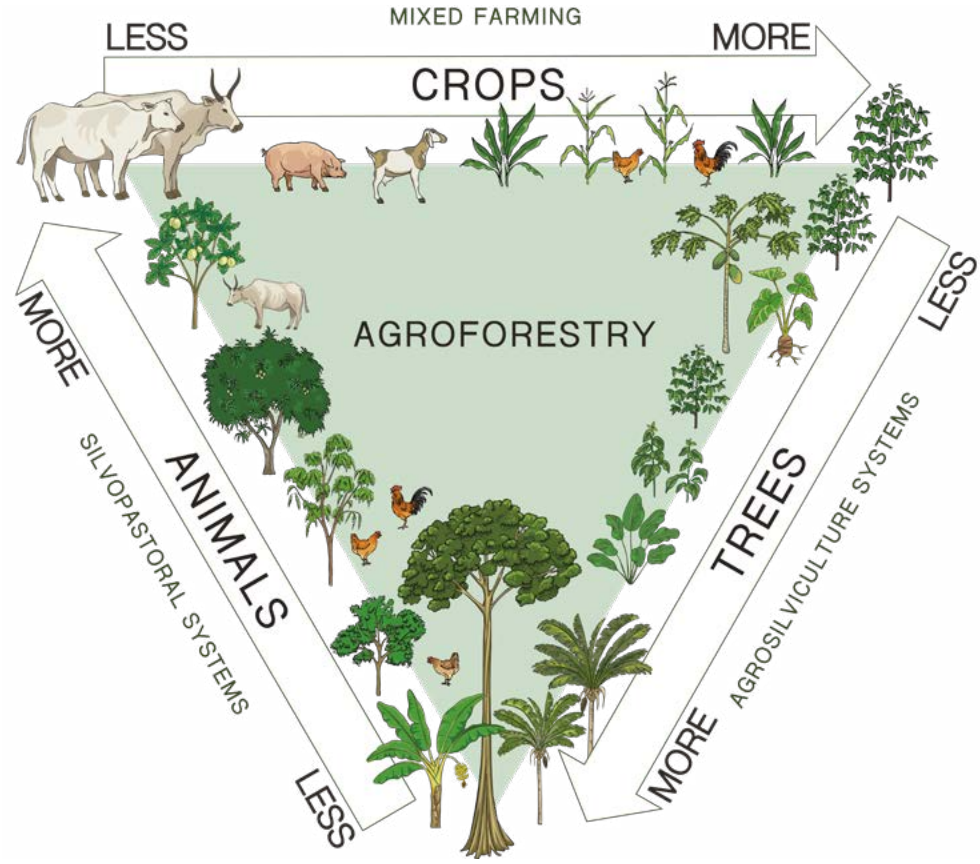
Agroforestry systems have unique potential, not only to enhance food security, but also to contribute to climate mitigation and adaptation, biodiversity conservation and land restoration (Smith et al., 2020). The expansion of agroforestry could provide substantial climate change mitigation (up to 0.31 petagrams of carbon per year), comparable to other prominent natural climate solutions such as reforestation (Terasaki Hart et al., 2023). Agroforestry also has significant restoration potential. Of the 2.2 billion hectares of degraded land identified as potentially available for restoration globally, 1.5 billion hectares is considered best-suited for mosaic restoration, including agroforestry, in which forests and trees are integrated in the management of other land uses (Minnemeyer et al., 2011; FAO, 2022).

Agroforestry comes in many forms (see Table 1). The lines between different types of agroforestry are somewhat blurred because there are essentially three continua between the pure forms of the main components — trees, crops and livestock (see Figure 1) — that can be developed in very different ecosystems (from rainforest areas and arid and semiarid tropics to temperate and even boreal regions).

1 Non-Annex I countries are mostly developing nations that are parties to the United Nations Framework Convention on Climate Change (UNFCCC) but do not have binding greenhouse gas emission reduction targets under the Kyoto Protocol. See https://unfccc.int/parties-observers

2 Reducing emissions from deforestation and forest degradation, plus sustainable forest management, conservation and enhancement of forest carbon stocks (REDD+).

Figure 1. Main agroforestry system components



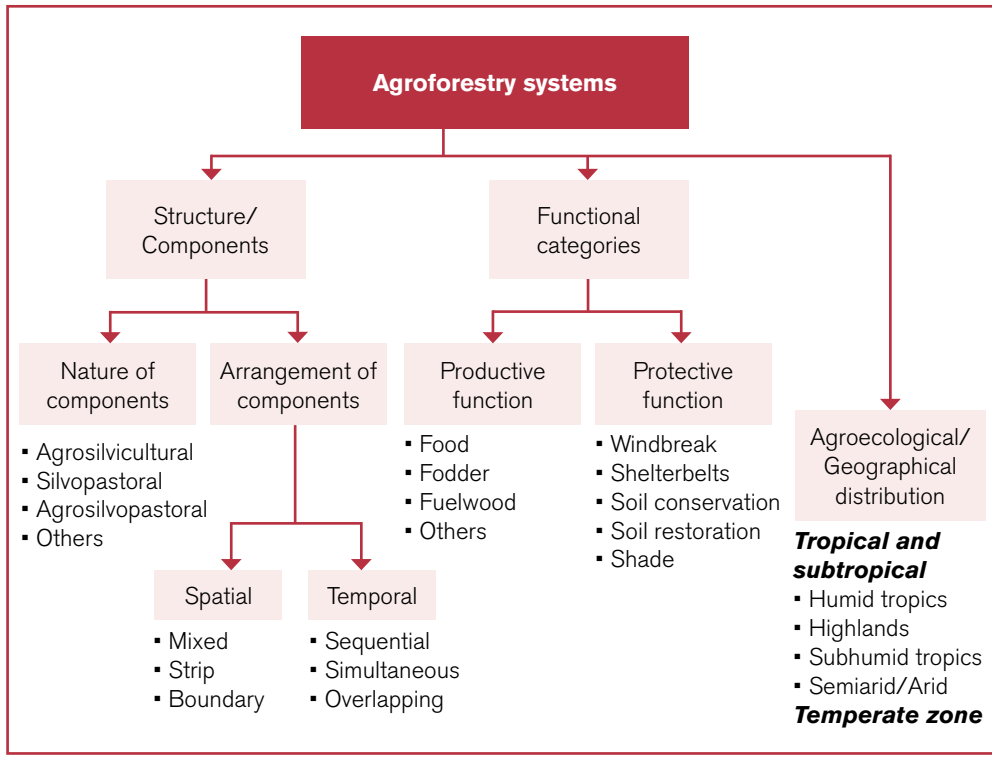
Source: Graphic by Ria Mishaal. Credit: IIED (CC BY-NC-ND 4.0)

Agroforestry systems can be most readily defined by the components that accompany the woody perennials (see Figure 1):

- Trees with crops (agrosilviculture)
- Tree with animals (silvopastoral) and
- Trees with both crops and animals (agrosilvopastoral).

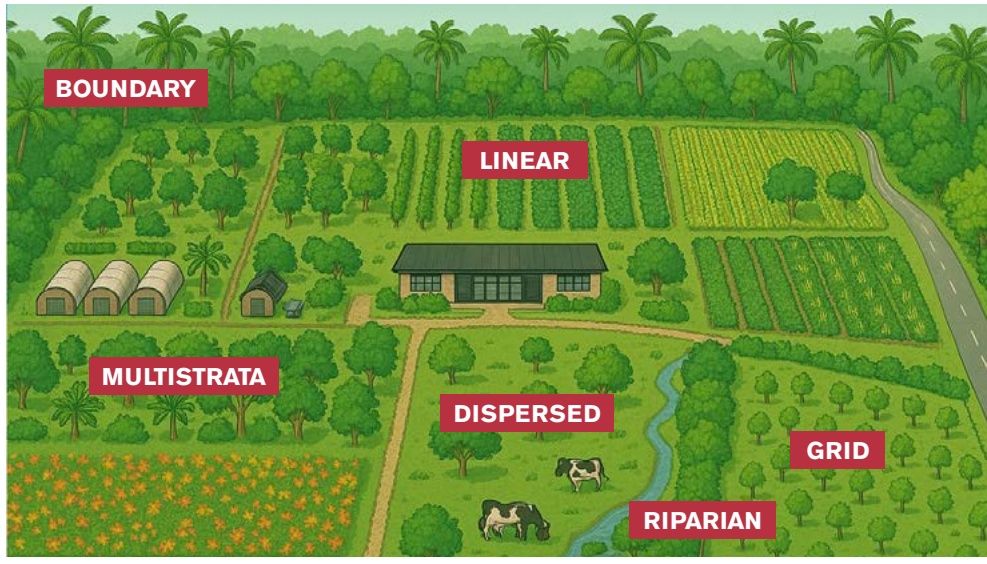
The primary types of agroforestry can be further classified based on the patterns through which tree, crop and animal components are arranged in space and time, and the functions they perform; for example, linearly or non-linearly, vertically uniform or divided into multiple strata, as well as whether they occupy the same space at the same time or occur sequentially (see also Figure 2).

Figure 2. Ways of breaking down the different elements of agroforestry systems



Credit: Nair et al. (2021a).

Figure 3. Some main spatial patterns that occur in agroforestry systems



Credit: Developed by Elaine Springgay.

Some of the main variants of these are described in Table 1, but readers should be aware of the almost limitless combinations that exist across the various components, patterns and strata, and temporal arrangements. Some systems are primarily field based, while others are primarily forest based. The choice is endless.

Table 1. Three main agroforestry system types

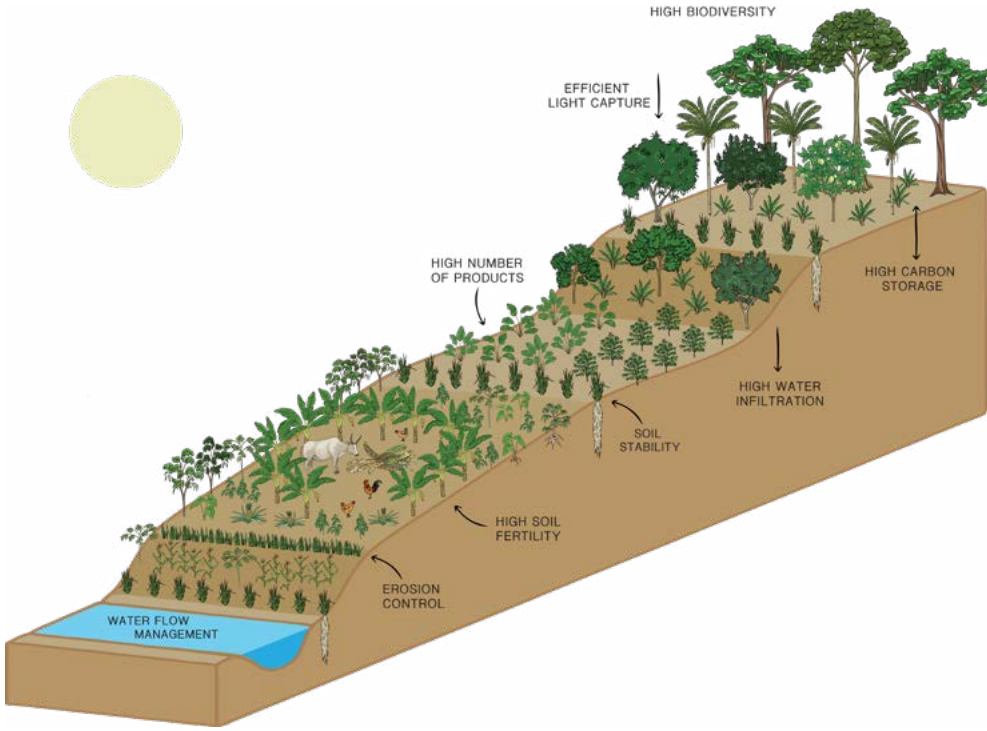
Agroforestry System	Description of main system and some common variants	Other terms commonly used to describe variants
1. Trees with crops Agrosilvicultural systems or intercropping (trees, crops; linear or non-linear; simultaneous)	**Intercropping** in agroforestry involves simultaneously growing trees and crops on the same piece of land (see discussion on types of intercropping in Huss et al., 2022). The trees may be scattered randomly or planted in a linear or other systematic pattern on agricultural lands (sometimes overlapping with shade systems or alley cropping — see below).	Multipurpose trees on farm, parkland agroforestry, mixed food crops agroforestry, agrosilviculture, traditional agroforestry, multifunctional agroforestry, scattered planting, woody perennials in cropland.
	Shade systems (trees, crops and sometimes also animals; linear and non-linear) are a form of intercropping where shade-tolerant crops such as coffee, tea, cocoa or rattan are grown under taller trees that provide partial shade (Nair et al., 2021b). These trees help create a cooler, more stable microclimate. These systems work especially well in warm, tropical areas and often look and function like natural forests.	Coffee or cacao agroforestry systems, multi-strata rainfed agroforestry, syntropic agriculture, permaculture, polyculture-shaded coffee or variants with specific tree names.
	Alley cropping systems (trees or shrubs, crops and sometimes also animals; linear) are a form of intercropping (Hombegowda et al., 2022). Usually, 2–3 rows of often nitrogen-fixing trees or shrubs, sometimes positioned along contour lines to reduce erosion, are planted with open spaces or alleys (often in the order of 4m wide) in between them to provide access to sunlight. These alleys can be used to grow crops or graze animals. The rows are cropped annually to provide nutrients into the soil so that trees and crops help each other, rather than compete. In alley cropping, both the trees and the crops can be important sources of food, income or other benefits.	Hedgerows, agrohortisilviculture system, agrosilviculture, bund planting, contour planting.

Agroforestry System	Description of main system and some common variants	Other terms commonly used to describe variants
2. Trees with animals Silvopastoral (trees, animals; linear and non-linear; simultaneous)	**Silvopastoral systems** focus on livestock production or animal husbandry with forage production and even forestry (Peri et al., 2024). Trees grow irregularly or are planted in a systematic pattern, often along boundaries on the grazing land (overlapping with boundary plantings) but also sometimes to shade cattle.	Silvopastoral systems, parkland agroforestry, trees in pasture, fodder systems.
	Boundary plantings (trees, crops or animals; usually linear) are either silvopastoral systems, or agrosilvicultural systems in which rows of woody perennials are grown along the edges of fields, roads, rivers or between farms — often with strong sociocultural overtones (Sheridan, 2016). They help mark property lines and act as natural fences or barriers against sun, water and/or wind. The main crops or animals are usually grown or raised in the open areas next to these rows of trees.	Hedgerows, shelterbelts, windbreaks, riparian buffer systems, live fences, fodder banks.
3. Trees, crops and animals Agrosilvopastoral systems (trees, crops and animals; linear and non-linear; simultaneous or sequential)	**Agrosilvopastoral systems** involve mixing all three components of trees, crops and animals in either linear or non-linear arrangements, sometimes simultaneously or sometimes sequentially over time (see Haddad et al., 2021). Such systems can be relatively simple or almost limitlessly complex.	Agrosilvopastoral systems, hortisilvopastoral system, integrated agroforestry.
	Home gardens (trees, crops, animals; linear or non-linear, simultaneous) involve multistorey combinations of a diverse and large number of woody perennials, crops and livestock established on small parcels of land surrounding homesteads (Sharma et al., 2022). They mainly serve household consumption, and often also include medicinal plants.	Backyard gardens, homestead gardens, chakra-type agroforestry, mixed agroforestry, multi-strata agroforestry, permaculture, forest gardens.
	Successional agroforestry woodlots (trees, crops, animals; non-linear or linear; sequential) are small areas where trees are grown in rows or clusters — often individually small but collectively important (Rahman et al., 2018). Sometimes they are used to restore degraded land (in fallows), or sometimes where a shifting or sequential system is used and crops are slowly shaded out by tree crops as they mature, and sometimes with permanent animals in the resultant understorey.	*Taungya* agroforestry, fallow systems.

The design of the agroforestry system will depend on environmental and sociocultural factors, as well as the primary objectives of the farmer/land user.

The benefits of agroforestry depend on the species used and their spatial and temporal arrangement. Nevertheless, when skilfully and intentionally planned, agroforestry can have multiple benefits, as shown in Figure 4.

Figure 4. Main benefits of different components of agroforestry systems



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1.3.1 High numbers of products and reduced costs and inputs

The mixture of trees, crops and livestock diversifies what can be grown and consumed or sold. Agroforestry reduces costs of buying subsistence items such as food, feed, fuel and fertiliser. It can also generate income in multiple periods of the year and not just at the harvest times of the main crops. This can provide resilience for farmers in the face of climate, market or other shocks, especially when farmers are organised to share information and develop market access collectively (Viñals et al., 2021). Diversified production can also greatly enhance nutrition and health (Jung and Vendrametto, 2025).

1.3.2 Efficient light capture

The multistrata nature of agroforestry systems, with a mix of light-demanding and shade-tolerant species, also means that light is generally captured and used more efficiently than monocropping alternatives. Systematic reviews confirm that agroforestry interventions may lead to a large, positive impact on yield, although there are high variations in findings depending on the system in question (Castle et al., 2021; Romero Antonio et al., 2025).

1.3.3 Soil fertility, stability and erosion control

In addition to greater efficiency of light capture, certain tree species can fix nitrogen to improve soil fertility, and the presence of greater above-ground biomass, practice of mulching and combination with contour planting arrangements can further enhance soil fertility, stability and erosion control. In many instances, agroforestry systems are introduced precisely to affect these benefits on soil structure and properties (Fahad et al., 2022).

1.3.4 High water infiltration and flow management

Water regulation in agroforestry systems is a function of improvements in soil properties that enhance water infiltration, regulate surface flows and recycle water through deeper tree-root systems. These tend to enhance water availability and quality (Kaushal et al., 2021).

1.3.5 High climate benefits

The above- and below-ground carbon captured within agroforestry systems is often also greater than monocropping because of the mixture of tree components with high above-ground biomass, plus organic soil-management practices that accompany its use (Zomer et al., 2022). But agroforestry is not only effective as a means of climate change mitigation, but its diversified production components also make it useful as a source of climate change adaptation and resilience (Quandt et al., 2023).

1.3.6 High biodiversity benefits

An obvious benefit is the greater number of species or agrobiodiversity that agroforestry systems include. Recent reviews reveal that floral, faunal and soil microbial diversity were significantly greater in agroforestry systems compared to monocropping — maintaining ecological processes of pollination, seed dispersal and nutrient recycling (Udawatta et al., 2019).

1.3.7 Competitive with monocropping?

This is an all-important question. Agroforestry theory is based on the principle that trees should utilise resources that crops would not otherwise access, but this may not be attained in practice. Is agroforestry competitive vis-à-vis monoculture production systems of farming, or forestry, or livestock alone? How the comparison is made is of critical importance. Some authors approach this by comparing productivity of single crops under monoculture and agroforestry — and draw the somewhat unremarkable conclusion that tree shade reduces crop yields. But they then acknowledge that the tree component may lead to a diversification and increase in overall productivity, leading to greater profitability and resilience in markets (see for example Mattalia et al., 2022; Scordia et al., 2023). Agroforestry is rarely established merely to enhance the yields of a single crop. Diversity of products is a typical aim. Indeed, many agroforestry systems, especially in the tropics where light intensities are high, have multiple crops and multiple tree crops, and multiple animal components too.

Other authors do try to assess competitiveness based on indicators of overall economic performance (Thiesmeier and Zander, 2023) and conclude that (in this case temperate) agroforestry is generally more competitive than forestry alone but variably competitive in relation to agriculture, depending on several factors. These include market prices of tree components, whether soil rehabilitation is required, the degree of system knowledge, the weighting given to risk and especially climate risk, and whether environmental externalities (such as benefits of agroforestry in terms of carbon, biodiversity or soil health) are included or not. When making comparisons in a range of tropical and non-tropical regenerative agriculture systems, including agroforestry does seem to be competitive across a wide range of sites, in both productivity and economic terms (Agnes, 2025). But there is often also a short-term dip in competitiveness in transitioning from monoculture to agroforestry. This dip reflects the time when tree components are installed (and reduce crop yields through shade), but before their trees start to produce products such as fruit, nuts, gums, resins or spices. Making these comparisons is not simple, as the sheer number of variables across the multitude of agroforestry crop, tree and animal components makes system management all important.

In summary, assessing the competitiveness of agroforestry versus monocropping requires comparisons that cover the full range of benefits that both systems produce. Categories that might need to be assessed include at the very least:

- Economic results of the full range of inputs and outputs of the systems
- Biomass/carbon results for crop, tree and livestock components in the systems
- Biodiversity benefits of the systems
- Ecological service benefits including soil fertility from the systems, and
- Social empowerment and gender inclusion benefits of the systems.

As a counterpart to diversity, some allowance must be made for the risk of failure between a single crop system and the much lower risk of failure in an agroforestry system. But also, any comparison must consider whether the potentially multiple products from an agroforestry system can be marketed and sold. Consideration must also be given as to whether chemical fertilisers and pesticides are allowable or not. All such considerations affect agroforestry's competitiveness. The same system may be competitive in one political and market context but not in another. For example, pressure to decrease the use of chemical inputs or reduce climate-related risks will increase agroforestry competitiveness. Additionally, competitiveness may increase naturally over time — for example, as agroforestry system management is refined in terms of crop combinations and as agroforestry product markets are understood.

Globally, the need for less risky, more regenerative agriculture is likely to swing policy support behind agroforestry, which will further increase its competitiveness. The consensus is that convergence of age-old wisdom with cutting-edge science represents a transformative pathway whereby agroforestry can help achieve sustainable agricultural landscapes (Johar and Priya, 2025). Shifting towards agroforestry is often already, and may be increasingly, competitive.

As farmers adopt agroforestry practices, some of these benefits might have greater priority for them than others. For example, in very steeply sloping areas, soil fertility, stability and erosion control may take priority in design considerations.

1.4 The climate-resilient flexibility of agroforestry systems

There is potential to combine almost limitless different woody perennials, crops and animals in different arrays. This makes for a great deal of contextually specific diversity and flexibility — which is a vital for climate resilience. Estimates have been made of the total land area under different types of agroforestry system. For example, the main types of spatial arrangements appear to include:

- Shade-crop systems (700 million hectares — see Figure 5)
- Silvopastoral systems (450 million hectares — see Figure 6)
- Alley cropping systems, sometimes used to anchor soils on steep slopes (300 million ha)
- Home gardens that mix trees, crops and livestock (100 million hectares — see Figure 7), and
- Tree woodlots (50 million hectares) (Nair, 2012).

However, current understanding of the spatial distribution of agroforestry is weak, with estimates of the global agroforestry extent varying fourfold, from 400 million hectares (Watson et al., 2000) to 700 million hectares (Lesiv et al., 2022), to 895 million hectares (Zomer et al., 2022), to 1,600 million hectares (Nair, 2012).

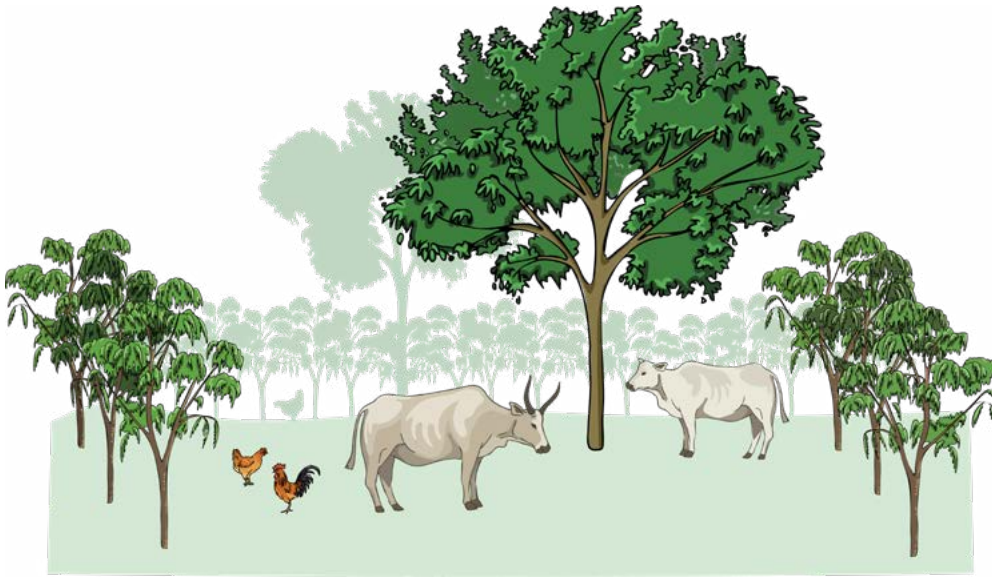
As noted earlier, shade-crop agroforestry systems in which one or more shade-tolerant plants are the main cash crops are probably the most widespread agroforestry system. These systems include well-known cash crops such as coffee and cacao but also a host of other shade-grown crop options such as many teas, rattan, bananas, cupuaçu, carambola, Surinam cherry, mulberry, turmeric, ginger, taro, sweet potato, kumquat, vanilla, kava, black pepper and so on. These crops can be grown under a range of different shade trees, including native timber, fruit and nitrogen-fixing fodder trees, making them highly versatile components of agroforestry systems (see Figure 5).

Figure 5. Example of a shade-grown cash crop (such as coffee) in an agroforestry system

Source: Graphic by Ria Mishaal. Credit: IIED (CC BY-NC-ND 4.0)

Another widespread type of agroforestry system includes silvopastoral systems where the main commercial product is some form of livestock (see Figure 6). Almost all livestock species can benefit from the judicious incorporation of trees, either as sources of fodder or shade. For example, cattle systems have been developed that use protein-rich nitrogen-fixing fodder hedges to increase cattle nutrition using a range of species such as *Gliricidia sepium*, *Leucaena leucocephala* or shade trees that also produce fruit or pods which offer good nutrition for cattle, resulting in increased milk or meat production.

Figure 6. Example of a silvopastoral system with cattle bounded by protein-rich hedges



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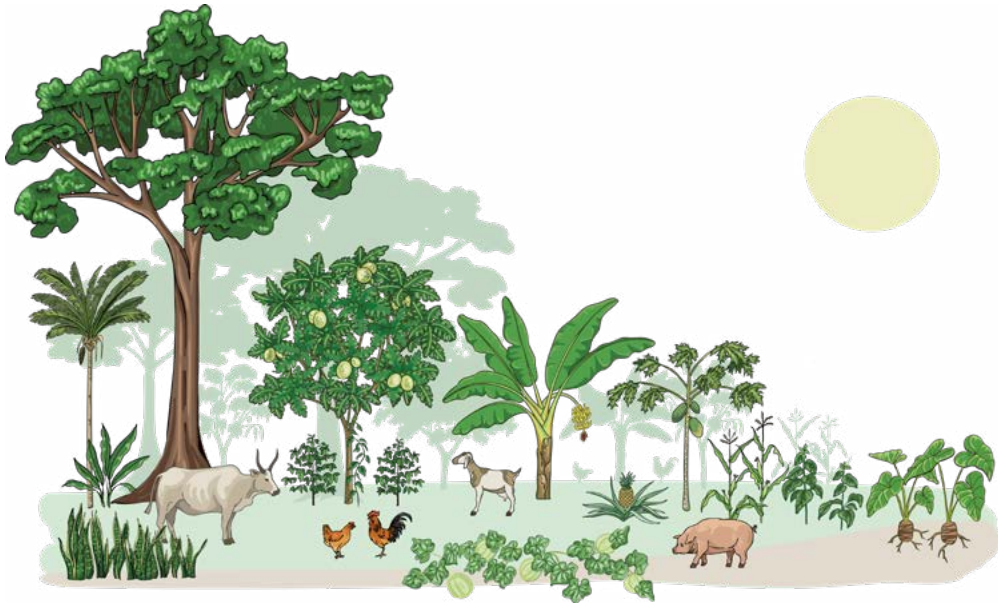
Perhaps most variable of all agroforestry systems in terms of spatial design and elements are home gardens. These combine a diverse range of woody perennials, crops and domesticated animals established on small parcels of land surrounding homesteads mainly for household nutrition, but also with occasional sales of excess product (see Figure 7). In many tropical countries, extremely complex systems have been managed over millennia by Indigenous Peoples in which the total number of species can number from between the low tens to low hundreds of species in diverse contexts such as Brazil (Pauletto et al., 2023), Southern Ethiopia (Legesse and Negash, 2021), Northern India (Yashmita-Ulman et al., 2021), and Java (Suwartapradja et al., 2023).

Figure 7. Example of a mixed-farming home-garden system mixing subsistence and commercial crops



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The degree to which these different systems store carbon or protect agrobiodiversity obviously depends both on the biome and the nature of the agroforestry system. Woodlots, shade-grown crops and boundary-planting systems often have the highest agroforestry-related above-ground carbon figures, with the highest carbon values found in tropical monsoon or humid subtropical zones and the lowest in dry tropical woodlands and savannahs (FAO, in press). Meanwhile, shade-grown crops and home gardens can boast very high agrobiodiversity.

There are a huge number of different terms that overlap with or are used synonymously with agroforestry, each with its advocates (see Box 1). Perhaps the most useful addition is the term 'multifunctional' that hints at the breadth of social, economic and ecological factors that need to be considered in making agroforestry work.

Box 1. Terms that overlap with agroforestry

For a useful summary of the different emphases, see Leakey (2024):

- Agroecological approaches (Sinclair et al., 2019)
- Conservation agriculture (Michler et al., 2019)
- Climate-smart agriculture (Lipper et al., 2018)
- Community-based adaptation (Kirkby et al., 2017)
- Ecoagriculture (McNeely and Scherr, 2003)
- Evergreen agriculture (Garrity et al., 2010)
- Farm forestry (Nair, 1993)
- Forest landscape restoration (Spathelf et al., 2018)
- Integrated agricultural systems (Gil et al., 2017)
- Integrated landscape approach (Duncan et al., 2021)
- Integrated natural resource management (van Noordwijk, 2019)
- Multifunctional agriculture (Leakey, 2024 based on IIASTD, 2020)
- Natural farming (Kumar et al., 2023)
- Nature-based solutions (IUCN, 2021)
- Organic agriculture (Mendoza et al., 2020)
- Permaculture (Mollison, 1997)
- Sustainable agriculture (Adhikari et al., 2018)
- Sustainable intensification (Cassman and Grassini, 2020)
- Syntropic agriculture and farming (Götsch, referenced in Andrade et al., 2020)
- Trees on farms (Zomer et al., 2009).

For the main types of agroforestry systems described in Table 1 and Figures 5–7, it is possible to identify several main structural components. These can be made up of very many different species depending on the geographical and ecological context (see Figure 8 and Table 2).[3] Structural components can help to describe and design agroforestry systems that meet the needs of individual farmers. But it is important to note that not all structural components exist across systems, or even simultaneously within a single system.

Figure 8. Main structural components of the three main types of agroforestry system

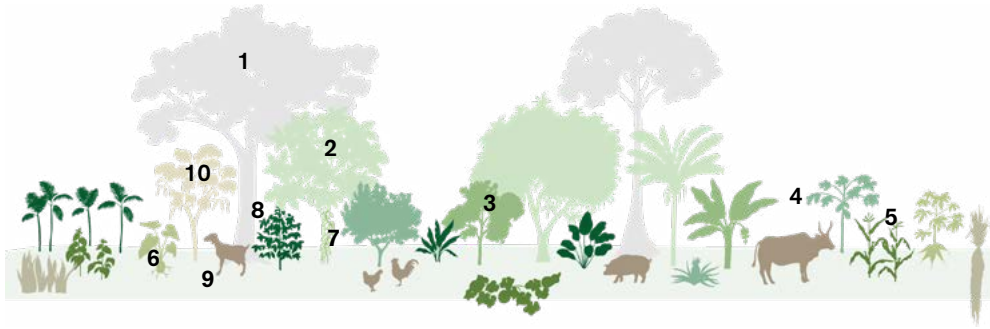

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Table 2. Agroforestry structural components with example species from case studies

Agroforestry component	African species examples (Tanzania)	Asian species examples (Nepal)	Central American species examples (Belize)
1. Emergent timber species	*Croton megalocarpus* (Mukinduri), *Grevillea robusta* (Silky oak), *Melia azedarach* (Chinaberry tree)	*Schima wallichii* (Chilauni) *Shorea robusta* (Sal), *Castanopsis indica* (Dhale Katus)	*Cedrela odorata* (Cedar), *Ceiba pentandra* (Ceiba), *Brosimum alicastrum* (Breadnut)
2. Upper canopy fruit and timber species (~30m)	*Annona cherimola* (Custard apple), *Mangifera indica* (Mango), *Persea americana* (Avocado)	*Artocarpus heterophyllus* (Jackfruit), *Mangifera indica* (Mango), *Litchi chinensis* (Lichi)	*Artocarpus altilis* (Breadfruit) *Attalea cohune* (Cohune), *Mangifera indica* (Mango)

3 The numbers shown in Figure 8 correspond to the numbered agroforestry components listed in Table 2; the example species shown in Table 2 are drawn from the IIED case studies from Tanzania, Nepal and Belize.

Agroforestry component	African species examples (Tanzania)	Asian species examples (Nepal)	Central American species examples (Belize)
3. Middle canopy fruit and timber species (~20m)	*Citrus sinensis* (Chungwa), *Eriobotrya japonica* (Loquat), *Musa acuminata* (Banana)	*Psidium guajava* (Guava), *Citrus sinensis* (Orange), *Diospyros kaki* (Persimmon) *Musa acuminata* (Banana)	*Musa acuminata* (Banana), *Anacardium occidentale* (Cashew), *Byrsonima crassifolia* (Craboo)
4. Dwarf trees and shrubs (~5–10m)	*Cyphomandra betacea* (Tree tomato), *Punica granatum* (Pomegranate)	*Carica papaya* (Papaya), *Bauhinia purpurea* (Tanki), *Bauhinia variegata* (Koiralo)	*Carica papaya* (Papaya), *Ananas comosus* (Pineapples), *Eugenia uniflora* (Surinam cherry)
5. Basic crops	*Zea mays* (Corn), *Phaseolus vulgaris* (Beans), *Cajanus cajan* (Pigeon peas)	*Oryza sativa* (Paddy rice), *Zea mays* (Corn)	*Amaranthus viridis* (Callaloo), *Zea mays* (Corn), *Cucumis melo* (Cantaloupe)
6. Root crops	*Allium cepa* (Onion), *Allium sativum* (Garlic), *Daucus carota* (Carrot), *Ipomoea batatas* (Sweet potato)	*Solanum tuberosum* (Potato)	*Colocasia esculenta* (Cocoa Yam), *Manihot esculenta* (Cassava), *Dioscorea trifida* (Yam)
7. Vine crops	*Coccinia grandiflora* (Ivy Gourd)	*Jasminum* species (Malati)	*Piper nigrum* (Black pepper), *Sechium edule* (Chocho), *Vanilla sp.* (Vanilla)
8. Understorey shade crops	*Amaranthus hybridus* (Amaranth), *Brassica chinensis* (Chinese cabbage) and *Malva trilobata* (common mallow)	*Coffea arabica* (Coffee), *Brassica oleracea var. capitata* (Cabbage), *Brassica oleracea var. botrytis* (Cauliflower)	*Zingiber officinale* (Ginger), *Calathea lutea* (Waha leaf), *Coffea arabica* (Coffee)
9. Livestock	*Anas platyrhynchos* (Duck), *Bos taurus* (Cattle), *Gallus gallus* (Chicken), *Sus domesticus* (Pig)	*Bos indicus* (Cattle), *Bubalus bubalis* (Buffalo), *Capra hircus* (Goat), *Gallus* (Chicken)	*Bos taurus* (Cattle), *Gallus gallus* (Chicken), *Sus domesticus* (Pig)
10. Nitrogen-fixing hedgerow species	*Calpurnia aurea* (East African Laburnum), *Albizia gummifera* (Peacock flower) and *Vachellia kirkii* (Flood Plain Acacia)	*Alnus nepalensis* (Uttis) and *Leucaena leucocephala* (Ipil-Ipil)	*Albizia lebbeck* (Albizia), *Gliricidia sepium* (Gliricidia), *Leucaena leucocephala* (Leucaena)

Beyond these main structural components, agroforestry systems can also provide shelter for many smaller animals, including both vertebrates (small mammals, birds, reptiles, amphibians and even fish) and invertebrates (especially arthropods such as insects). These smaller animals are often critical for pollination and seed dispersal, but can also contribute important products, such as honey and wax production by bees. Honey and wax can be among the most important products in some agroforestry systems.

Agroforestry nursery of MVIWAMA in Tanzania. Photo: Canisius Kayombo

1.5 Smallholder producers as the central engines of agroforestry

In the FFF surveys of what knowledge 41 smallholder farmer organisations from six countries most needed, 'climate-resilience information' topped the list of natural resource issues, followed by how to develop 'diversified climate-smart agroforestry' systems (Macqueen, 2021). In the agroecological realm, smallholder farmer organisations have developed sophisticated tactics to advance agrobiodiversity — such as marketing nutritional, health and cultural values, sharing knowledge and seed to cultivate diversity, aggregating baskets of quality products from the same landscape, mobilising internal finance to invest in experimental diversification, and shaping enabling policies for the above (Macqueen, 2024). Agroforestry systems can play a central role in such strategies.

Overlaying maps of the world's agrobiodiversity with maps of the world's average farm size reveals a striking correlation: smaller farms in general harbour greater agrobiodiversity (Rist et al., 2020). Their mix of subsistence crops (to maintain healthy nutrition) and cash crops (to earn income) imply that smallholders plant many more species than larger industrial-scale farms.

There are increasing calls for agroforestry to be farmer-centred rather than technology- or profit-centred (see Gassner and Dobie, 2022), whereby agroforestry is designed to address the primary production and overall objectives of the farmer and their household. Farmer-centred objectives may include reducing costs and/or increasing revenue, but they may also include generating additional products and production seasons, providing shelter or nutrients for crops and animals, maintaining soil health and water-storage capacity, and enhancing biodiversity or climate-change resilience.

From choices in species selection to their spatial and temporal arrangement and management planning, farmers can design agroforestry systems that meet their needs, taking into consideration their environmental and socioeconomic and cultural contexts, such as supply chain and market availability, existing capacities and extension services, accessible incentives, labour and financial flows. When co-designed with the objectives, resources and needs of the farmers and their households, the agroforestry system is more likely to benefit the farmer in the short, medium and long term. Several good manuals and guidebooks have been produced to guide farmers through agroforestry establishment in different biomes and using varied degrees of detail (see for example Rocheleau et al., 1988; Miccolis et al., 2019; Gassner and Dobie, 2022; A Rocha, 2024; Gold et al., 2024).

Shade-grown coffee under natural forest in Nepal. Photo: Duncan Macqueen

2

The history of agroforestry, its main proponents and approaches

The term 'agroforestry' was first coined by the Canadian forester John Bene in 1973, but in practice it has existed in various forms throughout the world for millennia, evolving with the domestication of crops, trees and animals (King, 1987; Dager and Tewari, 2017). In fact, it is likely that agroforestry was one of the earliest forms of agriculture. The earliest phases of agricultural management were dominated by shifting cultivation, with alternating periods of agriculture and forestry. These systems evolved into more permanent systems involving the integration of crops and woodland grazing within forested landscapes. Similarly, forest or tree elements were selected to remain within agricultural lands, sometimes with the transfer of nutrients from woodlands to cultivated crops via manure (King, 1987; Smith, 2007; Dager and Tewari, 2017; Rendón-Sandoval et al., 2020).

Over time, agroforestry has transitioned from management systems with an emphasis on subsistence and food production, to those with an emphasis on wood production, to an emphasis on systems that emphasise soil management and environmental service provision (King, 1987; Nair, 2007). More recently, there is a re-emergence of the importance of agroforestry to provide food and nutrition security. There is now an increasing movement for agroforestry to achieve these multiple objectives, managing priorities and trade-offs. However, achieving agroforestry systems that provide sustainable economic benefits to land users, while maintaining environmental integrity, has been rather elusive.

2.1 Traditional agroforestry practice (pre-history to 17th century)

The earliest practitioners of what is now known as agroforestry primarily aimed for food production, where trees were recognised as an integral part of food systems, enriching productivity and making food more accessible. These agroforestry systems were generally devoid of intentional intensified cultivation of agricultural or forage crops. Unlike more modern land uses, there was no strict boundary between 'forests' and 'agriculture' in many traditional societies. Instead, there was a continuum where forests were progressively domesticated to meet human needs while retaining ecological functions (Michon, 2005). Some of these systems still exist today and are distributed worldwide, including the temperate regions of Europe and North America, though they are predominantly found in the tropics across Asia and the Pacific, Africa and Latin America. These systems are often referred to as traditional agroforestry systems (TAFS) (King, 1987; Viswanath and Lubina, 2017) and include chestnut forests in France; cork oak forests in Portugal; grazing in forests in Galicia, Spain; forest gardens in North, Central and South America; coffee in Ethiopia; and rice agroforestry in China. Some of these systems have been recognised as Globally Important Agricultural Heritage Systems (GIAHS), due to their contribution to conserving agrobiodiversity, landscapes and cultures around the world.

Historically, the most common systems included multistorey cropping systems such as forest and home gardens, intercropping with select trees for shade and silvopastoralism (Nair, 2007; Smith, 2007; Mosquera-Losada et al., 2012; Viswanath and Lubina, 2017 and Rendón-Sandoval et al., 2020). Shifting cultivation was also very common: a form of sequential or rotational agroforestry occurring over long periods (such as decades). It involved the clearing or removal of most trees from degraded forest, burning the slash, cultivating food crops for varying periods on the cleared area, and then planting or sowing trees before, along with or after growing agricultural crops (Dager and Tewari, 2017).

Depending on the region and environment, the prevalence of these systems varied around the world. But a common characteristic of traditional agroforestry systems is their

dependence on native tree species that have structural, functional and socioeconomic attributes, as well as a service-provision role (Viswanath and Lubina, 2017). Home and forest gardens evolved with early domestication, and were established to provide more reliable food sources close to homesteads, communities and migration routes. Shifting cultivation depended on the extent of the territory, fertility of the land and population size.

As agricultural production became more permanent, intensifying and expanding into forested lands, trees that produced fruits, nuts and fodder were recognised as being of high value and often retained during forest clearance.

2.2 The loss of agroforestry in agricultural intensification (17th to 19th centuries)

The industrial and agricultural revolutions in the 18th and 19th centuries in Europe saw the development of new tools and methods that boosted agricultural production, an approach that slowly spread around the world. Earlier systems integrating trees and agricultural production began to decline as crop rotation was developed as a method to maintain soil fertility, replacing reliance on the transfer of nutrients from woodlands to croplands. With mechanisation, agriculture became increasingly specialised for crop, animal or wood production. Colonial administrations and later development models promoted single-crop plantations (such as rubber, coffee, oil palm and other commodities) as more 'modern', efficient and economically rational. These systems were designed for export markets, revenue generation and administrative simplicity (Michon, 2005). This generally resulted in integrated systems practised only where economic returns were still profitable or in areas of marginal lands that were considered less accessible, less productive, difficult to mechanise or better suited for agroforestry (Michon, 2005; Smith, 2007; Mosquera-Losada et al., 2012).

By the end of the nineteenth century, wood production was also increasingly a dominant objective for agroforestry due to the loss of forests, growing need for wood products, degraded agriculture land and the need to give landless labourers or farmers access to land and employment. The development of *taungya* in Myanmar (a successional forest-management system where land is first cleared for food crops, then tree seedlings are planted with a longer-term intention of harvesting timber) saw the return to shifting cultivation and agriculture in forest lands. Crops were grown within forest plantations in the early years, then grazing of the understorey was allowed, as the maturing trees increased canopy cover. Farmers gained access to land, and trees managed by the forest department were protected (King, 1987; Dager and Tiwani, 2017). The British spread *taungya* to India and then to South Africa and to other parts of the British Empire, influencing other regions as well.

2.3 Modern agroforestry and environmental awareness (20th century)

The rise of monoculture farming, particularly during the Green Revolution of the mid-20th century, profoundly reshaped agricultural landscapes worldwide. Driven by the imperative to increase food production, this model promoted the expansion of specialised single-crop systems and was heavily reliant on chemical fertilisers, pesticides and mechanisation (Shiva, 1991; Perfecto et al., 2009; van Noordwijk et al., 2011). Supported by governments, international development agencies and financial institutions, monoculture farming was framed as the pathway to modernisation and economic development. This new norm, increasingly influenced by capitalism, reduced the need for labour and promised an increase in quality of life (King, 1987). However, this shift often came at the expense of traditional systems, which were dismissed as inefficient, primitive or obstacles to progress (Michon, 2005). The widespread conversion of diverse, multistrata agroforests into monoculture plantations led to the erosion of Indigenous ecological knowledge, declining biodiversity, reduced ecosystem services and land degradation (Michon, 2005; Perfecto et al., 2009; van Noordwijk et al., 2011).

By the late 1970s, frustrations arising from the failure of the Green Revolution to benefit rural communities — combined with escalating land-management problems, such as tropical deforestation and soil degradation — brought a renewed interest in traditional practices, including tree-and-crop integrated farming practices. Increasingly, international development agencies and researchers recognised that conventional agricultural models — centred around monocultures and external inputs — were insufficient to sustainably address food insecurity and environmental degradation, particularly in the tropics (Garrity, 2004). Smallholder farmers were struggling with soil degradation, nutrient depletion and deforestation, which further exacerbated poverty and food insecurity. Simultaneously, traditional agroforestry practices were showing promise in improving yields while conserving the environment, yet there was little organised research or technical development to optimise and scale these systems (Sanchez, 1995).

In response, social forestry and community-based forest management emerged in the 1970s to address poverty and livelihood issues. Agroforestry played a pivotal role in social forestry projects. Meanwhile, FAO utilised the Eighth World Forestry Congress in Jakarta, Indonesia in 1978, to focus attention on the important topic of agroforestry. The central theme of the Congress was 'forests for people' and a special section was devoted to forestry for rural communities. It was also during this period that agroforestry became strongly linked to soil conservation and other environmental benefits, and research targeted knowledge gaps in ecosystem services from agroforestry (King, 1987; Viswanath and Lubina, 2017).

The International Council for Research in Agroforestry (ICRAF) was officially established in 1978 in response to mounting concerns over land degradation, soil fertility decline, deforestation and rural poverty in tropical regions (ICRAF, 2006).[4] Founded with support from the United Nations Environment Programme (UNEP), the World Bank and several bilateral donors, ICRAF was created to formalise and advance research into agroforestry. Its mandate focused on developing scientifically based agroforestry systems that could improve soil fertility, crop productivity, livelihoods and ecological sustainability. This involved research on the interactions between trees, crops and livestock, and the domestication and deployment of valuable tree species for fodder, fuelwood, timber and soil restoration, including nitrogen-fixing species.

Starting around the same time in the late 1970s, a drive to collect, domesticate and promote the use of multipurpose nitrogen-fixing trees was a significant effort in agroforestry development spearheaded by institutions such as the Oxford Forestry Institute and Winrock International. Research into the provenance of seeds and seed banks were established to better understand genetic diversity, adaptability to various climates and optimal uses in agroforestry systems (Brewbaker, 1986).

By the late 1990s and early 2000s, the use of multipurpose trees that improved soil health, provided nutritious leaves and had climate resilience became popular. These 'miracle trees', many of which are leguminous and nitrogen fixing, were widely promoted by the Oxford Forestry Institute, ICRAF, FAO and other organisations as solutions to land degradation, climate variability and food insecurity (Garrity, 2004). Trees such as *Calliandra calothyrsus, Faidherbia albida, Gliricidia sepium, Leucaena leucocephala, Moringa oleifera* and *Prosopis juliflora* are notable examples. Reported outcomes included improved soil fertility, higher crop productivity, enhanced biodiversity and greater climate resilience among smallholder farmers (Garrity et al., 2010; Leakey, 2012). However, some of these species also proved to be highly invasive and problematic to farmers and broader environments in certain contexts. As a result, a greater emphasis on Indigenous and naturalised species has become more prevalent.

During the last 30 years, the positive benefits of agroforestry to producers and the environment have been increasingly recognised. Combining trees and crops in spatial or temporal arrangements has been shown to improve food and nutritional security and to mitigate environmental degradation, offering a sustainable alternative to monoculture production. By providing supportive and complimentary roles with a flexible approach, agroforestry can offer specific social and environmental benefits across a range of landscapes and economies (Nair, 2007).

4 The International Council for Research in Agroforestry (ICRAF) changed its name to the World Agroforestry Centre in 1991. Then in 2019, ICRAF merged with the former Center for International Forestry Research (CIFOR) to become one organisation (CIFOR-ICRAF). See www.cifor-icraf.org

2.4 The challenge of agroforestry uptake

Despite its many benefits, the adoption of agroforestry practices has faced many challenges and the scaling up and impact of agroforestry has been less than expected. No sweeping agroforestry transition has taken place (Ollinaho and Kröger, 2021). The potential for landscape restoration, carbon sequestration and income diversification remains untapped. This is despite the fact that for smallholder farmer organisations, as the FFF surveys show, banking on monoculture crops serving single markets is apparently no longer a safe bet. Yet managing diverse agroforestry systems presents its own challenges.

Recent scientific reviews describe the challenges that smallholder farmer organisations might face to upscaling agroforestry (van Noordwijk et al., 2016; Bettles et al., 2021; Hastings Silao et al., 2023; Tranchina et al., 2024), which include eight main issues:

1. **Limited awareness of agroforestry benefits:** For example, farmers might be unaware of benefits to overall productivity, income options and diversity, reduced input costs (via nitrogen fixation, green manure and integrated pest management), nutrition and health, and climate and biodiversity benefits.
2. **High upfront costs in many systems:** Many farmers face the challenge of finding finance to pay upfront costs and/or to cover the transition period necessary to establish agroforestry until they can reap the benefits of greater productivity and income, which can range from 3–10 years (Agnes, 2025).
3. **Additional labour requirements:** Another challenge for farmers is the shortage of labour that can be differentiated, adequate equipment for effective tree management and time to implement or maintain agroforestry systems.
4. **System complexity and lack of extension support:** Farmers have knowledge deficits on technical and agronomic matters, sometimes gender differentiated, to do with the multidisciplinary management required of agroforestry systems and tree cultivation.
5. **Access to high-quality seed and seedlings of diverse components:** Farmers often experience information asymmetries about — or lack access to — good-quality source materials such as seeds or seedlings of unfamiliar agroforestry species, especially trees.
6. **Lack of secure land tenure, space and scale to aggregate products:** Smallholder farmers often have a limited scale of land or lack tenure security which is again often gender differentiated. This disincentivises the introduction of long-term and space-demanding trees.

7. **Disabling policies and institutional support:** Policies and institutions can discriminate against tree ownership or forest land ownership (the trees may belong to the state even if the land is owned by the farmer, or trees planted may belong to the landowner rather than the tenured farmer). Policies may also support monocropping.
8. **Lack of market information, pricing, returns-on-investment data, and logistics:** Farmers experience information gaps and socioeconomic uncertainties relating to value chains, markets, pricing and marketing of agroforestry products, as well as limited examples of agroforestry systems designed to optimise short-, medium- and long-term economic viability.

Finally, climate change may exacerbate these agroforestry challenges, for example by reducing tree growth, intensifying tree–crop resource competition and reducing crop yields (see Watts et al., 2022).

There are many challenges to the uptake of agroforestry. Nevertheless, some smallholder farmer organisations showcase successful management of diversified agroforestry systems. How have they achieved this? What innovative tactics have smallholder farmer organisations used to upscale the adoption of the more common types of agroforestry system? These are the questions that form the focus of our current research.

Traditional Ikalahan agroforestry system in the Philippines. Photo: Duncan Macqueen

3

Case studies on agroforestry uptake

This research comes out of the Forest and Farm Facility, which was established in 2012 as a partnership and multidonor trust fund that provides direct support to smallholder farmer organisations to achieve climate-resilient landscapes and improved livelihoods. The partnership comprises the Food and Agriculture Organization of the United Nations (FAO), the International Union for Conservation of Nature (IUCN), IIED and AgriCord. IIED manages the coproduction of knowledge with smallholder farmer organisations that will help deliver the goal of the programme.

As noted earlier, surveys of smallholder farmer knowledge needs relating to land and natural resources identified two top priorities, with 'diversified climate-smart agroforestry options' coming second to 'climate-resilience information'. Agroforestry systems are the central land-use system that allows the integration of trees, crops and livestock to advance agrobiodiversity and climate resilience. This report was commissioned by FFF to provide insights on how to increase the adoption of 'diversified climate-smart agroforestry'.

The knowledge coproduction process used by FFF involves a set of steps (see Covey et al., 2021). Having agreed on agroforestry uptake as a priority area of knowledge coproduction, and having conducted a background literature review, terms of reference were prepared for documenting locally managed agroforestry case studies from which knowledge could be derived. The intention was to create case studies drawing on locally led insights from across the world: in this case, from smallholder farmer organisations that were known to have successfully encouraged the adoption of agroforestry systems.

FFF facilitators identified which smallholder farmer organisations supported by FFF had done the best job of upscaling agroforestry adoption. The intention was for insights from the case studies to enrich an academic review of agroforestry adoption — and to provide the target audience of smallholder farmer organisations and their technical support partners with ideas and examples of successful best practices in promoting agroforestry. The selection process was subjective and based on the experiences of the facilitators rather than set criteria. The main aim was to draw findings from groups where agroforestry uptake was known to have been successfully achieved. The selected case studies are summarised in Table 3.

Table 3. Case studies summary: smallholder farmer organisations upscaling agroforestry adoption

#	Country	Name	Description of agroforestry	Reference
1	Bolivia	ASOCAFÉ (Asociación de Caficultores de Taipiplaya — Coffee Growers Association of Taipiplaya)	A shade-grown coffee agroforestry system covering 239 hectares, established by an association of 199 members from 34 communities and four agricultural centres, in the Taipiplaya region of the province of Caranavi in Bolivia.	Escobar Guevara and Fernández Arancibia (2025a)
2	Bolivia	CIAPEC (Cooperativa Integral Agrícola de Productores Ecológicos — Comprehensive Agricultural Cooperative of Organic Producers)	A shade-grown coffee system covering 208 hectares, established by a cooperative of more than 300 members in 12 settlements, in the municipality of Caranavi in Bolivia.	Escobar Guevara and Fernández Arancibia (2025b)

#	Country	Name	Description of agroforestry	Reference
3	Ecuador	Asociación de Pequeños Exportadores Agropecuarios Orgánicos del Sur de la Amazonía Ecuatoriana (APEOSAE)	Agroforestry systems covering approximately 1,300 hectares established by 130 members, growing shade-grown commercial crops (cocoa, coffee, banana, cassava, corn, Chinese potato), and featuring diversified family gardens, fodder banks, integration of fruit trees and medicinal plants.	Suquisupa Herrera and Herrera Ochoa (2025).
4	Madagascar	Fikambanan'ny Fikambanan'ny Tantsaha Faritra Atsinanana (FITAFA)	A home-garden agroforestry system with some shade-grown cash crops covering an estimated 1,925 hectares, established by the FITAFA Union's 350 household members, located in the Atsinanana region of Madagascar.	Raharison (2025)
5	Nepal	Setidevi Dairy Producers Cooperative Society Limited	An agrosilvopastoral system covering approximately 400 hectares, established by the 1,048 household members of Setidevi Cooperative, in the Dhulikhel municipality of Nepal.	Acharya et al. (2025)
6	Tanzania	MVIWAMA (Mtandao wa Vikundi vya Wakulima na Wafugaji wa Mkoa wa Manyara — the Manyara Region Network of Farmers and Pastoralists Groups)	A mixture of home-garden and agrosilvopastoral systems covering 2,727 hectares, established by the 399 local producer group members and organised into 59 local networks at ward level, comprising a total of 9,343 household members in the Manyara region of Tanzania.	Kayombo (2025)
7	Viet Nam	Dao Thinh Cinnamon Cooperative	A *taungya* (sequential) woodlot system of cinnamon and star anise covering 900 hectares, established by the 600 household members of the cooperative in the Tran Yen district of Yen Bai province in Viet Nam.	Nhuan (2025)

Once identified, the case-study authors then conducted field visits to the smallholder farmer organisations in question. They arranged interviews, both with the management of the organisation, and with ten male and ten female farmers involved, to allow for a gender-differentiated assessment of the perceptions of the benefits of their agroforestry system and its origins and development. These perceptions recorded in the original case studies are summarised in this section.

Some gender differences in perceptions were recorded and are very briefly touched on in the following sections. However, the case studies did not set out to assess how gender-differentiated approaches to agroforestry could contribute to gender-transformative outcomes. This is one area where further future research might be valuable, albeit moderated by the observation that in almost all cases, both men and women perceived very similar benefits from agroforestry adoption, implying generally inclusive processes (except where specifically mentioned, such as difficulties in attending training or accessing land tenure). Each case study was then submitted for peer review before publication online.

3.1 Bolivia: Coffee Growers Association of Taipiplaya (ASOCAFÉ)

3.1.1 About ASOCAFÉ

The Coffee Growers Association of Taipiplaya (Asociación de Caficultores de Taipiplaya or ASOCAFÉ) was founded in 1990 from two pre-existing coffee grower groups: the Taipiplaya Federation (covering Central Taipiplaya, Central Litoral and Central Antofagasta) and the Cruz Playa Federation (covering Central Cruz Playa, Central Nuevos Horizontes, Central Turístico Entre Ríos).[5] It currently has 199 members from 34 communities and four agricultural centres. These smallholder farmer members, many of them Aymara migrants from the Andean region, are now located in the Taipiplaya region of the province of Caranavi in Bolivia. The area is known as the coffee capital of Bolivia and has a warm-temperate climate, with temperatures ranging between 17°C and 26°C, and is at an altitude of 800–1,800 metres above sea level.

At its foundation, ASOCAFÉ members faced geographic isolation, lack of access to international markets and questionable sustainability across their non-organic farming practices. In the 1990s, ASOCAFÉ joined the Federation of Bolivian Coffee Growers and Exporters (FECAFEB — Federación de Caficultores Exportadores de Bolivia), a network of 30 cooperatives, which strengthened its access to training in organic farming techniques, quality control and international marketing. ASOCAFÉ adopted

5 This case study is summarised from a longer report prepared by Escobar Guevara and Fernández Arancibia (2025a).

Fairtrade principles and obtained organic certification, ultimately positioning its coffees in demanding markets such as Japan, the USA and Europe. ASOCAFÉ has a dry coffee-processing plant in the city of El Alto, and it is from this plant that containers of ASOCAFÉ coffee are shipped to its various international clients.

ASOCAFÉ's vision is "to be a solid association, a leader in ecological (organic) coffee growing, with integrated management and close coordination with its social base". It was set up primarily to produce, provide certification for, process, market and export coffee for its members. But more recently it has played a key role in the evolution of coffee production and sales by encouraging the adoption of agroforestry. This has allowed diversification into other crops such as citrus, avocado and other products. Its future strategic vision includes projects to expand agroforestry planting of nitrogen-fixing trees, fruit and timber trees; update its organic statutes; improve coffee harvesting and post-harvesting processes; install a modern hybrid solar dryer and roastery with its women's committee; achieve the export of at least six containers of coffee per year; better position its Madre Selva ('mother forest') coffee brand in the market; and strengthen inclusion and internal governance.

3.1.2 ASOCAFÉ's agroforestry system

ASOCAFÉ members implement an agroforestry system that is aligned with a shade-grown cash-crop model. They grow coffee for commercial sale while also producing subsistence products for family consumption. Members' properties have an average size of ten hectares, with 2.5 hectares or more per farm dedicated to coffee plantation. Currently, ASOCAFÉ has 239 hectares of coffee under an organic-certified agroforestry system.

The agroforestry system which ASOCAFÉ has promoted is characterised by a stratification of plant components into different levels:

- Upper canopy forest trees such as cedro (*Cedrela odorata*), toco (*Enterolobium contortisiliquum*), mara (*Swietenia macrophylla*), and more occasional verdolago (*Portulaca oleracea*) and paquio (*Hymenaea courbaril*)
- Middle canopy trees such as siquili (*Inga edulis*), avocado (*Persea americana*) and some oranges (*Citrus sinensis*)
- Lower canopy plants such as banana (*Musa paradisiaca*)
- Shade-tolerant crops, mainly coffee (*Coffea arabica*)
- Subsistence crops such as corn (*Zea mays*) and beans (*Phaseolus vulgaris*) among many other vegetables and spices
- Root crops such as cassava (*Manihot esculenta*), and
- On steeper slopes tree components are planted along contour lines to help reduce erosion.

The perceived benefits of the agroforestry system from ten male and ten female farmers that motivated its adoption include economic benefits such as higher yields and income from coffee, diversification of income sources, alongside nutritional diversification and food security. Perceived ecological benefits include more abundant green manure or mulch production, higher soil fertility, reduced erosion, and shade and temperature regulation that increases yields and income. Additional benefits listed included higher water infiltration, wind protection, better biodiversity including pollinators, and climate change mitigation and adaptation. Social benefits were felt to be marginal, but the system is inclusive of women and youth. However, there are challenges to do with complexity of management that require greater knowledge and skill, as well as a greater need for labour, especially for weeding, but also for land clearance, seedling cultivation and pruning. Upfront labour costs occur long before harvesting returns.

3.1.3 ASOCAFÉ's strategy to promote agroforestry uptake

ASOCAFÉ has been instrumental in promoting diversified agroforestry systems. The complexity of the system has been addressed primarily through technical training in workshops and meetings, where the benefits of agroforestry and best practices for their implementation were explained. For example, ASOCAFÉ technicians provided guidance on the design of agroforestry components (as described above), seed collection (especially how to select the best coffee seeds from mother trees 10–15 years old) and pruning techniques (to maintain optimal shade in the upper canopy and coffee production in the lower canopy). Labour costs remain a challenge, but fall away as the upper canopy develops, reducing the need for weeding, and the higher productivity helps to offset those costs.

ASOCAFÉ has also helped its member producers to organise themselves for coffee production and marketing, connecting them to national and international markets. The introduction of certification systems such as Fairtrade and organic has helped to improve sales prices, alongside technical support for quality improvement, packaging and marketing. Market differentiation has increased profitability and reduced risk. ASOCAFÉ now sells to local markets (both for coffee but also avocado, citrus, banana, cassava, achiote and other products), to national coffee markets through the development of the Madre Selva brand, and to green coffee export markets through companies such as Awataru (Japan) over ten years and Ana Katerin (Germany) and GrainPro (USA) over four years. The additional income generation has further helped to offset the higher labour costs of managing the agroforestry system.

Another way ASOCAFÉ has helped to overcome upfront labour costs is through attracting project support for agroforestry expansion. Training courses have been subsidised by projects such as the Latin American and Caribbean Network of Fair Trade Small Producers and Workers (CLAC). The Ministry of Rural Development and Land's National

Coffee Investment Programme has also paid for training and provided coffee seedlings, mainly of the Catuai Rojo and Castilla varieties. Currently, ASOCAFÉ manages a direct beneficiary grant (DBG) from the FFF for the expansion of its agroforestry coffee plantations with the provision of forest species and/or leguminous plants sufficient for 148 hectares.

Despite progress, challenges remain in addition to those cited above, such as the management of coffee diseases, price instability in markets and potential future compliance with the European Union Deforestation Regulation (EUDR). To overcome these obstacles, ASOCAFÉ is investing in new varieties and technologies, and broadening access to the most promising markets.

Overall, this case study demonstrates that ASOCAFÉ has been instrumental in promoting the uptake of diversified agroforestry systems with substantial perceived benefits. As well as improved subsistence food security, higher yields and income generation compared to monocropping, benefits include the long-term ecological sustainability of the systems and social inclusion of women and youth. The association also advocates with government for policies that support agroforestry, strengthen technical assistance, ensure linkages with fair markets, and promote research and innovation in agroforestry as enabling factors.

3.2 Bolivia: Comprehensive Agricultural Cooperative of Organic Producers (CIAPEC)

3.2.1 About CIAPEC

The Comprehensive Agricultural Cooperative of Organic Producers (Cooperativa Integral Agrícola de Productores Ecológicos or CIAPEC) was founded in 2003 and initially focused on supporting the coffee production of its 32 founding members.[6] Its success has led to an expanding membership that now stands at more than 300 members with the further involvement of more than 1,000 families, organised in 12 settlements, such as U. Camacho, E. Ríos, Alto Alianza, Magallanes, Huatahata, Waldo, Kantutani, Villamontes, Rosas Pampa, Villa Camacho, Villa Exaltación and Trinidad, in the municipality of Caranavi in the north of the department of La Paz in Bolivia. The region has a warm-temperate climate, with temperatures ranging between 17°C and 26°C, at an altitude of 1,000–1,700 metres above sea level. The region is characterised by its biodiversity, mountains and cloud forests, where producers, many of them Aymara migrants from the Andean regions, grow high-quality coffee.

6 This case study is summarised from a longer report prepared by Escobar Guevara and Fernández Arancibia (2025b).

CIAPEC has undergone a remarkable evolution over time. It was officially incorporated in the National Institute of Cooperatives of Bolivia (Instituto Nacional de Cooperativas de Bolivia — INALCO), obtaining the Legal Personality Nº 1086. From the initial focus on coffee, CIAPEC has diversified its production to include commercial sale of achiote, palillo (turmeric), citrus and coca, adapting to market needs and the capacities of its members. CIAPEC has successfully achieved certification both for Fairtrade practices and organic production across 140 hectares of its members' farms. It has achieved membership of key organisations such as FECAFEB, the Association of Ecological Producing Organisations of Bolivia (Asociación de Organizaciones de Productores Ecológicos de Bolivia — AOPEB), the Association of Specialty Coffees of Bolivia (Asociación de Cafés Especiales de Bolivia — ACEB) and the National Chamber of Exporters (Cámara Nacional de Exportadores De Bolivia — CANEB). CIAPEC has developed marketing agreements with the Food Production Support Company (Empresa de Apoyo a la Producción de Alimentos — EMAPA) and Ketal supermarkets for the sale of domestic organic coffee under the Bolcafé brand and has marketed green coffee to Germany (Benecke Coffee) and the Netherlands (A van Weely BV).

CIAPEC's vision for sustainable development is that future generations of producers will strengthen their capacities, promote the integral development of their communities and contribute to global sustainability through responsible farming. As part of that vision, the cooperative's members have implemented agroforestry systems allowing CIAPEC to expand its scope to help its members market products such as achiote (*Bixa orellana*), palillo (*Curcuma longa*), citrus (*Citrus sp.*), coca (*Erythroxylum coca var. coca*) and other products. Future plans include the continued expansion of agroforestry systems, further training for improving coffee quality, expansion in avocado production and Bolcafé brand development (including social media marketing) the pursuit of certification for single-origin coffee, and nursery modernisation.

3.2.2 CIAPEC's agroforestry system

In terms of productive characteristics, CIAPEC implements an agroforestry system that is aligned with a model of cash crops under shade, mainly focused on the cultivation of coffee (*Coffea arabica*), but also integrating other commercial crops as described previously alongside subsistence foods. CIAPEC members have plots of land of approximately ten hectares, with an average of two hectares dedicated to coffee plantations in production. Currently, CIAPEC has 636.8 hectares of land, of which 208 hectares of coffee are under agroforestry with 140 hectares certified as organic. In 2025, an additional 60 hectares of agroforestry is being developed with the support of a CIAPEC DBG from the FFF.

The agroforestry system is characterised by stratification in different levels:

- Upper canopy including large and tall trees such as cedar (*Cedrela odorata*), toco (*Enterolobium contortisiliquum*) and laurel (*Laurus nobilis*)
- Middle canopy trees including smaller species such as siquili (*Inga edulis*), avocado (*Persea americana*), ceibo (*Erythrina poeppigiana*) and various citrus species (*Citrus sp*)
- Lower canopy dwarf trees and shrubs including bananas (*Musa paradisiaca*) and coca (*Erythroxylum coca var. coca*)
- The main shade-tolerant crop coffee (*Coffea arabica*)
- Additional subsistence crops including corn (*Zea mays*) and beans (*Phaseolus vulgaris*) and spices such as achiote (derived from *Bixa orellana*), and
- Root crops including walusa (*Xanthosoma sagittifolium*) and palillo (*Curcuma longa*).

The ten male and ten female members' perceptions of agroforestry benefits that motivated their adoption of the system include increased nutrition (both in quantities and varieties of food) in addition to income from coffee and diversified income from the sale of other surplus crops. An additional economic benefit comes from cost reductions in the purchase of fertiliser. Ecological benefits are multiple: beyond cost-saving biofertiliser, members list erosion control, wind protection, water infiltration, microclimate improvement (shade and temperature control), biodiversity conservation, pest and disease control, and climate change mitigation and adaptation. Social benefits are more limited although some members do speak of "conserving community cultural tradition", and the efforts CIAPEC has made to include women, youth and other marginalised groups. The main perceived challenges are listed as management complexity, labour intensity, time delay before tree component harvest, initial fertiliser use, excessive shade, and pests and diseases (though not directly a function of agroforestry).

3.2.3 CIAPEC's strategy to promote agroforestry uptake

CIAPEC has implemented several key strategies to overcome these challenges and facilitate the adoption of more diverse agroforestry systems. In addition to general promotion and persuasion, CIAPEC has introduced training workshops and field demonstrations on agroforestry, including the use of digital tools such as ShadeMotion to optimise design. These have helped to overcome the barrier of system complexity, with special attention to how agroforestry design and pruning of branches can optimise shade and reduce key costs such as weeding. Meanwhile, ecological thinning practices have helped reduce the need for traditional burning practices to control weeds.

CIAPEC uses its revenues to subsidise the provision of new coffee plants and to reduce fertiliser inputs, and CIAPEC has procured training in how to generate and use green manure and mulch from the agroforestry system. To counter pest and disease outbreaks, CIAPEC has provided training in integrated pest management (IPM).

The issue of labour intensity and time delay before harvest is also addressed through funded project support, including from CLAC, a DBG from the FFF, and support for a collective loan from Rabobank. CIAPEC has also given support for the establishment of SACCOs that can make soft loans to cover initial establishment costs. Furthermore, CIAPEC is actively advocating for more supportive fiscal incentives and support from government.

As some of the main barriers to agroforestry adoption are the upfront labour costs, CIAPEC has also helped its members achieve greater returns from markets. This has included negotiating annual marketing agreements with EMAPA and Ketal for the sale of two tonnes of organic coffee under the Bolcafé brand, with plans to promote the brand more actively in regional and national market fairs and through social media. But CIAPEC has also introduced strict European quality standards to allow export sales to Germany and the Netherlands, in part through its rigorous pursuit of certification standards for organic and Fairtrade practices.

The main conclusions highlight the fact that agroforestry offers multiple benefits to CIAPEC members but comes with a set of challenges. Organisations such as CIAPEC have helped members overcome these challenges to allow the expansion of agroforestry. The cooperative advocates with government for public policies to support agroforestry, for the creation of economic incentives such as mechanisms for payments for ecosystem services (PES), and support for the promotion of certified agroforestry products to improve their market position.

3.3 Ecuador: Association of Small Organic Agricultural Exporters of the Southern Ecuadorian Amazon (APEOSAE Federation)

3.3.1 About the APEOSAE Federation

The Association of Small Organic Agricultural Exporters of the Southern Ecuadorian Amazon (Asociación de Pequeños Exportadores Agropecuarios Orgánicos del Sur de la Amazonía Ecuatoriana or APEOSAE Federation) was founded in 2006 in the southern Ecuadorian Amazon and was legally established as a federation in 2014.[7] The federation has grown to include 130 active producers spanning 34 communities in nine cantons in the provinces of Zamora Chinchipe and Morona Santiago. Together, these members manage 229.5 hectares of agroforestry and 106 hectares of forest at an altitude of 800–1,700 metres above sea level. Its main agroforestry products include cacao, coffee, plantain and yucca which are produced under the Sánku trademark. The natural vegetation consists of cloud forests and Amazonian piedmont jungle, with high biodiversity that includes native timber and fruit tree species which are naturally integrated into the agroforestry systems implemented by producers. APEOSAE established itself in 2023 as the first Latin American organisation to export deforestation-free organic cocoa products with support from ProAmazonía (Comprehensive Amazonian Programme for Forest Conservation and Sustainable Production/Programa Integral Amazónico de Conservación de Bosques y Producción Sostenible).

APEOSAE was founded in response to problems in the cocoa, coffee and plantain production chains. APEOSAE now provides support to its 130 producers of whom 64 are women (49.2%) and 66 are men (50.8%), although it faces a significant generational challenge with only 15 young people under the age of 30 (11.5% of the total). The average size of members' properties varies by area, but generally ranges from 5 to 15 hectares, with approximately 70% of the area devoted to commercial crops (coffee, cocoa, plantains) integrated into agroforestry systems, while 30% is used for subsistence crops and forest conservation.

The federation's vision is that, "By 2030, APEOSAE will lead a successful model of organic production, associative marketing at the national and international levels, innovation in processing and quality assurance, through the positioning of the Sánku brand and with a legally, administratively and financially strengthened organisation that influences the social, environmental and economic development of the Amazon region and provides economic stability to its members". The federation's founding documents clearly establish a commitment to production systems that integrate environmental

7 This case study is summarised from a longer report by Suquisupa Herrera and Herrera Ochoa (2025).

conservation with sustainable income generation, specifically including the implementation of agroforestry practices.

3.3.2 APEOSAE's agroforestry system

The agroforestry system APEOSAE has promoted is a multistrata model of commercial crops under shade that integrates coffee, cacao and plantain as the main crops. These are combined under a diversified canopy of native Amazonian forest species with economic values that are adapted to the ecological conditions of the southern Ecuadorian Amazon, and build on the traditional knowledge of Indigenous Shuar and Saraguro peoples and mestizo producers. The main strata include:

- Upper canopy dominated by Amazonian forest trees such as cedar (*Cedrela montana*), laurel (*Cordia alliodora*), guayacán (*Tabebuia chrysantha*) and seique (*Jacaranda copaia*)
- Middle canopy comprising fruit trees and legumes such as guava (*Inga edulis*), chonta (*Bactris gasipaes*), guava (*Psidium guajava*), citrus fruits such as lemon (*Citrus limon*), orange (*Citrus sinensis*) and mandarin (*Citrus reticulata*), as well as soursop (*Annona muricata*)
- Main lower canopy including cash crops such as fine-aroma cocoa (*Theobroma cacao*), Arabica coffee (*Coffea arabica*) and plantain (*Musa sp.*)
- Subsistence crops such as maize (*Zea mays*), beans (*Phaseolus vulgaris*) and medicinal plants such as guayusa (*Ilex guayusa*), dragon's blood (*Croton lechleri*), matico (*Piper aduncum*), and ayahuasca (*Banisteriopsis caapi*), as well as vegetables and other short-cycle foods, and
- Root crops such as Chinese potato (*Xanthosoma sagittifolium*), cassava (*Manihot esculenta*) and peanuts (*Arachis hypogaea*).

Some elements serve as fodder for animals such as guava, beans and peanuts. The stratified arrangement optimises productivity and strengthens family food security, generating an approximate 20% increase in income from the sale of agroforestry products, while contributing to the conservation of essential ecosystem services such as wind protection and efficient water management.

The ten male and ten female members' perceptions of agroforestry benefits are multiple. Nutritional benefits are listed as increases in the quantity and quality of both staple foods and fruit, the diversity of diet and the consumption of plant medicines. Economic benefits were felt to include additional income from organic cocoa and coffee sales, premium prices for organic and deforestation-free markets, diversification of income, and greater financial stability. Ecological benefits were perceived to include biological corridors for bird and insect pollinators and seed dispersers, improved soil fertility, soil erosion control,

water conservation and a better microclimate for production. Finally, members perceived there to be social benefits such as strengthening of organisations and collective work, opportunities for training, strengthening of Shuar and Saraguro ancestral traditions, women's empowerment, and general wellbeing, solidarity and reciprocity.

Despite the many benefits of agroforestry, significant challenges remain to do with increased farm labour and management time, low youth involvement, complex and specialised knowledge requirements, deferred income from long-term tree crops, limitations in marketing for diverse crops, crop-specific machinery requirements, high costs of certification, and difficulties in controlling pests and diseases.

3.3.3 APEOSAE's strategy to promote agroforestry uptake

To address these many challenges and pursue the multiple benefits of agroforestry, APEOSAE has developed a comprehensive process for the design and installation of agroforestry systems adapted to the southern Amazon region of Ecuador. To increase adoption, APEOSAE promotes agroforestry that respects cultural preferences of each community. To overcome complexity and labour concerns, both theoretical and practical workshops are designed to help understand stratification of the system and optimal management practices (how to establish an upper canopy of Amazonian timber species, a middle layer of fruit trees and legumes, and a lower layer of commercial and subsistence crops). These technical trainings are complemented by peer-to-peer exchanges that allow members learn from each other and see how ancestral traditions inform agroforestry design and practice.

Upfront costs of approximately US$800–1,200 per hectare (which would take three years to be recouped through premium prices) have been offset through APEOSAE projects from government and nongovernmental organisation (NGO) sources such as the ProAmazonía programme, Oxfam and the FFF. APEOSAE has also set up a revolving saving and loan fund that has covered 40% of all costs, with advance payment opportunities, operating through solidarity groups of 8–12 families to mutually guarantee repayments. There is also an emergency fund for those facing economic hardship in the transition to agroforestry.

Seed has been sourced from partnerships with the Provincial Government of Zamora Chinchipe and the Ministry of Agriculture, Livestock, Aquaculture and Fisheries (Ministerio de Agricultura, Ganadería, Acuacultura y Pesca — MAGAP). APEOSAE also maintains a community seed bank of key varieties of Amazonian species, while organic-certified community nurseries have been established in six communities to supply seedlings. Challenges such as specialised knowledge requirements for organic and certified deforestation-free production are met through specialised training by community promoters in each area. To overcome marketing challenges, APEOSAE has developed aggregation, processing and biodegradable packaging facilities for its main commercial

products, with strong Sánku brand development for export markets. Future plans include the establishment of new production lines based on Amazonian fruit trees and medicinal plants, with dehydration and packaging technologies that will allow APEOSAE to diversify its range of own-brand products, and the development of community-based rural tourism ventures that take advantage of the biodiversity and scenic beauty of agroforestry systems.

The federation has appreciated supportive policies such as the recognition of clean production territories granted by the Prefecture of Zamora Chinchipe in 2023, and MAGAP policies to promote organic agriculture, incentivise agroforestry, subsidise organic certification and provide lower tariffs for the import of organic inputs, and regulatory frameworks that recognise ancestral territorial and traditional knowledge rights. But they are also advocating for rural credit policies with 3–5-year grace periods for agroforestry, reduced bureaucracy for management permits, trade incentives for organic sustainable products, and protection from mining incursions.

3.4 Madagascar: Union of Agricultural Producers of Atsinanana (FITAFA)

3.4.1 About FITAFA

The Union of Agricultural Producers of Atsinanana (Fikambanan'ny Fikambanan'ny Tantsaha Faritra Atsinanana or FITAFA) was established in 2001 and now has 350 household members.[8] It is in the Atsinanana region of Madagascar, spread across three districts: Vatomandry, Antanambao Manampotsy and Mahanoro. The area has a humid tropical climate and vegetation, abundant annual rainfall (2,000–3,500 millimetres concentrated between November and April) and an average temperature of between 24°C and 27°C. Farms are generally inherited and privately owned and average farm sizes for male farmers are 6.5 hectares and for female farmers 4.1 hectares. FITAFA is a member of the apex-level farmers' organisation the Confederation of Malagasy Farmers (Fivondronamben' ny Tantsaha Malagasy — FEKRITAMA), established in 1988, that groups together 12 federations and 23 regional farmer organisations comprising 42,000 member households throughout Madagascar.

At the time of its foundation, FITAFA members faced significant challenges of natural resource degradation within the traditional slash-and-burn system used for rainfed rice, with increasing climate variability and more frequent droughts. In response, many have installed agroforestry systems which now cover on average 4.1 hectares for male farmers (63% of land) and 2.8 hectares for women farmers (68% of land). The agricultural system

8 This case study is summarised from a longer report prepared by Raharison (2025).

has been based around rice and maize (often half for sale), and cassava and sweet potato (mostly for subsistence consumption). Agroforestry has been promoted by FEKRITAMA to diversify production and is mostly based on a shade-grown cash-crop system, with integrated beekeeping and fish farming (in the lowlands).

Both FITAFA and FEKRITAMA are apolitical in nature and based on Christian values (while promoting religious tolerance, non-discrimination against cultures, and anti-racism in line with their democratic principles). The FEKRITAMA confederation works to strengthen grassroots organisations by:

- Structuring promising value chains (agriculture, livestock, fishing, cooperatives, women and youth farmers, rural ecotourism)
- Supporting the development of sustainable agricultural production as an economic lever for income improvement
- Defending farmers' interests and rights, and
- Promoting the emergence, development and sustainability of member organisations.

Although agroforestry systems are not explicitly mentioned in FEKRITAMA's founding texts, it aligns perfectly with these strategic objectives as a sustainable production model, promoting resilient, environmentally friendly and income-generating agricultural practices.

3.4.2 FITAFA's agroforestry system

The promoted agroforestry system which covers an estimated 1,925 hectares is based on a shade-grown cash-crop or home-garden model with a strong emphasis on commercial fruit and spice species. Initially, this starts with only 2–4 tree species but can evolve into complex systems with more than 50 species. It is characterised by different strata including:

- Emergent forest trees such as eucalyptus (*Eucalyptus citriodora*), bonara (*Albizia lebbeck*), varongy (*Ocotea species*), rotra (*Syzygium cumini*), breadfruit (*Artocarpus altilis*) and endemics such as nonoka (*Syzygium bernieri*) and manasavelona (*Rhodolaena leroyana*)
- Upper canopy timber or fruit trees such as lychee (*Litchi chinensis*), avocado (*Persea americana*), mango (*Mangifera indica*), voatoana (*Voacanga thouarsii*), acacias (*Acacia sp.*), manasavelona (*Streblus dimepate*), rosewood (*Dalbergia sp.*) and ambora (*Canarium madagascariensis*)
- A wide range of middle canopy species such as banana (*Musa sp.*), cinnamon (*Cinnamomum verum*), clove (*Syzygium aromaticum*), orange (*Citrus cinensis*), lemon (*Citrus limon*), mandarin (*Citrus reticulata*), jackfruit (*Artocarpus heterophyllus*), soursop (*Annona muricata*), sugar apple (*Annona squamosa*), bullock's heart (*Annona*

reticulata), noni (*Morinda citrifolia*), mangosteen (*Garcinia mangoustana*), palm (*Arecaceae sp.*), coconut (*Cocos nucifera*), raffia (*Raphia sp.*), pistachio (*Pistacia vera*), pink pepper (*Schinus molle*), ravenala (*Ravenala madagascariensis*), grevillea (*Grevillea banksii*), voapaka (*Voacanga africana*)

- Dwarf trees, shrubs and crops such as pepper (*Capsicum annuum*), strawberry guava (*Psidium cattleianum*), and pineapple (*Ananas comosus*)
- Shade-tolerant crops including the cash crops vanilla (*Vanilla planifolia*), coffee (*Coffea robusta*) and turmeric (*Curcuma longa*)
- Basic crops in central spaces including rice (*Oryza sativa*) and maize (*Zea mays*)
- Root crops such as cassava (*Manihot esculenta*), sweet potato (*Ipomoea batatas*), yam (*Dioscorea sp.*) and tavolo (*Tacca leontopetaloides*)
- Vine crops such as oviala (*Dioscorea sp.*), pepper (*Piper nigrum*) and grenadilla (*Passiflora edulis*)
- Livestock including zebus, pigs, poultry, bees and fish, and
- Nitrogen-fixing fodder hedges including gliricidia (*Gliricidia sepium*), leucena (*Leucaena glauca syn. Leucaena Leucocephala*) and jatropha (*Jatropha sp.*), alongside grasses such as ahipisaka (*Stenotaphrum dimidiatum*).

The benefits of agroforestry systems from the perspective of FITAFA members are numerous. Nutritional benefits include improved diet and diversification of products. Economic diversification and the spreading of income reduce risk, with income now coming primarily from cash crops (cinnamon, clove, coffee, lychee), fruits and vegetables (banana, mango, avocado etc), and livestock and aquaculture (pigs, poultry and tilapia). The circular economy at the farm level also reduces expenditure on inputs. For example, several plants are used as animal feed including cassava, other tuberous plants, breadfruit, voanjombazaha (peanuts) etc. Ecological benefits include soil restoration, climate resilience and a reduction of bushfires. Socially, agroforestry systems create rural jobs, valorise women's work and strengthen social ties between farmers. However, several constraints hinder agroforestry adoption, notably limited access to rewarding markets for producers' products, unpredictable yields due to climate change (droughts, season shifts) and the labour maintenance difficulties of agroforestry systems (especially challenging for women who are divorced or widowed), low representation of women and youth in technical training, restricted access to seeds and seedlings, and a lack of access to financing and necessary equipment.

3.4.3 FITAFA's strategy to promote agroforestry uptake

As an apex-level organisation, FEKRITAMA has been supporting farming activities and integrating sustainable practices with its regional farmer organisations such as FITAFA for over 15 years through a series of programmes and projects. FEKRITAMA has developed a comprehensive support package that involves finding alternatives in several areas. For example, FEKRITAMA has strengthened marketing of new agroforestry products by strengthening the negotiating skills of farmer leaders, and by putting them in touch with potential buyers (such as Phael Flor Export for cinnamon and AgriExport), as well as by increasing participation in national or regional agricultural fairs.

FEKRITAMA has provided training and technical coaching, and facilitated exchange visits covering topics such as climate-smart agriculture, forest landscape restoration, mulch and organic fertilisers, terracing and soil-conservation techniques, crop associations, and water management. They have also provided a supply of inputs (such as seeds, seedlings, fertilisers) and support for improving land-tenure situations. In addition, they have provided access to services and financial support (mostly through projects to offset high agroforestry start-up costs) and strengthened rural entrepreneurship. A particular innovation has been the development of up to 40 local nurseries for the multiple agroforestry species planted, which is also a source of income generation. FITAFA members feel that further opportunities exist to enhance impact by improving market structuring through processing and value addition (such as the use of distillation equipment for oils from spice plants), better access to credit, developing further public–private partnerships, and pursuing organic certifications. The members' recommendations to government include strengthening local infrastructure, developing tailored financial services that simplify existing agricultural credit, supporting access to fair markets, and integrating more women and youth into training programmes.

3.5 Nepal: Setidevi Dairy Producers Cooperative Society Limited

3.5.1 About Setidevi

The Setidevi Dairy Producers Cooperative Society Limited was established in 1994 in Dhulikhel municipality of Nepal under the Cooperative Act of 1991.[9] Its members farm on land at an altitude of 1,300–1,500 metres above sea level in the subtropical zone, characterised by seasonal rainfall and moderate temperatures. Setidevi is a member of the prior Central Dairy Cooperative Association Limited Nepal (CDCAN) that was established in 1992, and which leads Nepal's dairy cooperative movement, helping dairy cooperatives and unions with technical support, advocacy and programmes to grow and sustain the dairy sector.

The Setidevi cooperative began with 26 founding members collecting 150 litres of milk daily and an initial share capital of 2,600 Nepalese rupees (US$19) in 1993, but has since expanded its collection centres in Chisapani, Padali and Deurali, greatly increasing milk production. Now, Setidevi has a total of 1,048 members, with 509 female and 539 male members, with approximately 600 households supplying around 700 litres of milk every day through its seven milk-collection centres. In the last two years, the cooperative has constructed a demonstration farm that includes 80 cows, which has become an example for the farmers in the locality encouraging members to adopt professional dairy farming practices.

From December 2023 to December 2024, the Setidevi cooperative received support from the FFF programme through CDCAN to enhance its dairy producers' capacity to adopt climate-smart practices and sustainable farming techniques, notably the upscaling of agroforestry systems that support dairy production. The intervention contributed to improving farm productivity, reducing production costs (less need for chemical fertilisers), and increasing dairy farmers' resilience to climate change. For example, there has been an expansion in market-oriented crops such as tomatoes and potatoes from these agroforestry systems that have reduced reliance solely on milk.

3.5.2 Setidevi's agroforestry system

Setidevi has established 400 hectares of agroforestry which equates to 0.38 hectares per member household, involving a mix of systems that are locally described as agrosilviculture, hortisilviculture, agrosilvopastoral and home-garden systems. Put more simply, most farmers practise agroforestry by combining livestock rearing, mostly cows, but

9 This case study is summarised from a longer report prepared by Acharya et al. (2025).

also some oxen, buffalos, goats, chickens and pigs with the cultivation of trees and crops. There is substantial diversity in these systems:

- Emergent forest trees include needlewood (*Schima wallichii*), sal (*Shorea robusta*), dhale katus (*Castanopsis indica*), kharshu (*Quercus semicarpifolia*), baanjh (*Quercus leucotrichophora*), phalat (*Quercus lamellose*), kaiyo (*Grevillea robusta*), pine (*Pinus roxburghii*) and *Terminalia bellirica*.
- Upper canopy fruit trees are also grown such as jackfruit (*Artocarpus heterophyllus*), mango (*Mangifera indica*), lychee (*Litchi chinensis*), lapsi (*Choerospondias axillaris*), amla (*Emblica officinalis*), avocado (*Persea americana*) and pear (*Pyrus spp*).
- Middle canopy fruit trees include guava (*Psidium guajava*), banana (*Musa species*), papaya (*Carica papaya*), orange (*Citrus sinensis*), lime (*Citrus aurantifolia*), plum (*Prunus spp*), persimmon (*Diospyros kaki*) and pomelo (*Citrus maxima*).
- In the lower canopy there are dwarf trees and shrubs such as tanki (*Bauhinia purpurea*), koiralo (*Bauhinia variegata*), kutmero (*Litsea monopetala*), mulberry (*Morus spp*) and bakaino (*Melia azedarach*).
- Under the canopy shade or in fields are grown shade-tolerant crops such as coffee (*Coffea arabica*) or cash crops such as cabbage (*Brassica oleracea var. capitata*), cauliflower (*Brassica oleracea var. botrytis*), tomato (*Solanum lycopersicum*) and mustard (*Brassica juncea*).
- These are complemented by basic staple crops such as rice (*Oryza sativa*) and corn (*Zea mays*), alongside root crops such as potato (*Solanum tuberosum*).
- Vines are also present such as malati (*Jasminum species*).
- Other important species include livestock fodders such as super napier grass (*Pennisetum purpureum hybrid*), jai grass (*Bromus spp*) and a local grass fodder daley ghas (*Lathyrus sativus*), alongside nitrogen-fixing hedges of uttis (*Alnus nepalensis*) and ipil-ipil (*Leucaena leucocephala*).

Cooperative members' knowledge of agroforestry is mainly attributed to traditional practices passed down from their ancestors but is also supported and encouraged by the cooperative to improve livelihoods by selling milk and agricultural products. Setidevi encourages the uptake of agroforestry by promoting benefits such as improved soil health, increased fodder availability and higher income potential. When asked about the perceived benefits of agroforestry, 70% of the farmers surveyed reported increased food security, both through increased milk yields, but also an expansion in production, especially of potatoes, wheat and rice production, while 20% of members also pointed to greater diversity of fruits, vegetables and grains. Economic benefits of agroforestry have also been substantial, with better fodder leading to a 20% increase in milk yields since 2019 as agroforestry has expanded. Perceived ecological benefits have included

better soil structure and moisture, with tree leaf litter and organic matter enriching the soil with nutrients. Perceived social benefits have included the preservation of traditional knowledge and the greater participation of women, marginalised groups and youth (especially important in tree nursery development and agrotourism). The main challenges have been feedstock management throughout the year, the complexity of establishing agroforestry, pest control and market access issues for diversified crops.

3.5.3 Setidevi's strategy to promote agroforestry uptake

Improved uptake of agroforestry was achieved primarily through Setidevi's awareness-raising campaigns and training programmes, but also through a prize competition for the highest milk producer (the most recent winner boasting a 12-fold increase in milk production over 19 years). The Setidevi Cooperative members, who are also part of the Alchechaur community forest user group (CFUG), have come up with a smart solution to tackle fodder shortages at certain times of the year. They plant many fodder plants and grasses in the community forest, providing farmers with a sustainable and easily accessible resource. Their efforts have improved livestock productivity and reduced the strain on private farmlands.

To overcome the challenge of agroforestry complexity, Setidevi has spread knowledge and design by establishing demonstration farms, distributing high-quality seeds such as super napier grass (*Pennisetum purpureum x Pennisetum glaucum cv. Pakchong-1*), sourced from CDCAN, badahar (*Artocarpus lakoocha*) and other fodder trees (often in association with the Alchechaur CFUG). Setidevi has provided technical guidance on planting, harvesting and maintenance. They have sustained uptake by maintaining demonstration plots, organising peer-to-peer exchanges and conducting training sessions on sustainable land management. To address the specific challenge of pest and disease control, they have organised training in integrate pest management (IPM).

To support farmers' market access for expanding agroforestry products, Setidevi has fostered collective action by organising farmers into cooperatives. Setidevi has also helped farmers aggregate and sell their produce, linking them to local and regional markets for products such as milk, tomatoes and citrus fruits, which has increased incomes and encouraged diversification. Additionally, Setidevi has worked to overcome legal and policy constraints by advocating for supportive policies and addressing challenges such as limited access to credit for tree planting and unclear land tenure. The cooperative actively supports its farmers by running a SACCO that provides loans.

Through all these efforts, Setidevi has created a replicable agroforestry model that strengthens livelihoods and builds resilience to climate change. The cooperative advocates with government for subsidies or low-interest loans for farmers adopting agroforestry practices; extension services for agroforestry management; clearer tenure policies that encourage investment in agroforestry; procurement policies that favour agroforestry

product branding and market access; and research to develop climate-resilient agroforestry species and practices.

3.6 Tanzania: Manyara Region Network of Farmers and Pastoralists Groups (MVIWAMA)

3.6.1 About MVIWAMA

The Manyara Region Network of Farmers and Pastoralists Groups (Mtandao wa Vikundi vya Wakulima na Wafugaji wa Mkoa wa Manyara or MVIWAMA) was founded in September 2006.[10] It was established as a loose network of farmers in the tropical savannah of Manyara region, originally registered as an NGO (MVIWATA Manyara in 2011) under the apex-level farmers' NGO MVIWATA (Tanzania Farmers' Association Network — Mtandao wa Vikundi vya Wakulima Tanzania). In December 2020, MVIWAMA changed its registration to that of a cooperative, ending its membership of MVIWATA, and now operates as an independent membership organisation.

The MVIWAMA office is located at Babati town in Manyara region, but its member farmer producers are spread in all five districts of Babati, Hanang, Kiteto, Mbulu and Simanjiro. As of January 2025, MVIWAMA had 399 local producer group members, organised into 59 local networks at ward level, comprising a total of 9,343 household members including 4,321 males and 5,022 females. An average household farms between 0.2 and 5 hectares. As a voluntary non-profit, non-political aligned organisation, MVIWAMA's aims are to connect smallholder producer groups (of crop growers, livestock keepers and aqua-farmers) to learn, have a collective voice, advocate and influence social and economic rights.

MVIWAMA has been promoting agroforestry including home gardens, silvopastoral systems and shade-grown cash-crop systems (the latter much less frequently than the former two systems). Its future strategic plans include: distributed newsletters about the benefits of agroforestry systems; continued education, seminars and trainings to members and other people in the area; market research for the best prices for crops at local, national and international levels; investments in new machines with higher processing capacity (such as for garlic); exploring different varieties of garlic to attract buyers from abroad such as China and Japan; and conservation of the remaining natural vegetation patches while also thinking of ecotourism within the river banks (such as at Tumati village).

10 This case study is summarised from a longer report prepared by Kayombo (2025).

3.6.2 MVIWAMA's agroforestry system

Agroforestry systems have been established on approximately 2,727 hectares of land by village-level farmer producer groups in Mbulu district including a patchwork of home-garden systems, shade-grown cash-crop systems and silvopastoral systems which cannot easily be disentangled. These systems are made up of a very wide range of species in different components. In total, the case study recorded 27 agriculture food and/or cash-crop species and 18 timber species making a total of 45 plant species. The most common include:

- Emergent forest trees including *Croton megalocarpus, Eucalyptus camaldulensis, Grevillea robusta, Melia azedarach* and *Schinus molle*.
- Upper canopy fruit trees including custard apple (*Annona cherimola*), mango (*Mangifera indica*) and avocado (*Persea americana*).
- Middle canopy fruit trees including lemon (*Citrus lemon*), chungwa (*Citrus sinensis*), loquat (*Eriobotrya japonica*), and mulberry (*Morus alba*).
- In the lower canopy were found fruit species such as tree tomato (*Cyphondra betacea*) and banana (*Musa acuminata*) with dwarf trees and shrubs such as pomegranate (*Punica granatum*).
- Beneath the canopy were found some shade-tolerant crops such as amaranth (*Amaranthus hybridus*), Chinese cabbage (*Brassica chinensis*) and common mallow (*Malva trilobata*).
- In the more open fields were basic crops such as maize (*Zea mays*), beans (*Phaseolus vulgaris*), Callard greens (*Brassica oleracea*), pigeon peas (*Cajanus cajan*), Tabasco pepper (*Capsicum frutescens*), pumpkin (*Cucurbita pepo*), pearl millet (*Pennisetum glaucum*), sugarcane (*Saccharum officinarum*), and sorghum (*Sorghum bicolor*).
- Among these were grown root, tuberous and bulb crops such as onion (*Allium cepa*), garlic (*Allium sativum*), carrot (*Daucus carota*), sweet potato (*Ipomoea batatas*), and potato (*Solanum tuberosum*).
- Although no woody climbing crop was cultivated by sampled farmers at Mbulu, sometimes a native herbaceous climbing plant, *Coccinia grandiflora*, from the *Cucurbitaceae* family (pumpkin family) could be seen.

Farmer members of MVIWAMA perceive many benefits from agroforestry systems that have motivated their adoption of these systems. For example, agroforestry was perceived to provide more varied nutrition. Economically, it increases household income through reduced input costs by improving soil fertility and the additional sales of products such as fruits, timber and honey. Ecological benefits mentioned include enhanced soil conservation and fertility, better water management, and enhanced resilience to climate change,

alongside broader environmental benefits such as biodiversity conservation and carbon sequestration, contributing to global climate change mitigation. Socially, agroforestry systems were perceived to foster community collaboration through shared labour. The local farmer group members are also motivated by technical support and financial incentives received from MVIWAMA.

The main challenges to agroforestry were perceived to be the limited availability of casual labour to establish the system; high costs of hiring labour from adjacent villages to meet high labour demands of the system; related delays in planting agroforestry crops; input shortages and delays (leading many towards using manure as a biofertiliser); limited buyers and low prices for lesser-known crops; delays and market-selective behaviour of buyers who do pay good prices (such as paying higher prices for white corn compared to red, black, yellow or mixed colours of climate-resilient corn varieties).

3.6.3 MVIWAMA's strategy to promote agroforestry uptake

MVIWAMA has promoted the many benefits of agroforestry and provided technical support that has encouraged village-level farmer producers to form groups, register and pay a registration fee, and set aside annual fees to continue to receive MVIWAMA support services. Support services include seminars, trainings and demonstration plots that show how agroforestry can yield benefits. MVIWAMA also links its members to sources of project finance to cover the costs of seeds and tree seedlings as part of a strategy to reduce start-up costs. MVIWAMA also provides regular financial support to its farmer members through a group SACCO, helping them to overcome seasonal labour costs associated with establishing and maintaining agroforestry systems.

To support market access, MVIWAMA has researched and sought out buyers for products that now include honey, beeswax, garlic, carrots and potatoes. For example, garlic is bought from local farmer groups and others from outside membership. It is then processed using a machine, packaged, labelled and sold by MVIWAMA through both retail and wholesale. In the case of garlic, the group enterprise now produces garlic oil, paste and powder. The differentiation into different products is increasing profitability. In collaboration with MVIWAMA, the farmers have created market linkages with buyers, processors and different farmer exhibition events.

For the future, MVIWAMA has identified expansion plans that require increasing self-mobilised finance to support its members to:

- Invest in any enterprise project that would offer profit
- Grow the SACCO by charging reasonable rates of interest
- Develop nurseries and collectively sell tree seedlings for a profit which is then deposited into the group's account

- Continue to collect membership fees, and
- Seek local and international project funds.

Through these actions, MVIWAMA has helped smallholder farmer members to adopt more diverse agroforestry systems. MVIWAMA also advocates with government for better road infrastructure within the agroforestry operating areas, to formulate indicative prices of newer agroforestry crops to enhance market returns, provide incentives for agroforestry establishment, research markets for agroforestry products, and enforce biosafety checks on farmers producing crops with heavy chemical pesticide and fertiliser use.

3.7 Viet Nam: Dao Thinh Cinnamon Cooperative

3.7.1 About the Dao Thinh Cinnamon Cooperative

The Dao Thinh Cinnamon Cooperative was formally established in 2017.[11] It was created from four prior intercollective groups with 35 members, having at that time a total of 135 hectares of cinnamon based in Dao Thinh Commune in Tran Yen district of Yen Bai province. The province is mountainous with an average elevation of 600 metres and boasts 60% tropical forest cover, the second-highest level of forest cover in Viet Nam. With an initial 5 billion Viet Namese dong in capital, partly sourced through the Vinasamex company (a major producer, trader and exporter of organic cinnamon, anise and spices in Viet Nam) and bank loans, the cooperative has partnered with local farmers to expand supply, built a processing plant, enhanced value through sorting and packaging 12 different cinnamon and star anise products, and expanded organic farming, including meeting international standards such as United States Department of Agriculture (USDA) Organic, European Union (EU) Organic, and Japanese Agricultural Standard for Organic Plants (JAS). The cooperative has also successfully pursued certification from Fairtrade, For Life Corporate Social Responsibility, Vcert organic certification in Viet Nam, Union for Ethical BioTrade (UEBT) and Bureau Veritas.

The integration of production and processing together with Vinasamex has allowed the cooperative to commence exports to premium markets in the EU, Japan, South Korea and the USA from 2020 onwards, with 70% of total revenue in 2023 coming from exports, boosting farmer incomes and creating jobs. Currently, the cooperative has more than 900 hectares of cinnamon plantation by 600 households averaging 1.5 to 3 hectares per household, with 665 hectares certified as organic. It has also established linkages for raw material supply from over 2,000 hectares in neighbouring communes such as Tan Dong, Bao Dap, Viet Thanh and Hoa Cuong, with an estimated annual yield in 2023 of 792

11 This case study is summarised from a longer report prepared by Nhuan (2025).

tonnes of fresh cinnamon bark, 181 tonnes of star anise, and 45 tonnes of ginger and turmeric. These products have been sourced from members and associated producers for a total revenue of 100.9 billion Viet Namese dong (US$3.9 million). The cooperative now employs over 60 permanent and 100 seasonal employees. A technical service arm, HTX Que Hoi Viet Nam, pushes agroforestry innovation.

3.7.2 Dao Thinh Cooperative's agroforestry system

Dao Thinh Cooperative promotes an agroforestry system that is dominated by tree crops such as plantations of organic cinnamon (*Cinnamomum verum*) and star anise (*Illicium verum*). In the first four years of the production cycle of cinnamon, crops such as khoi nhung (*Ardisia silvestris*), turmeric (*Curcuma longa*) and ginger (*Zingiber officinale*), and other herbal tea products such as perilla leaf tea (*Perilla frutescens*) are integrated in the plantation for higher economic returns and additional income for farmers. These plantation crops complement the farmers' own subsistence production of conventional fruit trees, crops such as glutinous rice, grapefruit, orange and taro, as well as fish.

While organic plantation practices have been developed within the cooperative members' farms, there has also been a catalytic effect on the whole Tran Yen district. Ther are now 12,000 hectares of organic cinnamon production out of the district total of 20,000 hectares (60% of the total). Dao Thinh Cinnamon Cooperative has also played a crucial role in strengthening the development of another cooperative from the same commune, the Tien Thanh Cooperative, by fostering a value-chain partnership, ensuring product output, providing technical support, purchasing cinnamon bark for processing and export, and helping it to expand its product range with khoi nhung herbal tea and perilla leaf tea which are distributed locally, nationally and now internationally with a new export market in the Australian market, enhancing brand value.

Member farmers perceive several benefits from the transition to an organic agroforestry production system. The transition to organic farming has eliminated the use of synthetic chemicals, replacing them with organic fertilisers and natural soil-enrichment techniques. For example, many farmers now use manual weeding methods, herbal or microbial treatments instead of chemical herbicides, and the use of organic mulch, including using turmeric and ginger plant residues in the early phase of plantation development. This shift has resulted in healthier soil and stronger cinnamon trees, reducing long-term environmental damage, as well as the return of birds and insects that had suffered under the use of chemical pesticides.

Farmers also mentioned the increased carbon storage that the system provides, both in the standing crop and in the soils through reduced use of heavy machinery and chemical inputs. Economically, the member farmers have on average seen a 20–30% increase in income compared to conventional methods (with profits rising by US$1,500–3,000 per hectare per year). Additionally, the cooperative actively supports cultural and sports

activities, contributing to the construction of a 500-square-metre cultural house with three volleyball courts. These initiatives have fostered community engagement, enhanced quality of life and promoted sustainable socioeconomic development within the region.

3.7.3 Dao Thinh Cooperative's strategy to promote agroforestry uptake

In partnership with Vinasamex and the FFF programme, Dao Thinh Cinnamon Cooperative has conducted 15 training sessions for over 500 farmers on organic agroforestry techniques, backed by various financing strategies, including government grants, international development funds, and cooperative-based credit programmes. Organising domestic and international visits to advanced organic cinnamon regions has exposed members to successful models, innovative cultivation techniques, international standards, and value-chain strategies, while also fostering new partnerships to boost sales and exports. The cooperative has coordinated with local authorities to train farmers in organic cinnamon and star anise cultivation, cross-check raw material areas, provide support for seed selection, care and harvest, and to provide support for processing and packaging, labelling and marketing. This includes overseeing the pursuit of certification against a range of organic and other trade certification schemes. It has bought, aggregated and sold additional early rotation crops from member farmers such ginger, turmeric, khoi nhung and perilla herbal teas.

By purchasing products at prices above the market average, the cooperative significantly boosts household incomes. This is made possible by the processing of value-added items, such as cinnamon oil and powder, that further increases profitability and economic benefits for members. Dao Thinh Cinnamon Cooperative is proactively expanding its markets through diverse initiatives such as study tours, trade fairs and promotional activities. These efforts allow the cooperative to showcase its products, connect with potential partners, and extend its distribution network. By adopting new technologies and adhering to international certification standards, the cooperative hopes to ensure its long-term competitiveness in global markets and maintain a reputation for excellence. For example, the cooperative was awarded a certificate of merit from the Executive Committee of the Yen Bai Provincial Confederation of Labour for its outstanding performance in caring for workers' welfare and ensuring labour policies in 2021.

Despite its achievements, the cooperative faces challenges, including digital transformation, certification compliance, climate risks and market fluctuations. To ensure continued growth and resilience, cooperative members believe that future efforts should focus on further training in organic agroforestry techniques, upgrading processing technologies, enhancing branding and strengthening communication. Additionally,

the cooperative needs to continue to leverage policy support and foster collaborative networks that will be crucial for sustaining competitiveness and securing a strong position in premium markets. Policy incentives — such as tax breaks, financial aid, and grants for organic agriculture for example — could alleviate financial burdens and encourage further investment. Strategic partnerships with export firms, like Vinasamex, help the cooperative to expand into premium markets, increase export revenues and strengthen its brand presence. Effective communication is seen as vital to promoting cooperative achievements. High-quality visuals, detailed brochures and an updated website boost visibility, while active social media and online forum participation attract customers and partners.

Candlenut agroforestry system in Indonesia. Photo: Duncan Macqueen

4

Insights from the case studies on how to increase the uptake of agroforestry

4.1 Common strategy elements to increase agroforestry uptake

The seven case studies demonstrate how different smallholder farmer organisations in different contexts are facilitating uptake of diverse agroforestry systems. There are some common elements of strategy to increase uptake, despite the varied types of agroforestry system in question. Some of these elements span different agroforestry systems

from rather uniform shade-grown coffee systems (such as ASOCAFÉ and CIAPEC in Bolivia), more diversified shade-grown crop systems (APEOSAE in Ecuador), diversified home-garden systems (FITAFA in Madagascar), silvopastoral systems (Setidevi in Nepal), agrosilvopastoral systems combining home gardens with livestock (MVIWAMA in Tanzania), and sequential woodlot systems (Dao Thinh Cooperative in Viet Nam).

Common elements of an agroforestry uptake strategy in these different smallholder farmer organisations can be seen to correspond to addressing eight main challenges that have plagued agroforestry uptake, as discussed in Section 2. Some of these challenges have a gender dimension in specific contexts (for example, women having different labour demands due to family care, or different risks working in more remote locations, or having less, or less secure land). In some cases, these gender differences have resulted in differentiated access solutions, such as the observation in FITAFA that women found it more difficult to participate in training due to clashes with family care. Many of these challenges, including these gender dimensions, are issues that can be addressed through recognition of the need for gender-specific approaches in collective action, and tailored approaches have often been used to try and address gender inequalities. As a result, the general perception across the case studies between men and women is that agroforestry has proved beneficial, notwithstanding those gender differences. Indeed, some elements of agroforestry (such as the management of tree nurseries in and around households) are predominantly managed by and beneficial to women. Overall, collective smallholder farmer organisations seem a powerful and inclusive driving force to overcome the challenges to agroforestry adoption. The eight main elements of a strategy to increase agroforestry uptake are shown in Table 4, and these naturally address the eight main challenges to agroforestry adoption.

The cases were chosen because there has been an expansion of agroforestry within their membership. We can therefore draw from this that taken altogether these broad approaches and the more specific tactics shared could be regarded as a strategy to overcome the barriers to agroforestry adoption.

As noted in the introduction, agroforestry provides an integrated solution to the most pressing global challenges of persistent poverty, social inequality and hunger; biodiversity and agrobiodiversity loss; and climate change adaptation and mitigation. Understanding how local smallholder farmer organisations can develop strategies to increase uptake of such systems is an important priority. The sections that follow unpack the main elements of these locally led strategies to increase agroforestry uptake.

Table 4. Challenges to agroforestry uptake and main strategies to overcome them

No.	Challenges to agroforestry uptake	Strategic elements to increase agroforestry uptake
1	Limited awareness of agroforestry benefits	Quantification of benefits and sharing of experience to promote agroforestry benefits
2	High upfront costs in many systems	Mobilising finance to bridge upfront agroforestry installation-cost gap
3	Additional labour requirements	Developing incentives or tactics to offset additional labour costs
4	System complexity and lack of extension support	Building capacity for complex system management
5	Lack of access to seed and seedlings of diverse components	Providing agroforestry system species components
6	Lack of secure land tenure, space and scale to aggregate products	Cooperating between members to secure tenure and achieve market scale
7	Disabling policies and institutional support	Combining advocacy voice to shape enabling policies
8	Lack of market information, pricing, return on investment data and logistics	Joining forces to build knowledge, add value and access new agroforestry markets

4.2 More detailed tactics in support of increasing agroforestry uptake

By looking across the diverse agroforestry contexts in the case studies, it is possible to uncover a set of more detailed tactics that local smallholder farmer organisations have used under each strategy element to increase agroforestry adoption. Table 5 presents the eight strategic elements and 23 tactics used by local smallholder farmer organisations in the case studies to encourage agroforestry uptake and the number of smallholder farmer organisations found to have been using those tactics. Not all tactics are used by all groups as contexts differ and the case studies did not investigate tactics that had been used and that had failed. But together, these tactics form a powerful set of options for improving agroforestry uptake.

Table 5. Case study examples of strategies and tactics to encourage agroforestry uptake

Strategic elements and tactics for agroforestry uptake and their application by country case studies	Bol1	Bol2	Ecu	Mad	Nep	Tanz	Viet
1. Sharing experience to promote agroforestry benefits	X	X	X	X	X	X	X
Facilitating agroforestry awareness-raising sessions	x	x	x	x	x	x	x
Managing farmer-to-farmer learning exchanges to see successful agroforestry models	x	x	x	x	x	x	x
2. Mobilising finance to bridge upfront agroforestry installation cost gap	X	X	X	X	X	X	X
Securing project or private-sector linkages to fund initial adoption costs	x	x	x	x	x	x	x
Setting up SACCOs to fund adoption			x	x	x	x	
Accessing government funds to support agroforestry adoption	x		x	x		x	x
3. Developing incentives or tactics to offset additional labour demands		X	X	X	X	X	X
Minimising or subsidising additional labour costs through project training and finance		x	x	x	x	x	
Setting up competitions for high performers to incentivise additional labour			x		x		x
4. Building capacity for complex agroforestry system management	X	X	X	X	X	X	X
Running or inviting in technical training courses	x	x	x	x	x	x	x
Promoting traditional knowledge transfers from experienced farmers		x	x		x		
Encouraging external farmer exchanges to learn new approaches				x			x
5. Providing agroforestry system species components	X	X	X	X	X	X	X
Procuring seed through new partnerships and establishing community seed banks	x		x	x	x	x	
Developing the technical skills and facilities for tree seedling nurseries			x	x	x	x	x
Running farmer seed fairs and other exchange mechanisms	x	x	x		x		

Strategic elements and tactics for agroforestry uptake and their application by country case studies	Bol1	Bol2	Ecu	Mad	Nep	Tanz	Viet
6. Cooperating between members to secure tenure and achieve landscape scale of production	X	X	X	X	X	X	X
Encouraging local farmer group formation to ease collective sales of products	x	x	x	x	x	x	x
Mobilising collective community responsibilities in communal areas			x		x		
7. Combining advocacy voices to shape enabling policies	X	X	X	X	X	X	X
Fighting to secure tenure and tree rights for members			x	x	x		
Working with government to improve access to finance and to provide incentives			x	x			x
Collaborating to access markets, including payments for ecosystem services (PES) markets	x	x				x	x
8. Joining forces to share knowledge, add value and access new agroforestry markets	X	X	X	X	X	X	X
Research on markets and prices for unusual crops or products — especially from trees	x	x	x	x	x	x	x
Procuring aggregation, processing and packaging facilities	x	x	x	x	x	x	x
Participating in or running market-linking events	x		x			x	
Developing standards and approaches to shared certification and labelling	x	x	x				x
Investing together in brand development that highlights agroforestry benefits	x	x	x			x	
Agreeing market development partnerships with likeminded business partners	x	x	x	x	x		x

Key: Bol1 = ASOCAFÉ, Bolivia; Bol2 = CIAPEC, Bolivia; Ecu = APEOSAE, Ecuador; Mad = FITAFA, Madagascar; Nep = Setidevi, Nepal; Tan = MVIWAMA, Tanzania; Viet = Dao Thinh Cooperative, Viet Nam.

The sections that follow describe the main strategic elements and each individual tactic for agroforestry uptake, with at least one example of their application from the country case studies discussed in Section 3.

4.3 Sharing experience to promote agroforestry benefits

All the case-study smallholder farmer organisations describe how they have tried to share experiences on the benefits of agroforestry. In surveys of what benefits members perceive from their agroforestry system, awareness of agroforestry benefits has been built through two main tactics: specific awareness-raising sessions, and farmer-to-farmer exchanges with internal group members and early adopters of the agroforestry system.

4.3.1 Facilitating agroforestry awareness-raising sessions

All of the case-study smallholder farmer organisations have conducted some form of formal awareness-raising meetings or seminars on the benefits of agroforestry. For example:

- In Ecuador, the APEOSAE Federation provided a theoretical introduction to the benefits of agroforestry systems (Suquisupa Herrera and Herrera Ochao, 2025).
- In Madagascar, the apex-level farmer organisation FEKRITAMA started in 2021 to promote the benefits of agrosilvopastoral systems and useful crop association in agroforestry systems to 650 of its members, including farmer members of FITAFA (Raharison, 2025).
- In Nepal, the Setidevi cooperative supported by the CDCAN apex-level dairy farmer organisation promoted the milk yield benefits of combining grass fodders such as five types of napier grass with up to ten different fodder trees (Acharya et al., 2025).
- MVIWAMA in Tanzania started to promote agroforestry systems in 2013 using seminars on the advantages of agroforestry practices (Kayombo, 2025).
- Both ASOCAFÉ and CIAPEC in Bolivia have promoted the benefits of shade-grown coffee agroforestry systems (Escobar Guevara and Fernández Arancibia, 2025a; 2025b).
- In Viet Nam, the Dao Thinh Cinnamon Cooperative began in 2021 to promote organic production practices in cinnamon and star anise plots, introducing early-stage ginger, turmeric and medicinal plants in a sequential agroforestry system that would increase financial returns and improve sustainability (Nhuan, 2025).

4.3.2 Managing farmer exchange visits to successful agroforestry models

All of the case-study smallholder farmer organisations surveyed here have also either established formal demonstration plots or facilitated farmer exchanges with early adopters. These plots can be used to build awareness of the benefits of agroforestry but

can also be used as training aids to build understanding of more complex agroforestry systems (see also Section 4.6). For example:

- In Ecuador, the APEOSAE Federation has complemented technical training with exchanges of experience to producers from different communities, showing a wide range of different agroforestry designs and tree-crop combinations developed within the traditional farming system (Suquisupa Herrera and Herrera Ochao, 2025).
- In Viet Nam, the Dao Thinh Cinnamon Cooperative has also used farmer-to-farmer exchanges to develop a sequential spice agroforestry system (Nhuan, 2025).
- In Bolivia, ASOCAFÉ has set up demonstration plots for shade-grown coffee agroforestry where members could come and learn about planting, weed management and coffee varieties. CIAPEC has promoted farmer-to-farmer exchanges to encourage learning (Escobar Guevara and Fernández Arancibia, 2025a; 2025b).
- In Madagascar, the apex-level farmer organisation FEKRITAMA has helped develop a model site within FITAFA, where seedling production, system establishment and plot maintenance are taught starting with cinnamon, clove and banana trees planted with cassava and then diversifying the agroforestry system over time (Raharison, 2025).
- In Tanzania, MVIWAMA has offered support for agroforestry installation contingent on member farmers forming agroforestry groups. Once a group is established, they then select one farm to go through a process of agroforestry design suited to the farm, provide seedlings and crop plants, and then establish a demonstration plot which other group members can learn from (Kayombo, 2025).
- In Nepal, the Setidevi cooperative has gone as far as to establish a model farm with an agroforestry system, silage-making facilities and dairy-milking demonstrations (Acharya et al., 2025).

4.4 Mobilising finance to bridge the upfront agroforestry installation cost gap

Finding ways to finance the transition towards agroforestry systems — before returns for the system can repay the initial investment — is a challenge that smallholder farmer organisations routinely manage. Often this is by using their collective presence and visibility to attract project funding. In many cases, internal SACCOs are set up to help fund the transition. And in several cases, organised groups have managed to secure access to government support programmes.

4.4.1 Securing project linkages to fund initial adoption costs

Adoption costs include costs for seedlings, planting materials, training, tools and value-addition processing equipment. All the case-study smallholder farmer organisations surveyed here had been the beneficiaries of FFF funding, by virtue of their track record of existing collective action. Many smallholder farmer organisations have secured project and private-sector support from many allies beyond FFF. For example:

- In Viet Nam, the Dao Thinh Cinnamon Cooperative had since 2017 advanced from four collective groups towards an established cooperative with a cinnamon production factory manufacturing 12 different cinnamon products. But FFF support from 2021 was also complemented by private-sector funding from Vinasamex. This allowed the introduction of organic agroforestry practices, intercropping ginger, turmeric and the medicinal herb khoi nhung (*Ardisia silvestris*) in the early stages of cinnamon and start anise plantation (Nhuan, 2025).
- In Ecuador, the APEOSAE Federation has had projects with non-government programmes ProAmazonía, Oxfam and Ethiquable (a Fairtrade chocolate-producing company) (Suquisupa Herrera and Herrera Ochao, 2025).
- Similarly, both ASOCAFÉ and CIPAEC in Bolivia have secured funding from CLAC (Escobar Guevara and Fernández Arancibia, 2025a; 2025b).
- In Madagascar, FITAFA has benefited from project support from CARE and the CASEF project (Agricultural Growth and Land Security Programme — Croissance Agricole et de Sécurisation Foncière) (Raharison, 2025).

4.4.2 Setting up savings and credit cooperative organisations to fund adoption

With limited access to bank finance, many smallholder farmer organisations set up their own SACCOs partly to help finance the expansion of agroforestry systems. For example:

- In Nepal, Setidevi has established a SACCO with a total capital of US$1,094,890. This provides loans for farmers to purchase cattle, tree seedlings, equipment and more.
- In Ecuador, the APEOSAE Federation has established an internal group savings and credit scheme that covers an estimated 40% of the costs of agroforestry establishment (Suquisupa Herrera and Herrera Ochao, 2025).
- In Madagascar, FITAFA, with support from FEKRITAMA is developing village saving and loan funds (VSLAs) to help members of these groups take loans to develop seedling nurseries, or to purchase product prior to sales (Raharison, 2025).
- In Tanzania, MVIWAMA has established a SACCO which has made loans to various member groups within the organisation for the establishment of agroforestry systems.

For example, it has loaned US$807 to the Ufanisi group in Dongobeshi to top up their own SACCO which had US$646. This gave the group a total of US$1,453 to be invested in agroforestry establishment (Kayombo, 2025).

4.4.3 Accessing government funds to support agroforestry adoption

Agroforestry systems are often attractive to government support programmes promoting sustainable agriculture and/or forestry. It is therefore often possible for smallholder farmer organisations to tap into government support programmes. For example:

- In Ecuador, the APEOSAE Federation managed to link to the Provincial Government of Zamora Chinchipe and MAGAP to access agroforestry planting material (Suquisupa Herrera and Herrera Ochao, 2025).
- In Viet Nam, the Dao Thinh Cinnamon Cooperative received technical support from local agricultural extension services, the provincial forest ranger department, the provincial Viet Nam Cooperative Alliance (VCA) and the Viet Nam Farmers' Union (VNFU) for the development of its organic agroforestry system (Nhuan, 2025).
- In Bolivia, ASOCAFÉ has received support from the Ministry of Productive Development and Rural Economy (Escobar Guevara and Fernández Arancibia, 2025a).
- In Madagascar, FITAFA received support from the Regional Agricultural Development Fund (FDRA) (Raharison, 2025).
- In Tanzania, the MVIWAMA producer group has managed to secure capacity-building resources from the Sustainable Agriculture Tanzania programme.

4.5 Developing incentives or tactics to offset additional labour

In addition to the start-up transition costs to agroforestry (including land clearance, tree seedling production, tools, training and so on), many agroforestry systems also involve additional labour that is typically associated with greater weeding and tree pruning. Smallholder farmer organisations often try to support members by subsidising some of these costs until farmers become familiar with the new system, training to minimise such costs, and competition to incentivise farmers to put in the hard work.

4.5.1 Minimising or subsidising additional labour costs through project training and finance

In several examples, smallholder farmer organisations have tried to help members minimise or subsidise the additional labour costs that agroforestry systems can bring. For example:

- In Bolivia, the coffee cooperative CIAPEC gives special training to its members on how tree planting, pruning and shade management can minimise the presence of weeds, with design advice to reduce the need for weeding as the system matures (Escobar Guevara and Fernández Arancibia, 2025b).
- In Tanzania, MVIWAMA has provided training to its members on how to turn weeds into green manure, as a way of offsetting the labour costs of weeding by reducing the subsequent costs of buying fertiliser (Kayombo, 2025).
- In Nepal, where the Setidevi cooperative's main agroforestry product is fodder for stall-fed cattle, the cooperative has demonstrated how regular cutting of tree fodder and napier grass can increase milk yields by up to 20% to recompense the labour needed for those harvests. They have also worked with CDCAN to campaign for a 9% increase in government-determined milk prices to improve the viability of the system (Acharya et al., 2025).
- In Ecuador, the APEOSAE Federation has organised a work-exchange scheme that encourages farmers to help each other out at peak labour periods on their farms which may coincide with slack on another farm, to build reciprocity and social cooperation (Suquisupa Herrera and Herrera Ochao, 2025).
- In Madagascar, FITAFA often starts with very simple, readily marketable crops to encourage agroforestry, for example cinnamon, cloves and bananas, before enriching the system with other subsistence fruits and crops once the revenues recompense farmers' labour. They have also promoted cover crops that can help reduce weeding costs while providing green manure (Raharison, 2025).

4.5.2 Setting up competitions for high performers to incentivise additional labour

The balance between increasing productivity of agroforestry systems and the additional labour required can be sweetened by offering prizes for the adoption of agroforestry systems, or prizes for the productivity of those systems. For example, the Setidevi Cooperative in Nepal has set up, through its SACCO, an annual award for the highest producer of milk. A recent winner, Ramchandra Neupane, had produced 6,108 litres of milk in 2003–2004, but raised this to 75,341 litres of milk per year in 2021–2022 using the new agroforestry system techniques (Acharya et al., 2025).

The organisation itself can enter its own products into competitions that recognise and reward sustainable, organic, shade-grown products. For example, in Ecuador, the APEOSAE Federation coffee won second prize in the Taza Dourada competition, which can then bring better sales and prices to reward members for their efforts (Suquisupa Herrera and Herrera Ochao, 2025).

In Viet Nam, the primary approach of the Dao Thinh Cinnamon Cooperative has been to offer farmer members above-market prices for organically grown products, with 20–30% higher prices than available locally. At the same time, the cooperative has sponsored cultural, artistic and sports activities within the community, providing valuable recreational opportunities and enriching the social life of members' families. It has won a range of awards from the Executive Committee of the Yen Bai Provincial Confederation of Labour, including in 2022 a certificate of merit for its outstanding performance in caring for workers' welfare and ensuring labour policies and in 2023 a certificate of commendation for outstanding achievements in the movement for excellent workers and building a strong labour union. These financial incentives and social and labour investments help encourage farmers to invest the labour required to manage organic agroforestry systems (Nhuan, 2025).

4.6 Building capacity for complex agroforestry system management

The necessary process of building understanding to manage more complex agroforestry systems is a task that smallholder farmer organisations uniformly engage in. In all the case-study examples, smallholder farmer organisations have run or invited in technical training courses. Especially in Indigenous contexts, many of these technical trainings have been complemented by traditional knowledge transfer from farmer exchange visits. And in several cases smallholder farmer organisations have taken farmers to see distant external production systems to build their members' capabilities. In some cases, smallholder farmer organisations have worked with existing extension programmes to provide continuous support over time, especially during the initial stage until they can generate benefits from agroforestry.

4.6.1 Running or inviting in technical training courses

In Section 4.3 on the sharing of experience and raising awareness of the benefits of agroforestry, mention was made of the ubiquitous use of awareness-raising and training sessions. For example:

- In Ecuador, the APEOSAE Federation has complemented its promotion of the benefits of agroforestry with practical training on how to stratify upper canopy timbers and

middle canopy fruit trees with lower layers of commercial crops such as cocoa, coffee, cassava and banana (Suquisupa Herrera and Herrera Ochao, 2025).

- In Madagascar, the apex-level farmer organisation FEKRITAMA has drawn on existing agroforestry projects such as the CASEF project, the PROSPERER programme (Support Programme for the Rural Microenterprise Poles and Regional Economies in Madagascar — Programme de Soutien aux Pôles de micro-Entreprises Rurales et aux Economies Régionales) and the SPICES project (Securing and Protecting Investments and Capacities for Environmental Sustainability) to advance training in seedling production, system establishment and maintenance (Raharison, 2025).
- In Nepal, Setidevi has provided training at its model farm on how to establish, manage and grow tree fodders, alongside napier grass, plus also silage production (Acharya et al., 2025).
- In Tanzania, MVIWAMA has collaborated with technical partners such as Mkulima Mbunifu (meaning 'creative farmer') and the Sustainable Agriculture Tanzania programme to provide training in agroforestry practices (Kayombo, 2025).
- Often, farmer organisations use technical support agencies to help promote the benefits of agroforestry. For example, ASOCAFÉ in Bolivia has procured training courses from the Tropical Agricultural Research and Higher Education Center (Centro Agronómico Tropical de Investigación y Enseñanza — CATIE), a regional technical support organisation (Escobar Guevara and Fernández Arancibia, 2025a).
- Similarly, CIAPEC in Bolivia has brought in the Caranavi Technological Institute (Instituto Tecnologico Caranavi — ITC) among other organisations to help promote its own shade-grown coffee agroforestry system (Escobar Guevara and Fernández Arancibia, 2025b).
- In Viet Nam, the Dao Thinh Cinnamon Cooperative actively promotes organic agroforestry systems through a series of training events (Nhuan, 2025).

4.6.2 Promoting traditional knowledge transfers from experienced farmers

In some cases, agroforestry systems form a traditional part of Indigenous People's biocultural heritage, and the need is to recover and spread traditional practice alongside any introduction of new agroforestry techniques. For example:

- In Ecuador, APEOSAE promotes the exchange of ancestral knowledge of experienced Indigenous Shuar and Saraguro farms alongside mestizo producers (Suquisupa Herrera and Herrera Ochao, 2025).
- In other cases, the current smallholder farmer organisation may not have been the originator of agroforestry practices, but rather depends on predecessor organisations,

such as in the case of CIAPEC where coffee agroforestry was already in place, and CIAPEC merely promoted, refined and expanded the system (Escobar Guevara and Fernández Arancibia, 2025b).

- Similarly in Nepal, the Setidevi cooperative drew on pre-existing practices of using tree fodder by farmers in the middle hills, but expanded and formalised the system (Acharya et al., 2025).

4.6.3 Encouraging external farmer exchanges to learn new approaches

In areas where agroforestry has been less widely used, it can prove useful to organise exchanges to external sites to observe and learn from best practice. For example:

- In Madagascar, the link between an apex-level farmer organisation (FEKRITAMA) has allowed farmer exchanges to see agroforestry systems outside the immediate vicinity of local groups such as FITAFA (Raharison, 2025).
- Similarly, through starting to promote organic spice production agroforestry systems within the Dao Minh Cinnamon Cooperative, the apex-level VNFU has used demonstration visits to expand these practices. According to local VNFUs and cooperative leaders, the Yen Bai district now dedicates over 20,000 hectares to cinnamon cultivation, with more than 12,000 hectares farmed organically and over 3,000 hectares of organic cinnamon achieving (Nhuan, 2025).

4.7 Providing seed, seedlings and other inputs

Finding seed or seedlings of the different species within an agroforestry system can be challenging for individual farmers, and so smallholder farmer organisations often play a crucial role in sourcing materials. Sustainability usually requires that farmer organisations themselves develop community seed banks of some sort (see Vernooy et al., 2020), and/or the capacity to establish and manage tree nurseries (see Stott and Gill, 2014; Buyinza and Opolot, 2016). In the case studies, all smallholder farmer organisations played a role in improving access to seed and seedlings, either through setting up community seed banks or nurseries, or by running seed fairs and other exchanges.

4.7.1 Procuring seed through institutional partnerships and establishing community seed banks

- In Ecuador, the APEOSAE Federation has entered into partnership with the provincial government and MAGAP to procure plant seed or seedlings for the agroforestry components in different agroforestry strata. Women within APEOSAE have set up a

community seed bank to ensure the preservation of important local varieties of crops. Additionally, partnerships have been brokered by APEOSAE with technical agencies such as ProAmazonía, Oxfam and Ethiquable for improved varieties of coffee, cocoa and native forest species (Suquisupa Herrera and Herrera Ochao, 2025).

- In Madagascar, FEKRITAMA and FITAFA have helped to link farmers to sources of cash-crop seeds (Raharison, 2025).
- In Tanzania, as part of an agreement contingent on local farmers establishing an agroforestry group, MVIWAMA provides seeds and planting advice for a variety of components of the agroforestry system (Kayombo, 2025).
- In Nepal, Setidevi has ensured that its members get access to seed of five different types of napier grass, plus fodder trees, which it procures through the apex-level dairy cooperative CDCAN (Acharya et al., 2025).
- In Bolivia, ASOCAFÉ has helped its members to link to projects such as CLAC and the National Coffee Programme to get access to optimal planting varieties (Escobar Guevara and Fernández Arancibia, 2025a).

4.7.2 Developing the technical skills and facilities for tree seedling nurseries

- In Ecuador, the APEOSAE Federation has helped its members to share traditional propagation techniques and combine these with newer seedling nursery methodologies (Suquisupa Herrera and Herrera Ochao, 2025).
- In Madagascar, FEKRITAMA and FITAFA have helped to multiply the number of tree seedling nurseries among their farmer groups and developed a nursery-growers union to facilitate collaboration and skill-development (Raharison, 2025).
- In Tanzania, MVIWAMA also provides seeds or seedlings, the polythene bags for nursery establishment and planting advice to support its local agroforestry groups (Kayombo, 2025).
- In Nepal, Setidevi has helped its farmer members to establish their own tree nurseries (Acharya et al., 2025).
- In Viet Nam, the Dao Thinh Cinnamon Cooperatives has introduced organic nursery techniques to produce cinnamon, turmeric, ginger and other medicinal plants grown in the early phases of cinnamon plantation (Nhuan, 2025).

4.7.3 Running farmer seed fairs and other natural resource exchange mechanisms

- In Bolivia, both ASOCAFÉ and CIAPEC help members with neighbour exchanges of seed to ensure its members have access both to appropriate crop varieties and trees species for coffee shade (Escobar Guevara and Fernández Arancibia, 2025a; 20s5b).
- In Ecuador, the APEOSAE Federation organises regular seed exchanges between its members so that each family can select and preserve the preferred varieties of crop and tree on their farm (Suquisupa Herrera and Herrera Ochao, 2025).
- In Nepal, Setidevi has established an interesting partnership with the local Alchechaur CFUG, where fodder grasses and fodder trees have been planted over a substantial area of 30 hectares. Every 2–3 months, the CFUG provides access to the area for 20–22 days to allow farmers who have a shortfall from their own land to collect fodder (Acharya et al., 2025).

4.8 Member cooperation to achieve landscape and economic scales

Part of the challenge of adopting agroforestry with a wider range of products is to ensure that enough individual smallholder farmers or enough of any collective community area adopt the system so that products can be aggregated for market. Having one collective area of sustainable agroforestry production can provide the basis for many of the aggregation, labelling and marketing opportunities that are further considered in Section 4.10. Here we limit our discussion to the strategies for encouraging group formation for collective sale of product, and/or mobilising collective community responsibilities for harvesting from communal areas.

4.8.1 Encouraging local farmer group formation to ease collective sales of product

In Viet Nam, the Dao Thinh Cinnamon Cooperative has emerged out of separate collective groups that then united to form a larger cooperative that could develop processing facilities at a significant scale (Nhuan, 2025). In Tanzania, MVIWAMA provides perhaps the clearest example of a smallholder farmer organisation that encourages local group formation to adopt agroforestry practices. Indeed, MVIWAMA's subsequent technical support is conditional on local farmers joining forces into local groups, formally registering, and paying a registration fee and annual fees to the MWIVAMA organisation (Kayombo, 2025).

But this is by no means a unique occurrence. For example, in Nepal, the Setidevi dairy cooperative encourages local dairy group formation, linked to seven aggregation centres where members can bring their daily milk for collection, processing and transport (Acharya et al., 2025). In Madagascar, some local farmers within FITAFA are organising producer groups (such as in the Andasibe commune) to pool transport of their produce to more distant collection centres — although maintaining trust to ensure these groups work effectively is a struggle (Raharison, 2025).

A key challenge is to ensure uniformly high-quality products across many local producers — especially when selling to international markets for groups such as the ASOCAFÉ and CIAPEC cooperatives in Bolivia. Where organic and Fairtrade standards apply, for CIAPEC, it is essential that all local producer groups abide by those standards (Escobar Guevara and Fernández Arancibia, 2025b). Often some flexibility is allowed: for example, members can sell some of their products through ASOCAFÉ to export markets, often at high prices, and market some of their production locally (Escobar Guevara and Fernández Arancibia, 2025a).

4.8.2 Mobilising collective community responsibilities in communal areas

- In Ecuador, the APEOSAE Federation has individual private smallholder members, but also manages communal areas of Shuar community forest. The federation combines individual rights with collective responsibilities in communal land areas to ensure agroforestry practices are developed at scale (Suquisupa Herrera and Herrera Ochao, 2025).
- In Nepal, the Setidevi dairy cooperative has entered a partnership with the Alchechaur CFUG to expand the area of available fodder for dairy cattle. The community forest management plan is adjusted to allow for the collective production of fodder species that then serve private smallholders who may lack access to sufficient fodder (Acharya et al., 2025).

4.9 Combining advocacy voices to shape enabling policies

All the smallholder farmer organisations in the case studies have developed policy and advocacy agendas to try and pursue more enabling environments for their agroforestry production systems. In several cases, this involves actively fighting to help their members secure long-term tenure that gives farmers the confidence to plant trees. In other cases, smallholder farmer organisations fight for more accessible credit, including through pushing for payment for ecosystem services such as carbon payments. Smallholder farmer

organisations can marshal strength in numbers to give them credibility and influence with political decision makers.

4.9.1 Fighting to secure tenure and tree rights for members

- In Madagascar, FEKRITAMA and FITAFA have been fighting to help secure land tenure for their members, especially expanding populations of younger farmers who must get access to land, with a new reduction in the time farmers must occupy land before they can claim ownership (Raharison, 2025).
- Similarly in Nepal, the Setidevi cooperative has worked with its umbrella federation CDCAN to push for clearer land-tenure rules for smallholders to encourage the spread of longer-term tree-based fodder systems (Acharya et al., 2025).
- In Ecuador, the APEOSAE Federation has been fighting to simplify regulatory burdens for registering management of agroforestry plots (Suquisupa Herrera and Herrera Ochao, 2025).

4.9.2 Working with governments to improve access to finance and provide incentives

- In Viet Nam, the Dao Thinh Cinnamon Cooperative has worked closely with businesses such as Vinasamex, other cooperatives such as the Tien Thanh Cooperative and the VNFU, and commune, district and provincial government authorities to promote organic cinnamon and spice production — but also to adjust credit terms so that they can accommodate longer-term tree crops. Close collaboration with government has expanded market reach and supported branding efforts (Nhuan, 2025).
- In Madagascar too, FITAFA and FEKRITAMA are fighting to reduce the complexity of farmers accessing regional agricultural development funds such as the Regional Agricultural Development Fund (Les Fonds Régionaux de Développement Agricole — FRDA) (Raharison, 2025).
- In Ecuador, the APEOSAE Federation has been campaigning to introduce a specific rural credit policy for agroforestry systems (Suquisupa Herrera and Herrera Ochao, 2025).

4.9.3 Collaborating to access markets — including PES markets

- In Bolivia, cooperatives such as ASOCAFÉ and CIAPEC have been pressing government to develop support programmes not just for forestry but also for sustainable agroforestry. They are also working with governments to develop means of compliance with, for example, the EUDR. They are also exploring possibilities for

creating incentives for agroforestry farmers through payments for ecosystem services (PES) schemes (Escobar Guevara and Fernández Arancibia, 2025a; 2025b).

- In Tanzania, MVIWAMA has been advocating for the government to develop indicative price setting within its National Trade Policy for several newer agroforestry crops to improve market conditions, while also improving the implementation of biosafety standards and checks to help discriminate against the use of chemicals in competing conventional agriculture (Kayombo, 2025).
- In Ecuador, the APEOSAE Federation is fighting for PES schemes for agroforestry that recognise and compensate for carbon storage, biodiversity conservation and watershed protection. Similarly, they want trade policies that offer incentives for organic and deforestation-free production (Suquisupa Herrera and Herrera Ochao, 2025).

4.10 Joining forces to research and access new agroforestry markets

One of the most important functions of smallholder farmer organisations in encouraging agroforestry adoption is to improve market access. Smallholder farmer organisations do this through a range of strategies including using staff time to research markets for newer agroforestry products, setting up aggregation, processing and packaging centres for those crops, running market-linking events, developing shared labels or certification systems, investing together in brand development, and building market-development partnerships with likeminded organisations.

4.10.1 Researching markets for unusual crops or products — especially from trees

- In Bolivia, while the main market for ASOCAFÉ and CIAPEC is coffee, the agroforestry systems have introduced multiple other product options such as avocado, mandarins, oranges, corn and bananas. Both ASOCAFÉ and CIAPEC have helped explore local market options to allow its members to diversify their sales (Escobar Guevara and Fernández Arancibia, 2025a; 2025b).
- In Ecuador, the APEOSAE Federation, in addition to developing their Sánku organic coffee and cocoa brand, have also researched and developed markets for processed plantain and cassava chips under the same brand, alongside native fruit markets for guava, chonta, papaya and avocado, and medicinal plant markets for matico, aloe vera, rue and aritaco (Suquisupa Herrera and Herrera Ochao, 2025).

- In Madagascar, FEKRITAMA and FITAFA have helped members to research new markets for cinnamon, cloves, vanilla, lychee, pepper and coffee from their diverse agroforestry system (Raharison, 2025).
- In Nepal, in addition to their main milk product, the Setidevi cooperative has also been developing local markets for tomatoes, lemons, cauliflowers and potatoes (Acharya et al., 2025).
- In Tanzania, MVIWAMA has helped its members research and develop markets for new crops such as honey, beeswax, garlic, carrots and potatoes to broaden its members' income-generating opportunities (Kayombo, 2025).
- In Viet Nam, the Dao Thinh Cinnamon Cooperative has worked with market partners Vinasamex and Tien Thanh Cooperative to conduct market research and develop not only 12 different cinnamon products, but also a range of other spice and medicinal plant products (Nhuan, 2025).

4.10.2 Procuring aggregation, processing and packaging facilities

- In Bolivia, ASOCAFÉ has developed an aggregation centre for green coffee to be exported in containers to Germany, Japan and the USA. It is also planning a coffee-roasting centre to position its brand Madre Selva in the national market (Escobar Guevara and Fernández Arancibia, 2025a).
- Similarly in Bolivia, the CIAPEC coffee cooperative has developed aggregation and shipping of its organic green coffee to Benecke Coffee in Germany and A Van Weely BV in the Netherlands, while developing roasting and packaging of its national Bolcafé brand (Escobar Guevara and Fernández Arancibia, 2025b).
- In Ecuador, the APEOSAE Federation has developed an aggregation and processing facility for coffee, cocoa, plantain and cassava chips (Suquisupa Herrera and Herrera Ochao, 2025).
- In Madagascar, local groups within FITAFA have developed aggregation points for species such as cinnamon sticks, cloves and vanilla (Raharison, 2025).
- In Nepal, the Setidevi cooperative has set up seven aggregation, quality-checking and credit and loans centres to collect the 7,000 litres of milk produced daily (Acharya et al., 2025).
- In Tanzania, MVIWAMA has developed new aggregation and processing centres for both honey-produce and garlic-product production, with processed garlic (oil, paste and powder) doubling members' profits (Kayombo, 2025).

- In Viet Nam, the Dao Thin Cinnamon Cooperative, together with Vinasamex company and an investment bank, has developed a US$5 million cinnamon and star anise processing factory (Nhuan, 2025).

4.10.3 Participating in or running market-linking events

Smallholder farmer organisations — as well as government agencies — can help to facilitate the development of partnerships between smallholders and private-sector buyers and off-takers in matchmaking events for mutual benefits. For example:

- In Bolivia, ASOCAFÉ has arranged market-linking events which have culminated in three different international buyers for their coffee including Ana Katerin in Germany, Awataru in Japan and GrainPro from the USA (Escobar Guevara and Fernández Arancibia, 2025a).
- In Ecuador, market-linking events have helped to position the Sánku brand coffee, cocoa, and plantain and cassava chips in national and international markets (Suquisupa Herrera and Herrera Ochao, 2025).
- In Tanzania, MVIWAMA has helped its members by taking them to exhibitions and market events to showcase products such as honey and garlic (Kayombo, 2025).

4.10.4 Developing standards and approaches to shared certification and labelling

Certification is expensive (especially if third-party audited) and so it can help if individuals work together to share certification costs. For example:

- In Bolivia, ASOCAFÉ and CIAPEC have both managed to develop organic certification and ASOCAFÉ has also achieved Fairtrade certifications for its international coffee exports (Escobar Guevara and Fernández Arancibia, 2025a; 2025b).
- In Ecuador, the APEOSAE Federation's organic coffee and cocoa certification has been complemented by 'deforestation-free' certification to comply with the EUDR regulations — and they have also received recognition by The Other Bar project for their 'clean production territory', which has helped build market presence (Suquisupa Herrera and Herrera Ochao, 2025).
- In Viet Nam, the Dao Thin Cinnamon Cooperative has helped to develop organic certification procedures and processes for its products that are compliant with international standards such as USDA Organic, EU Organic and Japanese Agricultural Standard for Organic Plants (JAS) (Nhuan, 2025).

4.10.5 Investing together in brand development that highlights agroforestry benefits

- In Bolivia, ASOCAFÉ has developed its Madre Selva coffee brand for the domestic market to highlight the nature-friendly attributes of its organically certified agroforestry system. Similarly, CIAPEC has developed its Bolcafé brand, highlighting the national origin of its organic coffee (Escobar Guevara and Fernández Arancibia, 2025a; 2025b).
- In Ecuador, the APEOSAE Federation has invested in the development of their Sánku brand, which is built on sustainability and 'deforestation free' credentials (Suquisupa Herrera and Herrera Ochao, 2025).
- In Tanzania, MVIWAMA has developed the Manyara Honey brand to market its growing honey production (Kayombo, 2025).

4.10.6 Agreeing market-development partnerships with like-minded business partners

Cooperatives have more negotiating power, and provide a more attractive, less risky investment than individuals:

- In Bolivia, the ASOCAFÉ coffee cooperative has developed a series of business partners with Ana Katerin in Germany, Awataru in Japan and GrainPro from the USA. CIAPEC have developed similar partnerships with companies such as Benecke Coffee in Germany and A Van Weely BV in the Netherlands (Escobar Guevara and Fernández Arancibia, 2025a; 2025b).
- In Madagascar, FITAFA has developed market partnerships with Phael Flor Export for cinnamon stick spice export and with the AgriExport company for vanilla and cloves (Raharison, 2025).
- In Nepal, Setidevi has established market partnerships with the government's Dairy Development Corporation and several private milk companies (Acharya et al., 2025).
- In Viet Nam, the Dao Thinh Cinnamon Cooperative has developed strong partnerships with the Vinasamex spice company and Tien Thanh Cooperative to become a leading Asian player in the international spice market (Nhuan, 2025).

Rattan agroforestry system in Sulawesi, Indonesia. Photo: Duncan Macqueen

5 Recommendations for adopting agroforestry

As noted in Section 2.4, the many benefits of agroforestry systems have not yet translated into uniformly widespread adoption because of eight main barriers to uptake that are particularly onerous during the period of establishing agroforestry systems. But as the previous sections have shown, smallholder farmer organisations are routinely helping their members to overcome these barriers to agroforestry adoption. They are doing so because they see many benefits — including financial — for so doing.

Once established, agroforestry systems seem to be competitive in production and profitability terms compared with conventional monoculture agriculture. Perceptions from ten male and ten female farmers in each case study bear this out. For example:

- In Bolivia, member producers of organic shade-grown coffee agroforestry have seen increasing but importantly also more diversified income in both ASOCAFÉ and CIAPEC cooperatives (Escobar Guevara and Fernández Arancibia, 2025a; 2025b).
- In Ecuador, members of the APEOSAE Federation report increasing market returns from its organic, deforestation-free cocoa and coffee agroforestry, plus diversified income from plantain and cassava chip businesses (Suquisupa Herrera and Herrera Ochao, 2025).

- In Madagascar, members uniformly reported increased income and more diversified income from the sales of cinnamon, cloves, lychees, vanilla, turmeric and many other agroforestry crops (Raharison, 2025).
- In Nepal, members in the Setidevi cooperative report up to 20% milk yield increases through incorporating diverse tree-based fodders in agroforestry systems, plus diversified incomes from maize, ginger, citrus and many other crops (Acharya et al., 2025).
- In Tanzania, most members of the MVIWAMA organisation report increased income from sale of products such as honey, garlic and a range of fruit and other traditional crops (Kayombo, 2025).
- Finally, in Viet Nam more than 70% of male and female members of the Dao Thinh Cinnamon Cooperative report increases in income, as the cooperative revenues have increased from US$3.4 million in 2022 to US$5.2 million 2024 as turmeric and ginger began to be intercropped with cinnamon and star anise plantations (Nhuan, 2025).

When these economic benefits are complemented by the substantial nutritional and social benefits of risk-reduced production — plus the substantial environmental benefits of sustainable agroforestry systems — the competitive advantage of agroforestry is clear. But how can smallholder farmer organisations upscale their work to overcome the well-documented barriers to agroforestry uptake? This report concludes with three key recommendations for smallholder farmer organisations.

5.1 Continue to build the capabilities of members to adopt agroforestry

Smallholder producers within the case studies documented here are manifestly able to install and manage highly complex agroforestry systems. Some are focused on cash crops (coffee and cocoa in Bolivia and Ecuador), others on livestock (dairy cows in Nepal), some on the tree component (cinnamon and start anise in Viet Nam), and some on a combination of all three (the diverse systems developed in Madagascar and Tanzania). The capabilities and labour invested by these smallholder producers is leading to climate-resilient landscapes and improved livelihoods in each of the case studies presented here. But these advances do not happen overnight. For example, many of the coffee producers in ASOCAFÉ and CIAPEC had been practising agroforestry for as long as 30 years. There is role for higher-level apex farmer organisations in spreading successful strategies and tactics.

The rapid spread of agroforestry capabilities documented here can be attributed to the collective action of groups such as the APEOSAE Federation, ASOCAFÉ, Dao Thing Cinnamon Cooperative, CIAPEC, FITAFA, MVIWAMA and Setidevi. Each organisation has

played a fundamental role in building the capabilities of smallholder farmers to practise agroforestry, often drawing on and spreading the know-how from traditional expertise or particularly progressive lead farmers.

The process through which smallholder farmer organisations build agroforestry capabilities naturally corresponds or maps onto the main challenges that smallholder farmers face when trying to install agroforestry. These organisations have:

- Overcome a lack of awareness of the benefits of agroforestry by sharing their experiences of those benefits.
- Overcome the finance barrier of installing agroforestry systems by mobilising internal finance and finding projects to bridge the upfront agroforestry installation cost gap.
- Overcome any reticence to put in the increased labour of pruning and weeding by developing incentives, prizes or ways of compensating additional labour costs.
- Overcome fears of the complexity of mixing trees crops and animals by running training courses and exchange visits.
- Overcome unfamiliarity with the species involved by procuring or making available seed and seedlings.
- Overcome farmers' fears of 'going it alone' by developing groups of agroforestry practitioners, and community forest management plans.
- Overcome policy barriers by using their collective strength in numbers and voter voice to shape more enabling policies, and
- Overcome the problem of market access by joining forces to research, aggregate, process, package and broker market links for new products.

These smallholder farmer organisations have not just sought solutions for each challenge they face (as we would expect them to do). The point is that they have found the solutions.

As noted in the introduction, while agroforestry can accommodate mechanisation, largescale mechanisation is not easily achieved in more complex agroforestry systems. Agroforestry fits most comfortably on a smallholder scale where labour, not mechanisation, can plan and position crops, trees and animals in the most productive combinations. Agroforestry is as much shared art as science. The variables involved in mixing so many potential crops, trees and animals defy simple standardised prescription. Smallholder producers are ideally placed to take up agroforestry. Smallholder farmer organisations enable them to learn how, and how to achieve scale by working together. Through social organisation, they are able to restore landscapes and shape sustainable markets — and in doing so, they have found solutions to the barriers constraining agroforestry uptake.

5.2 Broadcast the benefits of agroforestry adoption as a solution to global challenges

Agroforestry uptake represents an opportunity for smallholder farm organisations and technical support partners to join forces with external donors. This will help tackle priorities such as poverty, social inequality and hunger; biodiversity and agrobiodiversity loss; and climate change adaptation and mitigation in an integrated way. In each of the case studies documented here, the starting point has been to build awareness of the benefits of agroforestry.

Economic benefits are one important concern. As noted in Section 1.2 the question 'is agroforestry competitive?' is one critical issue. With so many permutations of crops, trees and animals — each with their own production challenges, each with their own market challenges — providing an answer to that question is not easy. But the case studies here show that with the right organisational support, with growing experience of the system and potential markets for its products, agroforestry can indeed be economically competitive. Much clearer are the strong benefits agroforestry can bring to food security, restoration of nature (and the biodiversity and agrobiodiversity in these systems) and climate action. These benefits can be used by smallholder farmer organisations and their technical support partners as a bridge into donor agendas, and a means to attract funding and support.

In a recent FFF mission to Nepal at a meeting with apex-level organisations representing smallholder foresters, farmers and livestock keepers, a strange convergence happened. The apex-level representatives of community foresters (Federation of Community Forestry Users Nepal — FECOFUN) and family foresters (Association of Family Forest Owners — AFFON) were advocating for changes in policy to permit agroforestry as a way of introducing horticultural crops into community and family forestry in ways that would add economic revenues to those from forest products. Smallholder farmers' representatives from the National Farmers Group Federation (NFGF) and the Himalayan Grassroots Women's Natural Resource Management Association (HIMAWANTI) had been advocating for policy changes to mainstream agroecological practices into the new agricultural bill, so that agroforestry products could help diversify income streams and help maintain farm fertility. Dairy livestock farmers had been advocating for better milk prices alongside achieving 20% increase in milk yields from tree fodder agroforestry systems so as to give them adequate returns in the market. In each case, agroforestry provided a flexible and yet common agenda for all three groups. Nepal, let us recall, is a country where tree cover has almost doubled in the last 20 years as a result, primarily, of community and smallholder tree planting in community forest areas and on family farms.

The point is this: the benefits of agroforestry as an integrated solution to key global challenges need to be more widely broadcast and used as a basis for attracting donor

support directly to these smallholder farmer organisations. Yes, there are barriers to agroforestry uptake to be overcome. But the benefits of agroforestry provide a common platform around which to build climate-resilient landscapes and improve livelihoods.

5.3 Pursue agroforestry business models until they attract enabling and/or private-sector investment

Smallholder farmer organisations have developed a series of eight strategic elements and 23 individual tactics to help improve agroforestry uptake — overcoming the eight main barriers to agroforestry adoption. These strategies and tactics include the following:

1. Sharing experience to promote agroforestry benefits

- Facilitating agroforestry awareness-raising sessions
- Managing farmers' exchanges to see successful agroforestry models

2. Mobilising finance to bridge upfront agroforestry installation cost gaps

- Securing project linkages to fund initial adoption costs
- Setting up SACCOs to fund adoption
- Accessing government funds to support agroforestry adoption

3. Developing incentives or tactics to offset additional labour demands

- Minimising or subsidising additional labour costs through project training and finance
- Setting up competitions for high performers to incentivise additional labour

4. Building capacity for complex agroforestry system management

- Running or facilitating external experts to run technical training courses
- Promoting traditional knowledge transfers from experienced farmers
- Encouraging external farmer exchanges to learn new approaches

5. Providing agroforestry system species components

- Procuring seed through new partnerships and establishing community seed banks
- Developing the technical skills and facilities for tree seedling nurseries
- Running farmer seed fairs and other exchange mechanisms

6. Cooperating between members to secure tenure and achieve landscape scale

- Encouraging local farmer group formation to ease collective sales of products
- Mobilising collective community responsibilities in communal areas

7. Combining advocacy voice to shape enabling policies

- Fighting to secure tenure and tree rights for members
- Working with government to improve access to finance and to provide incentives
- Collaborating to access markets, including payments for ecosystem services (PES) markets

8. Joining forces to share knowledge, add value and access new agroforestry markets

- Research on markets and prices for unusual crops or products — especially from trees
- Procuring aggregation, processing and packaging facilities
- Participating in or running market-linking events
- Developing standards and approaches to shared certification and labelling
- Investing together in brand development that highlights agroforestry benefits
- Agreeing market development partnerships with likeminded business partners

Not all of the case-study smallholder farmer organisations had adopted all the tactics, but all of them had adopted at least one tactic in each of the main strategic areas. Taken together, these strategic elements and tactics can be regarded as a comprehensive strategy for increasing agroforestry uptake. Many smallholder farmer organisations are already financing this approach by using their own SACCOs. Many more are attracting in enabling grants from donors and private-sector investments to upscale this work.

Agroforestry can provide an integrated yet flexible solution to the three pressing challenges facing humanity: poverty, social inequality and hunger; biodiversity and agrobiodiversity loss; and climate change adaptation and mitigation. If we want to upscale that solution and increase agroforestry adoption, we need to strengthen the smallholder farmer organisations who are building the capabilities of smallholders to make agroforestry into a going and growing concern.

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Knowledge Products

Research Report

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Agroforestry's time has come. It is increasingly recognised to solve, in one integrated approach, three global challenges of poverty and hunger, climate change and biodiversity loss. Agroforestry mixes trees and other woody plants together with crops and livestock. By so doing, it diversifies what is cultivated, multiplies economic options, increases land productivity, biodiversity and carbon storage, and builds local people's resilience. Diverse mixtures like this are not easily compatible with industrial-scale mechanisation. But agroforestry suits and can readily enrich the lives of 1.3 billion smallholder farmers and Indigenous Peoples. If spread, it will maintain the ecosystem functionality of agriculture, the world's largest terrestrial land use. Yet, eight main barriers constrain agroforestry uptake: (1) limited awareness of agroforestry benefits, (2) high upfront costs, (3) additional labour requirements, (4) off-putting system complexity, (5) limited access to seed, (6) lack of space and scale to aggregate volumes to penetrate markets, (7) disabling policies and (8) limited market know-how and logistics. This report documents seven case studies that show how forest and farm producer organisations are helping overcome each one of these barriers. In diverse country contexts worldwide, they are spearheading agroforestry uptake of very many different types. To accelerate this, it is necessary to recognise the importance of such producer organisations in overcoming barriers to agroforestry uptake, promote the benefits of their efforts to increase agroforestry uptake and channel finance more directly to them as the main agents of change.

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International Institute for Environment and Development
44 Southampton Buildings, London WC2A 1AP, UK

Tel: +44 (0)20 3463 7399
www.iied.org

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