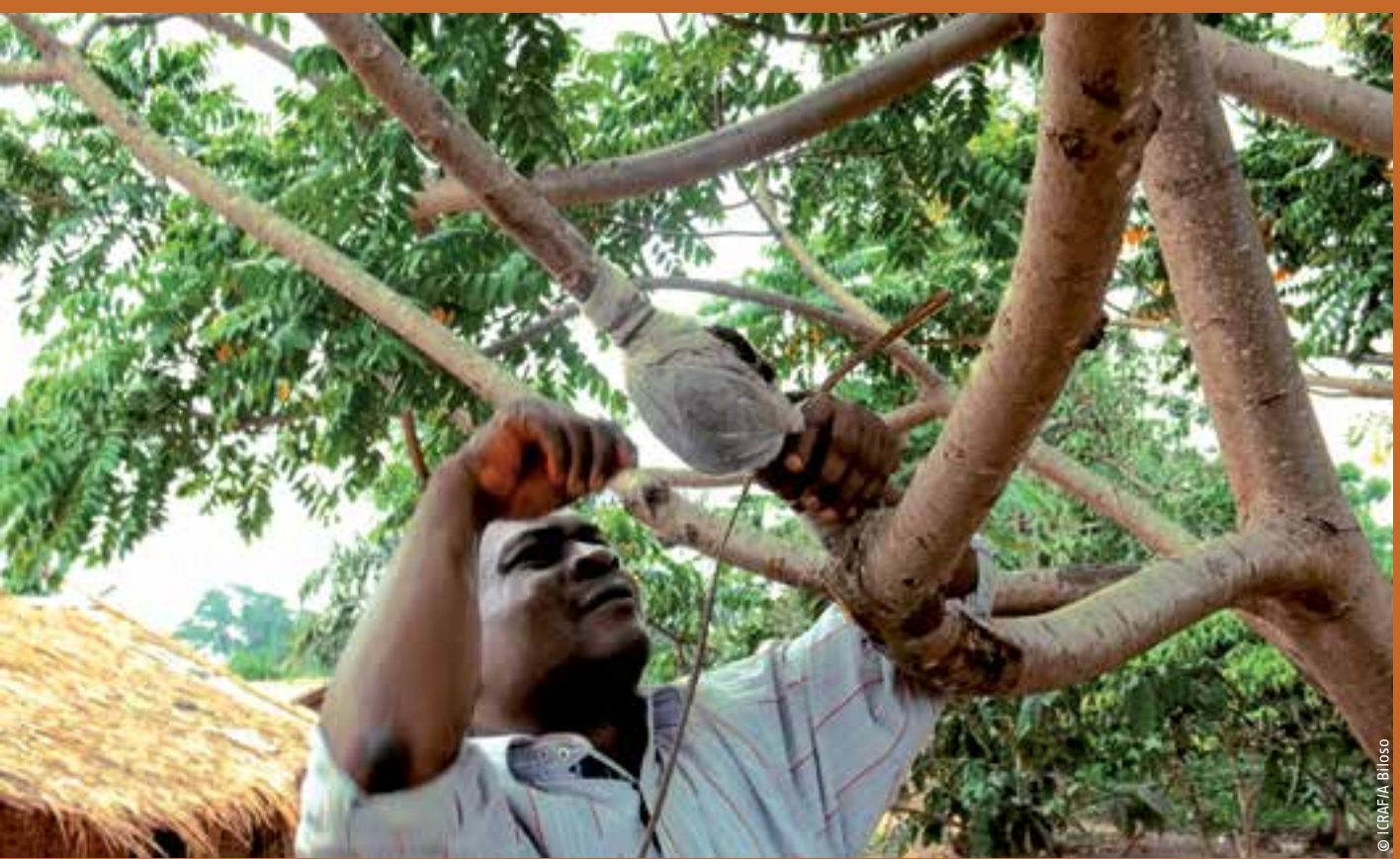
From providing fruit to fertiliser, farmers have many reasons to grow trees on their land. A growing alliance of governments, researchers and development organisations are recognising the importance of this, and carving out an agenda to bridge forestry and farming.

TREES ON THE FARM

Agroforestry spreads fresh branches



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Taming okok in forest regions

In Haiti, once-lush natural forest cover has long since succumbed to deforestation. Land was first cleared for plantations and, as the nation's population grew, for subsistence farming and charcoal production. But farmers have found little promise in the degraded soils left behind, which have led to poor yields and severe flooding.

However, these farmers might provide their own solution to deforestation if they are able to adopt trees into their homesteads alongside crops and livestock - a practice known as agroforestry. During Haiti's recovery from its 2010 earthquake, a number of organisations such as FAO and Trees for the Future began promoting agroforestry initiatives around the country as a key to a greener, less vulnerable future.

FAO believes that the productive re-establishment of trees within smallholder farming systems can return some of the resilience that Haiti has lost, stabilising land against storms and regenerating soil fertility while providing more diverse income sources. To accomplish this, they are supplying local nurseries with seedlings, tools and equipment to provide farmers with young trees to plant.

Agroforestry is far from a new concept, however. Trees have long been used in traditional farming systems worldwide, and farmers often know how best to integrate local species into their fields. Almost half of the world's farmland is under at least 10% tree cover.

This figure reflects the many roles of trees on the farm. Tree crops provide fruit, fodder and medicines for local consumption as well as producing profitable commodities such as nuts and oils. The right species of trees provide mulch, shade and a beneficial micro-climate to crops growing under them, improving and protecting yields while preventing erosion and water loss. Trees also serve as an on-farm source of timber and firewood for household use or sale.

Growing fertiliser

In February 2013, FAO made a strong call to policymakers to work towards the greater adoption of agroforestry. The UN organisation's publication *Advancing Agroforestry on the Policy Agenda: A Guide for Decision-makers* acknowledges the promise of these methods in supporting harvests, food security and environmental sustainability for millions of farmers. With the guide, FAO demonstrates how agroforestry can be integrated into national strategies and adapted to countries' own conditions.

The call comes as many African governments are undertaking ambitious programmes to bring hundreds of thousands more farms under the canopy of 'fertiliser trees' that naturally enrich soils. The World Agroforestry Center (ICRAF) has been evaluating the use of these trees around the continent since the 1980s, and has found that fertiliser trees used by farmers in the Sahel boost cereal yields by around 30%. Trials with maize plants under trees in Malawi and Zambia revealed an increase in the efficiency of the crop's rain use of up to 380%. ICRAF is promoting the use of such trees in a system it calls 'EverGreen Agriculture'.

In recent years, researchers have focused on the benefits of a native African fertiliser tree, *Faidherbia albida*. This tree was already growing in many fields; farmers simply recognised the seedlings as they emerged and let them grow. In the past fertiliser trees like *Leucaena leucocephala* and *Gliricidia sepium* have also been introduced to the continent from Central America and elsewhere, but ICRAF sees great benefits in the native *Faidherbia*, whether it is planted or simply allowed to grow naturally.

"As an indigenous species, it's well adapted and widely acceptable," says ICRAF scientist Catherine Muthuri. "Many farmers are already protecting the tree through farmer-managed natural regeneration. Farmers appreciate that the tree is compatible and highly beneficial to accompanying crops in their farming systems."

Uniquely, *Faidherbia* drops its leaves in the rainy season when farmers are planting their crops, leaving the canopy open to sunlight as the crops grow beneath. The leaves provide nitrogen, which the tree fixes from the atmosphere, and other vital nutrients brought out of the deep soil by its long taproot. The tree then returns to life in the

Above: Phylis Wambui Mungai harvests branches of *Calliandra* – a useful fodder shrub – on her farm in Kenya
Right: Maize growing under *Faidherbia albida*

dry season, providing valuable fodder for livestock when other sources are in short supply.

Faidherbia has been found to increase grain yield of crops such as maize, millet, sorghum, groundnut and cotton from 30-400%, depending on conditions in the field. In Zambia, a study showed that maize yields under *Faidherbia* averaged 4.1 t/ha, compared to 1.3 t/ha elsewhere in the field.

Opportunity overhead

However, no single tree, not even one as versatile as *Faidherbia,* is the answer to every farmer's needs. Farmers still need to find the right trees for their farm, with trade-offs between soil nutrient benefits, erosion control, shade, timber, fruit and fodder.

Thus EverGreen Agriculture and other systems of agroforestry focus on a whole range of tree species. Some nitrogen fixing species including *Gliricidia sepium* and *Tephrosia vogelli* are managed as shrubs, with farmers pruning the branches regularly to spread on their fields for a nutrient boost. There are also numerous useful fodder shrubs for livestock, such as *Calliandra calothyrsus.* Fruit and nut trees, meanwhile, can improve both nutrition and incomes (see Field Report p18).

Timber production is sometimes undervalued as an on-farm activity, especially when the clearing of trees is often seen by farmers as a necessary first step before crops are planted. In a recent study in Cameroon, however, the Center for International Forestry Research and the Partnership for the Tropical Forest Margins found that farmers were unknowingly supplying a high-value market. The researchers observed smallholder farmers selling trees from their fields for quick cash when extra finance was required. However, they did not see themselves as real timber producers and were not negotiating good prices.

Nevertheless, 80% of timber traded in Cameroon's capital city comes from these farms, as booming ▶

KEY FIGURES:

10% of tree cover on agricultural land is defined as an agroforestry system

1 billion ha of land worldwide is under agroforestry

9–10 years of growth are needed for a *Faidherbia* tree to reach full maturity

1.4–2 tonnes of maize per ha increase in yield was achieved under the fertiliser trees *Gliricidia* and *Tephrosia*

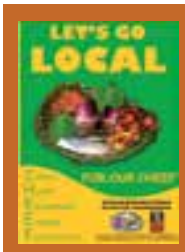
▶ demand far outstrips supply from the formal logging sector. The researchers propose that if this activity was managed sustainably, and farmers sought a greater share of the true market price for their product, on-farm timber could potentially constitute a valuable source of income.

The long view

The rallying call for on-farm trees from the likes of ICRAF and FAO has been answered by many African governments. In 2009, an African Union meeting brought Ministers of Agriculture, Land and Livestock together to make a declaration for the greater adoption of agroforestry. These governments have been joined by an alliance of donors, researchers and development partners who hope to establish EverGreen Agriculture and similar practices across the continent. National agroforestry programmes are presently operating or being established in at least 17 countries.

The 're-greening of the Sahel' has been an ongoing, well documented project in Niger, where some 5 million ha have been reclaimed from looming desertification with useful tree species including *Faidherbia*. According to one study by the International Food Policy Research Institute, this re-greening has increased yields in southern Niger enough to meet the grain needs of 2.5 million more people. In recent years, the initiative has spread to the plains of Burkina Faso, Mali and Senegal.

In 2009 Kenya introduced a bold policy under its Greening Kenya Initiative, which aims to reach 10% tree coverage across the country by 2030. Through national legislation, tree cover of 10% has become compulsory on all agricultural land. Meanwhile, Ethiopia has committed to putting 15 million more ha under agroforestry systems by 2015, focusing especially



A fruit for all seasons

On many Pacific islands, densely intercropped home gardens preserve the diversity of local trees and diets. A successful 'Go Local' campaign on the Micronesian island of Pohnpei has revitalised this tradition, while combating the effects of unhealthy imported foods. The campaign promotes the island's incredible food diversity, which includes more than 130 varieties of breadfruit. "Breadfruit is an important crop in Pohnpei – it sustains existence in our culture, and supplies the basic food need of the household year round, from January to December," says 65-year-old grower Alwis Ioakihm.

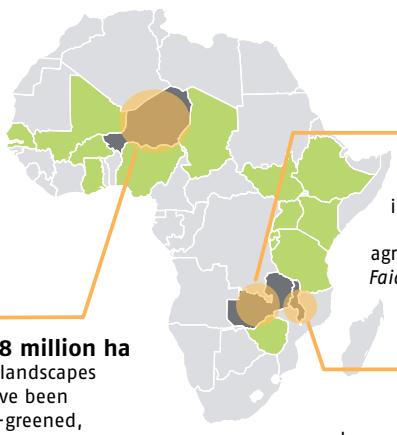
In one traditional agroforestry system, breadfruit is grown with climbing yam. The vines climb up trellises into the branches during the non-fruiting season. The yam plants then fall dormant before the breadfruit harvest, so the fruit can be picked without damaging them.

The Island Food Community of Pohnpei, which created the 'Go Local' campaign, aims to sustain the island's knowledge of preserving breadfruit to be consumed throughout the year. Breadfruit may be eaten raw or cooked, and the large nut even ground and brewed to make a coffee-like beverage. The campaign is also introducing new products like breadfruit chips to be sold around the region.

The results are clear to island resident Kermen Hadley. "There's establishment of new breadfruit plantings and addition of missing cultivars in the traditional home gardens. And more cooked breadfruit and other fresh tree food crops like pandanus, citrus, mango, soursop and mountain apple are being served, especially in the traditional feast known as *Kamadipw*," he observes.

EverGreen Agriculture

17 African countries are implementing or developing programmes to scale-up EverGreen Agriculture



Zambia

160,000 farmers introduced to conservation agriculture with *Faidherbia* trees

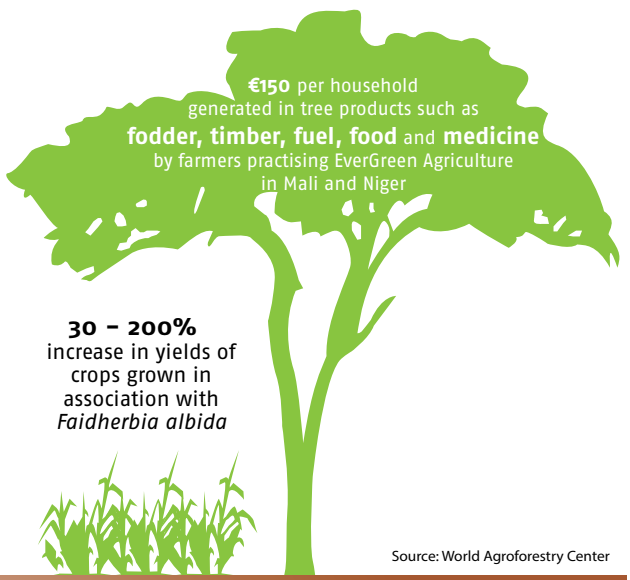
Niger

50,000 tonnes of additional cereal production per year under EverGreen Agricultural systems

4.8 million ha of landscapes have been re-greened, many with trees which improve soil fertility

Malawi

200,000 farmers have recently been testing tree-maize intercrop systems



€150 per household generated in tree products such as **fodder, timber, fuel, food** and **medicine** by farmers practising EverGreen Agriculture in Mali and Niger

30 – 200% increase in yields of crops grown in association with *Faidherbia albida*

Source: World Agroforestry Center

100% increase in soil nitrogen levels and a **200%** increase in soil organic matter in a conservation agriculture maize system under *Faidherbia albida*

on desertified areas. And in Zambia, *Faidherbia* trees stand over more than 160,000 farms.

Malawi is integrating the EverGreen system into its Agriculture Sector Wide Approach to propel a rapid upscaling within the country. More than 50,000 Malawian farmers have been piloting fertiliser trees with ICRAF and its partners since 2005. With clear evidence of the trees' benefits, 200,000 more households have now joined a scaled-up programme. The national programme provides tree seeds and nursery materials along with training in the planting and management of fertiliser trees.

This broad national support is essential for newly thriving agroforestry, says Muthuri. "Despite the numerous benefits of agroforestry, the sector has been hampered by adverse policies, legal constraints and lack of coordination between the sectors to which it contributes: agriculture, forestry, rural development, environment and trade."

Perhaps the biggest problem for farmers using trees has been this lack of a natural policy space for agroforestry, which hangs suspended between multiple government ministries. Some forest codes have the unintended consequence of restricting how farmers are allowed to manage trees on their own farms. And a lack of long-term land security makes agroforestry impossible, especially with a tree like *Faidherbia* that only produces its most beneficial effects after 9-10 years.

Muthuri believes that the establishment of more national agroforestry programmes is a necessary step in creating this policy space. "But it's definitely not the only one," she says. "It's more to ensure that there are synergies between national, regional and local priorities. A top down approach should be avoided, as variation across scales is important to the success of agroforestry." With no single tree or approach offering a solution for everyone, the future of agroforestry is in the hands of farmers. ■

Farmers in Malawi are being provided with tree seeds and nursery materials

Viewpoint

Sairusi Bulai is the coordinator for the Forests and Trees Team at the Secretariat of the Pacific Community's (SPC) Land Resources Division.

Agroforestry, a vital system for the Pacific

What is the role of agroforestry in the Pacific, in view of climate change?
Agroforestry has always been the mainstay of traditional farming in the Pacific islands, and with climate change it is even more vital. Most of the small island states in the Pacific have limited land available for food production, and severe land use competition from urban and tourism developments. Add in sea level rise and extreme weather events, and the situation becomes very precarious. Our approach at SPC is to intensify production systems and make them more resilient – more diverse and better adapted – to provide food and economic security in the face of climate change.

What is SPC doing to build more resilient agroforestry systems?
We're developing model agroforestry systems for the different Pacific agroecosystems, such as atolls, river deltas and uplands. We have a project across six Pacific countries (Fiji, Kiribati, Samoa, Solomon Islands, Tonga and Vanuatu) to increase the resilience of production systems, and we are building demonstration areas for the model systems. We are working with local communities to adapt the systems, and also developing community nurseries to supply climate-adapted crops and trees.

What are the challenges to developing resilient agroforestry systems?
There are many, but one major challenge is the availability of native tree species. We need much more effort on breeding and propagating these trees. The focus in the past has been on exotic high-value species like mahogany and teak, and our local species have fallen by the wayside, but we need to return to more diverse systems that mimic the natural ones that we have lost. Our local species provide a wealth of ecosystem services and also many high-value products such as nuts and oils. We are also helping to develop markets for these products, which also increases financial resilience for the communities.

Is there any climate change financing available for agroforestry in the region?
No, not at the moment. There has been a lot of talk about it, but it's hard to implement in practice, especially as these approaches are designed for larger land areas. We also lack data, for example on carbon budgets associated with different agroforestry systems and other land management options.