



THE FRUITS OF SUCCESS

A programme to domesticate West and Central Africa's wild fruit trees is raising incomes, improving health and stimulating the rural economy



The World Agroforestry Centre, an autonomous, non-profit research organization, aims to bring about a rural transformation in the developing world by encouraging and enabling smallholders to increase their use of trees in agricultural landscapes. This will help to improve food security, nutrition, income and health; provide shelter and energy; and lead to greater environmental sustainability.

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Suggested citation: Pye-Smith C. 2010. *The Fruits of Success: A programme to domesticate West and Central Africa's wild fruit trees is raising incomes, improving health and stimulating the rural economy*. ICRAF Trees for Change no. 4. Nairobi: World Agroforestry Centre.

ISBN: 978-2-9059-275-4

Publisher: World Agroforestry Centre

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Front cover: Comfort Loah of MIFACIG Rural Resource Centre with an African plum tree raised from a cutting.

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Foreword

There are around 3000 species of wild fruit tree in Africa, representing an enormously important, and largely untapped, natural resource. For proof of the difference that these fruits can make to the health and welfare of rural communities, you need look no further than the participatory tree domestication programme managed by the World Agroforestry Centre in West and Central Africa.

This booklet describes the remarkable progress made by the programme in Cameroon, where farmers and scientists have worked together to develop and domesticate superior varieties of African plum, bush mango, kola nut and several other species. Instead of having to search for the fruits and nuts of these trees in the wild, as their forebears did, farmers are now planting them on their land.

Thanks to the domestication programme, farmers can now pay school fees for their children, something many could not afford in the past. They also have a much healthier diet, and sufficient income to improve their homes and buy mobile phones and other consumer goods. In short, the domestication programme has helped thousands of families to lift themselves out of poverty.





The programme has developed superior varieties of fruit trees with the attributes farmers want: large, sweet fruit, grown on trees that mature quickly. But what makes this effort unique is not so much the science of domestication as the partnership that has been established between scientists and farmers, with the latter playing a key role in developing and testing new varieties. A similar effort with the private sector is domesticating a native tree, *Allanblackia*, whose seeds contain an oil with unique properties. And this is just the beginning: the participatory approach has the potential to bring scores of other species of wild fruit tree out of the forests and onto farmers' fields.

The International Fund for Agricultural Development (IFAD) has been a staunch supporter of this programme from the very beginning, along with other donors and partners, including the UK Department for International Development (DFID), Belgium Development Corporation, the United States Department of Agriculture (USDA) and the Government of Cameroon.

Dennis Garrity
Director General
World Agroforestry Centre

Rodney Cooke
Director, Technical Division
International Fund for Agricultural
Development (IFAD)

◀ *Alain Tsobeng of the World Agroforestry Centre with a superior variety of njansang.*



African plums for sale in a village market.

Introduction: 'Fighting the stomach devil'

If you had visited Christophe Missé in the 1990s, on his small farm some 40 kilometres north of the Cameroonian capital, Yaoundé, you would have heard a story of hardship and poverty. "My cocoa crop yielded an income for just three months a year," he recalls, "and even with the extra cash I earned as a part-time teacher, we struggled to make ends meet."

Then, in 1999, Missé attended a training session held by the World Agroforestry Centre in Nkolofep, West Region. It was, he says, an experience that changed his life. He learnt about the techniques used to develop superior varieties of indigenous fruit trees, and two years later he set up a nursery with his neighbours. They now sell over 7000 trees a year. He has also planted hundreds of indigenous fruit trees on his farm. "With the money I've made I've built a new house," he says proudly, "and I can now pay for two of my children to go to private school."

Christophe Missé is one of many thousands of smallholders who are benefiting from the participatory tree domestication programme managed by the World Agroforestry Centre. Ten years ago, there were just four farmers' nurseries, established with the help of the programme in Cameroon, the Democratic Republic



▲ Christophe Missé has significantly improved his income by growing superior varieties of indigenous fruit tree, such as African plum.

of Congo (DRC) and Nigeria. There are now several hundred. The programme has significantly improved incomes, enabling people like Missé to pay for more and better food, school fees and decent health care. It is also helping to change the way people farm.

Several hours drive to the north of his village, in the rolling hill country near the Nigerian border, Zachary Tchoundjeu, the World Agroforestry Centre's Regional Coordinator for West and Central Africa, studies the notice board outside a tree nursery run by the Mboyni Farming Group. "I like their motto," he says. It reads: FIGHT AGAINST THE STOMACH DEVIL.

"That sums up the situation round here very well," says Tchoundjeu. "For many families, hunger is a real problem. Most of the smallholders are almost entirely dependent for their income on selling cocoa or coffee – crops they can't eat, and whose price is determined by brokers on the other side of the world."

During recent years, the price of both coffee and cocoa has fluctuated on the world market. Low prices have caused great hardship among small-scale producers, and this is one of the reasons why half the predominantly rural population of Cameroon lives in poverty. According to the 2009 Human Development Report, published by the United Nations Development Programme (UNDP), Cameroon ranks 153 out of 182 countries in the 'human development



▲ The domestication programme has helped to tackle hunger, as this nursery sign suggests.

index' devised by the UN as a relative measure of health, education and economic status. Two other countries where the domestication programme has been active fare even worse: Nigeria ranks 158; DRC 176.

Tchoundjeu believes that by encouraging farmers to grow superior varieties of indigenous fruit trees, much can be done to improve the livelihoods of smallholders and boost the local economy. "When farmers plant trees like African plum, they become less dependent on the commodity markets," he says. "And they produce a crop they can both eat and sell."

Towards a better future

The African continent is home to some 3000 species of wild fruit trees. According to Roger Leakey, a former director of research at the World Agroforestry Centre, several hundred of these are ripe for domestication. He calls them 'Cinderella species': their attributes have gone unrecognized by science and big business, but the time has come for them to step into the limelight.

The last great round of crop domestication took place during the Green Revolution in the mid-20th century. This led to the creation of high-yielding varieties of starchy staples like rice, maize and wheat, and did much to increase food supplies and reduce hunger. However, the sort of large-scale, capital-intensive agriculture promoted by the Green Revolution brought few benefits to smallholders in countries like Cameroon.



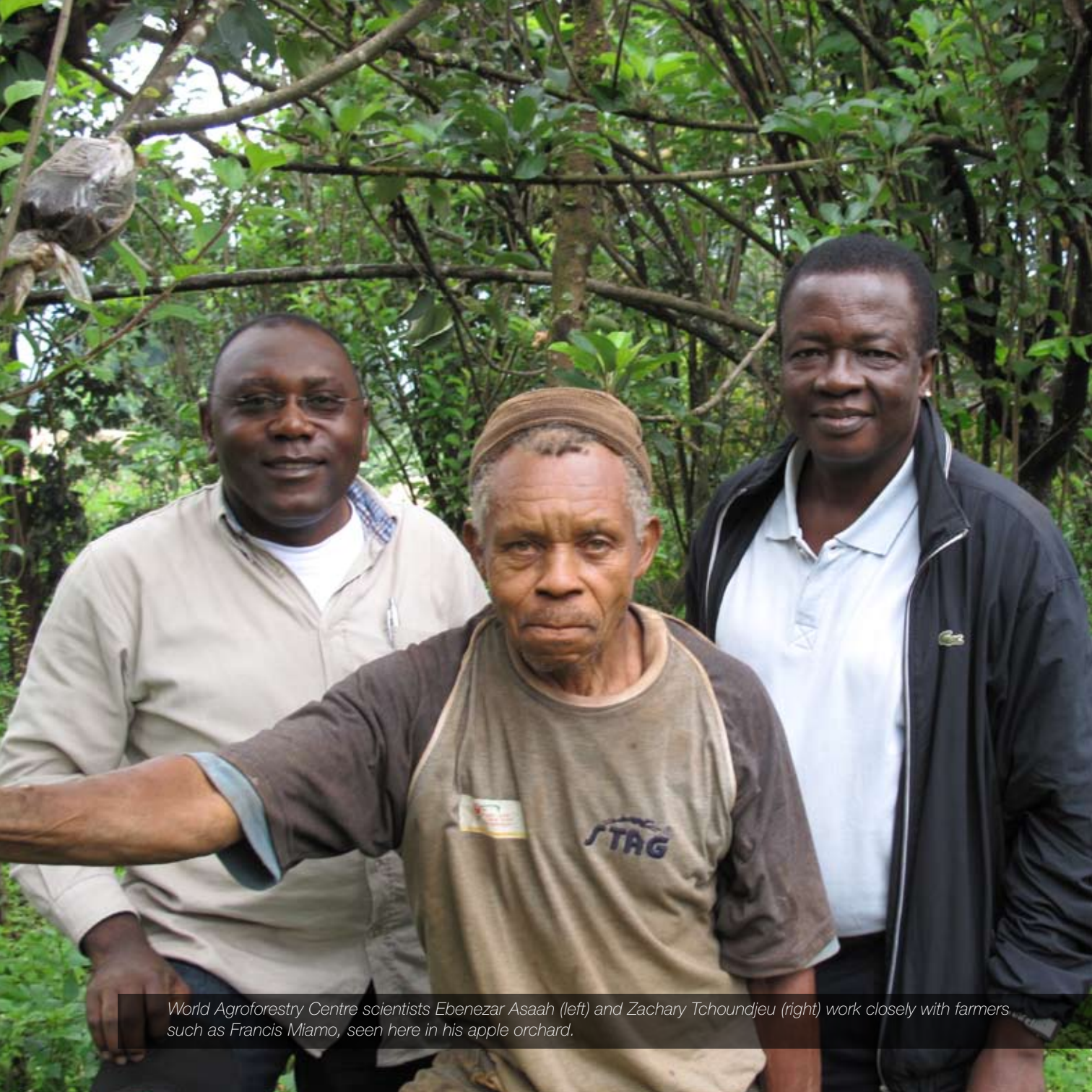
▲ Marcotting is one of the techniques used to propagate superior varieties of indigenous fruit tree.

The conventional model of crop domestication involves the development of new varieties that can be grown as monocultures, often in large plantations. "What's happening with the fruit tree domestication programme in West Africa is completely different," says Leakey, one of the architects of the agroforestry programme. "We encourage local farmers to play a key role in developing and testing new varieties, and they're the ones who stand to benefit most." Sparsely funded, and largely ignored by agribusiness and high-tech research labs, this is a smallholders' revolution informed by smart science.

This booklet focuses on Cameroon, telling the story of participatory tree domestication through the eyes of scientists and farmers. However, similar research programmes, managed by the World Agroforestry Centre and its national partners, are also helping to bring superior varieties of wild species out of the forests and on to farmland in other parts of Africa, and in Asia and Latin America. In short, the Cinderella species whose stories are described in the following pages are just a few of many that could improve food security in areas plagued by poverty and malnutrition.



MIFAOIG Rural Resource Centre has provided agroforestry training for thousands of smallholders.



World Agroforestry Centre scientists Ebenezar Asaah (left) and Zachary Tchoundjeu (right) work closely with farmers such as Francis Miamo, seen here in his apple orchard.

1. GETTING THE BEST OUT OF INDIGENOUS TREES

In the 1990s, scientists from the World Agroforestry Centre conducted surveys in West Africa, Southern Africa and the Sahel to establish which indigenous trees were most valued by local people. Some 6000 farmers responded to the survey in Cameroon, Gabon, Ghana and Nigeria. “We were startled by the results,” says Tchoundjeu. “We were expecting people to point to commercially important timber species, but what they valued most were indigenous fruit trees.”

Although there were some variations in preferences, both within and between countries, a relatively small number of trees – including bush mango (*Irvingia gabonensis*), African plum (*Dacryodes edulis*), African nut (*Ricinodendron heudelotii*) and bitter kola (*Garcinia kola*) – were particularly popular. Although they were relatively common in forests, and as wild trees on farms, they were almost unknown to science.

“We knew their biological names, but that was about all,” says Ebenezer Asaah, a tree scientist at the World Agroforestry Centre. “We had no idea how long it took them to reach maturity and produce fruit, and we knew nothing about their reproductive behaviour.” (See box: Favourites for the Future, page 13)



▲ Njansang fruits are used to make a spicy sauce; they're also highly valued for their medicinal properties.

Local people, in contrast, knew a good deal about these trees, as they and their ancestors had been harvesting and processing their fruits and nuts for generations. They had also practised a very basic form of domestication by selecting and eating the tastiest varieties of African plum and a few other species, planting their seeds and trading the seedlings. However, this was a haphazard and unscientific way to domesticate wild plants.

As local people knew much more about these species than the scientists, the World Agroforestry Centre decided to work with them to develop superior varieties. The participatory tree domestication programme was launched in 1998. This has involved rural communities selecting, propagating and managing trees according to their own needs, in partnership with scientists, civic authorities and commercial companies. Programmes such as these are usually oriented towards local markets and encompass the use of both indigenous knowledge and genetic selection based on scientific principles.

In West and Central Africa, the programme's first task was to establish which traits were most appreciated in the villages. Most farmers said the same thing: they wanted trees that produce large, sweet fruit, mature at an early age, and are relatively small in height.

One of the conventional ways of developing new crop varieties involves sexual reproduction. For example,



▲ Bush mango seedlings. This species was identified as the highest priority for domestication by farmers in Cameroon and Nigeria.

scientists may decide they want to combine the sweetness of the fruit produced by Variety A with the large size of fruit produced by Variety B. This is achieved through cross-pollination, and the resulting hybrid may then be back-crossed with one of the parent varieties to produce progeny with a wide range of variability derived from both parents. Among all this variability there may be individuals with precisely the size and taste of fruit desired. This form of plant breeding works particularly well for annual crops, but many varieties of apple, pear and orange have also been developed this way. However, it is a very time-consuming way of producing new tree varieties, and as far as Tchoundjeu and his colleagues were concerned, time simply wasn't on their side.

"Superior varieties of indigenous fruit trees were needed now if they were to bring benefits to smallholders in the immediate future," he says. "That's why we decided to capture the desired traits through vegetative reproduction."

Old techniques, new approach

Roger Leakey recalls how hard it was to convince donors that this was a project worth funding. "When I first tried to get money, I was told the project would be a waste of time, that local villagers weren't interested in eating these fruits and nuts," he says. "Their argument was that you often see wild fruit rotting on the ground. That's true, of course, but what these people were failing to realize was that there is huge genetic diversity in the wild." Some trees produce sour fruit, which are left to rot; others produce sweet fruit, which are gathered by villagers before dawn. The size of the fruit may vary too, with the largest African plums being 10 times the mass of the smallest. Domestication seeks to capture and multiply the trees with desirable characteristics, thus taking advantage of the variations found in the wild.

With the help of local farmers and collectors, the scientists were able to identify the individual trees which possessed the desired traits. They collected germplasm, in the form of vegetative material, and this was used to establish superior 'accessions' at research sites and nurseries. An essential part of the process involved recording precisely where each sample came from, using a GPS, and labelling the parent tree.

The scientists then proceeded to research the best ways of propagating superior trees so that large numbers of identical copies would be available in a relatively short period of time. At the same time they began to train farmers in techniques such as rooting, grafting and marcotting, which would enable them to produce their own superior varieties.

Initially, many farmers viewed the techniques with suspicion. "People said this was white man's witchcraft, and at first they didn't want anything to do with it," says Florence Ayire, a member of a women's group in Widikum village, Northwest Region. Her neighbours changed their tune, however, once they saw how her grafted fruit trees – created by splicing



▲ Florence Ayire has been encouraging women in her village to grow superior varieties of indigenous fruit trees.

material from a superior tree on to healthy rootstock raised from seed – flourished. “Now they all want to learn,” she says.

Farmers also received training in how to clone superior trees by taking cuttings – one of the best ways of producing large numbers of genetically identical plants – and how to create marcots, a practice that involves peeling bark away from a branch and tricking it into producing roots while it is still attached to the parent tree. Once the roots appear, the branch can be cut down and planted.

For some species marcotting proved to be an excellent way of establishing clones from sexually-mature wild trees. These could then be used as a source of cuttings or scions for rooting and grafting. Marcotting also reduces the time it takes a tree to reach maturity and bear fruit. “There is a saying round here that if you plant the nut of the cola tree [*Cola* species], you will die before the first harvest,” says Kuh Emmanuel, who manages one of the rural resource centres described in the next chapter. It is still not known how long it takes a wild cola tree to reach maturity – probably 20 years or more. However, by using marcots, farmers can raise cola trees that fruit after just four years. What’s more, says Emmanuel, these



▲ Thanks to the domestication programme, thousands of farmers have mastered propagation techniques such as grafting.

are dwarf varieties, an important consideration in a country where many people fall to their death when harvesting fruit from tall trees.

Certain species such as bush mango and bitter kola have proved difficult to marcot, but are being successfully multiplied by grafting. It is relatively easy, on the other hand, to take marcots from the African plum, but it has only been through an assiduous process of research that the scientists have determined the methods that result in high levels of successful rooting and nursery establishment. Information such as this has played a vital role in helping farmers to propagate wild species in their own nurseries and on their farms.

“There is nothing new about the horticultural techniques we are using,” says Asaah.

“What’s new is the knowledge we’ve acquired about the biology of these species, and the close involvement of farmers in the whole process of domestication.”

Favourites for the future

Bush mango (*Irvingia gabonensis*). Known locally as andok, bush mango was identified as the highest priority for domestication by farmers in Cameroon and Nigeria. The pulp can be made into jam and wine, and the pounded seeds are used to thicken soups and stews, and flavour meat and vegetable dishes. The bark is used to treat gastric and liver disorders.

African plum (*Dacryodes edulis*). The African plum, or safou, was considered the third most valuable wild fruit by farmers in both Cameroon and Nigeria. Widely sold in local markets, the highly nutritious fruits have an oily texture similar to avocado and are eaten boiled or roasted.

African nut (*Ricinodendron heudelotii*). A spicy sauce made from the kernels is widely used, and the high oil content of the seeds make them suitable for use in the soap and varnish industries. Njansang, as it is called in Cameroon, is valued for its medicinal properties and used to treat constipation, dysentery, eye infections and female sterility, and also as an antidote to poison.

Bitter kola (*Garcinia kola*). The bitter kernels of this nut species are highly valued across West and Central Africa and are chewed as a stimulant. The kernels are also used for the treatment of coughs, bronchitis and liver disorders. Twigs are chewed as anti-bacterial toothbrushes.

Other species identified by the priority-setting exercises conducted in the mid-1990s include *Chrysophyllum albidum*, the white star apple, and several *Cola* species, whose seeds are used as a stimulant.

During recent years the domestication programme has focused on *Prunus africana* and *Pausinystalia johimbe*, both of which have suffered from over-harvesting in the wild. The former is internally and externally traded and used in the treatment of benign prostate cancer; the latter is used as an aphrodisiac and remedy for male impotence.



Agroforestry has helped Christophe Missé to transform his farm – and his life.

2. FROM MARCOTS TO MARKETS

In 1998 and 1999, the World Agroforestry Centre established four pilot nurseries, two in the forest zone and two in the humid savannah zone in the Western Highlands of Cameroon. Here, the researchers evaluated different propagation techniques and provided the first training sessions to local farmers. Christophe Missé was typical of those trained at Nkolfep nursery in the forest zone.

“As soon as I’d completed the training, I realised that it would help me to transform my farm,” he says. Bush mango, African plum and African nut now grow besides his main cash crop, cocoa. The African plums are particularly impressive, with some of his most fruitful trees earning 10,000 CFA francs (US\$22) a year, five times as much as his individual cocoa bushes. And some farmers get even more from each plum tree.

But not everyone was as impressed as Missé by the idea of domesticating and planting indigenous fruit trees, especially in the forest zone, where many farmers considered trees an obstacle to progress: clearing the forest, as far as they were concerned, was a first step on the road towards prosperity; planting more trees was not.

However, the farmers who attended training sessions at the pilot nurseries were able to convince others – by example and word of mouth – that domestication would bring real



▲ A training session at a rural resource centre managed by PROWISDEV, near Batibo.

benefits, and many went on to establish their own satellite nurseries, with the help and encouragement of the World Agroforestry Centre and local non-governmental organizations. Between 1998 and 2004, eight satellite nurseries, including Missé's at Lekei-Assi, were established by farmers who had trained at Nkolfepe. A similar story was repeated elsewhere, and by 2004 there were over 40 farmers' nurseries producing superior varieties of indigenous fruit tree.

During the early years of the programme, the World Agroforestry Centre decided to enlist the help of extension workers employed by the Ministry of Agriculture and Rural Development. Around 50 staff received training, but little came of it. Within a year or two, most had either left government service or been transferred to other departments.

"It was very disappointing, and we started thinking about other ways of promoting fruit tree domestication on a bigger scale," explains Ebenezar Asaah. "We'd noticed that some groups of farmers were already doing great things, providing training in all sorts of agricultural practices. So we began to work with them, and that's how we came up with the concept of the rural resource centre."

Science for the people

"In 1998, we got married to the World Agroforestry Centre," explains Kuh Emmanuel, the coordinator of the Twantoh Mixed Farming Common Initiative Group (MIFACIG), "and most of what you see here has been created since then."



▲ MIFACIG Rural Resource Centre has provided support for 35 satellite nurseries.

Situated on gently sloping land in Northwest Region, the centre is beautifully laid out, with offices, a training hall and accommodation for 30 visitors on the higher ground, besides a vegetable garden, a medicinal plant garden and extensive tree nurseries. Below these, running alongside a small stream, demonstration plots show how a healthy and sustainable smallholding might look, with indigenous fruit trees scattered among annual crops and coffee plants.

During the five years prior to 1998, Emmanuel and a group of local farmers in Boyo Division managed a small nursery here. "We had some very basic activities," he recalls. "We raised tree seedlings and medicinal plants and provided some training on beekeeping." Basic it may have been, but the way in which they were going about their business impressed scientists from the World Agroforestry Centre. They suggested to Emmanuel that they should work together to create an enterprise to expand the tree domestication activities in Boyo Division and beyond.

This was to be one of the first Rural Resource Centres. By mid-2009, there were another four in West and Northwest Regions, with a further five under development, all now supported by the US-funded Agricultural and Tree Products Program, whose story is told in another booklet in this series. Between them, the centres have provided a huge fillip to the domestication programme and become, in Emmanuel's words, places that make science available to tens of thousands of people who live off the land.



▲ Thaddeus Salah is 'fighting against the stomach devil,' using indigenous fruit trees.

The Rural Resource Centres provide training to farmers, NGOs and students on a wide range of topics, from the domestication of indigenous trees to pig rearing, from beekeeping to enhancing soil fertility. The centres also have demonstration plots and produce large numbers of plants, with annual sales from MIFACIG over the last past five years ranging from 5 million CFA francs (US\$11,100) to 10 million CFA francs (US\$22,200).

In 1998, Emmanuel's nursery group had less than a dozen members. The number swiftly rose to over 40 once the partnership with the World Agroforestry Centre was established. And such was the demand for training, especially in fruit tree domestication, that it would have risen further had there not been a concerted effort to set up satellite nurseries in the surrounding countryside. By mid-2009, MIFACIG had provided training and support for 35 satellite nurseries, serving some 2500–3000 farmers.

The story you hear from the Mboyni Farming Group – motto: 'Fight against the stomach devil' – could be told at many other satellite nurseries. Had you come here in the 1990s, explains Thaddeus Salah, the leader of the group, you would have seen real hunger and poverty. Their fortunes began to change in 2000, after he and his neighbours attended a training programme at MIFACIG.

Salah is full of praise for MIFACIG and he remains a regular visitor. "Every time I visit the centre, I get a new idea. It would be impossible to come back from there with an empty head." Besides learning how to identify the best fruit trees in the wild and



▲ African plums for sale in the market at Makenene East.

multiply them by grafting and marcotting, he and his friends have also benefited from training in beekeeping – there are over 50 hives near the nursery – and they sell their honey commercially. During recent years they have planted over 300 trees on the verges of the tarmac road that runs past the nursery. “It’s our way of showing the passing people why planting trees is such a good idea,” he explains.

A study conducted by World Agroforestry Centre socio-economist Ann Degrande, reflecting on the achievements between 2004 and 2006, compared nurseries established under the participatory tree domestication programme with nurseries outside the programme. “In terms of the quality of the material they produced, and their efficiency, the nurseries established under our programme performed much better than those outside,” she says. Especially revealing was a survey of customer satisfaction. The nurseries within the programme scored better on everything from price to quality, quantity to propagation methods.

Market matters

Learning how to propagate and grow superior varieties of indigenous fruit trees is one thing; processing them efficiently and getting good returns in the market place is quite another. Although farmers in Cameroon have been trading indigenous fruits and nuts for generations, processing methods are often laborious and the markets poorly developed.



▲ This cracking machine is making it much easier for farmers to process the hard kernels of njansang.

Take, for example, kola nuts, much prized for their stimulant properties. For many centuries, farmers in the humid parts of Central Africa have traded kola nuts with people from the Sahel in return for salt, yet until recently no attempt was made to develop them into a true commodity with a structured market. This was partly because the trees grew extremely slowly, and there was no incentive for farmers to plant them.

Thanks to the participatory tree domestication programme, superior varieties of kola nut, propagated by marcotting, can now produce nuts after just four or five years, compared to 10–15 years for non-selected trees. But growing superior, early maturing varieties is just the start. Farmers producing kola nuts, cola nuts, African nuts, African plums and other indigenous fruit still need to improve their processing, storage and marketing. The Farmer Enterprise Development Initiative, launched in 2003, is helping them to do precisely that.

Five years ago, farmers belonging to the Association pour le Développement Intégral des Exploitants Agricoles du Centre (ADEAC), in Central Region, used to get very low prices for their African nuts (*Ricinodendron heudelotii*), or njansang as they are locally known. This had nothing to do with the lack of demand for these aromatic kernels: most households in Cameroon use njansang to prepare soups and other dishes. Rather, it reflected the difficulty of extracting the edible kernels and the failure to market them successfully.

Visit the farmers today and you'll hear a very different story. They are now getting an average 31% more for their kernels; and, because they're harvesting more, they have seen an 80% increase in their revenues.

According to Charly Facheux, an economist with the World Agroforestry Centre, three distinct processes have enabled njansang sellers to get higher prices. First, they have acted collectively to improve their bargaining power and gain a better understanding of the markets. Second, microfinance provided by the Farmer Enterprise Development Initiative during the first year meant that farmers were no longer forced to sell their crops when there

was a glut and prices were low. By taking out small loans, they could meet their daily needs and wait until the market improved before selling their njansang.

Finally, the farmers benefited from more efficient methods of processing. One of the problems with njansang is that the seeds are hard to crack, and it can take 10 women up to 25 days just to produce a 50 kg bag of kernels. The introduction of a cracking machine, developed by engineers working in partnership with the World Agroforestry Centre, has dramatically improved processing capacity. Now, it takes just two days to get a 50 kg bag of njansang, and farmers from other parts of the country are coming to ADEAC to use the machine.

The approach pioneered by the Farmer Enterprise Development Initiative is now being used for other agroforestry tree products elsewhere in the country. “With the right training, and access to microfinance and better processing facilities, farmers can dramatically increase their incomes from tree crops,” says Facheux.

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- POTS
- Etc.

3. REAPING THE BENEFITS

Visit the nurseries supported by the tree domestication programme and you will hear how much they have done to improve people's lives. "Before the programme," explains Thaddeus Salah of the Mboyni Farming Group, "we didn't have enough chop to eat." It wasn't just food – "chop" in pidgin English – that his family lacked; they couldn't afford school fees, healthcare, or even chairs for their dilapidated grass-thatch house.

Salah estimates that he is now earning five times more than he was before 2000, when he and his neighbours learned how to identify the best fruit trees in the wild and propagate them in their nursery. His family now has "plenty chop", as he puts it. He is also earning enough from the sale of indigenous fruit trees, and from the fruit harvested on his farm, to pay school fees for four of his children, and he's been able to re-roof his house with zinc sheets. He even has a mobile phone.

At another nursery in Northwest Region, Demaine Aseh of Mulombo Mixed Farming Group says that the sale of indigenous fruit trees – over 1500 people visit the group's nursery each year – has transformed the way he and his colleagues live. "I've been able to build a new house and pay for my children to go to private schools," he says. He can also pay hospital bills when members of his family fall sick – something he could never afford in the past.



▲ Demaine Aseh with a cocoa marcot. He is the coordinator of the Mulombo Mixed Farming Group, which sells a wide variety of plants (opposite).

Richard Ndeudgui runs a thriving tree nursery behind the market in Makenene East. When the idea of domesticating indigenous fruit trees was first mooted by staff from the World Agroforestry Centre at the *chefferie*, the chief's office, he didn't dismiss it as witchcraft, as many others did, and he was the only person to turn up for the first training session. It was, he says, one of the best decisions he ever made. By 2005, gross profits from his nursery amounted to 1.6 million CFA francs (US\$3,550) a year.

As Ndeudgui shows us his African plum marcots – “These are the most popular indigenous fruit in this area,” he says – his son, Pierre, comes to join us. He explains that he is studying natural sciences at the University of Yaoundé 1. “I would never have been able to go to university if my father hadn't set up this nursery,” he says. He still returns home from time to time to lend a hand.

It's not just the nursery owners who have benefited from the tree domestication programme; their customers – the farmers who buy their trees – have also seen their incomes rise, and their priorities are much the same. They invest the money they make from selling indigenous fruit and nuts on more and better-quality food, school fees, decent healthcare and zinc sheets to replace leaking thatch.

Indigenous fruit trees work particularly well as a shade tree with cocoa agroforestry. One study of different agroforestry systems in Cameroon found



▲ The domestication programme is providing jobs in rural areas, and encouraged young men like Hansel Angoh to return to their villages.

that returns per hectare were highest for intensive cocoa with fruit trees, at US\$1,755. This compared to US\$1,236 for intensive cocoa without fruit and US\$616 for extensive cocoa without fruit. Admittedly, the study was conducted in 1999, but scientists at the World Agroforestry Centre believe the relative values still hold true.

One of the most exciting things about the domestication programme, says Tchoundjeu, is the way it is encouraging young people to stay in their villages, or return to them after working as migrant labourers elsewhere.

Take, for example, Hansel Angoh, who attended a domestication training session in March 2008 at a newly established nursery in Batibo, a village in Northwest Region. The trainees learned how to identify superior varieties in the wild and propagate them in the nursery, using techniques such as grafting and marcotting. After the training session, Angoh was offered a job on a cocoa plantation in the south-west of the country, and he decided to take it. "I found the work tedious," he recalls, "and after six months I began to think about the training session and what I'd learnt. I woke up one morning and decided to return home."

His father gave him some land, and he has planted a range of crops, including bitter kola, pears, pineapples and oil palm. "Soon I expect to make a good living here, and I will be my own master, not a poorly-paid plantation worker," he says. Since he has returned home, he has told other migrants what



▲ George Kangong, the coordinator of the RIBA Rural Resource Centre, says the domestication programme has helped to boost biodiversity.

he is doing. "They have started to come back, because they can now see that there is a future here."

The fruit tree domestication programme has also done much to improve the environment. When George Kangong, the coordinator of the RIBA Rural Resource Centre, in Bui Division, Northwest Region, first arrived at the hilltop site in the mid-1990s, the soils were so degraded that the land had been abandoned by farmers. "Where we are now was completely bare," he recalls. "There were no trees, and scarcely a bush." Today, RIBA boasts a small forest, a network of dense hedges, tree nurseries and fertile fields growing wheat, potatoes and other crops.

Since the World Agroforestry Centre arrived on the scene in 2003, RIBA has helped local farmers' groups to establish 16 satellite nurseries, and most are now producing and selling superior varieties of indigenous fruit tree. Progress in recent years has been rapid. The number of trees planted by individual households rose from 10 to 120 between 2007 and 2008, and these and other activities have led to a significant increase in income. They have also brought considerable benefits to wildlife. "When I arrived here in 1995, the only bird was a warbler," says



▲ A fine harvest of bitter kola nuts.

Kangong. “But as soon as we began to plant trees and shrubs at RIBA, the birds began to return, and we now have over 40 resident species.”

If you’d travelled through the hill country around Bamenda, the capital of Northwest Region, a decade ago you’d have hardly seen any African plums. Now they seem to be everywhere, and the tree domestication programme has helped to increase biodiversity on thousands of smallholdings. Kuh Emmanuel, coordinator of MIFACIG Rural Resource Centre, also believes the programme has taken pressure off natural forests. “Farmers who have improved their incomes are much less likely to exploit the forests,” he says. “They no longer need to when their land is so much more productive.”



The future is in their hands.

4. FRUIT FOR THE FUTURE

The experience over the past decade shows that the participatory approach to tree domestication has much to offer. The domestication programmes rely on simple, low-cost horticultural techniques and they build on traditional uses of tree products, for example as foods, stimulants and medicines. They have an almost immediate impact by reducing poverty and improving human welfare. Participatory domestication encourages farmers to adopt diverse farming systems and reduce their dependency on commodities such as cocoa and coffee. It also acknowledges local ownership of germplasm, although the international property rights system, in its current form, has yet to provide legal protection for locally developed varieties of superior fruit tree.

According to Roger Leakey, the tree domestication programme has proved how important it is to involve local communities. “Programmes which don’t involve farmers will fail,” he says. “Participatory tree domestication is a self-help approach to research that gets things done quickly, and avoids many of the problems which occur when research budgets are controlled by governments.”

In the short term, the World Agroforestry Centre will continue to promote participatory tree domestication in new areas within Cameroon, Ghana, Nigeria and DRC, and it hopes to extend its activities to other countries in West and Central



▲ The fruit tree domestication programme is helping to improve the diets of rural children.

Africa, including Liberia, Sierra Leone, Guinea and Gabon. Its researchers will also continue to develop and test new varieties of indigenous fruit tree, including those that produce fruits in the off-season, like the Noel cultivar of the African plum. Farmers who sell the fruits of this cultivar in December can get 10 times more than those selling their plums in August, when the majority of trees are fruiting.

During the past decade, the World Agroforestry Centre has collected over 600 accessions of African plum, and hundreds of accessions of several other indigenous fruit trees. Using molecular markers and quantitative genetics, researchers will establish the degree of genetic variation between the different accessions. "We expect to end up with around 20 to 50 distinct cultivars of African plum," explains Ebenezer Asaah, "and each will be provided with a popular name." In future, farmers will be encouraged to plant a genetically diverse range of trees. "If they don't," says Asaah, "then in-breeding might reduce productivity and the lack of genetic variation on farms might make trees more disease prone."

So far, research in West and Central Africa has focused on a small number of trees, but surveys show that there are at least 30 other species of indigenous fruit tree which are commonly used by local people. During the coming years, many of these will be subject to the participatory domestication approach developed over the past decade.

As he sips a glass of Missé's home-made palm wine, Tchoundjeu muses on the changing landscape. "If you come back here in 10 years' time, I hope – I'm sure – you'll see improved varieties of indigenous fruit tree on every smallholding," he says. "I think you'll see a great diversity of tree crops and a much more complex, more sustainable environment. And the people will be healthier and better off." It's a story, he believes, that could be repeated across Africa.

Further reading

For a comprehensive list of academic papers on participatory tree domestication, visit the World Agroforestry Centre website: www.worldagroforestry.org. However, the following books and papers provide a good overview.

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Acknowledgements

Many people provided help and information during the research and writing of this booklet. Special mention should be made of Zachary Tchoundjeu, the World Agroforestry Centre's Regional Coordinator for West and Central Africa, Ebenezar Asaah, a tree scientist with the World Agroforestry Centre, and Roger Leakey, who helped to establish the participatory tree domestication programme in Cameroon. Many thanks, too, to Ann Degrande, Charly Facheux and Alain Tsobeng of the World Agroforestry Centre; to the staff of the rural resource centres; and to all the farmers and nursery owners who shared their experiences of domestication.

The African continent is home to some 3000 species of wild fruit trees, yet they have been largely ignored by science and big business. But this is all set to change. This booklet describes the participatory tree domestication programme, managed by the World Agroforestry Centre, which has developed superior varieties of several indigenous fruit trees in West and Central Africa. Already, the programme has transformed the lives of thousands of farmers. The species whose stories are told here are just a few of many that have the potential to improve food security in areas plagued by poverty and malnutrition.

ISBN: 978-2-9059-275-4

