



A Rural Revival in Tanzania

How agroforestry is helping farmers to restore the woodlands in Shinyanga Region



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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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Author: Charlie Pye-Smith

Supervision: Paul Stapleton

Editor: Kris Vanhoutte

Design and Layout: Reagan Sirengo

Cover photo by Charlie Pye-Smith

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Front cover: The *ngitili* on the hilltop will provide fodder for livestock during the dry season.

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World Agroforestry Centre
United Nations Avenue, Gigiri
P. O. Box 30677-00100
Nairobi, Kenya.
Phone + (254) 20 722 4000
Fax + (254) 20 722 4001
Via USA phone (1-650) 833-6645
Via USA fax (1-650) 833-6646
Email: icraf@cgiar.org
Website: www.worldagroforestry.org

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Foreword

When President Julius Nyerere visited the Shinyanga Region in 1984 he was shocked by what he saw. Decades of deforestation and inappropriate land management had turned Shinyanga into the ‘Desert of Tanzania.’ The president immediately launched the Shinyanga Soil Conservation Programme, widely known by its Swahili acronym, HASHI. This booklet relates the remarkable story of what has happened since then.

The HASHI project helped tens of thousands of smallholders to restore degraded land, and in doing so to significantly improve their incomes. One of the project’s great achievements was to revive a traditional system of land management which increases the supply of livestock fodder for use during the dry season. When the project began, there were just 600 ha of documented *ngitili* – enclosed fodder reserves – in the region. There are now thought to be over 500,000 ha of such reserves.

The *ngitili* provide fuelwood and building timber as well as livestock fodder. Their rapid expansion has brought about a significant increase in biodiversity. Species that had disappeared decades ago are now returning. The economic benefits have also been considerable. One study calculated the total monthly value of benefits derived from the *ngitili* to be US\$14 per person – a significant sum in rural Tanzania. The HASHI project also encouraged farmers to adopt a range of other agroforestry technologies, including the planting of woodlots, fodder banks and fertilizer trees. These, too, have yielded considerable environmental and economic benefits.





The HASHI project was deeply rooted in the administrative structures of Tanzania's central and local governments, and this helps to explain why it has been such a success. Throughout the 20-year project, staff from the Forestry and Beekeeping Division in the Ministry of Natural Resources and Tourism worked closely with local government staff, researchers from the World Agroforestry Centre and the region's entire farming population. The project encouraged village governments and traditional institutions to work together to restore and manage the *ngitili*. The experiences here, we believe, hold lessons that could be a basis for models to help transform lives and landscapes in many other areas in Tanzania and beyond which have suffered from serious environmental degradation.

Many organizations and individuals contributed to the success of the HASHI project. However, none of this would have been possible without the generous long-term support of the Norwegian Development Assistance Agency (NORAD), to whom we owe a special debt of gratitude.

Dennis Garrity
Director General
World Agroforestry Centre

Felician Kilahama
Director
Forestry and Beekeeping
Division, Ministry of Natural
Resources and Tourism

◀ *Women have played an important role in the HASHI project.
Teresa Gashyle with one of her medical plants.*



Shinyanga's ngitili are a source of fodder, fuelwood and medicinal plants.

Introduction

In 2006, Deoscory Msoma confronted a group of men who were stealing timber from one of his woodlots in Shinyanga, a region of sweeping plains and low, rocky hills in northern Tanzania. They broke both his legs and he now walks with a slight limp. Had he subsequently considered abandoning his woodlots? “No, never,” he answers emphatically. “I need my woodlots, and my other agroforestry enterprises, for my survival and the survival of my family.”

Thirteen years earlier, in 1993, Msoma had met government officials working for the HASHI project – HASHI being the Swahili acronym for the Shinyanga Soil Conservation Programme. “At the time, my wife was forced to travel long distances in search of firewood,” recalls Msoma. “Sometimes she would even come back empty-handed.”

He visited a demonstration site established by the HASHI project and learnt how to plant woodlots that yield firewood and building timber. The project provided him with a long knife, a wheelbarrow and a watering can and he and his



▲ Deoscory Msoma in one of his woodlots.

wife immediately set to work. Besides establishing their first woodlot, they planted fruit orchards and trees which now supply protein-rich fodder for their livestock.

“The HASHI project transformed my life,” says Msoma. “The profits from my woodlots and orchards meant I could buy extra land, pay school fees for my children and renovate our house.” His family can now afford proper medical care and he’s been able to buy fertilizers. He used to get seven sacks of rice from one half-acre field; now he gets 20 sacks from the same area. The week we visited his farm, he sold firewood and building timber for 90,000 Tanzanian shillings (US\$63) and he was preparing another order for the local army barracks worth 600,000 shillings (US\$420). These are huge sums of money in rural Tanzania.

Hope, at last

Tanzania is one of the most stable countries in the region, but it remains among the poorest. In 2008, the gross national income per capita – a measure of relative



▲ The ngitili are an important source of medicinal plants.

poverty, or wealth, used by the World Bank – was US\$430, placing it 188 out of 210 countries. This compared with US\$770 for Kenya, US\$5820 for South Africa and – to give just one example from the developed world – US\$87,070 for Norway. Around 35% of Tanzanians live below the poverty line, on less than US\$1 a day; 45% of the population lack access to safe drinking water; and around 40% of women are unable to read and write.

Yet here, in Shinyanga, there is a real sense of hope. Deoscory Msoma is among tens of thousands of smallholders whose lives have improved as a result of the HASHI project. Besides introducing a range of agroforestry technologies which have increased local incomes, HASHI has helped to restore a landscape which former President Julius Nyerere once described as the 'Desert of Tanzania.'

"If you'd come here 15 years ago, you'd have seen that all this was bare land, almost lifeless," says Msoma as he shows us around a woodlot. Today, the cool, scented air is alive with birdsong.

"The landscape is like heaven now, compared to how it was," says Robert Otsyina, who spent over 10 years in Shinyanga directing research for the World Agroforestry Centre (ICRAF), a key partner in the HASHI project.



▲ Not quite a thing of the past: cattle grazing illegally in a protected area.

“When I arrived in 1991, there was degradation everywhere you looked, and in some areas the soil erosion was so severe that we used to get sandstorms.” The World Agroforestry Centre set up its office – now occupied by the Tanzanian Forestry Research Institute (TAFORI) – just outside the town of Shinyanga in an area classified as Forest Reserve. “There was almost no vegetation,” recalls Otsyina, “but we enclosed the area, excluded livestock and began planting trees. And just look at it now!”

Since then, virtually every household in the region has planted trees and many have helped to revive the ancient system of land management which the Sukuma pastoralists traditionally used to conserve livestock fodder for the dry season. In the mid-1980s, there were approximately 600 ha of documented *ngitili* – the Sukuma word for enclosed fodder reserves – in Shinyanga Region. There are now thought to be over 500,000 ha, thanks to the activities of the HASHI project. All enclosed areas, including woodlots, are now locally referred to as *ngitili*.

By drawing on the latest agroforestry research, making the most of indigenous knowledge and establishing a close relationship between government officials and local communities, the HASHI project has improved rural livelihoods and restored a degraded environment. This booklet provides a brief portrait of a project whose experience could help to transform lives and landscapes in other parts of East Africa.





The HASHI project has benefited from close cooperation between scientists, farmers and local government officials. Chrispinus Rubanza is on the left.

1. A NEW BEGINNING

A century ago, Shinyanga was extensively covered with miombo and acacia woodlands, and the Sukuma agro-pastoralists made good use of them, both as a source of fodder for their livestock and food and fuel for themselves. But there was a serious problem: the woodlands acted as a reservoir for tsetse fly, the vector for a parasitic disease, trypanosomiasis, which caused heavy losses among cattle and sleeping sickness in human beings. In the 1920s, the colonial authorities embarked on a programme to eradicate the tsetse fly, paying local people to cut down large areas of woodland. “The Sukuma were very happy, because they were livestock people and the eradication programme not only destroyed the tsetse fly’s habitat, it opened up new grazing land,” explains Otsyina.

However, the programme was an environmental catastrophe. By the time it came to an end, shortly after the Second World War, vast areas had been cleared and the environmental transformation was to continue over the coming decades. The human population rapidly expanded, leading to an increase in demand for fuelwood and cropland, and so did the number of livestock. This inevitably led to the overgrazing of pasture and woodland. At the same time, large areas of land were devoted to cash crops like cotton and tobacco, leaving less land available for



▲ Farmers report that their cattle are now in better health, thanks to a year-round supply of nutritious fodder.

food crops. Then, in the mid-1970s, the government's 'villagization' programme forced families to abandon their farmsteads and move into newly created settlements. Traditional soil conservation practices were abandoned and many of the *ngitili*, lacking the protection of traditional institutions, were destroyed.

When President Nyerere visited Shinyanga in 1984, he found the region and its people in a state of distress. Previous attempts to restore the woodlands of Shinyanga, led by the World Bank and other agencies, had largely failed and Nyerere gave instructions for a new land rehabilitation project. HASHI – Hifadhi Ardhi Shinyanga – was launched in 1986.

HASHI got off to a slow start. "That was partly due to the lack of financial support during the early years, and partly because the villagers saw this as a government scheme in which they weren't fully involved," says Emmanuel Minja, the manager of the Natural Forest Resources Management and Agroforestry Centre (NAFRAC), an organization created to take the place of HASHI. Two factors in particular encouraged the project managers to change their approach. A pledge of long-term support from the Norwegian Development Assistance Agency (NORAD) meant that the project could be more ambitious. And the World Agroforestry Centre, an organization with a long history of conducting participatory research, came onto the scene.



▲ Flowering trees provide pollen for honey bees.

“When we arrived, HASHI staff were simply going around the villages with lots of seedlings, and getting people to plant them,” recalls Otsyina. “It was a very traditional reforestation project, and we immediately suggested that local communities needed to be much more involved. We argued that the programme would only succeed if they had a sense of ownership.”

Otsyina and his colleagues were struck by the fact that that little attention was being paid to the *ngitili*. “We thought much could be done to restore this traditional system of land management,” he recalls. “The local people had all this knowledge, acquired over the centuries, about how to conserve fodder for use in the dry season, so it made sense to build on that.” Besides focusing attention on the restoration of the *ngitili*, the World Agroforestry Centre encouraged the project to introduce a range of agroforestry technologies, including the planting of woodlots and fodder banks and the use of nitrogen-fixing trees to increase fertility and crop yields. Meanwhile, the scientists began to conduct research on



▲ Local government staff have been closely involved in the HASHI project. The chairman and executive officer of Igung'hwa village.

which practices worked best under the prevailing conditions. In short, an old-fashioned aid project was transformed into an innovative R&D programme.

HASHI used a variety of approaches to inform local people about agroforestry and encourage their involvement. Film shows, plays, newsletters, workshops, dances and exhibitions helped to spread the message, and HASHI staff established demonstration plots and arranged farmer-to-farmer visits. Participatory rural appraisals enabled villagers to identify their most pressing environmental problems and agree how to solve them. The villagers also received training on a range of agroforestry and land management practices, including how to protect their *ngitili*, which species to plant in their woodlots and how to improve soil fertility.

“One of the great strengths of the HASHI project was that it was firmly rooted within the administrative structures of central and local government,” says Chrispinus Rubanza, until recently the head of TAFORI’s Shinyanga research station. Field officers employed by the Forestry and Beekeeping Division in the Ministry of Natural Resources and Tourism worked closely with staff employed by the regional, district and village governments, with HASHI employing between 60 and 80 full-time government staff at any one time.



▲ Chrispinus Rubanza, formerly of TAFORI, with members of the Upendo Women's Group.

If you visit a local government office today and talk to the men and women responsible for natural resource management, you will find that many received their training while working on the HASHI project. “One of the reasons why HASHI activities have proved sustainable is because the government staff were so well trained,” suggests Rubanza. “Even though the project came to an end in 2004, they’ve continued to work with the villagers, promoting agroforestry, tree planting and the protection of the *ngitili*.”



▲ The HASHI project has also helped farmers to improve their dairy enterprises.



A restored ngitili in Kahama District.

2. RESTORING THE NGITILI

In 1974, Pascao Hamisi Maganga and his family were forced to abandon their homestead near Igung'hwa village, Kahama District, under the government's villagization programme. When they returned, in 2003, it was to a very different landscape. "This area had been degraded by tree cutting and charcoal making," he says, "and I immediately decided I needed to set aside a portion of my land as *ngitili*." Initially, his *ngitili* covered 50 ha. Since then, he has lost around 10 ha to make way for a secondary school.

"I established my *ngitili* because I could see that the population around here was growing rapidly and there'd be more and more competition for grazing and livestock fodder," explains Maganga, the father of 13 children. Now that he has his mature *ngitili*, he believes he will always have enough fodder to feed his cattle during the dry season, when forage is scarce on the open rangelands. The *ngitili* also provides him with firewood and construction poles, as well as protein for his dairy cow and a plentiful supply of pollen for his bees. "I get more milk from my cow than I used to," he says, "and when my cattle have been feeding in the *ngitili* they put on weight quickly and fetch a better price in the market."

There is nothing new about this. Maganga is doing much as his forebears have always done: protecting a defined area of land from grazing and other activities



▲ Pascao Hamisi Maganga points to hyena tracks outside his goat pen.

so that it can provide fodder during the dry season. Some farmers allow their livestock to graze inside the *ngitili* during the dry season; others ‘cut and carry’ fodder to their livestock, which they keep near their homesteads. “It’s a very common system among pastoralists in East Africa,” explains Aichi Kitalyi, the World Agroforestry Centre’s country representative in Tanzania. “The key issue – in Shinyanga and elsewhere – is finding out what management practices can improve productivity and protect the *ngitili* from degradation.”

In Shinyanga, approximately 60% of the *ngitili* are privately owned, with the rest being managed by village governments or institutions such as schools, community-based organizations, churches and mosques. It is estimated that some 90% of the farmers who keep livestock, and 50% of crop growers, now have their own *ngitili*. They vary greatly in terms of both their size and maturity. In the eastern part of the region, an area of relatively low rainfall, *ngitili* of 500 ha are quite common, but in the more populous central and western areas, where there is more rainfall, they may be just a few hectares or less in size.

“The definition of *ngitili* also varies from one place to another,” explains Chrispinus Rubanza. “In some areas, people will refer to a crop fallow, left untouched for a few years to regenerate naturally, as *ngitili*, but for others *ngitili* must have a covering of scrub and trees.” Otsyina points out that farmers who have established woodlots, but decided not to harvest the trees, often refer to them as *ngitili*, especially when they manage them as a source of livestock fodder.



▲ A traditional beehive in Mr Maganga's *ngitili*.

This makes it difficult to establish precisely how much *ngitili* there is in Shinyanga. When the HASHI project began there were just 600 ha of documented *ngitili*. The number of *ngitili* rapidly rose over the following years. A survey of 172 villages in the late 1990s found that there were over 18,000 *ngitili* covering some 78,000 ha. By extrapolating these figures to cover Shinyanga's 833 villages, the project managers estimated that 350,000 ha of land was in use as *ngitili* by the time HASHI ended.

Recent estimates suggest the figure could now be as high as 500,000 ha. But is this wishful thinking? "No, I don't think so," says Otsyina, whose company, Development Associates, is currently studying the carbon sequestering potential of the *ngitili* in Shinyanga. "If anything, I think it's an underestimate. We recently did a survey in five wards in one district, and we found that the district government had dramatically underestimated the area of *ngitili*." It is the data supplied by district governments which provide the basis for the estimate of 500,000 ha. Whatever the true figure, there is no denying that the HASHI project dramatically increased the area of land being managed as *ngitili*.



▲ Members of the Upendo Women's Group at one of the farmer nurseries.

Blending the old with the new

The project blended the traditional system of *ngitili* management with new agroforestry technologies, including the planting of exotic species. This meant that regeneration wasn't just a natural process; it was given a helping hand. "Just as importantly," says Frederick Shirima, the District Natural Resources Officer for Bariadi District, "the project encouraged village governments and traditional institutions to work together to oversee the restoration of old *ngitili* and the establishment of new *ngitili*."

Elected village governments officially manage the communal *ngitili*, but the traditional Sukuma institutions also play a significant role in protecting both communal and private *ngitili*. Throughout the region village scouts known as Sungusungu – men over the age of 16 – conduct regular patrols. If they catch anybody grazing livestock illegally inside an *ngitili*, the culprit will be fined. Where disputes arise, cases can be referred to the local *Dagashida*, which is led by the Council of Elders.

In the village where Maganga lives, herders caught grazing cattle illegally inside an *ngitili* are fined 20,000 Tanzanian shillings (US\$14). There is a similar penalty for illegally felling a tree inside an *ngitili*. "And if somebody does something really serious,



▲ Woodlots are a source of fodder as well as fuelwood.

such as lighting a fire, they will be fined a live cow, which will have to be slaughtered,” explains Maganga with satisfaction. When disputes arise which can’t be sorted out by the Dagashida, they can be referred to the lower judicial and district courts for resolution.

HASHI’s approach of encouraging village governments to work together with traditional Sukuma organizations has been central to the success of the project. This is not to say that the decisions about where to site new *ngitili*, and the bylaws governing their management, have always been made in the interests of all. However, the most comprehensive study to date, carried out for the World Conservation Union (IUCN), concluded that by devolving decision-making to village institutions, the project had increased local responsibility for managing the *ngitili* and other natural resources.

The benefits

The same study, led by Professor Gerald Monela of Sokoine University of Agriculture, analysed the economic contribution the *ngitili* have made in Shinyanga Region. Based on a survey of 230 households in 12 villages, conducted during 2004, the study found that the total monthly value of the benefits derived from the *ngitili* amounted to US\$14 per person. This was considerably higher than the average consumption per person of US\$8.50 in rural Tanzania.

The researchers also provided an estimate of the average annual value of 16 major products



▲ Woodlots provide a significant income for many farmers.

harvested from *ngitili* in one particular district. These were worth US\$1190 per household, US\$700,000 per village and US\$89.6 million for the district. The products considered of the greatest value by those interviewed were firewood, timber and medicinal plants. (See box: Medicines from the wild). Other products such as thatching grass and wild foods were also considered important.

The restoration of old *ngitili* and the creation of new *ngitili* has meant that women, in particular, now spend less time searching for firewood and other materials than they did in the past. “We used to walk long distances to collect firewood, and it could take us many hours,” explains Teresa Gashyle, the chair of Upendo Women’s Group in Igung’hwa village, “but since the *ngitili* near our farms has been restored, we’ve been able to collect firewood there, and that’s saved us a lot of time and effort.”

You’ll hear similar stories throughout the region, and indeed the IUCN survey found that the regeneration of the *ngitili* reduced the time families spent collecting firewood by up to 6 hours a day. Likewise, women now spend less time searching for water, fodder and thatching grass. Less time collecting life’s essentials, says Teresa, means that women now have more time to spend with their families and more time to carry out productive, income-earning tasks on their farms.



▲ The restoration of the *ngitili* has helped reduce the time women spend gathering fuelwood.

It goes without saying that the restoration of the *ngitili* and the creation of new areas of woodland have done much to restore biodiversity. The IUCN study found that of the 51 species of mammal which had disappeared in Meatu District, 21 had returned since farmers had restored their *ngitili*, including aardvark, eland, black-backed jackal, African civet and spotted hyena. Inevitably, the return of major carnivores had caused some problems, and the IUCN study estimated that the cost of wildlife damage as a result of woodland restoration was US\$63 per family per year.

As we wander back from Mr Maganga's *ngitili* towards his home, he falls on one knee to inspect the ground. The sandy soil outside a shed where he keeps his goats is pocked with the footprints of hyena. Were these and other wildlife causing more problems than in the past, we ask? This particular hyena hadn't caused any trouble, he says, before adding that he once lost six goats to a pack of hyenas in a single night. From the quiet, considered way he tells the story, it is clear that he takes a pragmatic, farmer's point of view: when it comes to living with nature, you have to take the rough with the smooth. But it is infinitely better to live in a healthy environment, with a productive *ngitili* behind your farmhouse, than in a heavily degraded landscape.



▲ Many species of mammal, including hyena, are now flourishing in Shinyanga Region, thanks to the HASHI project.

Medicines from the wild



“The demand for herbal medicines is going up, and every day some 30 to 40 clients come to buy my products,” explains Kassim Haruna Kuhangaika, the Chairman of the Association of Traditional Healers at Shinyanga New Bus Stand, seen here at his stall. He rummages among the seeds, branches and powders haphazardly displayed

in his stall, explaining their use. Some concoctions are taken for sleeping sickness and malaria; others he prescribes for urinary tract infections, yellow fever, bilharzia and male impotence.

“There’s no doubt in my mind that many of these herbal medicines are effective,” says Dr Chrispinus Rubanza. Working with scientists from Heidelberg University, Germany, Rubanza has conducted tests on some 20 popular herbal medicines. “The results so far have been very promising, and we’ve found that several species contain ingredients already used in conventional medicine.” When Rubanza gets a dose of malaria, he visits the herbalists here – not the smart, downtown pharmacies.

“Traditional healers like these represent a very sound health care system, especially for the poor in rural areas,” explains Rubanza, “but I’m concerned about the sustainability of supply.” The overharvesting of medicinal plants has led to significant degradation, even inside designated protected forests. This makes Shinyanga’s *ngitili* all the more important. Mr Kuhangaika, one of 32 herbalists in his association, believes that the HASHI project played an important role in protecting areas where he and his colleagues get their medicinal plants.



Kaligilwa Mbasha and his daughter-in-law outside his house, which he recently extended using timber grown on his farm.

3. BRAVE NEW WORLD?

Encouraged by the HASHI project, farmers in Shinyanga have planted around 1500 ha of new woodlots. Compared to the area under *ngitili*, this is modest, but the woodlots have made an enormous difference to those involved. In nearly every case, farmers decided to plant woodlots because they were finding it difficult to get enough firewood.

“We used to have to visit a distant forest, and that was very time-consuming,” recalls Kaligilwa Mbasha, a farmer in the village of Isagehe, Kahama District. In 1996, when he was still working as a government livestock officer, HASHI staff provided him with some tree seedlings which he planted along his farm boundary. Once he’d done that, he established the first of several woodlots.

He shows us around a woodlot of white teak, planted in 2006. For three years, he explains, he grew cassava and maize here, together with *Leucaena leucocephala*, a nitrogen-fixing tree. “This increased the soil fertility and my crop yields were double what I used to get,” he says. After three years, the canopy began to cast too much shade to grow crops, and Mbasha now allows his livestock to graze the understory in the woodlot. When the trees are 10 years old, they will be ready to harvest.



▲ By planting nitrogen fixing trees, Mr Mbasha has significantly increased soil fertility and crop yields.

Besides firewood, the woodlots have provided Mbasha with timber to make rafters, doors and furniture for the house where he lives with his wife and a new dwelling which he rents out in the village. The sale of timber from his woodlots, together with the sale of his livestock, also enabled him to pay school fees for his 10 children, and he proudly lists the occupations of those who have left home: teacher, teacher, laboratory technician, priest, teacher, housewife, farmer.

When you walk around the boundary of Mbasha's farm, in the shade of mature trees, you immediately notice the difference between his land and his neighbours'. Everything – crops, hedges, trees – looks more lush and productive. Are his neighbours jealous? "Yes, they are," he replies, "but most are jealous in a positive way, and some are beginning to copy what I'm doing." HASHI has come to an end, but the lessons HASHI taught continue to spread across the countryside.

"In this area," explains Stephen Dwasi, a farmer in Bariadi District, "people now recognize that farmers with trees are even richer than farmers with cattle!" This goes against the conventional wisdom in a society where wealth is traditionally measured in livestock. Since he planted his first woodlots in 1998, Dwasi has found that they are far more profitable than traditional cash crops.



▲ Steven Dwasi's maize fields are dotted with *Faidherbia* trees, a rich source of nitrogen.

“Woodlots make me 3 to 4 times more money than the same area under cotton,” he says. “You don’t have to use fertilizers or devote lots of time to weeding and harvesting, like you do with cotton.” A big tree provides around three ox carts of firewood – worth around US\$120 – and in his most intensive woodlots Dwasi grows around 700 trees per hectare. The woodlots also provide him with building timber, for his own use and for sale.

The value of woodlots, and the fact that they are a perennial crop, has significant implications for land tenure. This is an important issue in Tanzania. “Our research suggests that when farmers have secure land tenure, they’re much more likely to manage their land sustainably,” says Aichi Kitilyi of the World Agroforestry Centre. Indeed, this issue was raised in Parliament in February 2004, when Edson M. Halinga suggested issuing title deeds to *ngitili* owners.

Although all land belongs to the state, recent legislation has enabled farmers like Kaligilwa Mbasha to apply for a long-term lease. “If I hadn’t planted trees, it would have been much more difficult for me to get title deeds for my farm,” explains Mbasha. He expects to get them within the next year. “Once I get the leasehold, it will provide much greater security for me and my family.” At present, if a farmer in Tanzania dies without title deeds, the entire family, including distant relatives, can demand a slice of the cake. Mbasha, in contrast, will be able to leave his land and possessions to his immediate family once his deeds come through. They will also be able to use them as collateral to secure bank loans.



▲ Mr Dwasi's woodlots are proving more profitable than cash crops such as cotton.

Fodder and fertility

Research by the World Agroforestry Centre under the HASHI project had a significant influence on the way farmers planted and managed their woodlots. The scientists, led by Robert Otsyina, also conducted research on fodder trees for small-scale dairy farmers. “We looked at which species worked best here, at different cutting regimes, at how to handle the fodder after harvest, and how fodder trees could be used most effectively with other supplements,” explains Otsyina. “Now, you only have to drive around the outskirts of Shinyanga town to see how popular fodder banks have become.”

In 1994, Elizabeth Mihayo and a group of friends set up a small retail business to supplement their farm incomes. They were also interested in environmental matters and two years later, with the help of the HASHI project, they began planting grafted fruit trees, medicinal plants and fodder trees. “In those days, there were just 16 of us,” recalls Elizabeth, “but before long other small groups were doing the same sort of things.” Now, she is chair of Safina Njema – ‘Good Ark’ in Swahili – which has 120 members, 70 of whom have one or more dairy cows.

Before they began planting their fodder banks – the main species they grow are two nitrogen-fixing trees, *Gliricidia sepium* and *Leucaena leucocephala* – they used to get, on average, around 3



▲ Members of 'Good Ark' have enthusiastically embraced a range of agroforestry technologies.

litres of milk a day from their dairy cows. Now, many are getting 10 litres or more. The increase can be attributed, in part, to the fact that many women are using improved breeds of dairy cow. However, a better diet, combining protein-rich fodder crops with supplements like maize bran and cotton-seed cake, has also helped to increase yields.

Talk to any of the women here and they'll immediately tell you what a difference this has made to their lives. "I've increased the milk yield of my cow from 7 to 11 litres a day," explains Juliana Mwandu, "and with the money I've made from the extra milk I've been able to pay school fees for my youngest children." Her three eldest children, in contrast, were unable to go to secondary school as she didn't have the money, at the time, to pay for school uniforms and books.

The environmental benefits of growing nitrogen-fixing fodder crops have been considerable. "I had a plot of land that was completely rocky and bare when I decided to try planting fodder trees there," recalls Maria Manyanga. "After a while, the roots broke through the hard pan and the soil has improved to such an extent that I'm about to plant a crop of maize."

A tree for the future?

Thanks to HASHI, many families are now planting nitrogen-fixing legumes such as *Gliricidia*, *Calliandra* and *Leucaena*. Some they grow as fodder for their dairy cow; others specifically to improve fertility and



▲ Maize yields beneath *Faidherbia* trees are often higher than yields beyond the canopy.

crop yields. In recent years, some farmers have also begun to recognize the potential value of *Faidherbia albida*, an acacia-like tree which is found throughout much of sub-Saharan Africa. Like all leguminous trees, it has nitrogen-fixing properties, but what makes it particularly unusual is a habit known as ‘reverse leaf phenology.’ The tree becomes dormant and sheds its leaves during the early rainy season, at a time when farmers are planting their crops. This means it does not compete for light, nutrients or water. It does, however, provide the crops, and the farmers, with a free supply of nitrogen. Once the dry season begins, after most crops have been harvested, the tree comes back into leaf again.

Local government officers in Bariadi District are well aware of *Faidherbia*'s virtues and many farmers are now retaining the tree in and around their smallholdings, although their knowledge about its properties is often sketchy. Steven Dwasi feeds *Faidherbia* pods to his livestock and he has harvested some of the larger trees for timber. “Even if you plant crops beneath *Faidherbia* trees, you’ll still get a good yield,” he says, although he admits that he hadn’t, until our visit, heard about their nitrogen-fixing properties and potential to increase soil fertility.

Nor had Joseph Magori, a former government officer and gospel preacher, when he acquired his farm in 1998. “People round here were planting lots of exotic trees,



▲ Joseph Magori's *Faidherbia* provide natural fertilizer, timber and fencing for his cattle enclosures.

but I could see that the *Faidherbia* on my land were performing well, so I left them,” he recalls. “After a while, I noticed that the crops underneath my *Faidherbia* trees often performed better than the crops beyond the tree canopy.” Besides improving soil fertility, his *Faidherbia* provide him with construction timber and thorny branches which he uses as fencing for the enclosure where he keeps his cattle at night.

The HASHI project did not actively promote *Faidherbia*, but its influence in Bariadi District and elsewhere has encouraged farmers and government offices to think creatively about the potential of agroforestry. Indeed, Aichi Kitalyi says that one of the things that impressed her most when she visited farmers involved with the HASHI project was the way some had conducted their own experiments to establish which species worked best under which conditions. In particular, she is full of praise for Anthony Katakwa and his wife Agnes Saidi, who have done much to disseminate good practices from the HASHI project among neighbouring communities.



These woman have been helping to spread the agroforestry message far beyond their own village.

4. AN UNCERTAIN FUTURE?

First, the good news. Although the HASHI project came to an end in 2004, many of its core activities have continued. “One of the reasons why farmers have carried on doing what they were doing during the HASHI project is because they are making good money,” observes Robert Otsyina. The woodlots are proving profitable; the *ngitili* are yielding tangible benefits; and the introduction of new agroforestry technologies such as fodder banks and grafted fruit orchards has increased family incomes.

During the lifetime of the project, considerable efforts were made to ‘scale up’ the agroforestry activities introduced by government staff and researchers from the World Agroforestry Centre. As a result, HASHI helped to influence tens of thousands of farming families. Furthermore, local government staff have continued to promote agroforestry and sustainable land management. In Shinyanga District, to give one example, they have identified ‘champion farmers’ in each ward and provided them with technical advice and materials. “Since 1998, we have also provided training for over 150 teachers so they can promote environmental issues in their schools and train local villagers,” explains Thadeus Maganga, Shinyanga’s District Natural Resources Officer.

Local government departments are also promoting the use of fuel-efficient stoves, often with the help of their champion farmers. This, it is hoped, will help to take pressure off the woodlands, as well as reduce the amount of time families spend searching for firewood. According to Maganga, half the households in Shinyanga District will be using fuel-efficient stoves within three years time.

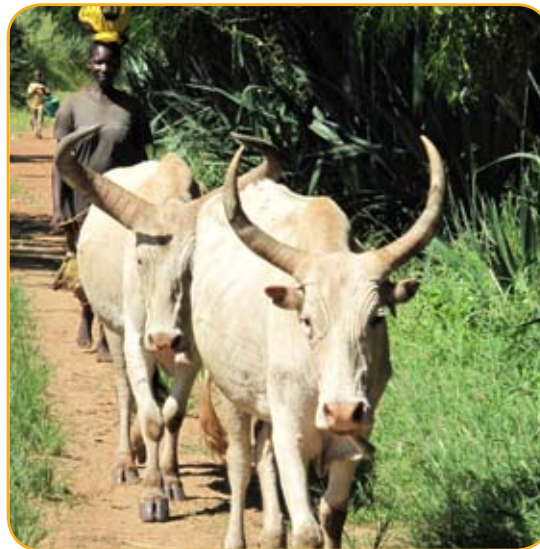
“I think this is wildly optimistic,” suggests Chrispinus Rubanza, “but there’s no doubt that significant progress has been made during recent years.” Upendo Women’s Group, for example, is one of many community-based organizations promoting fuel-efficient

stoves, both among its own members and in neighbouring villages. “In the past, a head-load of timber would last a household of 6 to 7 people for three days at the most,” says Flora Paul, “but with the fuel-efficient stoves, we can now make a head-load last seven days.” This is good news for the environment.

In 2002, the HASHI project was awarded the prestigious United Nations Equator Prize for tackling poverty through conservation and the sustainable use of biodiversity. And there’s no doubt that the project promoted many activities which have proved sustainable – so far. Unfortunately, a range of factors, and especially the rapid growth in population, threaten to undo much of the good that has been done in recent years.

In 1988, the population of Shinyanga Region was 1.77 million. By 2002, it had reached 2.8 million. Since then, population growth is thought to have continued at around 2.9% per year and it is estimated that there are now at least 3 million people living in the region. This means that there are 70% more human beings in Shinyanga than there were when the project began. The number of livestock has also increased at approximately the same rate.

“We are already beginning to see quite a lot of the *ngitili* being degraded because of the increase in population and demand for resources,” says Otsyina.



▲ The rising population — of both people and livestock — threatens to undo much of the good that has been done.

“This trend is going to continue unless we put some significant conservation measures in place.” Rubanza agrees. “I think that the increase in population is going to lead to the fragmentation of many *ngitili* and shortages of firewood and fodder that could lead to serious environmental degradation,” he says.

A recent study conducted by Otsyina and Rubanza has highlighted the potential of the region’s woodlands to store carbon, and a four-year project, managed by Tanzania Traditional Energy Development and Environmental Organization (TaTEDO), with technical input from Development Associates Ltd (DASS), is currently exploring how local communities could benefit from the funds that are likely to be made available for projects that Reduce Emissions from Deforestation and Forest Degradation (REDD) in developing countries.

“The idea is that if we end up with the *ngitili* in Shinyanga in a good state, and farmers continue to plant woodlots, local communities will be able to enter the carbon market,” explains Otsyina. However, there are a number of obvious obstacles to any future carbon deals, the most obvious being rapid population growth and the inevitable impact this will have on the region’s natural resources.

None of this detracts from the importance of the HASHI project and its lessons for future development in Tanzania, which recently launched a new initiative to transform the country’s agricultural sector. Among other things, Kilimo Kwanza – literally Agriculture First – aims to increase the allocation of funds for agriculture, encourage greater private sector investment and make good use of science and technology to support the agricultural transformation of dryland areas. All of this, it is hoped, will lead to higher productivity and better incomes for those involved in the sector.

Aichi Kitalyi, the World Agroforestry Centre's country representative, believes that environmental sustainability should be at the heart of Tanzania's programme to modernize the agricultural sector. And if that's to happen, then policymakers and farmers should look at the example set by the HASHI project. "If Kilimo Kwanza is going to encourage sustainable and productive land management, then agroforestry practices of the sort promoted in Shinyanga need to be scaled up across the country," she says.

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