



World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

TAKING THE HEAT OUT OF FARMING

An innovative agroforestry project is helping
Indian smallholders to join the global carbon market





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.

We are one of the 15 centres of the Consultative Group on International Agricultural Research (CGIAR). Headquartered in Nairobi, Kenya, we operate six regional offices located in Brazil, Cameroon, India, Indonesia, Kenya, and Malawi, and conduct research in eighteen other countries around the developing world.

We receive our funding from over 50 different investors. Our current top ten investors are Canada, the European Union, Finland, Ireland, the Netherlands, Norway, Denmark, the United Kingdom, the United States of America and the World Bank.



Kavati Anjaiah has planted over 100 teak seedlings around his rice paddies. These will sequester carbon and provide him with additional income.

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Front cover: Lehri Lal , a farmer in Udaipur District, Rajasthan, has established an orchard which will sequester carbon and provide him with fruit and an income.

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Contents

	Page
Foreword	
Introduction	1
Chapter 1:	
THE CHALLENGE FOR INDIA	7
Chapter 2:	
CUTTING CARBON IN ANDHRA PRADESH	13
Chapter 3:	
REACHING THE UNREACHED IN RAJASTHAN	19
Chapter 4:	
A COOLER, BRIGHTER FUTURE?	25

Foreword

How can we produce enough food to feed a rapidly growing population without causing further environmental damage and increasing emissions of the greenhouse gases responsible for global warming? This is one of the greatest challenges we face.

Agriculture is both a victim of climate change – changing weather patterns are likely to lead to lower yields in many countries – and a significant cause. It is estimated that 20% of India's greenhouse emissions come from the agricultural sector. Reducing these emissions, and helping smallholder farmers to increase their yields and incomes, lies at the heart of the project described in this booklet.

Until recently, smallholders have been unable to take advantage of the world's growing carbon market, which is based on organizations selling the carbon they capture – for example through tree-planting – to countries or companies which wish to offset their own emissions. The difficulty of producing the minimum volumes required by the trade, the cost of registering projects and measuring carbon stocks, a lack of business skills – these are among the factors which have prevented smallholders from tapping into the carbon market.

A project launched in India in 2009 and managed by the World Agroforestry Centre has devised ways to overcome these considerable difficulties. With field sites in Andhra Pradesh, Orissa, Rajasthan and Uttarakhand, the project – 'Enabling



The World Agroforestry Centre's carbon and livelihoods project is helping villagers to reduce their consumption of fuelwood. Many villagers use crop roots as cooking fuel.

smallholders to improve their livelihoods and benefit from carbon finance' – has encouraged large groups of smallholders to adopt activities, especially those involving agroforestry, which have already helped farmers to improve their yields and incomes. Soon, it is hoped, these smallholder communities will be able to sell their carbon on the international market.

The project has been generously supported by the Government of India, but many thousands of farming families have also made financial contributions: nothing other than technical advice has been given free of charge. This has enabled local communities to establish funds which should ensure that climate-smart agricultural practices and energy-saving activities continue to spread after the project officially comes to an end in 2013. We firmly believe that this provides a model for the future.

Dr. S. Ayyappan

Secretary and Director General,
Indian Council of Agricultural Research,
Ministry of Agriculture,
New Delhi

Date the 13th January, 2012



Komaraiah Nomula, a farmer in Warangal District, believes the carbon project will yield many benefits.

Introduction

Warangal District, in northern Andhra Pradesh, is classified as ‘backward’ by India’s Planning Commission. It’s easy to see why. Many villages can only be reached by dirt track and remote areas receive little in the way of public services. Nevertheless, for many families life has changed for the better during recent years.

“If you’d come here 20 years ago, you’d have seen that we were much poorer,” says Komaraiah Nomula, a sprightly 60-old farmer who lives with his wife in a modest, mud-walled house in a hamlet near Jaffergudem. “In those days, I grew sorghum, millet and castor bean, and the yields were very low. We had just about enough to eat, but hardly any cash, and there was no electricity in this area.”

Since then a series of development activities has helped to change the way people farm. Many smallholders grow high-yielding varieties of rice, maize and cotton, and they now have more money to spend on health care and consumer goods – Mr Nomula has a mobile phone and television – than they had in the not-so-distant past.

Yet problems remain. “There used to be large areas of forest round here,” recalls Mr Nomula, “but most has been lost or reduced to scrub.” As the population has risen, so has the demand for fuelwood and cropland. When harvests were poor, as they frequently were in the 1980s and 1990s, the larger trees were felled in return for cash. Many villagers believe that the loss of forests has led to a rise in temperature and more frequent droughts.

► *Energy-saving compact fluorescent light (CFL) bulbs use less electricity, last longer and give more light than old-fashioned bulbs.*





However, Mr Nomula is optimistic about the future. “I see lots of benefits coming from the carbon project,” he says, reflecting on an ambitious new venture managed by the World Agroforestry Centre. By introducing measures which sequester carbon, or reduce carbon emissions, the project is not only yielding significant environmental benefits, but the opportunity – previously undreamt of in these parts of rural India – for smallholders to take advantage of the international carbon market.

Mr Nomula points proudly to two new energy-saving compact fluorescent light (CFL) bulbs, which cast a brilliant glare throughout his home. “The old-fashioned bulbs used to get very hot, and their light was poor,” he says. They also used more electricity and frequently had to be replaced. During the coming weeks, he explains, he plans to buy a fuel-efficient smokeless stove, which will reduce his firewood consumption by half. The project has already helped his neighbours acquire fuel-efficient stoves, and he has seen the benefits. “I’m also about to start planting teak seedlings around my rice paddies and fruit trees around the house,” he says.

The CFL bulbs and the new stove will reduce his family’s carbon emissions and the trees will take carbon from the atmosphere and provide fruit to eat

◀ *Renuka Nomula of Jaffergudum village, Warangal District, with her fuel-efficient, smokeless chulah, which uses much less fuelwood than traditional stoves.*

and timber to sell. “At the household scale, these measures may sound trivial,” says Pal Singh, the World Agroforestry Centre’s Regional Coordinator for South Asia. “But when you add together the activities of many thousands of farming families, they become highly significant, both for the environment and the farmers.”

An idea for the future?

Singh first began to take a serious interest in the carbon market and its potential for small farmers in 2007. “At the time,” he recalls, “I was reading a lot about climate change, and the huge amount of funding available for projects that reduced carbon emissions, and I started searching for information about how agriculture was benefiting.” The answer was: hardly at all. The same remains true today. By mid-2011, there was just one agriculture-based scheme registered under the Clean Development Mechanism (CDM), which promotes projects designed to reduce greenhouse gas emissions.

There were a number of reasons, Singh realised, why it was so difficult for smallholders to take advantage of the burgeoning carbon market. “They can’t produce the minimum volume required,” he says. “What’s more, their landholdings are small and scattered and they conduct all sorts of diverse activities to feed themselves and make a living. This means measuring carbon stocks is a complicated business.”

The costs of registering projects, drawing up contracts and monitoring carbon stocks are prohibitively high for smallholders acting alone or in small groups. This applies not just to the CDM, but to the growing range of voluntary mechanisms linking sellers and buyers of carbon credits. Indeed, one estimate for emission reduction projects in India found that the average transaction cost was around US\$75,000 per project.

Eager to make the carbon trade work for smallholders, Singh devised a project – ‘Enabling smallholders to improve their livelihoods and benefit from carbon finance’ – to overcome these difficulties. It encourages smallholders to act collectively over large, contiguous areas, adopting practices which reduce emissions and sequester carbon. “At the heart of what we’re doing is a new concept – we’ve called it SMART-CDM – which we believe could transform the livelihoods of huge numbers of smallholders in countries like India,” says Singh.

This booklet focuses on the experience in two areas, Andhra Pradesh and Rajasthan. The project is a work in progress, but it has already attracted the attention of a wide range of potential buyers and the interest of government departments and international donors. Two decades ago, farmers like Mr Nomula were scarcely able to take advantage of the agricultural markets in nearby towns. Soon, they could be selling their carbon to sharp-suited traders in high-rise offices in Mumbai and beyond.



A semi-nomadic family in Warangal District, Andhra Pradesh.

Chapter 1: THE CHALLENGE FOR INDIA

Climate change is likely to have a major impact on food production and the livelihoods of farming communities. Even a 2°C rise in temperature by the end of the 21st century – an optimistic scenario – will lead to dramatic changes in patterns of land use. There will be winners, such as farmers who experience longer growing seasons, and losers, whose livelihoods will be disrupted by water shortages, higher temperatures, extreme weather events and changes in the prevalence of pests and diseases. It seems almost certain that farmers in poorer, hotter countries like India will be among the hardest hit.

Yet agriculture is partly to blame. The sector contributes 15% of the greenhouse gas emissions responsible for global warming; double, if you include the emissions resulting from the clearance of forests to make way for farmland. Around 80% of these emissions occur in developing countries.

In 2007, the average Indian citizen was responsible for 1.43 tonnes of carbon dioxide (CO₂) emissions – small beer compared to the 19.34 and 9.57 tonnes emitted by the average American and German. But this only tells part of the story. India's greenhouse gas emissions rose by almost 60% between 1994 and 2007, and its per capita CO₂ emissions are expected to triple by



▲ India's 280 million cows are a significant source of methane, as well as milk, hides and draught power.

Approximately a fifth of India's greenhouse gas emissions come from the agricultural sector. Irrigated rice releases significant quantities of methane.

2030. The country is currently the world's fifth largest emitter of greenhouse gases, and there are compelling reasons why it should curb its emissions.

Approximately 20% of India's emissions are thought to come from the agricultural sector. Flatulent, burping livestock – the country has over 280 million cows – and irrigated rice production release large quantities of methane, which is 20 times more potent than CO₂ when it comes to trapping heat within the Earth's atmosphere. Emissions of nitrous oxide (N₂O), another potent greenhouse gas, are primarily caused by the use of nitrogenous fertilisers. A significant portion of the sector's carbon emissions relate to the energy used to power machinery. Most of the rest comes from the cultivation of annual crops. These sequester carbon as they grow, but much of this is released into the atmosphere when they are harvested.

Making the most of markets

Broadly speaking, there are two ways to reduce the levels of greenhouse gases in the atmosphere. We can either reduce emissions or adopt practices which actively sequester carbon. This has led to the trade in carbon credits, described by the *Economist* as the fastest-growing commodity market in the world, worth US\$120 billion in 2010.

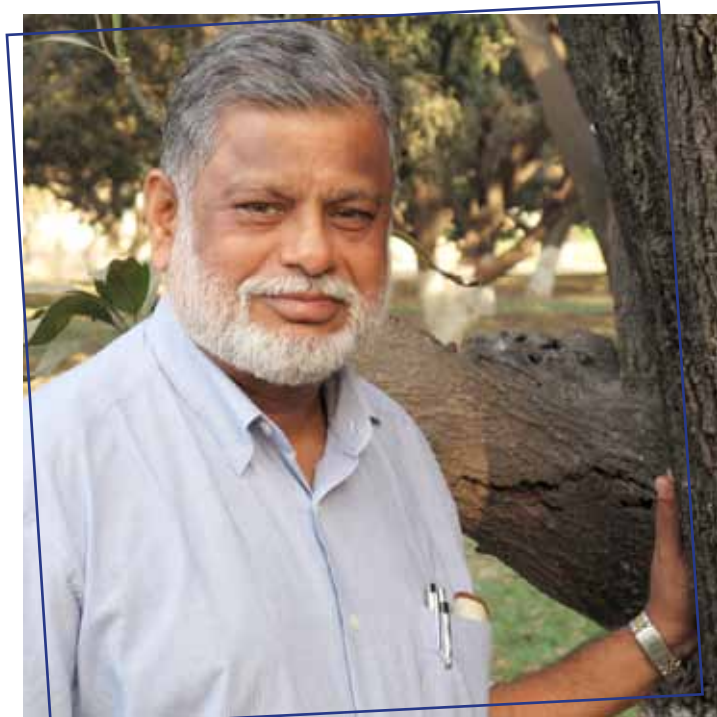
The Clean Development Mechanism (CDM) of the Kyoto Protocol enables businesses and organisations in developed countries to meet their emission quotas by financing mitigation activities in developing countries. Let's say a European power company is unable to implement measures to remain within the quota allocated by its government. It has the option of purchasing carbon credits to offset its excess emissions, for example by financing energy-efficiency or forestry schemes in developing countries. Companies can also purchase carbon credits in voluntary markets which are not subject to such strict rules and regulations as the CDM.

The number of new CDM projects approved each month has steadily risen, from less than 40 in mid-2007 to over 170 by mid-2011. India and China now account for over two-thirds of all CDM projects. By July 2011, 3021 projects had been approved. Of these, just 61 related to forestry schemes and one to agriculture.

During recent years, there has been considerable debate about how to develop and finance projects which Reduce Emissions from Deforestation and Forest Degradation (REDD). The logic is simple. Deforestation accounts for around a fifth of greenhouse gas emissions, so saving forests, or planting trees, is a good way of tackling global warming. However, in many countries a significant portion of forest-related emissions occur outside areas officially designated as forest. That is why the World Agroforestry Centre has been promoting REALU, or Reducing Emissions from All Land Uses. The activities described in this booklet are putting this concept into practice, on a scale never attempted before.

India has reached a critical stage in its development. As the population continues to rise, there is ever-increasing pressure to produce more food. "Soon, we won't have the luxury of growing trees and crops separately," explains Pal Singh. "Whether we like it or not, we have to put them together, and that's what agroforestry is all about."

► Pal Singh, the World Agroforestry Centre's regional coordinator for South Asia, has been a driving force behind the carbon project.



Agroforestry – planting trees on farmland – significantly increases the amount of carbon sequestered below the ground. Agroforestry also traps carbon in woody material that can later be transformed into furniture and building timber. There are other benefits too. Nitrogen-fixing trees help to increase soil fertility and crop yields, and fruit trees provide vitamin-rich food and an income. Agroforestry also helps to increase the rate at which underground aquifers are replenished and it can reduce erosion and water run-off on steep slopes.

“Visit any of our project sites, and you’ll see that agroforestry provides farmers with a much more diverse source of income than they get when they just grow field crops like rice and maize,” says Singh. Indeed, he believes it would be unreasonable to ask farmers to undertake practices which don’t yield immediate economic benefits. “You can’t say to farmers, ‘If you plant trees now, you’ll get carbon payments in 20 years’ time’, and expect them to wait that long. The activities we’re promoting ensure that they either make money, or save money, straight away.”

Smart solutions

At the heart of the project is the concept of SMART-CDM. The aim is to introduce practices which qualify for approval under the CDM, and which are specific, measurable, achievable, realistic and tangible; hence the acronym. Smallholders can also take advantage of voluntary carbon credit schemes, although payments under these tend to be less than those made to CDM projects.

The SMART-CDM protocol seeks to overcome the obstacles which currently prevent smallholders from gaining access to the carbon market by adopting a ‘grid’ approach. Instead of acting as individuals, large numbers of smallholders work together to reduce their carbon footprint and establish institutions that act on their behalf.

“There is a strong element of research and we have chosen four very different agro-ecological zones to test and develop our ideas,” explains Singh. “We want to establish a protocol and methodology that will work anywhere in India, from the humid forests to upland areas and arid regions.” The project activities are being developed and managed by four research partners: two university departments in Rajasthan and Orissa and two national agricultural research centres in Andhra Pradesh and Uttarakhand. A fifth partner, Bangalore-based OUTREACH, provides training for farmers and their organisations.

Of course, the key players are the farmers themselves. Most belong to the scheduled tribes or castes, which are among the poorest communities in rural India. By mid-2011, over 5000 farming households were adopting a broad range of measures to reduce emissions and sequester carbon. “One of the great challenges for us is to make sure that when the pilot schemes come to an end, the farmers and their institutions will have developed the skills and knowledge needed to continue without us,” says JVNS Prasad, senior scientist with the Central Research Institute for Dryland Agriculture (CRIDA) in Andhra Pradesh.



▲ Many of the small-scale farmers who are benefiting from the carbon project depend on both livestock and crops to make a living.



Dharavat Rajitha's family used to take 12 days to gather enough wood to last a year. Now that they have a fuel-efficient stove, it takes just half that time.

Chapter 2: CUTTING CARBON IN ANDHRA PRADESH

In January 2009, JVNS Prasad organised a meeting in Jaffergudem with Vishvanatha Raju, a retired agricultural extension officer who was now acting as a consultant to Modern Architects for Rural India (MARI). The two men knew each other well, having worked together on a livelihoods project in Warangal District for several years. On this occasion, they wanted to talk to the villagers about the carbon project, soon to be launched by the World Agroforestry Centre.

“We discussed climate change, and how this might affect them in the future,” recalls Prasad, “and we told them that there were some things they could do themselves to cope with variable weather and improve their incomes.”

This fell on receptive ears. Many of the villagers were already convinced that winter temperatures were getting warmer and the seasonal rains more erratic. “When we were young,” says Pratap Reddy, a farmer in his 60s, “we had a very good climate. The forests were in good condition, and the rains would come when they were supposed to come. It’s very different now.” Like most villagers, he believes the loss of forests is partly to blame for the frequent droughts over recent years.

► *Scientist JVNS Prasad (right) discusses the carbon project with villagers in Andhra Pradesh.*



In Andhra Pradesh, CRIDA chose to focus its activities on a 'grid' encompassing some 2000 ha of land, the village of Jaffergudem and seven hamlets. The project partners in Rajasthan, Orissa and Uttarakhand chose their sites using similar criteria. They had to be reasonably near the research partner's headquarters; far enough from towns not to be unduly influenced by urban life; predominantly inhabited by scheduled tribes and scheduled castes; and the beneficiaries of livelihoods programmes supported by the National Agricultural Innovation Project (NAIP). In Andhra Pradesh, CRIDA enlisted the help of MARI to conduct day-to-day activities at the project sites.

The MARI staff, three of whom live in the villages, spent several months gathering data on every aspect of local life: the crops each family grew, the livestock they owned, their incomes, access to irrigation, ownership of farm machinery, cropping intensity, standards of education, and details about the number of lightbulbs they had and the amount of firewood they used each year. Scientists from CRIDA conducted a survey of the soils, crops and vegetation, and measured carbon stocks for each type of land use. "This gave us a very accurate idea about all the activities taking place in the grid and the current carbon budget," says Vishvanatha.

The only data that should be viewed with suspicion relates to the levels of poverty. In 2009, 687 out of the 689 families within the grid were classified as being below the poverty line (BPL). However, it is in every family's interests to be classified as a 'BPL household', as this gives them access to benefits such as subsidised vegetable oil and free medical care. In fact, recent development projects, including the livelihoods project managed by CRIDA

► Villagers involved in the carbon project are keen to replace old-fashioned chulahs, such as this one, with fuel-efficient stoves.



and MARI, had significantly reduced poverty. Mr Reddy, who chairs the society which will handle the community's carbon funds, believes the number of people genuinely living below the poverty line fell from around 60% in the 1990s to 10–15% by the end of the decade. Nevertheless, there are no health centres, farm-input shops, post offices or banks in the area; it is justly classified as backward by the Planning Commission.

Agents of change

Every household is implementing at least one of 40 possible activities designed to reduce emissions or sequester carbon. These can be divided into three main categories: tree-planting activities; agricultural activities which reduce emissions, such as ploughing crop residues back into the soil, rather than burning them; and activities which reduce energy consumption.

By December 2011, Prasad had supplied over 1600 CFL bulbs. These are a source of great pride to the villagers, who claim that they give four to five times more light than the old-fashioned incandescent bulbs. In the evenings the hamlets sparkle in the darkness like constellations of brilliant stars.

By the end of the year, 164 villagers had received fuel-efficient, smokeless *chulahs*. Their owners were universally impressed. "With the old stoves, we used to get so much smoke in our eyes when we were cooking," says Renuka Nomula, as she lights up the stove for the evening meal. "This stove cooks much more quickly than the old stove. It takes 10 to 12 minutes to cook rice, rather than 20 minutes." She reckons she is now using 50% less fuelwood than she did in the past. The stoves not only reduce carbon emissions, they reduce the amount of time spent collecting sticks and branches. According to Dharavat Rajitha, who lives with her family in a nearby hamlet, it used to take 12 days to gather

enough wood to last a year. The fuel-efficient stoves reduce this by half. “By 2012, every family in the grid will be using one,” says Prasad.

Tree-planting activities have also begun to take off. Some farmers are planting fruit trees, such as custard apples and mangoes, around their homesteads, and many are planting teak trees on the bunds in their rice paddies. “I have planted over 100 teak trees so far,” says Kavati Anjaiah, “and I will be planting more as soon as I can get the seedlings.” He expects to sell his trees after 8 to 10 years, and sees them as a valuable cash crop.

Mr Anjaiah paid 3 rupees for each seedling, which represents half the cost paid to nurseries by the project. The villagers are also expected to pay around half the cost of *chulahs* and lightbulbs. Some believe the benefits are so obvious that they don’t even wait for the project to help. “I’m going to buy a smokeless *chulah* soon – with my own money,” says Mr Nomula. Why wait, when the benefits are so obvious?



▲ Farmers are contributing towards the cost of the teak seedlings which they are planting around their fields.

Fit for the future

When the carbon project comes to an end, in 2013, the villagers will have to manage their own affairs without the support of CRIDA and MARI. To make sure this happens, OUTREACH is providing training in every aspect of carbon management to 4 or 5 young adults in each of the pilot sites. They

will report to the organisations established to represent the villagers. In Andhra Pradesh, this is the Navakalpana Society, or New Vision Society, whose elected president is Pratap Reddy. “We will handle all the financial aspects of carbon management,” he says.

Money which has been raised through the sale of stoves, seedlings and lightbulbs has been placed in the Society’s bank account. At the time of writing, there were no immediate plans to use the savings. Eventually, the Society will pay the wages of the individuals trained to manage the community’s carbon affairs. The savings may also be used to finance further carbon-related activities. Once the community begins to sell its carbon, either through the CDM or on the voluntary market, the Society will determine how the profits should be allocated within the community.

“It is impossible to say precisely how much the carbon market will raise for any of our grids, but we’ve estimated that for the Andhra Pradesh site, it could amount to 11,500 CERs,” says Singh. If each CER, or Certified Emission Reduction, is worth US\$5, the households within the grid would receive over US \$55,000 a year – a huge sum of money in a remote tribal area. But the beauty of the scheme is that even if they receive nothing from the carbon market, they will continue to adopt measures which reduce their carbon footprint, because these make financial, as well as environmental, sense.

► Jarupula Lingam, who is currently responsible for running the market information kiosk in Jafferugudem, is being trained to manage the community’s carbon affairs.



Chapter 3: REACHING THE UNREACHED IN RAJASTHAN

Until recently, the farming communities in Mavali Block in Udaipur District received little help from the government, even though they live less than an hour's drive from Udaipur, one of the great tourist destinations in Rajasthan. However, this is no longer the case, thanks largely to a livelihoods and nutritional security programme funded by the National Agricultural Innovation Project (NAIP) and managed by Maharana Pratap University of Agriculture and Technology.

“Before the livelihoods programme began, we never saw any extension workers here,” recalls Lehri Lal, a farmer employed by the programme as a ‘village worker’. “We didn’t know about high-yielding hybrid seeds, or the benefits of growing fruit trees.”

The programme has helped to transform the lives of some 12,000 farming families in this arid part of India. The introduction of hybrid seeds has helped to double and sometimes treble yields of wheat and maize. Thousands of households are now cultivating a range of vegetables; many have planted fruit orchards. The programme has also focused on improving the health and productivity of livestock and increasing the area under irrigation. All this has helped to improve nutrition and incomes. In the words of a World Bank evaluation, the programme “has reached the unreachable.”

Here, as in Andhra Pradesh, Orissa and Uttarakhand, the carbon project has benefited greatly from the existence of the NAIP livelihoods programme. “The carbon project got off to a shaky start, because there was a delay before I was appointed manager,” says Manmohan Dobriyal, a professor based at the university’s College of Horticulture and Forestry, “but we are now making up for lost time.”



Harvesting a traditional variety of wheat in Rajasthan.

The villagers immediately grasped the significance of the carbon project and they are adopting a range of measures to reduce their emissions and sequester carbon. Already familiar with the virtues of planting fruit trees, farmers like Lehri Lal and his uncle Narayan Lal have increased the rate at which they are establishing new orchards.

“In the past, the only trees we regularly planted were *neem*, *karanj* and *subabul*,” says Lehri Lal. These species provided them with oil and livestock fodder. “Once we learned how fruit trees could improve our incomes, we began to plant pomegranates, guava, custard apple and citrus.” Lal has a rapidly maturing orchard on a plot of land just below a rocky hilltop, to which he pumps irrigation water using a system introduced by the livelihoods programme. In the fields below, he has intercropped citrus with wheat. His uncle has done the same, on an even bigger scale, planting pawpaw and guava in fields originally devoted to annual crops.

During the first year of the project, farmers in the Rajasthan pilot site planted 6000 fruit trees and 1600 teak around their fields and homesteads. During the same period, Dobriyal supplied over 400 CFL bulbs and many households are now replacing their old-fashioned open stoves with smokeless *chulahs*. He estimates that by using a fuel-efficient *chulah*, each household will save around 1000 rupees (US\$22) a year. Farmers are also being encouraged to fit capacitors to their irrigation pumps. This will reduce electricity consumption.



▲ Narayan Lal was encouraged to establish new orchards by the carbon project.

The price of progress

“The livelihoods programme and the carbon project give nothing away free, apart from advice and knowledge,” says Dobriyal. “The farmers pay a percentage of the cost of everything they get – fruit trees, *chulahs*, CFL bulbs, capacitors.” The precise share varies, but it is mostly around 50%, or more. Dobriyal has found that individuals are perfectly happy with this arrangement, but it doesn’t work for products, such as solar lanterns, intended for use in public spaces. “If the benefits are being shared with others, they’re not interested in investing their own money,” he says.

BL Basar, retired head of soil science at Maharana Pratap University of Agriculture and Technology, now provides advice, *pro bono*, to a non-governmental organisation which manages the livelihoods programme. “It’s very important that nothing is given away – that’s one of the lessons we’ve learned,” he says. “Because the farmers are contributing, they make sure that nothing is wasted. You won’t see young saplings being left to wilt, as you frequently do on government projects where farmers are given seedlings free of charge.”



▲ A temporary state of affairs: a cereal field in Rajasthan in the process of being converted to a citrus orchard.



▲ During the first year of the project, farmers in the Rajasthan pilot site planted 6000 fruit trees. Pomegranate is one of the more popular species.

Besides engendering a duty of care, this ethos will ensure the sustainability of both the livelihoods programme and the carbon project. Farmers' contributions to the livelihoods programme amounted to 19.8 million rupees (US\$440,000) by mid-2011. The figure for the carbon project is much smaller, partly because it is of more recent origin and partly because it reaches fewer people. By March 2011, farmers at the Rajasthan pilot site had contributed 60,000 rupees (US\$1300) towards the total cost of saplings, *chulahs* and CFL bulbs, which amounted to 200,000 rupees (US\$4500). As in Andhra Pradesh, these funds are held by an organisation representing local communities. They will be used to pay the salaries of individuals who manage the grid's carbon finance and support carbon-related activities once the project officially comes to an end.

"We can't support farmers forever," reflects SS Chahal, the Vice-Chancellor of Maharana Pratap University of Agriculture and Technology. "But we can show them what is possible and we can provide them with the knowledge and the institutions they need to stand on their own feet."



Herding goats in rural Andhra Pradesh.



Working in the tree nursery in Jaffergudem.

Chapter 4: A COOLER, BRIGHTER FUTURE?

In June 2011, the World Bank and NAIP conducted a mid-term review of the carbon project. They gave it their wholehearted approval and even went so far as to suggest that the project managers could request more support, and add extra pilot sites, if they wished. The evaluation found that the project was well on the way to achieving its key objectives. These included testing and validating the SMART-CDM protocol; establishing pilot sites in different ecological zones; and creating a skilled pool of scientists and technicians trained in all matters related to the carbon market.

Considering that the project had only been fully operational for 18 months – less in the case of Rajasthan – it had generated considerable interest among potential buyers of carbon credits. “Quite early on, we were approached by the French company, Danone, who’d heard about what we were doing and were keen to support activities that involved agroforestry,” says Singh. Danone said they would like to purchase carbon credits from over 10,000 ha of land in India and Bangladesh. At the time of going to press, discussions about how this could work were continuing.

Other companies who approached the World Agroforestry Centre with a view to buying carbon credits included Sony, the Japanese electronics company, the Ambuja Cement Foundation and JK Industries, an Indian machinery manufacturer. The World Bank’s International Finance Corporation (IFC) has also expressed an interest in the carbon project. It is funding the construction of a pulp and paper mill in India and looking for ways of offsetting the mill’s carbon emissions.

► *Changing the sort of light bulbs people use may sound trivial, but measures such as this can make a real difference.*



International donors have also taken a keen interest in the carbon project. To give just one example, the German agency GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) recently commissioned a similar scheme, to be managed by the World Agroforestry Centre, in a heavily degraded, drought-prone part of Rajasthan.

“The way the carbon project works, taking a grid of 1000 ha or more with 700 or 800 households, makes a lot of sense to us,” says Sanjay Tomar of GIZ’s Natural Resources Management Programme. “If you focus intensively on one area, you can have a real impact, and that’s what we’re hoping will happen in Rajasthan.” GIZ has put up €300,000 for the project. Half will be spent on the stabilisation and rehabilitation of an area of sand dunes; the rest on a carbon sequestration project based on agroforestry.



▲ A tree nursery established under the carbon project.

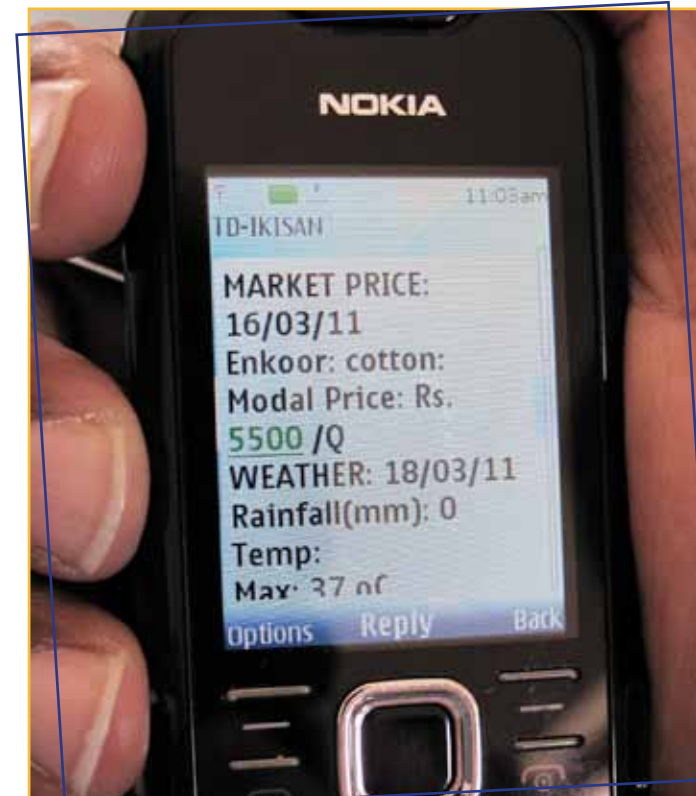
Closer to home

The carbon project has fired the imagination of government departments. Officials from the Ministry of Tribal Affairs have told Singh that they are keen to finance carbon projects using the SMART-CDM protocol. “They even said we shouldn’t worry if we couldn’t find a carbon buyer, as they saw this as a learning process,” recalls Singh. By this, they meant that involvement in the carbon scheme would provide people with the skills needed to measure carbon, negotiate with purchasers and create the institutions needed to share the profits from carbon trading.

It is worth pointing out that Singh and his colleagues have been researching the costs involved in joining the carbon market. As we have seen, a study of four emission-reduction projects in India estimated the transaction costs for each at around US \$75,000. “One of the reasons why costs are so high for many project is because private companies and consultants are charging usurious rates,” says Singh. He estimates that registration should cost each grid involved in the carbon project no more than US\$5000 each. Only time and experience will tell if this is an accurate figure.

The carbon project has been periodically scrutinised by senior officials within NAIP. Rakesh C Agrawal, who manages the component which oversees the carbon project, visited the Orissa pilot site in 2011. “My impression is that the project is doing well,” he reflects. “When I got back to New Delhi, I decided that it would be interesting to set up a similar pilot scheme in villages near Delhi, in Haryana state.” Ideally, he adds, he would like the project to be self-financing, with large groups of farmers adopting activities which would enable them to enter the carbon market. “If I can get that to work, then I’ll talk to the Chief Minister to see how we can take it further.”

Singh has derived the greatest satisfaction from the enthusiasm for the project shown by the people who matter most in this story – the men and women who make a living from the land. Talk to almost anybody in the pilot sites, and they will tell you much the same thing: even if



▲ An SMS service in Andhra Pradesh provides farmers with information about the price of crops and the weather. Soon, farmers may get texts about the price of carbon.

they don't get money from carbon payments, they will continue adopting practices which sequester carbon and reduce their emissions. Why? Because they save money, make money or reduce their workload. Neighbouring communities have taken note.

"We began by saturating an area of 2000 ha around Jaffergudem with carbon activities," says JVNS Prasad of CRIDA, "and now we're spreading outwards into other districts." Eventually, carbon grids in his state could cover 50,000 ha or more.

If you'd visited this part of rural Andhra Pradesh a decade or more ago, you would have been warned about the Naxalites, a revolutionary Communist group which is conducting an armed insurgency against government forces in some of the poorest tribal districts. The fact that there is no Naxalite presence in this area now says much about the improvements which have taken place in recent years, diminishing local support for the insurgents. Credit must go not only to the carbon project, but to earlier development programmes, most supported by the Government of India, which have helped to improve the welfare and incomes of farming families.



Komaraiah Chokkamma of Jaffergudem village, Andhra Pradesh, is one of many thousands of farmers who are benefiting from the carbon project.

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AGRICULTURE IS BOTH A VICTIM OF CLIMATE CHANGE, AND A SIGNIFICANT CAUSE. REDUCING THE INDUSTRY'S CARBON EMISSIONS AND HELPING FARMERS ADAPT TO CLIMATE CHANGE SHOULD BE A PRIORITY. UNTIL RECENTLY, A RANGE OF FACTORS HAVE PREVENTED SMALLHOLDERS FROM TAKING ADVANTAGE OF THE CARBON MARKET, WHICH IS BASED ON ORGANISATIONS AND INDIVIDUALS SELLING THE CARBON THEY CAPTURE – FOR EXAMPLE BY TREE-PLANTING – TO COUNTRIES OR COMPANIES WHICH WISH TO OFFSET THEIR OWN EMISSIONS. THIS BOOKLET DESCRIBES AN INNOVATIVE PROJECT, LAUNCHED IN INDIA BY THE WORLD AGROFORESTRY CENTRE, WHICH HAS DEvised WAYS TO OVERCOME THESE OBSTACLES. IT COULD BECOME A MODEL FOR THE FUTURE.

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