



New technologies, **new** processes, **new** policy options:

Tried-and-tested and ready-to-use results
from DFID-funded research





What's in this book and CD?

This book contains 280 easy-to-read summaries that describe key outputs from the projects run by DFID's recently completed 10-year Renewable Natural Resources Research Strategy (RNRRS) programmes. Detailed information on summaries that interest readers can then be easily accessed through a user-friendly, easy-to-search database on the CD attached to the back cover.

The 10 RNRRS programmes investigated five major strategic areas: crops, livestock, forestry, fisheries and natural resources management. The summaries in this book deal with proven-to-work technologies, practices and policies that can improve livelihoods in resource-poor

communities that rely on natural resources to make a living.

All 280 summaries have been clustered into seven logical groupings (see the table of contents below). Full acknowledgement to the authors of the research and the associated stakeholder organisations is given on the CD.

The accompanying CD is one in a series of comprehensive RIU information products aimed at field practitioners, policy makers and development researchers. Updated and more in-depth information on these and complementary outputs will be regularly uploaded onto the RIU website www.researchintouse.com and will be free to download.

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Section 1

Improving Farmers' Livelihoods:

Better Crops, Systems & Pest Management

Communities reap the benefits from new, improved cassava varieties

Locally adapted cassava varieties with resistance to cassava brown streak disease (CBSD) are promoting improved food security and livelihoods in Malawi, Mozambique, Tanzania and Uganda. Specially designed seed systems are being used to produce disease-free planting material for wide distribution. An information campaign, using radio, leaflets and posters, is helping to get the word out.

The CBSD-resistant varieties are used by smallholders in semi-arid and coastal fishing communities that supply fresh cassava to urban areas. They are also used for processing to make cassava flour. Previously, CBSD damage resulted in poor yields and root quality. Over five years the improved materials have reached more than 1 million people in eastern and southern Africa, and their use is still spreading.

■ Find out more by typing **CPP22** into the search box on the search page of the CD attached to this book.

Project title: Promotion of control measures for cassava brown streak disease

Winning the battle against cassava mosaic disease

Millions of farmers in Uganda and Tanzania are fighting the cassava mosaic disease (CMD) pandemic using new, resistant cassava varieties and other control methods. Government organisations and NGOs are multiplying and distributing these CMD-resistant varieties on a huge scale. And, new options, such as selecting clean planting material and identifying varieties resistant to the whiteflies that spread the disease, are also proving useful.

Leaflets and a guide that describe CMD control strategies, developed by Ugandan and Tanzanian partners and validated by farmers, are available in different languages including English, Swahili and Luganda. The solid, scientific knowledge gained about control strategies and how they work will be invaluable to other countries threatened by CMD, such as Rwanda, Burundi, DR Congo, Republic of Congo, Gabon and Nigeria.

■ Find out more by typing **CPP24** into the search box on the search page of the CD attached to this book.

Project title: Control of cassava mosaic disease

Partnering with farmers in cassava-breeding pays dividends

New cassava-breeding skills, and high-yielding cassava varieties which are resistant to pests and diseases—including cassava mosaic disease—are benefiting both farmers and processors in Ghana. The new varieties developed jointly with farmers yield well with few inputs in rain-fed fields. They also meet local people's preferences for taste and food preparation, and are suitable for other West African countries. Involving processors in selection too has led to high-starch varieties that farmers can find a ready market for.

The new, participatory breeding method has produced these new varieties fast, in just five cycles of cropping and selection. It is also being used in Uganda and Tanzania for sweet potato, and could easily be applied to other crops like potato and yam.

■ Find out more by typing **CPP23** into the search box on the search page of the CD attached to this book.

Project title: Farmer-participatory, client-oriented breeding for disease-resistant cassava

A well-known lifesaver finds new promise

Consumers and farmers in Africa will soon be able to benefit from the huge untapped potential of sweet potato thanks to a series of new findings.

They include improved selection methods, guidelines for consumer tests, new breeding strategies, and knowledge of the factors that cause damage during handling and storage, among others.

Sweet potato is considered the most under-exploited of the developing world's major crops. The new knowledge can be used in programmes across Africa to ensure that this crop will fulfil its promise in fighting hunger, contributing to livelihoods and combating vitamin A deficiencies among the poorest of the poor.

■ Find out more by typing **CPH34** into the search box on the search page of the CD attached to this book.

Project title: Sweetpotato cultivars with improved storage root quality



Life is sweet with new sweet potato varieties

Hundreds of thousands of farmers in central Uganda and Tanzania are counting on improved sweet potato varieties to boost their nutrition and incomes. These sweet potatoes were chosen through a process involving farmers at all stages. Some varieties were selected from available materials, under local smallholder farming conditions: taste, market characteristics and resistance to pests and diseases were some of the things farmers were looking for. Farmers and scientists also worked side by side to develop new varieties through client-orientated breeding at decentralised, on-farm communal sites.

This process has provided—in addition to the new sweet potatoes—knowledge among farmers about the potential of variety development, as well as scientists' insights into farmers' needs.

■ Find out more by typing **CPP20** into the search box on the search page of the CD attached to this book.

Project title: Sweet potato virus disease management and promotion

Better sweet potatoes boost farmers from subsistence to the market economy

Sweet potato growers in Uganda have gone from not having enough produce to eat, to wondering how best to market all the sweet potatoes they harvest. Previously, vines for planting sweet potato crops were in extremely short supply. Plus, sweet potato virus severely damaged tubers.

Now, farmer groups produce and market plenty of quality planting material—varieties resistant to virus disease. The new sweet potatoes, high in beta-carotene, also help reduce serious vitamin A deficiencies which affect 30% of children and 50% of women. Quality sweet potatoes for export fetch high prices. A new growers' association is already working to export the new varieties. The potential is huge and the improved varieties have spread to D.R. Congo, Kenya, Tanzania, Sudan and even Chad.

■ Find out more by typing **CPP53** into the search box on the search page of the CD attached to this book.

Project title: Rapid multiplication and distribution of improved sweet potato varieties

Learning is made easy
by new sweet potato
guides and manuals

New learning tools are providing a fast, easy way to access important knowledge on pre- and post-harvest management of sweet potato in East Africa. The materials include information on the farmer field school (FFS) approach, validated in Uganda, Kenya and Tanzania, as well as on the control of important sweet potato diseases. Posters, leaflets and training guides are available in English, Ateso, Swahili and Luganda. A manual with comprehensive technical information for farmers and facilitators has also been field-tested and published as individual farmer guidebooks in local languages.

The materials, relying heavily on photos, are specially designed to help in training people who are illiterate or for whom the language of the materials is not their native tongue.

■ Find out more by typing **CPP21** into the search box on the search page of the CD attached to this book.

Project title: Sweet potato management and promotion through FFS

Genetically-engineered
resistance to potato
nematodes

Potatoes that are genetically modified to resist nematodes are ready to use.

Nematodes are parasites that cause huge crop losses—about US\$125 billion a year—or enough to provide for 50 million people in Africa. Already accepted in Bolivia, Peru, India and China, nematode-resistant potatoes could boost potato harvests worldwide. People just need to be reassured that they are completely safe, both as food and for the environment.

Breeding nematode resistance in potatoes by conventional methods takes ages—up to fifty years. Now, the gene technology makes it possible very quickly. So, the technology has a huge potential for crops that are important for reducing poverty but are neglected by profit-oriented plant breeders.

■ Find out more by typing **PSP21** into the search box on the search page of the CD attached to this book.

Project title: Resolving biosafety issues and defining policies ...

Combating potato pests safely in Bolivia

Potato farmers in Bolivia, and their children, are learning about biological controls and integrated pest management.

The potato is the staple food in Andean countries as well as the main cash crop. But pests and diseases cause huge losses each year. So, farmers use more and more pesticides, threatening human health and damaging the environment.

Books for farmers, teachers and children introduce the ideas of integrated pest management. Children help in the potato fields, so raising their interest at an early age could pay off later.

Farmers are also testing traps baited with natural extracts. These could help safely control the Andean potato weevil. Locally made traps intercept weevils heading for the potatoes. Other farm communities are keen to test the traps so demand could grow significantly.

■ Find out more by typing **CPP57** into the search box on the search page of the CD attached to this book.

Project title: Integrated pest management of potato pests in hillside systems in Bolivia

New techniques multiply success with potatoes

A new method for multiplying potato tuber seed is helping poor smallholders to overcome a deadly potato disease known as bacterial wilt.

The seed production system includes field inspection and on-farm detection of bacterial wilt.

Collective marketing activities through a new Seed Producer Association are ensuring that the increased production translates into improved livelihoods. The members of the association have acquired skills in marketing and post-harvest handling. Simple potato storehouses are preserving tuber quality and extending product life. Local committees control distribution of the seed potatoes to ensure that all members receive their fair share, giving priority to women and poor households. The successful techniques have now spread to farmers in Kenya and Uganda.

■ Find out more by typing **CPP02** into the search box on the search page of the CD attached to this book.

Project title: Sustainable potato seed ...

Farmers learn to profit from not saving seed

Seed-tuber production schemes are helping farmers in Kenya and Uganda to produce quality potato planting material.

Previously, because of the difficulties smallholders faced in purchasing good quality seed-tubers, they found themselves forced to depend on tubers saved from their own harvest. Yet infected home-saved tubers often carried bacterial wilt over to the next crop.

A method known as the 'seed-plot' technique now allows smallholders with limited access to land to multiply seed-tubers effectively, lessening the impact of home-saved seed practices. Farmer associations, market chains, and communication and management structures support these production schemes. Materials designed to strengthen farmers' knowledge of marketing, finance and group dynamics help to ensure success.

■ Find out more by typing **CPP10** into the search box on the search page of the CD attached to this book.

Project title: Sustainable potato seed management systems

Giving seed-yams the credit they deserve

Ways of producing 'clean' healthy seed-yams, and an innovative micro-credit scheme, are helping to combat falling yam yields and declining yam quality in West Africa.

Because farmers use pieces of tuber to plant their next yam crop, any pests and diseases in the soil get carried over into that crop. Breaking that cycle is easy, however, using the 'mini-sett' technique—which involves dipping small pieces of tuber in a mix of insect- and fungus-killing pesticides before planting. A micro-credit facility is also proving valuable to seed-yam producers in Kogi State, Nigeria.

These advances can be used throughout West Africa and India, where yam is an important staple food. Posters and fact sheets on yam pests and diseases, and on the 'mini-sett' system, are also available.

■ Find out more by typing **CPP25** into the search box on the search page of the CD attached to this book.

Project title: Clean seed-yam production systems



New varieties and methods boost maize production in Tanzania

New strategies are improving the quality and yield of maize to benefit poor people in the southern highlands of Tanzania.

Two new varieties—which are highly resistant to important maize diseases, among other attractive attributes—were tested and validated by farmers and other stakeholders. Improved management approaches were developed and promoted through leaflets in English and in Kiswahili. To ensure regular supply of quality seed, a public–private partnership for certified seed production and distribution was put in place.

Farmers, scientists, extension services, seed companies, NGOs and stockists in at least 60 villages in Tanzania's southern highlands are using the new strategies and materials.

■ Find out more by typing **CPP01** into the search box on the search page of the CD attached to this book.

Project title: Improved maize seed systems to meet farmers' needs ...



Maize–bean systems: better practices mean better crops

Farmers in Kenya growing mixed maize–bean systems are using improved fertilisers, disease-tolerant maize varieties and early-maturing bean varieties to increase the productivity of their crops; herbicides are helping to protect crops, reduce women's labour (weeding) and conserve soil; and Farmer Field Schools are promoting the new methods.

Farmers are also using an affordable, lightweight chisel plough to break up the soils ('hard pans') that result from years of shallow cultivation with hand implements or disc ploughs. Soil pans make it hard for crops to take root and for rainwater to penetrate the earth. Consequently, crops do not achieve their yield potential and are more susceptible to drought, and soils have high potential for erosion.

■ Find out more by typing **CPP12** into the search box on the search page of the CD attached to this book.

Project title: Dissemination of improved crop varieties and crop management practices ...

Improved maize fits niches in Indian and Nepalese hill farms

Farmers involved in testing improved varieties can be quick to see and take up possibilities.

Hill farmers in India and Nepal given improved maize quickly chose those that fitted into empty niches in their traditional farming systems. In western India they chose maize suited for intercropping with horsegram. And in Nepal, subsistence farmers took the new varieties and intercropped them with finger millet in terraced agroforestry systems.

Previously, farmers could do little with obsolete varieties—between 11 and 27 years old—that gave poor yields and didn't fit their farming systems. Now, nearly all farmers who have access to seed of improved maize choose to use them to boost production of food and fodder in various ways. The seed is also spreading through self-help groups and from farmer to farmer.

■ Find out more by typing **PSP09** into the search box on the search page of the CD attached to this book.

Project title: Participatory varietal selection in maize ...

Maize varieties picked by farmers for farmers in western and eastern India

Tribal hill farmers in Gujarat, Madhya Pradesh and Rajasthan in western India, and Jharkhand, Orissa, and West Bengal in eastern India, helped select and test maize specifically for these areas where droughts are frequent and soils are poor.

The new varieties have spread over thousands of hectares because they were picked by farmers for farmers. They are earlier than the strains they used previously, they're drought-tolerant, and meet preferences for taste and cooking quality. Plus, they intercrop well with important later crops such as horsegram and blackgram.

These new maize varieties have major potential to improve the lives of small farmers who can't irrigate their crops: around two-thirds of the population in these hill areas.

■ Find out more by typing **PSP15** into the search box on the search page of the CD attached to this book.

Project title: Client-oriented breeding in maize ...

Maize farmers in East Africa have a new basket of options

Farmers in Kenya, Tanzania and Uganda are using a new 'basket of options' to fight a maize disease known as grey leaf spot (GLS).

They tested and approved the practices in farmer field schools, and posters, leaflets, radio programmes, videos and a television documentary are helping to spread the new knowledge. Seed companies are also using a rapid screening method to select locally available varieties with good levels of resistance.

A wide range of stakeholders in the East African region, including individual farmers, farmer groups, seed companies, community-based organisations, NGOs and researchers, is using these new options. More than 20,000 households are benefiting from the package, and demand for the promotional materials continues to grow.

■ Find out more by typing **CPP04** into the search box on the search page of the CD attached to this book.

Project title: Promotion of integrated pest management strategies for maize grey leaf spot

Maize farmers strike back against *Striga* and stemborer

Poor farmers in 30 villages in Tanzania have increased their demand for *Striga*-tolerant maize varieties, as well as green manure and improved maize seed that is distributed in small, affordable packs. The reason:

they've seen how well they work.

Previously, *Striga*, a parasitic weed, and the stemborer insect pest took a terrible toll on these farmers' maize crops. Now, improved understanding of cropping strategies, on-farm evaluation of selected technologies, improved access to inputs and stronger partnerships are giving them new hope. Soil fertility has also increased using simple farming practices, such as rotation and rainwater harvesting to increase soil moisture.

■ Find out more by typing **CPP14** into the search box on the search page of the CD attached to this book.

Project title: Increasing food security and improving livelihoods through the promotion of integrated pest ...



Simple labour-saving ways to boost maize and rice harvests in southern Africa

Cereal farmers in southern Africa now have new ways to increase their yields.

Farmers in dry uplands in southern Africa mainly grow maize. In wetlands, where their fields flood in the rainy season, they intercrop maize with rice. But maize and rice are labour-intensive and harvests were poor. Now, farmers use simple labour-saving practices and work their oxen more effectively.

New farmer groups in Masvingo, Zimuto, Mshagashe, Chatsworth and Chivito, Zimbabwe, are spreading the word that soaking seeds, planting on ridges to combat waterlogging, ridging fields to get rid of weeds, and conserving moisture in furrows and pits saves work and boosts harvests. The Universities of Zimbabwe and Gweru, and agricultural colleges also now teach these and other practices. Plus, seeing the benefits for themselves, farmers are quick to copy what obviously works.

■ Find out more by typing **CPP48** into the search box on the search page of the CD attached to this book.

Project title: Improving crop establishment and weed management in cereal-based systems

Seed priming makes good stands of maize the rule rather than the exception

Even when maize is irrigated, good crop stands are the exception rather than the rule for poor farmers. Yet, simply soaking seeds in water overnight and drying them before sowing as usual has been proven to increase yields in India, Pakistan, Zimbabwe and Nepal.

In western India, where maize is often followed by another crop, priming means that maize can be harvested earlier. This gives farmers a chance to sow the second crop earlier and makes the most of the end of the rains. Hundreds of NGOs, farmers and researchers have asked for instructions on how to prime maize seed. Through these, maize seed priming has spread to Thailand, Myanmar, Kenya, Uganda, Ethiopia and Tanzania.

■ Find out more by typing **PSP28** into the search box on the search page of the CD attached to this book.

Project title: Seed priming for maize in Africa and South Asia

Breeding better groundnut for Sub-Saharan Africa

A variety of new technologies are now available to boost groundnut production in Sub-Saharan Africa.

Advances include a new method to detect rosette disease using reverse transcription-polymerase chain reaction (RT-PCR) and the development of high-yielding, fast-maturing varieties that will allow farmers to grow two crops of groundnut per year. This work is complemented by a groundnut production manual that targets agricultural extension agents and NGO staff.

To combat disease, researchers have also identified molecular markers that can be used to pinpoint resistance genes. They also developed a basic genetic linkage map for groundnut. Hybrid groundnut breeding lines have also been developed for use in crop improvement programmes.

■ To find out more, please type **CPP38** into the search box on the search page of the CD attached to this book.

Project title: Improved technologies for groundnut production in sub-Saharan Africa.



Oiling the wheels of groundnut production

By using an improved variety of groundnut and treating their seed with fungicide, farmers in India's leading groundnut production zones are cutting their losses and limiting applications of fungicide.

Previously, late leaf spot and rust caused crop losses of more than 70%. Now, groundnut crops are producing more and better oil for human consumption and fodder for ruminants, which translates into higher milk yields.

The integrated management techniques the farmers are using are promoted through farmer-to-farmer extension. A village-level seed system is helping to ensure supplies of quality seed. The new technologies have already made a big difference to the lives of more than 10,000 poor farmers, in particular women, in more than 120 villages.

■ Find out more by typing **CPP15** into the search box on the search page of the CD attached to this book.

Project title: Promotion of crop residues for fodder

Boosting chickpea production in Nepal

Growing high-yielding chickpea varieties as a fallow crop after rice or wheat could provide food security and much-needed incomes for the poor in Nepal.

Chickpea is the main source of protein for around 1.8 million Nepalese people. So it was a major blow to the country when in the 1990s chickpea production collapsed because local varieties failed. This was partly a result of pests and diseases. Now, 90% of the country's chickpea has to be imported.

The development of a tailored, low-cost, integrated crop management (ICM) package means that poor farmers in Nepal can now grow new high-yielding varieties reliably and sustainably. The package has been proven to work in various areas of the country, providing the poor with high yields and incomes.

■ To find out more, please type **CPP35** into the search box on the search page of the CD attached to this book.

Project title: Development and promotion of high-yielding production of chickpea on cereal fallows ...

Spreading the word: making stakeholders aware of new chickpea options

Important lessons have been learned from an integrated crop management project to increase chickpea production in Nepal.

These have been used to make decision makers aware of the crop's importance and to boost its spread through Nepal and other areas of Asia.

As part of this work, a strategy for chickpea promotion was developed in partnership with Nepal's government. Other outputs included the production of policy documents and information bulletins—which were widely distributed to senior agricultural policy makers and scientists in Nepal, Bangladesh and India. As a result of these efforts, around 8000 farmers in Nepal were growing new chickpea varieties in 2005.

■ To find out more, please type **CPP36** into the search box on the search page of the CD attached to this book.

Project title: A policy and supporting strategy for the increased generation of wealth ...



Chickpea, an orphan crop with potential for dry areas

Farmers in drought-prone western India have helped choose drought-tolerant chickpeas that mature early.

These are now grown on land that otherwise would not be cultivated after the rainy season crop of rice. Previously, the chickpeas recommended for this area were developed for irrigated land so farmers tended not to grow them. They stuck with old varieties or just let their land lie fallow.

Farmers only had small amounts of seed of the new varieties to test. They save seed of varieties they like because, although farmer demand for the new varieties is strong, their preferences have very little influence on national seed production. So although there is a huge potential for improved chickpea it is still an 'orphan' crop.

■ Find out more by typing **PSP07** into the search box on the search page of the CD attached to this book.

Project title: Participatory varietal selection in chickpea

Putting farmers first in chickpea selection in Bangladesh

In Bangladesh, new crops are already tested on farms as well as on research stations.

Even so, farmers often don't get what they want or need. Now, farmers themselves decide what works best for them on their farms under normal farming conditions.

Involving farmers in selecting and testing improved varieties, known as 'participatory varietal selection', has proven successful with chickpea in Bangladesh's High Barind Tract. Here chickpea is becoming popular but yields are often less than a quarter of what they could be.

Farmers who tested and adopted new varieties already harvest more grain. Plus, they can get an extra crop from land that previously just lay fallow after the annual rice crop. Involving farmers in selecting varieties has great potential, so efforts need to be focused on making this approach more widely accepted in Bangladesh.

■ Find out more by typing **PSP11** into the search box on the search page of the CD attached to this book.

Project title: Participatory Varietal Selection (PVS) of chickpea in Bangladesh

Chickpea and horsegram
to grow after rice in
eastern India

Farmers in Jharkhand, Orissa and West Bengal favour new, early-maturing chickpeas to grow after rice in the post-rainy season. Other qualities they look for are lots of branches and pods, and red seeds that cook well. They like the same qualities in horsegram except that the seeds must be creamy.

In these areas of eastern India, chickpea is the main crop planted after monsoon rice and is grown mostly in poor quality soils. But chickpea productivity is very low. The yield of horsegram, grown on degraded hillsides as a late rainy-season crop, is also low. The new varieties perform much better and widely replace old varieties and landraces because farmers were involved in choosing and testing them.

■ Find out more by typing **PSP17** into the search box on the search page of the CD attached to this book.

Project title: Client-oriented breeding in chickpea and horsegram ...

Seed priming in
mungbean and
chickpea strengthens
disease resistance

Chickpeas sown from primed seed in farmers' fields in Bangladesh have proved to be more resistant to collar rot than chickpeas from seed that was not primed. Likewise, primed mungbean proved resistant to mungbean yellow mosaic virus in Pakistan. Then, tests in glasshouses showed that primed pearl millet was resistant to Downy Mildew. All this means that priming helps prevent serious damage to pea and bean crops from common diseases.

Farmers in the High Barind Tract of Bangladesh and in eastern India now readily prime chickpea seed. They've seen for themselves that primed chickpeas are more resistant to disease than those that aren't primed.

■ Find out more by typing **PSP29** into the search box on the search page of the CD attached to this book.

Project title: Seed priming to improve disease resistance

Full of beans: new varieties fight drought and sell well

New bean varieties are now available for the Southern Highlands of Tanzania.

These include 'Urafiki', which tolerates drought and disease, and cooks well. 'Urafiki' has been adopted by many women farmers, especially by those growing for market. It has great potential for drier areas too.

Working with public-sector seed supply systems, NGOs and community groups has brought the new varieties to many villages. Adoption rates of even recently-released varieties are very high: up to 40%. And, seed from the 350 farmers that were growing 'Urafiki' in 32 villages has already spread to 400,000 growers. Laminated information sheets are available which describe 'Urafiki' and other new bean varieties produced at the Uyoile Agricultural Research Institute.

■ Find out more by typing **CPP28** into the search box on the search page of the CD attached to this book.

Project title: Dissemination of improved beans

Bean farmers go with the information flow

Smallholder farmers throughout East and Central Africa are benefiting from new, integrated strategies to protect their bean crops.

The methods are particularly beneficial to women, who are the principal bean growers. Control options include pest-tolerant, high-yielding varieties, fertilisers and weed control.

The key to success is the use of a participatory approach that builds on indigenous knowledge to generate interest among farmers. Each group and community selects its preferred dissemination methods from a range of options, including media (radio, newspapers, TV, video), promotional materials (extension posters and leaflets, group reports), and traditional communication methods (word of mouth, drama, poems and songs).

■ Find out more by typing **CPP08** into the search box on the search page of the CD attached to this book.

Project title: Promotion of bean ICPM strategies



Farmers control bean root rot with a blend of science and indigenous knowledge

African farmers—and women farmers in particular—are using a wide range of integrated management options to protect against bean root rot.

Researchers and partners in Uganda, Kenya, Malawi and South Africa are using manuals describing new tools, methods and techniques, and Village Information Centres are helping community members to access appropriate information and technologies.

Participatory rural appraisals and surveys of indigenous technical knowledge were combined with sophisticated screening, selection and diagnostic techniques to come up with the management components, which are specially designed for use in south-western Uganda, as well as in areas with similar conditions.

■ Find out more by typing **CPP09** into the search box on the search page of the CD attached to this book.

Project title: Bean root rot disease management

Don't neglect rainy season legumes in India

Blackgram and horsegram are important for poor indigenous farmers in eastern and western India.

But they are largely ignored by officialdom. Even though there are recommended varieties, farmers can't get seed. So they grow poor varieties that are prone to mildew and other diseases.

Better varieties of horsegram have a huge potential for intercropping with maize in western India and rice in eastern India in the rainy season. They could provide additional food and fodder at little or no extra cost.

But farmers can only abandon old varieties by saving seed of new varieties themselves. Others would also grow the better grams if they could get seed. Although there is major potential for grams to improve food and incomes, the only way to get seed at the moment is through a few schemes and NGOs.

■ Find out more by typing **PSP08** into the search box on the search page of the CD attached to this book.

Project title: Participatory varietal selection in rainy season legumes ...

Better blackgram and horsegram for the hills of western India

In the Gujarat, Rajasthan and Madhya Pradesh hills of western India, resource-poor indigenous farmers now have a choice of three blackgram and four horsegram varieties. In this semi-arid region, small-scale farmers cultivate infertile forest clearings. So they like the new varieties that not only ripen earlier and produce more grain than those they were growing previously, but are more acceptable as regards colour and cooking qualities.

Because the new varieties are earlier and yield more they have a huge potential for intercropping with maize—the main rainy season crop. And one of the horsegram varieties is particularly suitable for this because it has fewer tendrils and so does not climb up the maize. This means less weeding.

■ Find out more by typing **PSP14** into the search box on the search page of the CD attached to this book.

Project title: Client-oriented breeding in rainy season legumes ...

Solar energy gives small farmers new arms against insect pests

Smallholders are harnessing the power of the sun to reduce pest damage in their stored cowpea crops.

In many zones of sub-Saharan Africa, farmers depend on storage to ensure supplies and sales over the long dry season. Previously, however, the cowpea or bruchid beetle (*Callosobruchus maculatus*) caused serious damage to stored crops.

The solution is simple but effective: appropriate exposure of cowpeas to the sun leads to a temperature rise that kills most if not all of the pests—eggs, larvae and adults—on and inside the grains. This technique is being used by smallholders in 40 villages in Ghana, as well as by farmers in Uganda.

■ Find out more by typing **CPH28** into the search box on the search page of the CD attached to this book.

Project title: Low cost and safe pest control for the storage of cowpea by small scale farmers

Pheromone traps help save cowpea

Simple traps made from small plastic jerry-cans and baited with pheromones give farmers a valuable early warning system against the legume podborer.

This insect's caterpillars cause devastating losses in cowpea. But, catching a certain number of adult podborers in traps lets farmers know that caterpillars will soon appear in their fields, and that they should spray their crop in the next few days.

The system was designed and tested in tandem with farmers and NGOs in Benin and Ghana, and there is demand for traps and lures from other farmers who have heard about the technique. The system has potential for many more areas where the podborer threatens cowpea.

■ Find out more by typing **CPP27** into the search box on the search page of the CD attached to this book.

Project title: Pheromone traps as an aid to controlling *Maruca vitrata*

A billion people stand to benefit from pigeonpea production improvements

Research has overcome a long-standing barrier to improved pigeonpea production by identifying the cause of the pigeonpea sterility mosaic virus (SMD).

This has permitted the development of diagnostic tools and improved methods of screening for resistance, as well as integrated technologies to combat this and two other major pigeonpea problems: fusarium wilt and pod borer.

Over 600 resource-poor farming families who grow pigeonpea in India now have high-yielding, disease-resistant varieties, integrated control components, village-level seed systems, special machines to help them in hulling, and bio-pesticides to safeguard their harvests. Pigeonpea is the principal dietary protein source for an estimated 1.1 billion people.

■ Find out more by typing **CPP17** into the search box on the search page of the CD attached to this book.

Project title: Promotion of integrated pest management technologies ...

Legume rotations improve fertility and help control witchweed

Farmers in eastern and southern Africa could double their yields simply by growing legumes for a year in between cereal crops.

Two problems that cause low yields are poor soil fertility and the rampant witchweed, *Striga*. Rising populations in rural areas mean that land is cropped more intensively. So farmers plant cereals—maize, upland rice, sorghum and finger millet—year after year, instead of leaving the land crop-free to recover and to help control witchweed.

Villagers in Kyela, Morogoro and Mbeya in Tanzania now rotate cereals and legumes. They dig in the legumes as green manure. In rice–legume rotations, witchweed dropped by half. These rotations could have a major impact in the region, as many poor farmers cannot afford fertilizers or herbicides.

■ Find out more by typing **CPP66** into the search box on the search page of the CD attached to this book.

Project title: Enhanced cereal productivity on *Striga*-infested land using legumes

Seed priming boosts legume crops in South Asia

Poor farmers in Bangladesh, India and Nepal have seen for themselves how easy it is to get better crops of legumes by simply priming (soaking) the seed before sowing.

Because legume seeds are large and hard to store properly, and are sown in the poorest soils, no-one has paid much attention to improving the way they are grown. But legumes provide valuable protein for the poor.

Farmers in Bangladesh, eastern India and Nepal, now prime chickpea seed so they can grow it as an extra crop following rice. Lentil seed is being primed in Nepal, and mungbean in Nepal and Pakistan. As priming is so simple and farmers quickly reap the benefits, the potential for widespread use is huge.

■ Find out more by typing **PSP26** into the search box on the search page of the CD attached to this book.

Project title: Seed priming for legumes in South Asia

Transgenic banana
could feed millions

A safe transgenic banana could prevent nematodes (worms) destroying around 6 million tonnes of bananas a year. This is enough to feed the 60 million people in Uganda, Rwanda, Ghana, Nigeria and Cameroon for whom banana is a staple food.

Because bananas are sterile, it's very hard to breed resistance to nematodes by conventional plant breeding methods. And the chemicals that are used to control nematodes are harmful both to humans and the environment. The gene introduced into East Highland African Bananas stops the nematodes growing and laying eggs, but does not affect humans at all.

This technology is already being used in the UK, and also in Uganda on local cooking bananas. The transgenic method is also being applied to develop nematode-resistant potatoes and rice.

■ Find out more by typing **PSP20** into the search box on the search page of the CD attached to this book.

Project title: Genetically engineered resistance to banana nematodes

Insect visitors are made
to feel unwelcome in
banana crops

Farmers are controlling a major banana disease, *Xanthomonas wilt*, by preventing the entry of insects that carry a bacterium (Xcm) that causes the disease. Removing male buds from the plants is one solution. Another is the destruction of infected plants to keep them from continuing to attract insects. Finally, by opting for banana varieties in which the male flower cushions have a natural protective covering, farmers make their crops inaccessible to the insect vectors.

These findings were made possible thanks to the identification of an improved medium for isolating Xcm from insects, soil and plants. The new control techniques are being promoted in Kenya, DR Congo, Rwanda, Tanzania and Uganda using participatory methods.

■ Find out more by typing **CPP18** into the search box on the search page of the CD attached to this book.

Project title: Identifying insect vectors and transmission mechanisms for banana *Xanthomonas wilt*



Basket of remedies revives ailing Ugandan banana industry

In Uganda, worn-out soils, pests, diseases and social problems mean trouble for the banana industry. A basket of remedies is helping the industry get back on its feet—new varieties, manuring and mulching, biological controls for pests, and disease-free planting material.

New varieties of banana are already being sold in Uganda, Kenya, Rwanda and Tanzania. Several agencies distribute clean plantlets produced by tissue culture to farmers in these countries, and in Burundi and D.R. Congo as well. Plus, in Uganda, a local laboratory has been set up that could produce 10 million plantlets a year.

Consumers like the new varieties. Prices are rising and farmers are expanding their plantings to meet demand. So, Uganda has a great opportunity to supply bananas to urban and regional markets.

■ Find out more by typing **CPP54** into the search box on the search page of the CD attached to this book.

Project title: Integrated pest management in banana

Tissue culture removes obstacle to control of banana nematodes

To get rid of banana nematodes without using chemicals, farmers in East Africa had to uproot all infected plants, grow a break crop, and then replant with pest-free bananas. But, they couldn't be sure that the new banana plants were free of nematodes. Now, low-cost tissue culture removes this obstacle and makes mass plantings of disease-free bananas possible.

The break crop plus tissue-culture plantlet method was proven by farmers in Kayunga and Kayanamukaka, Uganda. Their soils were badly infested with nematodes but they didn't want to use harmful pesticides. Now, a laboratory in Uganda produces 10 million plantlets a year by tissue culture. So, this technology has major potential for banana production in East Africa and for poor producers.

■ Find out more by typing **CPP73** into the search box on the search page of the CD attached to this book.

Project title: Non-chemical control of banana nematodes in East Africa



Prevention is the best cure for banana viruses

Smallholder growers in the Philippines and Uganda can now recognise virus infections in their banana plants.

Simply spotting viruses early and pulling out the infected plants, then making sure new plants are healthy, helps double yields.

The banana bunchy top and banana streak viruses devastate banana crops across South Asia and the Pacific. Now they are spreading in southern Africa. No varieties resistant to either virus have been found and, because chemicals don't work against viruses, prevention is the best option.

Growers in Davao-Mindanao, in the Philippines, and in Rakai, Masaka and Ntungamo, Uganda, found that just by removing infected plants they reduce damage and prevent spread of the viruses. They also now make sure that they plant healthy plantlets, produced by low-cost tissue culture.

■ Find out more by typing **CPP75** into the search box on the search page of the CD attached to this book.

Project title: Increasing yield and sustainability of banana production by small-scale growers ...

Farmers want better wheat varieties but lack seed

Demand for seed of improved wheat that farmers have tested themselves and want to grow is strong.

In the rice-wheat areas of Gujarat, farmers grew the same five varieties of wheat for many years. So they missed out on the higher yields that new varieties could give them. Farmers involved in testing new varieties want to keep on growing those they really like but can only do so by saving their own seed.

Other farmers also want to grow the improved wheat. But because the formal sector doesn't deal with these varieties, there just isn't enough seed. So, the potential for the spread of improved wheat is huge but community groups and NGOs need to help to boost seed production.

■ Find out more by typing **PSP03** into the search box on the search page of the CD attached to this book.

Project title: Participatory varietal selection in wheat - improved varieties for Gujarat, India

Seed priming in wheat, barley, sorghum, pearl and finger millet in South Asia and Africa

On-farm seed priming is a simple, proven technology that has been developed, tested, and refined in laboratories, in experimental plots, and by farmers themselves in their fields. It's easy to use with a wide range of crops in many different farming conditions. Farmers in India, Nepal, Pakistan, Botswana and Zimbabwe now prime wheat, barley, sorghum, pearl and finger millet seed before sowing.

This simple method is now spreading to other countries, such as to Saudi Arabia. Although priming with water alone makes a huge difference, the method is being explored further in Pakistan. Here, the effects of adding tiny amounts of phosphorus, boron and zinc to the priming water are now being explored.

■ Find out more by typing **PSP27** into the search box on the search page of the CD attached to this book.

Project title: Seed priming in wheat, barley, sorghum, pearl- and finger millet and other crops in South Asia and Africa

Improving a 'poor people's crop' in Karnataka, India

In dryland Karnataka, farmers readily took part in trials to improve finger millet, a 'poor people's crop'. They adopted new varieties at amazing rates and created a huge demand for improved finger millet seed. One old variety was completely replaced by new ones and there were spectacular increases in the amount and quality of grain harvested.

Previously, farmers grew old varieties—although they were prone to disease and harvests were poor—because they were adapted to the harsh conditions. Testing new varieties in their fields let farmers choose the varieties that fitted in with their traditional farming system. They were happy to trade-off less grain if that meant they could squeeze in a crop of sesame, green gram or cowpea as well.

■ Find out more by typing **PSP04** into the search box on the search page of the CD attached to this book.

Project title: Participatory varietal selection in finger millet ...

Biotech tools improve pearl millet

Genes can now be inserted into pearl millet to make them more tolerant to heat and drought, and more resistant to disease. Millet is a staple cereal and important animal feed in the hot dry regions of Sub-Saharan Africa and India. High temperatures often kill millet seedlings. This means that the crop has to be re-sown and so doesn't ripen before the rains end. When the rains end early, millet produces very little grain or leaf. Plus, up to a third of the crop is often lost to downy mildew.

The genes that help plants withstand the three main threats—heat, drought and mildew—could vastly improve harvests. They are already being used in India by government and international research laboratories.

■ Find out more by typing **PSP23** into the search box on the search page of the CD attached to this book.

Project title: Genetic improvement of pearl millet seedling thermotolerance and terminal drought tolerance

Cost-effective breeding for disease resistance in pearl millet

A cost-effective method of breeding millet resistant to disease is now available. This new technique has already been used to insert genes resistant to downy mildew—the most devastating of all the pearl millet diseases—into top hybrid varieties. Poor farmers in Haryana and Rajasthan now grow these hybrids over 150,000 hectares, both as food grain and for animal feed.

Government and international laboratories in India use these methods. Millet resistant to mildew could have a huge impact in India where 40% of the world's millet is grown and over half of world's poorest people live. Now, the techniques are spreading to the private sector and research organisations in Africa, South Asia, and the Americas.

■ Find out more by typing **PSP24** into the search box on the search page of the CD attached to this book.

Project title: Marker-assisted breeding of disease-resistant versions of farmer-preferred pearl millet hybrids

Science and partnership
take the punch out of
finger millet blast

Farmers in East Africa are safeguarding their food security and nutrition thanks to new understanding of finger millet blast:

its diversity, aggressiveness and epidemiology. Farmer-selected blast-resistant varieties and improved control techniques are being promoted through scientific conferences, stakeholder workshops, on-farm testing and training, and the mass media.

Previously, the lack of linkages between grain processors and other stakeholders was a major barrier to realizing the enormous potential of finger millet in fighting malnutrition and poverty. Now, efforts to foster innovation and linkages along the finger millet production–supply chain are creating an effective pathway for improving finger millet production and use.

■ Find out more by typing **CPP13** into the search box on the search page of the CD attached to this book.

Project title: Finger millet blast management in East Africa ...

Farmers now benefit from
better sorghum varieties

Over three years in India, farmers tested 27 varieties of sorghum in their fields.

They chose five, and three of these went on to be officially released. All three are resistant to shoot fly and charcoal rot and make good *roti* flour. Plus they are suitable for intercropping with chickpea or safflower.

Until these trials, farmers weren't benefiting from decades of plant breeding because researchers had just concentrated on raising yields. They had overlooked strains that made good *roti* flour although this was an important factor for farmers. So, farmers didn't adopt the new varieties. On-farm trials meant that farmers, as well as testing new varieties could, at the same time, try out better farming practices such as transplanting seedlings rather than sowing seed directly.

■ Find out more by typing **PSP05** into the search box on the search page of the CD attached to this book.

Project title: Participatory varietal selection in *rabi* sorghum ...

New sorghums combat witchweed

Small farmers in dry areas of Tanzania can now grow sorghum again.

Previously, rampant witchweed stifled their crops of sorghum and maize, so they had to grow pearl millet and cassava instead. Now they plant two new varieties of sorghum that are resistant to witchweed. And they apply manure as another weed deterrent.

Farmers themselves tested the new varieties of sorghum. The ones they chose, as well as doing well where there's witchweed, are drought-tolerant and mature early, yield well and are good to eat. When farmers apply manure, yields are a quarter to half as much again. These two varieties are now registered and formally released, and farmers in Tanzania are already using them.

■ Find out more by typing **CPP78** into the search box on the search page of the CD attached to this book.

Project title: *Striga* management in sorghum



Transplanted sorghum and pearl millet does well in semi-arid regions

Transplanting is a simple way to overcome the problems of erratic rainfall in semi-arid regions.

Farmers in Zimbabwe and northern Ghana now raise sorghum and pearl millet seedlings in nursery plots before the rainy season and transplant them into the fields when the rains arrive. This considerably reduces the risks of poor or failed crops.

Previously, when young crops were patchy, farmers used thinnings to fill in the gaps. But the transplants matured later than the rest of the crop and often didn't do as well because they were susceptible to pests, diseases and end-of-season drought. Transplanting is already used for many other crops and could double harvests of sorghum and millet in semi-arid areas.

■ Find out more by typing **PSP31** into the search box on the search page of the CD attached to this book.

Project title: Transplanting sorghum and pearl millet in semi-arid regions

Improved rice for uplands, lowlands and in-between

Thousands of farmers in Nepal now have a choice of rice varieties to suit their particular needs, whether they farm in the uplands, lowlands or on the slopes in between. In conventional plant-breeding, new varieties developed on experimental stations can take up to 18 years to become widely used. This means that varieties suitable for a range of climates, environments and purposes just aren't available.

Now that farmers are involved, the process of improving varieties is much quicker. Plus farmers' choices give them not only higher yields but other qualities they value—perhaps good quality straw, grain that cooks well, drought tolerance, or early ripening so as to allow a follow-on cash crop.

Thousands of farmers are already growing the improved rice varieties and they have major potential to improve livelihoods.

■ Find out more by typing **PSP02** into the search box on the search page of the CD attached to this book.

Project title: Participatory varietal selection in rice - Improved rice varieties for rainfed upland ...

Farmers speed up rice improvement in Ghana

Involving farmers in testing improved varieties of rice has proved very successful. The time it takes for new varieties to be released falls from 15 to 5 years. Booming demand for rice in Africa has fuelled imports. But domestic producers have been going out of business because the traditional African or old varieties they grow perform poorly and are not liked by consumers.

In Ghana, a pilot project showed that involving farmers speeds the spread of new varieties. The varieties that farmers chose were being grown up to 100 kilometres away within a year. And because farmers are getting better harvests, larger areas are planted to rice.

Involving farmers in testing new varieties has great potential for many crops and is already being used for groundnuts, sorghum, cotton and cassava.

■ Find out more by typing **PSP06** into the search box on the search page of the CD attached to this book.

Project title: Participatory crop improvement: rice in Ghana



Rice varieties for eastern Indian lowlands

Poor farmers in eastern India now have a wider choice of rice varieties. Where the land is not irrigated, rice is transplanted into flooded paddies in the monsoon. But plant breeders focused on rice for irrigated areas, and neglected the need for drought-tolerant strains for rain-fed areas. So farmers in these areas relied on old varieties prone to disease and drought.

Farmers given improved seed to test were free to grow it as they pleased. They found that the new varieties gave better quality grain, higher yields and were more drought-tolerant. Although farmers now have a wider choice of seed, supplies are limited. Because the seed is un-released it needs to be certified to be eligible for official subsidies. So, to realise the full potential of these varieties, groups need to be helped to produce certified seed.

■ Find out more by typing **PSP10** into the search box on the search page of the CD attached to this book.

Project title: Client-oriented breeding in rice ...

Rice bred in Nepal is a hit with farmers in the Bangladesh lowlands

Rice varieties bred in the Nepal lowlands and introduced to farmers in similar environments in the High Barind Tract of Bangladesh are spreading rapidly. Stagnant yields of rice in the Barind mean that incomes of resource-poor farmers are falling. But big increases in quantity and quality, and early ripening varieties that allow a follow-on cash crop, could improve lives.

Farmers managed the trials of the Nepalese rice themselves. They found the new varieties both yielded more and matured earlier. In less than two years, two-thirds of the farmers were growing the new varieties. And nearly half share seed with other farmers. Development organisations are promoting them and villages are already organising community-based seed production.

■ Find out more by typing **PSP12** into the search box on the search page of the CD attached to this book.

Project title: Participatory varietal selection and client-oriented breeding in rice ...

One rice doesn't fit all
in Nepal

One type doesn't fit all when it comes to rice varieties for the huge diversity of physical and socio-economic environments in Nepal.

But by putting customers—rice farmers—first, varieties that match a range of needs can be produced rapidly.

The term 'client-oriented breeding' means that farmers select strains specifically for the particular environments in which they live. Using these methods, the Nepalese farmers saw tremendous increases in productivity over the old varieties.

Many farmers in many districts are now using the varieties selected by this process and several community groups across the country are also producing and distributing seed. The area planted to the new varieties is expanding two- to three-fold a year and there is huge potential for further expansion.

■ Find out more by typing **PSP13** into the search box on the search page of the CD attached to this book.

Project title: Better rice varieties by client-oriented breeding (COB) in Nepal

Improved rice for hill
farmers in eastern and
western India

Poor hill farmers in eastern and western India now have modern rice varieties suitable for rain-fed cropping.

The new varieties were tested by thousands of farmers in their fields, and traders were also consulted on consumer preferences for eating and cooking qualities. The varieties have spread widely. Farmers didn't need to change their farming methods. And, as long as they save or can get seed, they continue to grow the new varieties.

The new types of rice are now grown in rain-fed uplands in Jharkhand, Orissa, West Bengal and Chhattisgarh in eastern India; Rajasthan, Gujarat and Madhya Pradesh in western India; Karnataka and Tamil Nadu in southern India; and Uttar Pradesh in northern India. Plus, many farmers are distributing seed to other farmers. So, even without fresh supplies of seed, the new varieties are spreading.

■ Find out more by typing **PSP16** into the search box on the search page of the CD attached to this book.

Project title: Client-oriented breeding in rice ...

Low-tech plus high-tech for good upland rice

A novel combination of high-tech and low-tech approaches has successfully bred rice varieties for upland farms in eastern India. Farmers in Jharkhand, Orissa and West Bengal selected from among varieties whose roots had been improved by molecular breeding techniques. It's not possible to select for traits such as better rooting in farmers' fields, but combining laboratory methods and farmer selection works well.

Nearly half the rice-growing area in the three eastern states is rain-fed upland. Here, as droughts are common, it's important for rice to send its roots deeply into the soil to get water. The new varieties reduce farmers' risks of losing crops or of poorer harvests because of lack of rain.

■ Find out more by typing **PSP22** into the search box on the search page of the CD attached to this book.

Project title: Molecular marker-assisted rice breeding

Combating rice sheath blight in Bangladesh

Farmers in Bangladesh now have ways to lessen the damage that sheath blight can do to their rice crops.

Sheath blight is a serious disease and difficult to detect. Due to better methods of detection, simple biological control methods, and improved varieties of rice that are more resistant to blight (but still have good eating and cooking qualities), farmers in the Comilla, Gazipur, Bogra and Rajshahi districts are already reaping better rice harvests.

Agricultural organisations in Bangladesh use the new molecular techniques to detect rice sheath blight and develop better varieties. This will help combat the disease and make a major contribution to raising the country's food production by a quarter within five years—an important government goal.

■ Find out more by typing **CPP59** into the search box on the search page of the CD attached to this book.

Project title: Sustainable management of rice sheath blight

Direct-seeded rice saves money, water and labour

A suite of new techniques associated with direct-seeding of rice has the potential to secure and sustain India's rice bowl—the Indo Gangetic Plains.

The time is ripe for alternatives to transplanted irrigated rice, as the system used now is threatened by increasing shortages of irrigation water, higher energy costs, and the rising cost of labour.

Recommendations on managing weeds, and on how and when to plant, have been produced for areas with different soils, rainfall and ploughing methods. Plus, decision-support tools are available for extension workers and farmers that present the choice of technology options for direct-seeded rice in a farmer-friendly way.

■ Find out more by typing **CPP29** into the search box on the search page of the CD attached to this book.

Project title: Facilitating the adoption of direct-seeded rice by smallholders ...

Boosting lowland rice yields and banishing weeds

New ways to control weeds and plant rice using direct-seeding have great potential to increase rice harvests in Bangladesh.

At the moment, one-third of farmers lose half a tonne of rice per hectare because of weeds. Now, a range of cost-effective weed management practices have been validated, which include applying herbicides or using a manual rotary weeder. Yields are the same or better than with normal hand-weeding, but costs are 30-45% less.

Direct-seeding has also proved valuable in drought-prone areas. It gives earlier rice harvests, allows farmers to grow a second crop, and reduces outlays on irrigation water and labour. Extensionists and NGOs are already spreading the word, and training manuals, leaflets and posters for pesticide-dealers' stores are available.

■ Find out more by typing **CPP30** into the search box on the search page of the CD attached to this book.

Project title: Direct-seeded rice – securing the harvest and raising incomes

Controlling wild rice infestations in cultivated rice

New practices for managing infestations of wild rice species in lowland rice in West and East Africa have been developed and validated by farmers.

Such infestations can reduce rice yields by up to 2 tonnes per hectare, and require a lot of labour for weeding. Plus, rice contaminated with seeds of wild species sells for only half the market price.

In Ghana, farmers preferred to spray with glyphosate before planting, or to switch to transplanting in banded fields if they couldn't afford herbicide. In Tanzania, farmers took up a reduced tillage-plus-herbicide system as it was a cost-effective labour-saving option that could even reclaim land previously abandoned to wild rice. These practical options are ready for out-scaling to large areas, and extension materials already exist.

■ Find out more by typing **CPP31** into the search box on the search page of the CD attached to this book.

Project title: Wild rice management strategies

Beating tungro virus disease in rice

A suite of new techniques to tackle the devastating rice losses caused by tungro is now helping small-scale farmers in Indonesia, the Philippines and India.

Better understanding of the leafhopper insect that spreads the virus has led to better growing practices, especially late planting. New resistant rice varieties have been produced, as well as a spatial model which helps identify the best strategies to cut the incidence of disease. A simple, reliable and relatively low-cost diagnostic kit for the virus has also been developed to help rice breeders and extension services.

Farmers in Bali (Indonesia) are already growing the improved varieties on over 40,000 hectares, while farmers in East Java and Lombok (Indonesia), and Mindanao and the Visayas (Philippines) are also benefiting. Training manuals are also available.

■ To find out more, please type **CPP45** into the search box on the search page of the CD attached to this book.

Project title: Improved pest and disease management for irrigated rice systems

Weed pest no longer a bottleneck in raising rice–wheat productivity

Thousands of farmers in rice–wheat areas of the Indo-Gangetic Plains now practice reduced tillage to control the weed *Phalaris minor*.

This pest was a major bottleneck in raising yields. Previously, farmers didn't understand how long the weed seeds survived in the soil and what caused them to start growing. Now, they've stopped ploughing their fields because they know that this encourages the weed seeds to germinate.

Farmers in Haryana State and Punjab, India, successfully used low tillage to control *Phalaris*. The technique has already spread throughout the Indo-Gangetic Plains in India, Pakistan, Nepal and Bangladesh. Besides curbing the weed, low tillage also reduces erosion, improves soil fertility and lowers input costs—fuel, farm machinery and labour.

■ Find out more by typing **CPP72** into the search box on the search page of the CD attached to this book.

Project title: Minimising the economic and sociological impact of *Phalaris minor* ...

Beating rice hispa in Bangladesh

A computer program to help predict likely outbreaks of the insect pest, rice hispa, is now available.

Rice hispa is a serious pest in Bangladesh—up to half the crop can be lost—and in other countries in tropical Asia. The insects are almost everywhere in small numbers and, given the right conditions, plagues erupt dramatically.

Now, pest control teams have a simple model—based on humidity levels the previous winter—to forecast outbreaks. This means they can warn farmers. Farmers then use sweep netting and spot applications of insecticide to control the insects, methods proven by small rice growers in Sylhet, northeastern Bangladesh. These methods are now being spread by farmer field schools. This integration of national forecasting with farmer action has great potential for rice-growing areas.

■ Find out more by typing **CPP76** into the search box on the search page of the CD attached to this book.

Project title: Ecology and management of rice hispa (*Dicladispa armigera*) in Bangladesh

Farmers test new crops for replacing rice fallows

In Nepal, farmers played a key role in choosing and testing new crops to grow on land that previously lay fallow for part of the year.

Growing more crops per year means more food, more income and better nutrition. Nearly two-thirds of the land used to be left fallow after the rice harvest because farmers only had seed that was unsuitable, poor, or prone to disease.

Farmers tested mungbean, chickpea, lentil, pigeonpea and field peas. To make sure that the overall cropping system worked they also trialled the rice varieties that would be planted before the legumes. Now, data from their on-farm trials are being accepted by the official seed registration system. This has major potential for fruitful partnerships between farmers and seed companies.

■ Find out more by typing **PSP01** into the search box on the search page of the CD attached to this book.

Project title: Dry season crops for replacing rice fallows in Nepal

Priming gets rice off to a good start in upland Africa and Asia

A simple, low-cost method for getting rice off to a good start is now available.

On-farm seed priming simply means soaking seeds in water overnight, drying them so that they don't stick together, then sowing them as usual. Previously, poor farmers in upland rice-farming areas suffered because much of the seed they sowed failed.

Farmers in Cameroon, the Gambia, Ghana, India, Nigeria, Sierra Leone and Thailand now prime rice seed. Primed rice germinates better, grows more quickly and strongly, flowers and matures earlier, and often produces more grain than rice that isn't primed. And, when rice gets a good start it is better able to compete with weeds—a big problem with upland rice, particularly in West Africa.

■ Find out more by typing **PSP25** into the search box on the search page of the CD attached to this book.

Project title: Seed priming for upland, direct-seeded rice in West Africa and Asia



Double cropping rice-fallow systems of south Asia

A new cropping system helps farmers grow two crops a year where before they could only grow one. The new system combines early ripening varieties of rice with chickpeas. Because the rice can be harvested early, there's time to sow a chickpea crop to take advantage of the moisture still left in the soil. Previously the rice ripened too late and the land was left fallow.

Now, farmers can grow an extra crop, a big advantage where there is no irrigation. Farmers in India, Nepal and Bangladesh are growing chickpeas—popular because they fetch good prices—and also lentils, mungbean, pigeonpea, field pea, buckwheat, horsegram and vegetables. This system could impact over 15 million hectares of fallow land in South Asia.

■ Find out more by typing **PSP35** into the search box on the search page of the CD attached to this book.

Project title: Double cropping in rice-fallow systems of South Asia

Videos help cocoa farmers see the big picture

Poor farmers in West Africa are using a participatory learning curriculum to reduce the impact of pests and stabilise the productivity of their tree crops, reducing their input and labour costs and improving their living conditions. The curriculum helps farmers, support staff and advisors build up video production capacity to spread the use of improved techniques. Several digital videos, as well as a video training guide, now exist in English and local languages.

Improved pesticide use and pheromone traps are among the technical options promoted in the videos. A global, discovery-based learning manual, in hard and electronic copy, is also being used throughout West Africa, as well as in other global regions, to get the word out.

■ Find out more by typing **CPP05** into the search box on the search page of the CD attached to this book.

Project title: Implementation of cocoa IPM in West Africa (Phase 1 and 2)

Perking up smallholder coffee production

New ways of managing coffee trees are now available to boost yields and cut losses caused by insect pests and diseases.

In Malawi, a new dwarf variety of Catimor coffee called 'Nyika' is spreading fast, as it is resistant to both coffee leaf rust and coffee berry disease. Other parts of the 'integrated crop and pest management' system that farmers are taking up are painting stems with Fipronil insecticide to combat the white stem borer pest, inter-planting Catimors with banana to improve food security, and better ways of using fertilizer and saving water in soils.

Information leaflets on coffee berry disease, white stem borer and managing Catimors are available in two local languages in Malawi, in Kiswahili in Kenya and in English in Zambia.

■ Find out more by typing **CPP26** into the search box on the search page of the CD attached to this book.

Project title: ICPM for smallholder Arabica coffee

Trapping coffee beetles with natural baits

Natural chemical extracts—pheromones—that attract female coffee stemborers are now being commercially manufactured in India.

This new bait, together with specially designed traps, means that females can be caught and destroyed.

The coffee white stemborer is a beetle that seriously damages coffee crops in India, Sri Lanka, China, Vietnam and Thailand. In India, coffee growing, as well as providing a living for over half-a-million workers and their families in remote rural areas, checks soil erosion on hillsides.

Farmers in all the main coffee-growing areas of India, Karnataka, Kerala, Tamil Nadu and Andhra Pradesh, now use over 40,000 pheromone traps. Since the only pesticide effective on stemborer has been withdrawn from use in India, there is major potential for these traps to help control this major pest of coffee.

■ Find out more by typing **CPP77** into the search box on the search page of the CD attached to this book.

Project title: Development of pheromones for management of coffee stemborer ...

Ploughs, hoes and
cheap herbicides beat
weeds in cotton

Smallholder cotton growers in Zimbabwe now use low-cost techniques to control weeds.

In the Zambezi Valley, the rainy season is short and hot. If farmers don't weed promptly and thoroughly, they can lose nearly all their crop.

Previously, controlling weeds needed lots of labour for constant weeding. In the Lower Zambezi Valley and South East Lowveld of Zimbabwe, farmers now beat weeds by ploughing before planting, hand hoeing and applying low-cost herbicides—techniques within their means and that save labour. Extension services now routinely advise farmers that this is a good way to deal with weeds and universities teach this system in their courses. Plus, inquiries from South Africa, Mozambique, Tanzania, Uganda, Kenya, Pakistan, Slovenia, Togo and Brazil are pouring in.

■ Find out more by typing **CPP67** into the search box on the search page of the CD attached to this book.

Project title: Promoting weed management options for cotton-based systems ...

Virus-fighting tomatoes

Three new varieties of tomato that are resistant to Tomato leaf curl virus (ToLCV) are boosting Indian farmers' profits up to ten times over and are capturing much commercial interest.

Previously, the disease could cause farmers to lose their whole crop, and infection spread rapidly, as the virus is carried by whiteflies. Now, the new varieties 'Sankranthi', 'Nandi' and 'Vybhav' give very high yields and don't need to be sprayed with insecticide.

Sixteen seed companies have already used the new varieties to produce hybrid tomatoes—which are being grown by an estimated 55,000 farmers in southern India alone. Seed of the three varieties has reached more than 14 institutes in 13 different countries, and there is continuing global demand, which is being met mainly through the World Vegetable Center.

■ To find out more, please type **CPP33** into the search box on the search page of the CD attached to this book.

Project title: Tomato leaf curl virus disease and whitefly, *Bemisia tabaci*, management

Kale seed multiplication schemes take off in Kenya

Smallholders in Kenya are producing healthy, good quality kale seed thanks to a new model for sustainable multiplication.

The first step was to establish the primary virus diseases responsible for crop loss. Then, researchers identified and compared new, improved varieties with resistance to the major threats to farmer varieties. They also surveyed farmer preferences to determine their preferred multiplication methods.

The new model, together with a scheme for improved seed certification, has reached more than 1000 farmers, NGOs and micro-entrepreneurs. Multiplication plots are providing large batches of seed and farmers have been set up as seed producers in remote zones.

■ Find out more by typing **CPP11** into the search box on the search page of the CD attached to this book.

Project title: Management of virus diseases of vegetable crops and the promotion of quality kale seed in Kenya



Participatory varietal selection takes into account poor farmers' realities

'Participatory varietal selection' is a four-step approach that offers farmers a choice of crop varieties matched to their needs.

It arose from the realisation that farmers weren't using varieties developed and tested on research stations because they didn't work in the real world. So farmers continued to grow old, unproductive varieties prone to pests and diseases.

The approach has been proven—and refined to become even more client-oriented—in Ghana, Bangladesh, India and Nepal for rice, wheat, mungbean, horsegram, maize, chickpea, finger millet and sorghum. Improvements in quality and yield have been startling. The potential for participatory varietal selection is huge as it could be applied to all farming systems, all major crops, all types of farmers, and all countries.

■ Find out more by typing **PSP33** into the search box on the search page of the CD attached to this book.

Project title: Concepts and approaches of participatory varietal selection (PVS)

Client-orientated breeding is quick, cheap and effective

'Client-Oriented Breeding' is a pioneering approach that puts the customer—the farmer—first. Farmers set the goals. They say what qualities they want in new varieties. Next, they select those that work best under local conditions from a large batch of possible varieties, and then test them in their fields using their own farming practices. It's a quick, cheap and effective approach.

This system helps develop improved varieties very quickly. Farmers in India, Bangladesh, Nepal and Ghana already use maize, rice, chickpea and cassava varieties developed this way. So, putting farmers first could have a rapid impact in areas where conventional plant breeding has failed to produce the choice of varieties farmers need.

■ Find out more by typing **PSP34** into the search box on the search page of the CD attached to this book.

Project title: Concept and approaches of client-oriented breeding (COB)

Community-based seed production in Nepal

New community-based systems fulfill a big need for seed. Now, farmers can

get seed of the varieties they prefer. Community networks find suitable new varieties, involve farmers in selection, and produce seed commercially. They are market-oriented, and cost-effective because they involve all stakeholders—farmer groups, government and non-government research and development organisations, seed traders and entrepreneurs.

Community-based seed organisations dealing with rice, wheat, maize, kidney bean, chickpea, mungbean, lentil, field pea and oilseed rape already operate in Nepal, and are spreading to India and Bangladesh. They boost local seed markets, open up possibilities for people to start seed-trading businesses, and offer farmers a 'basket' of their favourite crop varieties from which to choose.

■ Find out more by typing **PSP36** into the search box on the search page of the CD attached to this book.

Project title: Concepts and approaches of community-based seed production (CBSP) ...

Low-cost boost for crops in poor soils

A simple, low-cost way to boost crop yields in poor soils is now available.

Farmers who till infertile land are often the poorest and can't afford fertilisers. Now, they can reap better harvests just by adding tiny amounts of nutrients to the water that they soak seeds in before sowing.

Farmers in Bangladesh, India, Nepal and Pakistan added small amounts of molybdenum, zinc, boron, phosphate and *Rhizobia*—the bacteria that help fix nitrogen—to priming water. In some cases, yields of chickpea, mungbean, maize and wheat improved by up to two-thirds. The simple 'nutrient priming' technology has almost unlimited potential. So many soils in less-developed countries are poor. Plus, the method can be used for many of the major tropical and sub-tropical crops.

■ Find out more by typing **PSP30** into the search box on the search page of the CD attached to this book.

Project title: On-farm seed priming to improve plant nutrition in low fertility soil

Bridging the knowledge gap on a valuable tree

A project to bridge a critical information gap on the valuable mesquite tree, with inputs from 10 countries, has resulted in many valuable publications.

These include a field guide, country-specific policy briefs on India, Ethiopia, South Africa, Sri Lanka, Kenya and Brazil, other briefs on the weed problem and global issues, and many journal and popular articles, as well as a video.

Mesquite, *Prosopis juliflora*, is a common species in the world's hot, arid and semi-arid regions. It provides fuel, food, fodder, wood products (parquet floors, furniture, fence posts), and bee pasturage. However, in many parts of Asia and Africa it remains under-used, and is often regarded as an invasive weed. Over 18,000 copies of the publications were downloaded from the project website in 2006 alone; 70% of this demand was from sub-Saharan Africa and Southeast Asia.

■ For more information type **FRP05** in the search box on the search page of the CD attached to this book.

Project title: *Prosopis juliflora* and related arboreal species: a monograph, extension manual ...

199 suggestions for adding trees to farms

A method has been developed to collate practical information about the benefits of trees and how best to integrate them on farmland—and to transfer this knowledge to farmers.

Central to this was the 'Central American Trees Sourcebook' produced by the project, which covers 199 tree species popular with farmers. It also identifies the native tree species best suited for different uses, such as living fences and perennial crops. Also available are decision-support tools and a digital image library useful to extensionists.

The Sourcebook is being used widely in Central America, and over 1400 extensionists and farmer leaders have already been trained to use it. A website is also used for dissemination. Such a successful approach could be applied in many other regions of the world.

■ For more information type **FRP09** in the search box on the search page of the CD attached to this book.

Project title: Tree species for farmers: offering sustainable management options

Simple agroforestry manuals and a CD-ROM help non-literate farmers

A series of eight, simple agroforestry manuals, with a CD-ROM of all illustrations, was produced in The Gambia using inputs from local government, NGOs and a large number of women farmers. This responds to the need to disseminate key agricultural development information that can be understood by non-literate farmers. The publications were tested in The Gambia and Ghana.

There are about 800 million illiterate adults in the world, the bulk of them in the poorest countries, with limited access to information that could help to cut poverty and boost economic growth. A training handbook on the methods used to produce this type of manual is available, and the individual manuals are already being used by national and international NGOs from Africa and Southeast Asia.

■ For more information type **FRP12** in the search box on the search page of the CD attached to this book.

Project title: Training manuals for non-literate farmers



Guidelines for managing non-timber products of miombo woodlands

Appropriate methods, better knowledge of product demand, and improved understanding of the factors that determine villagers' abilities to manage the miombo woodlands in eastern and southern Africa, have now been developed. Preliminary guidelines for the management of the three types of miombo forests (low altitude dry, montane/hill, and wet plateau) are now being used by government and NGOs in Malawi. Guidelines on the harvesting of non-timber products have also been produced, and awareness raised within target communities.

Although abundant, miombo trees are slow-growing and were long thought unsuitable for cultivation, but these indigenous woodlands harbour a diversity of tree species producing lumber and valuable non-timber products such as poles, firewood, ropes, wild fruits, honey, reeds, bamboos, and medicinal plants.

■ For more information type **FRP14** in the search box on the search page of the CD attached to this book.

Project title: Sustainable management of miombo woodlands by local communities in Malawi

Practical guidelines for pro-poor forest management

A thorough review of policy and its impacts has produced valuable recommendations for making participatory forest management (PFM) more pro-poor in India and Nepal.

The proposals range from improving high-level policy processes and making devolution more equitable to the use of new forest-livelihood assessment methods and better processing and marketing of non-timber forest products. They also suggest ways of making local PFM more pro-poor, by leasing forest land to the poor for agroforestry or herb cultivation, for example.

The outputs are already being used by donor-supported PFM projects, NGOs, and to some extent by Forest Department field staff and local PFM groups. However, incorporating these recommendations into pro-poor PFM policies could significantly alleviate the poverty of as many as 300 million forest-dependent poor in India and Nepal.

■ To find out more, please type **FRP17** into the search box on the search page of the CD attached to this book.

Project title: Review of participatory forest management (PFM) support processes...

Domesticating caterpillars helps the very poor in south-central Africa

In southern Africa, people with virtually nothing could now become farmers. Villagers in Botswana and Zimbabwe already domesticate and farm the Mopane Worm, an edible caterpillar. Both rural and urban folk relish these caterpillars. Harvested from woodlands throughout south-central Africa, and high in protein and fat, they are also an important food for the rural poor.

Now, caterpillar farming can be a household enterprise. Children help find and collect eggs and the adults, mainly women, raise the larvae, and harvest and market the caterpillars. Proven methods of breeding, processing and storing the caterpillars ensure a steady output and maintain quality.

Many other edible caterpillars popular all over sub-Saharan Africa could be domesticated and farmed like this.

■ Find out more by typing **FRP41** into the search box on the search page of the CD attached to this booklet.

Project title: Mopane Worm farming: a new mini-livestock system (MWF)

Know-how boosts cottage industries for tropical fruit

Some successful small entrepreneurs in Sri Lanka have doubled their incomes by processing and marketing tropical fruits. Previously, they just didn't have the know-how. Now, villagers in Bangladesh, India, Nepal, Vietnam and Sri Lanka use posters and fact sheets in local languages to learn how to preserve, pack and market fruits.

Asia, Africa and Latin America are home to many edible tree fruits. But, they're mostly eaten straight off the tree or sold in the markets nearby, especially the less common varieties.

This is changing as people learn to juice, dry, preserve and pickle fruit to add value and prolong shelf life. Learning how the market economy works and how and where to sell their products also helps.

■ Find out more by typing **FRP44** into the search box on the search page of the CD attached to this booklet.

Project title: Underutilised crops processing and marketing for the benefit of the poor

Intercropping boosts smallholder tree crops

New intercropping systems can double returns from small rubber plantations.

Smallholders in Asia—often cultivating less than two acres—produce more than three-quarters of the world's natural rubber. But, because young trees produce no rubber for the first 5-6 years, farmers plant bananas as an intercrop to tide them over.

Farmers in Sri Lanka now plant a third more bananas than officially recommended and find they can make twice as much profit. Plus, the higher density of bananas stimulates growth in the young rubber trees. Intercropping has major potential for rural communities of rubber growers. And, although the system was proven on rubber and banana, it is also being applied to maize, upland rice and tea, and in India and Ghana.

■ Find out more by typing **PSP32** into the search box on the search page of the CD attached to this booklet.

Project title: Improving land-use efficiency and income generation of smallholder rubber ...

Trees for fodder and fuel in Nepal

In Nepal, farmers are planting trees wherever there's space.

More trees mean more animal food and more fuel—both in desperately short supply. Farmers know the advantages of planting trees: less animal feed and firewood needs to be gathered from forests, animal dung can be used as fertiliser rather than for fuel, and trees can be grown on land that's not much use for anything else.

In Nepal, farmers now plant trees on banks between rice paddies, on farm boundaries and on poor land. Tree foliage often has much-needed protein—improving milk and meat production. And it's much better than straw, the main food for livestock in the dry season. Plus, many of the trees are leguminous and fix nitrogen in the soil, improving fertility.

■ Find out more by typing **PSP37** into the search box on the search page of the CD attached to this book.

Project title: Agroforestry on rice bunds, farm boundaries and marginal lands ...

Teak predators
destroyed by virus from
their own larvae

A simple, effective and environmentally benign method of reducing teak defoliator moth numbers has been tested successfully in Kerala, India.

Attacks by the moth dramatically strip the leaves from these valuable trees, causing poor growth and yield loss, distortion of the wood and loss of income for teak farmers. The new method prevents defoliation, minimizes tree damage and increases growth, productivity and employment opportunities.

The system uses a baculovirus, obtained from moth larvae and harmless to humans and other insects, sprayed directly on the moths when they appear on the trees, their arrival monitored by forest workers. A pilot virus production plant is already supplying both commercial and government teak plantations in Kerala and neighbouring states. When fully adopted, the strategy will provide jobs for local people as monitors, larvae collectors, and virus sprayers.

■ Find out more by typing **FRP03** in the search box on the search page of the CD attached to this book.

Project title: Integrated pest management of teak defoliator moth

Village forecasts
combat armyworm
plagues in eastern and
southern Africa

Villages in eastern and southern Africa now make their own forecasts of armyworm outbreaks.

The low-cost system—using a single trap to catch armyworm moths and a rain gauge—means that farmers no longer depend on warnings from central pest offices.

Warnings from central offices were often too late and too general to be useful. Villages now organise the forecasts themselves. They decide who will be trained to use the equipment and work out the forecast from the moth catch and rainfall data, and who will warn everyone.

The self-contained forecasts, proven to be accurate four times out of five in Tanzania, Ethiopia and Kenya, help farmers prepare for outbreaks and prevent damage to their crops.

■ Find out more by typing **CPP42** into the search box on the search page of the CD attached to this book.

Project title: Community-based armyworm forecasting (CBAF) in eastern and southern Africa



Photo: D. Grzywacz

Low-cost natural spray kills African armyworm

Poor farmers now have a new, low-cost spray to control African armyworm.

This devastating pest migrates from Tanzania and Kenya to eastern and southern Africa. Farmers can lose between a quarter to nearly three-quarters of their crops and pastures in armyworm outbreaks.

As well as being environmentally friendly, the new spray replaces expensive chemical insecticides. It's made from armyworms that die when they feed on low-grade pastures sprayed with a virus. Because the dead armyworms are full of the virus, they can then be used to make more spray to kill more armyworms. This can be done locally rather than in far-off factories. Proven in Tanzania, the spray kills armyworm just as effectively as conventional insecticides and is already used in the armyworm control programme there.

■ Find out more by typing **CPP43** into the search box on the search page of the CD attached to this book.

Project title: Novel biological control for African armyworm

Baits and lures get the upper hand on fruit flies

Simple, practical and economic fruit fly controls are helping poor farmers in India and Pakistan to cut their losses of tree fruit and cucurbit vegetables.

Previously, because these farmers lacked the resources to buy insecticide sprays, they lost as much as 21% of their fruit and 24% of cucurbits to these pests.

Home-made baits of banana or raw sugar (bait application technique, or BAT) and wood blocks soaked in insecticide (male annihilation technique, or MAT) are two very effective components of the control package. In cucurbits BAT reduced losses by 50% and MAT by 43%, while together they cut losses by 59%. In orchard fruit, MAT reduced losses by 39%, BAT by 36% and the two together by 69%.

■ Find out more by typing **CPP19** into the search box on the search page of the CD attached to this book.

Project title: IPM of fruit flies in Asia and Africa

Trench warfare to combat crickets in southern Africa

Crickets that devastate crops can now be kept out of fields by simple trenches or narrow barriers of insecticide. Sorghum and pearl millet are the main subsistence crops in eastern Botswana and much of southern Africa. The armoured bush cricket seriously affects both. But, farmers are reluctant to spray pesticides because they consider them dangerous.

Now, farmers simply dig half-metre-deep trenches around their fields. Marching crickets, once in the trenches cannot get out. Putting bait in the trenches or encircling fields with narrow bands of insecticide also works, but most farmers are happy just with trenches. Now the trench system has been proven on research stations, extension workers and farmers are keen to try it out during the next cricket outbreak.

■ Find out more by typing **CPP68** into the search box on the search page of the CD attached to this book.

Project title: Control of armoured bush cricket in southern Africa

Catch brown locusts before they hatch

Forecasters in southern Africa can now predict swarms of locusts cost-effectively and accurately. Plagues of the brown locust are extremely destructive in Botswana, Namibia and South Africa. They happen in at least seven out of ten years, often coinciding with droughts—a double whammy for poor farmers. Previously, warnings based on field surveys often came too late for farmers to take action.

Forecasters in South Africa successfully used a new computer model—based on rainfall, vegetation, historical and satellite data—to show where locusts were likely to hatch out. They then warned farmers to prepare for outbreaks. Now, the governments of South Africa, Namibia and Botswana intend to use this system to strengthen control of locust and other migrating pests.

■ Find out more by typing **CPP70** into the search box on the search page of the CD attached to this book.

Project title: Components of an improved Brown Locust forecasting system for southern Africa

Helping small companies compete in biopesticide markets

Small enterprises are now manufacturing and marketing non-toxic environmentally friendly natural compounds to replace harmful pesticides. Although lots of small companies in India already produce biopesticides, they don't have much marketing know-how.

Now, a new professional society and a quality manual help them improve their product ranges and take advantage of booming markets—as exports alone are growing at 10% a year because of the demand for organic produce. In South Asia the society and quality manual have already had a profound effect on manufacturing and quality. Policies for registering biopesticides in Bangladesh have been changed. Plus, in India, small companies sell over 200,000 traps a year baited with natural compounds and, in Sri Lanka, biopesticides are sold for fruitfly and palm weevils.

■ Find out more by typing **CPP60** into the search box on the search page of the CD attached to this book.

Project title: Support to small and medium enterprises (SMEs) supplying pheromone control technologies ...

'Off-the-shelf' biocontrol for weeds in India

Scientists in India now have the skills to screen and use biological controls for pests. The exotic noxious weed parthenium not only causes severe crop losses but also affects people—causing contact dermatitis and allergies.

Already used in many countries, biological controls for weeds are sustainable and environmentally friendly. Now, Indian scientists have successfully imported, screened and released a rust fungus to control parthenium. Proven in UK and Australia, this opens the door for other 'off-the-shelf' pest controls to be introduced. Biological controls could have a major impact on raising incomes of the poor, helping them to use less pesticide and boost crop yields. Interest in these biological control methods is now spreading throughout Asia.

■ Find out more by typing **CPP71** into the search box on the search page of the CD attached to this book.

Project title: Developing a sustainable management strategy for parthenium in India ...

Pesticides that come naturally

Plants with pesticide properties are helping farmers to improve their earnings by reducing the impact of insect pests in storage.

Previously, farmers were forced to minimise their losses by selling grain soon after harvest, when market prices are low.

Natural pesticides are cheaper than commercial chemicals. They are also readily available, and safer and easier to use. Traditional methods of using these pesticide plants are, however, highly variable. Farmers need reliable information to support their decision making.

Participatory trials in Ghana have yielded new knowledge that can revive and modernise farmer practice by optimising the use of botanical pesticides. With this knowledge, farmers can make informed decisions on application concentrations and methods, preparation of the botanicals and the duration of control.

■ Find out more by typing **CPH14** into the search box on the search page of the CD attached to this book.

Project title: Optimising the indigenous use of pesticidal plants

Safe biological pesticides for India and South Asia

Small-scale farmers in India can now use environmentally benign pest management methods.

New biological pesticides mean that smallholders can control crop pests but still meet international food safety standards. This is particularly important for vegetables and fruit for export.

Pollution from chemical pesticides is a major concern in India. Some of the old pesticides still in use are extremely toxic. Many workers, especially in cotton-growing areas, are poisoned.

Government policy encourages locally produced, low-cost biological pesticides. Already, nearly 500 private and state laboratories have taken a 2.5% share of the Indian pesticide market. This share is growing rapidly as more and more are registered.

■ Find out more by typing **CPP55** into the search box on the search page of the CD attached to this book.

Project title: Scaling up availability of safe biological pesticides for poor farmers ...



Clean-gene technology has promise for safe genetically-modified crops

An easy and efficient way to develop genetically-modified crops that are 'biosafe' is now available.

People worldwide are reluctant to accept genetically-modified foods. They are afraid that they might contain genes, such as those resistant to antibiotics or herbicides, which could be harmful.

The clean-gene technology has great potential for Asian and African research programmes that aim to improve rice by genetic methods. It can also be readily used to improve crops grown by poor farmers in China, India and South Africa. Not only important staples, such as maize and wheat, but also orphan crops, such as millet, cowpea, sorghum and many fruits, nuts and vegetables could be improved by this technology. And laboratories in Asia, Africa, the USA and the UK are already using this process.

■ Find out more by typing **PSP18** into the search box on the search page of the CD attached to this book.

Project title: Genetically engineered rice free of selectable marker gene

Biotechnology helps engineer resistance to rice nematodes

An effective and biosafe method of controlling nematode worms in rice is now ready for trials in rice-growing countries.

Nematodes are a serious pest in a wide range of crops and the technique is generating a lot of interest, particularly in South Asia, Africa and South America.

Tested on a wide range of crops in the USA, China and Uganda, the technology is already being used in both developed and developing-world countries. It has great potential for agriculture in India and China where governments strongly support biotechnology as a way to rapidly raise food production.

■ Find out more by typing **PSP19** into the search box on the search page of the CD attached to this book.

Project title: Genetically engineered resistance to rice nematodes

Best practice bird control

Plant protection teams in Sub-Saharan Africa now have best practices to guide them in controlling bird pests.

The Red-Billed Quelea devastates subsistence crops of sorghum and millet, as well as of commercial wheat and rice. But current methods of dealing with the birds—spraying them with chemicals or blowing up their roosts with a mix of diesel and petrol—are harmful to the environment.

Plant protection departments in ministries of agriculture in Botswana, Mozambique, Namibia, South Africa, Swaziland and Zimbabwe now use these best practices. They assess the effects of their bird control measures and adapt them to have less harmful effects on the environment. This means lower doses of chemicals and smaller charges of explosive.

■ Find out more by typing **CPP74** into the search box on the search page of the CD attached to this book.

Project title: Environmental impact assessments of Quelea bird control

Biological controls to combat root-knot nematodes

In East Africa, a combination of biological controls, cultural practices and new pest-resistant varieties helps reduce damage to valuable tomato export crops.

Root-knot nematodes are a chronic problem for vegetable growers. Crops do not thrive on land that's severely affected, so it's often abandoned.

Export markets for vegetables from East Africa are booming. But growers must make sure their produce meets the safety standards set by importing countries. This means they can't use harmful pesticides. Many smallholders in western Kenya, Tanzania and Uganda now practice safe production, using biological controls and resistant varieties.

A small company in Kenya already produces 40 kilogrammes a week of a biological fungicide. And Kenya has amended its registration system to include biopesticides. So, there's a huge potential.

■ Find out more by typing **CPP50** into the search box on the search page of the CD attached to this book.

Project title: Biocontrol of root-knot nematodes

Imported fungi help farmers defend themselves against invasive weeds

A rust fungus collected in Trinidad and Peru is helping to control *Mikania micrantha* in southwest and northeast India. Previously, this invasive ('mile-a-minute') weed smothered vegetation over vast areas of tropical forests. Smallholder farmers can now fight back using biological control methods.

The Indian Government provided a national framework for the project and sponsored public awareness activities to promote understanding of the control technology. Indian scientists and extension workers received training and are now undertaking on-going monitoring programmes. The rust fungus is being mass-produced in specially built facilities for wide release on the continent. Scientists in China, Fiji, Taiwan and Papua New Guinea are also using the technique, and many other countries have expressed interest.

■ Find out more by typing **CPP06** into the search box on the search page of the CD attached to this book.

Project title: Sustainable management of *Mikania micrantha* in India, focussing on classical biological control



Push-pull deals with pests and improves soils

'Push-pull' pest management means growing plants that repel pests together with those that attract and kill them. One of these partnerships, Napier grass and the legume Desmodium, prevent stemborer and witchweed in maize. These push-pull partners are also good fodder crops and improve soil fertility.

Other integrated pest and soil management strategies proven in Kenya, Uganda, Tanzania, Malawi, Ethiopia and Nigeria are now available for small farmers to improve mixed maize-livestock systems—crop rotation, intercropping, manure and fertilizer, dual-purpose grain legumes and resistant varieties.

Over 6000 smallholders in Kenya and Tanzania already use environmentally friendly push-pull methods to control witchweed and stemborer, improve soils, and grow more fodder for livestock. These technologies have great potential for other cereals, particularly sorghum and millet.

■ Find out more by typing **CPP52** into the search box on the search page of the CD attached to this book.

Project title: Improving livelihoods of small-holders through integrated pest and soil ...

Quick, accurate tests identify plant diseases

Easy-to-use test kits now help laboratory staff in developing countries diagnose diseases rapidly.

The traditional tests are expensive and time-consuming. This means that diseases, such as bacterial wilt in potato, groundnut and tomato, and leaf spot in banana, are often not correctly detected, or not detected in time. So, crop losses from these diseases in Africa and Asia are devastating.

Now, laboratories in Mauritius, Malaysia, Tanzania, Zimbabwe and Trinidad use cost-effective kits to detect these diseases quickly and accurately. The design of the kits takes into account the often poor conditions in these laboratories. The tests have great potential for certifying crops for export and import, as well for meeting food safety standards. Many plant pathology laboratories around the world have already asked for them.

■ Find out more by typing **CPP79** into the search box on the search page of the CD attached to this book.

Project title: Validated molecular diagnostic methods for important bacterial and fungal diseases ...

Keeping watch on agrochemicals

New tools are helping Caribbean countries introduce effective controls on agrochemicals.

A policy and management strategy document provides key recommendations. A toolkit for National Plans of Action supports national level implementation within the regional strategy and to satisfy international regulations. Although, these documents were developed in the Caribbean, they are generic and can be applied more widely in other developing countries and to African and Pacific States faced with the threat of losing market access to Europe.

The tools are used extensively throughout the Caribbean, promoted by regional organisations. Nationally, implementation of the strategy has spread from two countries in 2003 to eight (St. Kitts and Nevis, Trinidad and Tobago, Suriname, Dominica, Antigua, Belize, Jamaica and St. Lucia) in 2006.

■ Find out more by typing **NRSP11** into the search box on the search page of the CD attached to this book.

Project title: A strategy for management of agro-chemicals ...

