

## Global Research On Cocoa - *working with and for farmers*

### Widening the Focus

Once again *GRO-Cocoa* focuses on farmers as the foundation of a sustainable cocoa economy, but looks at a diversity of topics and initiatives, which still share some common themes: the importance of putting cocoa farmers and their needs at the centre and listening to what they have to say.

Fairtrade is one of the most visible ways in which the public supports farmers, by paying a premium price for products. But Fairtrade, as the Twin and Kuapa Kokoo story demonstrates, is also about adding value, building long-term trading relationships and bringing farmers closer to the market.

In Nigeria, plans the Federal Government has set in motion to revitalise its cocoa industry mean this is a country to watch. The Cocoa Research Institute of Nigeria (CRIN) is playing a key role in delivering technical know-how to farmers, and its capacity for collaboration is already achieving results. At the institutional level, local, national and international organisations are cooperating to improve cocoa production, while at the farm level, these scientists and the farmers are working together to develop farmer-focused skills and technologies - an approach that is creating a groundswell of enthusiasm amongst farmers.

A good deal has been said about the benefits of shade cocoa, but what do farmers mean by shade? When farmers in Ecuador were asked, their answers were not what many scientists and ornithologists might have expected, and provide food for thought.

Although most global research on pests and diseases targets the major threats, such as black pod, farmers also incur severe losses from less publicized problems. Work in Ghana on canker, a lesser-known symptom of *Phytophthora* infection, is profiled.

And finally, a note on new publications draws attention to a handy guide to safe and effective pesticide spraying designed for use by and with farmers.

### Fairtrade Means More than Money

Most consumers in the North are familiar with Fairtrade products and the message

they carry: 'buy this and more of what you pay goes to the farmers'. For Twin, the UK's leading alternative trading company, Fairtrade is about much more than that: it is about building sustainable businesses.

Twin's principles and approach have remained consistent as it has evolved over the last 20 years:

- Developing long-term trading relationships built on trust with producers
- Including producers in Twin decision-making processes
- Bringing the producer and the market closer together
- Avoiding dependency on Twin by increasing the ability of small producers to trade on an equal footing with large organisations

During its history Twin has developed successful brands of coffee, fruit and cocoa, and has done much to make Fairtrade a household word. The farmers who supply Twin do get paid a fair price and a Fairtrade premium, but its success is more deeply rooted in developing long-term equal partnerships with farmer groups and creating robust Fairtrade supply chains.

Twin strengthens producer organizations through a raft of training and support processes, helping them to identify new business opportunities, and to develop and market their products. The companies set up to sell the products are mutual partnerships, with Twin and the farmers as shareholders. By owning the company that markets their produce, the producers have more power in the trading relationship, and it brings them closer to the market.

How this operates is illustrated by the story of Twin and Kuapa Kokoo ('Good Cocoa Farmers' Company'). This Ghanaian farmers' organisation now supplies about 45% of the world's Fairtrade cocoa, and is a major shareholder, with Twin as its partner, in the Day Chocolate Company, which manufactures and sells a range of Fairtrade chocolate in the competitive UK market. It is a farmer-owned business that manages and sells brands in Europe, speaks globally and demonstrates that Fairtrade products are quality products.

### The Beginning

During the late 1980s the World Bank



*Mr Ohemeng, MD of Kuapa Kokoo, lifted into the air at the 10th Kuapa AGM (The Day Chocolate Company)*

and IMF (International Monetary Fund) convinced many West African cocoa-producing countries to liberalise their internal and export markets; this allowed traders and exporters with no prior experience to enter the cocoa business. Initially this achieved its objective and producers received higher prices for their cocoa but the quality of produce declined because quality controls were relaxed or ignored.

Ghana resisted pressure to liberalise fully its market, planning to allow private buying groups, meeting specific criteria, to become licensed as cocoa traders.

Under the Ghana plans, COCOBOD, the Ghana government structure controlling the cocoa industry introduced competition in the 1992/93 cocoa year into the internal marketing of cocoa. Private Licensed Buying Companies (LBCs) com-

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*Kuapa Kokoo farmer Dora Atta tries her first taste of Divine (The Day Chocolate Company)*

peted with the Produce Buying Company, which hitherto, was the main subsidiary of COCOBOD responsible for the internal marketing of the commodity. The LBCs are responsible for purchasing cocoa from farmers at a stated minimum price and delivering the cocoa to the ports. Quality control and external marketing continue to be controlled by COCOBOD.

Twin wanted to use the experience, gained by working with coffee producers in Latin America, in Africa and formed a link in 1993 with an LBC formed by a farmer leader who had been a Producer Representative on COCOBOD.

Kuapa Kokoo was set up in 1993 by around 120 farmers, with financial support from the Max Havelaar Foundation, the UK government, the charity Comic Relief, and with the assistance of Twin and SNV, a Dutch development NGO. Their mission was to produce cocoa that was 'Pa Pa Paa' or 'best of the best.'

The original group developed into a cooperative comprised 22 farmers' groups in three cocoa-growing regions, with just under a thousand members.

Although Kuapa Kokoo was launched, it was not a smooth ride. Poor financial planning caused enormous problems and support (both monetary and human resources) had to be continued longer than anticipated.

But as the cooperative became established and its democratic structure formalised it was entered on the Fairtrade Register and arrangements were made with COCOBOD to allow a portion of the Kuapa Kokoo members' cocoa to

be exported under Fairtrade terms. This resulted in greater income for the farmers and an additional Fairtrade Premium which was used in developing projects to benefit the whole community; an important project has been the digging of wells and fitting them with hand pumps to ensure a reliable supply of potable water.

Kuapa Kokoo employs Research and Development Officers who maintain contact with members in all the societies, ensuring that their needs are addressed and that they are kept informed about the progress and development of Kuapa. They also report to Kuapa management what is required at the society level to serve the members' best interests.

After 10 years, Kuapa Kokoo is flourishing; Kuapa Kokoo Union has more than 900 primary societies and more than 40,000 members in five cocoa-growing regions. Kuapa Kokoo Limited is the most successful LBC in Ghana and also one of the larger suppliers of Fairtrade cocoa.

### Adding Value

The real value of cocoa is in the finished products, one of which is chocolate.

Encouraged by Twin, the farmers took a bold step at their Annual Assembly in 1997 and passed a resolution to establish a chocolate company in the UK. With financial support from Twin Trading, The Body Shop, Comic Relief and Christian Aid, the Day Chocolate Company was launched to market quality Fairtrade chocolate in the mainstream UK market.

Divine, the brand name of the Day Chocolate Company, was first marketed in 1998. Its success has been due to the enormous good will and support of many influential groups in UK, ranging from members of the Christian Aid Nationwide Network, who lobbied their local supermarkets to begin stocking Divine chocolate, to some top comedians who championed the new Fairtrade chocolate on TV and in the press.

In 2000 the launch of Dubble, the first Fairtrade chocolate bar especially for children, followed. Comic Relief endorsed the brand, and together with Day Chocolate, used Dubble as a vehicle to inform children about Fairtrade and the benefits it brings to the farmers. Award-winning teachers' resource packs were created which schools all over the country have successfully used to introduce children to the reality of life for farmers in developing countries. The packs were designed to meet National Curriculum needs within Geography, Religious Education and Citizenship studies.

Dubble now has a fan club of over 40,000



*Kuapa Kokoo farmers' children with a giant Dubble bar (The Day Chocolate Company)*

signed-up 'Dubble Agents' - young people committed to spreading the word about Fairtrade.

The Day Chocolate Company has extended the Divine range from one milk chocolate bar to 15 products and the company has grown at a rate no one would have predicted given the competitiveness of the confectionary market in the UK. This success is due, not only to having a range of quality products, but also to having the unique story of Kuapa Kokoo.

Kuapa Kokoo has two representatives on the Day Chocolate Board of Directors and one board meeting takes place in Ghana at the time of the Kuapa Kokoo Annual Assembly. Media representatives and other interested parties regularly visit Kuapa to see the organisation at work and observe the benefits derived from Fairtrade. Each year, during the UK Fairtrade Fortnight, held in March, two farmers are invited to attend and speak directly to consumers and explain to them how Fairtrade is benefiting the cocoa producers.

Kuapa has flourished and developed into a self-sufficient, democratic organisation and is using its Fairtrade Premiums to improve the lives of its member farmers.

Day Chocolate has a unique story to support the products made from the 'best of the best' cocoa and, because they own one third of the company, Kuapa Kokoo members will share in Day Chocolate Company profits; it is a win-win situation for everyone in the supply chain and provides proof that there are viable alternatives to the conventional ways of trading and conducting business.

As Mr Ohemeng, the Managing Director of Kuapa Kokoo has pointed out, "everyone has to go shopping, Fairtrade is just shopping with a bit of respect."

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## Building a Future for Cocoa in Nigeria

A cocoa industry is founded on its farmers. Cocoa is a fundamental component of rural livelihoods in West Africa, but young people are leaving owing to low profitability. In February this year, the Nigerian Federal Government launched a programme aimed at revitalizing the cocoa industry through a series of cocoa rehabilitation programmes. It recognizes that retaining the young generation in cocoa farming is key to the sector's future. For this to happen, cocoa needs to be perceived as providing an economically viable and sustainable livelihood.

The cocoa sector in Nigeria occupied a prime place in the 1960s and 1970s when cocoa was its largest export. Although now the world's fourth largest cocoa-producing country, its production dropped from 400,000 tonnes in 1970 to about 130,000 tonnes in the 1990s. The decline is attributable to a number of constraints faced by farmers, including: inadequate and limited access to production technologies and practices; high costs of and limited access to production inputs and credit; poor cooperative skills amongst farmer groups; inefficient marketing channels and market power; limited access to information; low and inconsistent quality standards; inadequate and mismanaged incentive environment and moribund cocoa farms.

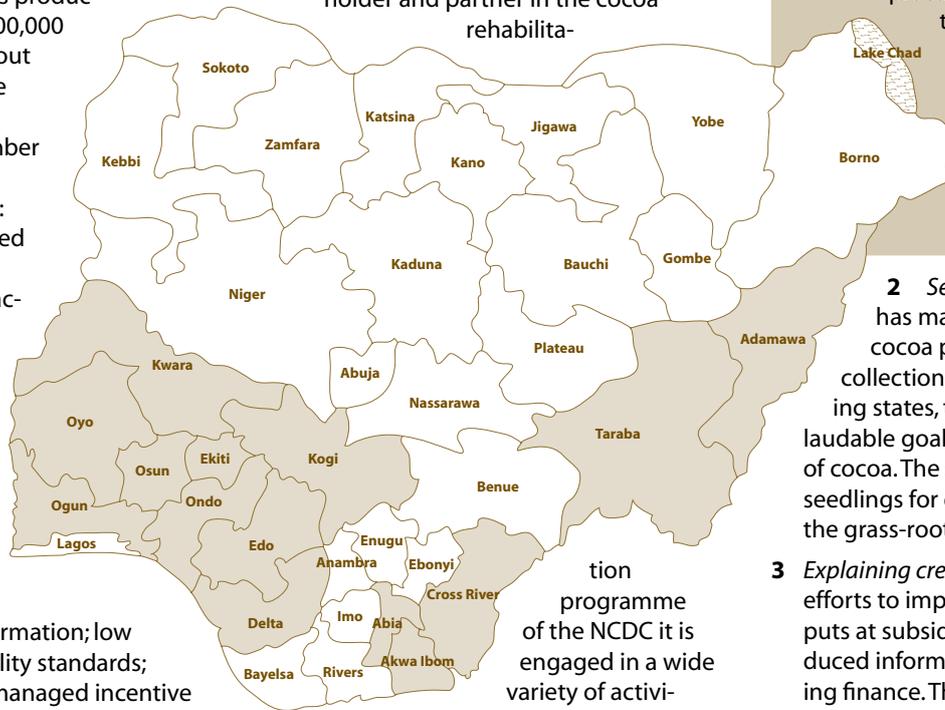
It is against this background that the Federal Government set up the National Cocoa Development Committee (NCDC) in 1999 to promote cocoa production and trade (see Box). The thrust of NCDC's intervention is to reinforce Nigeria's position in the world cocoa economy, with the current goal of trebling production over the next 3 years to 600,000 tonnes by 2008. As part of this, an expansion in the areas planted to cocoa is planned, from the current 400,000 ha effectively in production to one million hectares.

The Federal Government of Nigeria is supporting the country's cocoa industry to achieve its goal, directly and through NCDC and its partners, by improving farmer access to inputs and knowledge.

The Federal Ministry of Commerce, for example, in collaboration with ICCO provides weekly information to farmers about local and international cocoa prices in newspapers, and on local radio. However, the key player it has tasked with providing technical know-how for Nigeria's 2-3 million cocoa farmers is the Cocoa Research Institute of Nigeria (CRIN), which is working in partnership with local, national and international partners to deliver this.

### CRIN: a Major Stakeholder

CRIN was established in 1964 in Ibadan, Oyo State as a parastatal of the Federal Government of Nigeria. Presently, it has a national mandate to conduct research on five crops: cocoa, kola, coffee, cashew and tea. To facilitate its outreach and extension services to farmers and industrialists, it maintains six substations strategically located country-wide. As a major stakeholder and partner in the cocoa rehabilitation-



programme of the NCDC it is engaged in a wide variety of activities, encompassing the many aspects of restoring and expanding the cocoa industry.

**1 Rehabilitation.** A major training programme organised by CRIN focused on rehabilitation of cocoa plantations that have become moribund through old age and abandonment. Farmers were shown how to bring these back into production through coppicing, planting cocoa seedlings under old trees and re-planting to replace dead or unproductive trees. In addition, trainers drawn from the state Agricultural Development Project (ADP) were trained on the various rehabilitation methods in 2001, and are expected to transfer the knowledge they acquired to cocoa farmers in their various states.

## NCDC Works for Cocoa

- The NCDC is a broad-based committee with membership drawn from cocoa-producing states, federal agencies and private sector operators including farmers' associations.
- It implements its programmes through its various sub-committees in partnership with various agencies of both the Federal and State Governments (of the 14 cocoa-growing states) as well as through stakeholders such as the Cocoa Research Institute of Nigeria (CRIN), the Cocoa Association of Nigeria (CAN), the Cocoa Farmers Association of Nigeria (CFAN), the Cocoa Growers Association of Nigeria (COGAN) and other commodity associations.
- The subcommittees address input procurement, input distribution, farmer sensitisation and training, regeneration and rehabilitation, alternative uses, organisation and mobilization of farmers, and funding of NCDC.

**2 Seedling distribution.** NCDC has mandated CRIN to distribute cocoa pods from F3 Amazon collections to all the cocoa-producing states, towards achieving the laudable goal of one million hectares of cocoa. The states are to raise the seedlings for distribution to farmers at the grass-roots level.

**3 Explaining credit.** As part of NCDC's efforts to improve farmers' access to inputs at subsidized costs, CRIN has produced information material on sourcing finance. The handbook *Education of farmers on ways of accessing funds states*, "Credit facilitates agricultural output, food security and investment". Inadequate education means farmers do not have the knowledge to access credit that is nonetheless available for financing labour and other inputs.

**4 Training in crop production and processing.** NCDC provides support for CRIN to train farmers to implement proven technologies it has developed. Training activities address best production and processing practices with emphasis on appropriate and adequate farm maintenance practices to reduce disease and pest insect incidence, appropriate methods of fermentation to ensure high quality cocoa beans, and how to establish a nursery. The information material on credit, above, is one of a



series that builds into a training manual for cocoa farmers, to aid training and enhance their understanding. Other handbooks focus on the crop itself:

- *Fermentation and drying of cocoa beans* takes farmers through the details of six sequential steps, explaining the timings and procedures to follow to ensure good quality beans.
- *Processing cocoa* covers options developed by CRIN for using non-bean cocoa products, which add to the farmer's profit by ensuring that no part of the crop is wasted.
- *Preparation of a cocoa nursery* explains the processes of site selection and preparation, shade provision, preparation and sowing of seeds, and seedling care.

### Partnering for Development: Contributions of International Agencies

#### Facilitating Farmer Training

Engaging farmers' interest is clearly essential to revitalizing the cocoa industry, and so is providing them with knowledge and support. Initiatives in Ondo State (see map, p. 3), within the framework of the Sustainable Tree Crops Program (STCP) Nigeria Pilot Project<sup>1</sup>, are having striking impact. In particular, participatory approaches, in which farmers have been working in partnership with local, national and international organisations, have given farmers a sense of enthusiasm and energy. Their capacity to translate this into better productivity and improved livelihoods is being underpinned by further STCP-managed initiatives to strengthen infrastructure (see below).

The STCP-Nigeria Pilot Project in Ondo State is focused on implementing and testing the feasibility and impact of interventions aimed at raising the social and economic well-being of smallholders.

During the past 2 years the Pilot Project has trained over 1 500 farmers in Ondo State in integrated crop and pest management (ICPM) practices using the farmer field school (FFS) approach. Many

<sup>1</sup> STCP, hosted by the International Institute of Tropical Agriculture (IITA), is a collaborative initiative of the public and private sector operators to improve the economic and social well being of smallholders and the environmental sustainability of tree crop farms. The programme which is supported by USAID (US Agency for International Development) and the global chocolate industry represented by World Cocoa Foundation (WCF), individual chocolate companies and trade association presently supports five pilot projects focused on cocoa and cashew in five West African countries including Nigeria.



*Two-way communication between farmers and facilitators is essential in participatory training and research: by listening to each others' concerns the training and research elements become tailor-made and outputs are more likely to be taken up far and wide (Janny Vos)*

more have been reached indirectly through mass-media programmes as well as farmer-to-farmer diffusion. The FFS approach - a participatory method to extend complex, knowledge-based practices and technologies to small-scale farmers - brings a revolutionary change to training cocoa farmers. The curriculum for the FFS was developed by drawing on the experience of a number of international partners such as CABI *Bioscience* and WCF and national partners such as CRIN. It covers topics on ICPM, rehabilitating plantations and integrating other trees, improving cocoa quality and rational pesticide use. In addition, in collaboration with the International Labour Organization/West Africa Cocoa/Commercial Agricultural Project, social messages (primarily on child labour and HIV/AIDS) have also been integrated into the curriculum.

A preliminary impact survey of the FFS graduates shows a more than 30% increase in the productivity of their farms. The STCP partners in the FFS programme in Nigeria are CRIN, Ondo State Agricultural Development Program and the Tonikoko Farmers Union.

As news of the outstanding successes recorded through FFSs in Ondo State has spread, other cocoa-growing states in the country have asked to become part of the 'FFS experience'. As a part of the scaling up process of the validated innovations, STCP-Nigeria is also making efforts to develop the capacity of the extension departments of the states' Agricultural Development Projects (ADPs) and interested NGOs, who are expected to mainstream the FFS approach into their extension services. Already, STCP-Nigeria is backstopping FFSs in Cross River State, Nigeria in collabora-

tion with the Associates for Rural Development (ARD), USA.

#### Strengthening Farmers' Organisations

Farmer organisations are not only key to implementing project activities in a participatory manner, but are also vital in underpinning farmers' efforts to revitalise cocoa farming. To mobilize and harness the collective wisdom and strength of the farmers, the STCP-Nigeria Pilot Project supported the establishment of the Tonikoko Farmers Cooperative Multipurpose Union (otherwise known as Tonikoko Farmers Union) whose membership has grown from 665 to over 3000 in 2 years, with 35 farmers' societies.

Following an STCP-sponsored diagnostic survey of its cocoa production and trade potential, the Union has developed a collective trading arrangement that will enable its members get the best price for their produce. The trading arrangement is being implemented through its Trade and Information Center, which has facilities for storage, training, meetings and information handling and dissemination. To support the emerging trading arrangement, complementary initiatives aimed at linking the farmers to affordable inputs and credits as well as market information have been developed as an integral part of this effort.

#### Facilitating Farmer Innovation

The STCP FFSs yielded trained and excited farmers, curious to discover more about improved methods of crop production. This was built on through Farmer Field Research (FFR). CABI *Bioscience*, in partnership with CRIN, IPARC (International Pesticide Application Research Centre, Imperial College London, UK) and STCP-Nigeria,



*Preparing a trombone sprayer: because of the wasteful output, reloading is needed more frequently than when more efficient sprayers are used (Janny Vos)*

supported a process of building further farmer knowledge through validation of novel technologies. The work was funded by DFID (UK Department for International Development) as part of a 2-year cocoa IPM implementation project in West Africa, which also funded CABI and partners' support to the STCP FFSs.

The Nigerian FFR concentrated on pesticide application methods. Worldwide, there is huge concern over the amount of 'wasted' pesticide applied in cocoa - on cost, environmental impact and human health grounds. The objective was to test rational pesticide use compared with the farmers' usual practice for managing black pod disease (caused by the invasive *Phytophthora megakarya*). The research was conducted at four sites in Ondo State where farmers, all graduates of the STCP FFSs, had already been trained to make systematic observations and evaluate the data they generated. The thrust of the research was a comparison between pressure-controlled knapsack sprayers fitted with a so-called 'cocoa nozzle' selected by IPARC for the uniformity of droplets it produced (also see p. 8, *Spraying cocoa, 10 essentials*), and the farmers' traditional 'trombone' sprayers. The project data are now being analysed and will be published as a case study, but preliminary feedback from farmers is exciting. According to them, they used much less chemical (about a two-thirds saving) when they used the 'cocoa nozzle', and their spraying operations also took less time. They attributed the savings in chemical to the efficiency of the cocoa nozzle in ensuring that the chemical 'sticks' to the pod and does not run off. In their estimation, the yield was at least as good or better with rational pesticide application. A key con-



*Testing locally available controlled pressure knapsack sprayers in their own fields has convinced cocoa farmers (Ondo State) of the benefits of adapting their traditional spray techniques (Janny Vos)*

straint now is the local availability of the cocoa nozzles themselves, although the Tonikoko Farmers' Union may be able to facilitate their import. The interest of the farmers is strong.

Like conventional research, FFR is a continuous process: the results of one experiment suggest further experiments. FFR on rational pesticide application gave encouraging results but the knapsack sprayer-cocoa nozzle set-up could not reach high enough into the cocoa canopy to protect the pods there. The unprotected pods, as well as developing disease, could constitute an inoculum source for re-infection of pods lower in the canopy. However, the farmers themselves may already possess answers - and what is more, thanks to their FFS and FFR experience, they have the know-how to test their ideas. One proposal is to assess extension

lances fitted to the spray equipment, but more importantly the role of tree structure will be tested. A key component of the STCP FFS training, and one being widely adopted by farmers, is pruning to reduce density: some 80% of FFS graduates have adopted it. The pilot FFR project began before the farmers' had had an opportunity to apply the proper pruning techniques they had learnt, but were going to do so once the pruning season arrived. The realisation that it may improve disease protection afforded by rational pesticide application is an added impetus, and will allow them to explore the interaction of the two techniques.

Given the cost saving potential of this innovation, the next steps will be to disseminate the technology to other farmers through participatory training and potentially involving media to further disseminate the newly generated farmer knowledge.

The benefits of the two-way process of participatory research, with farmers and scientists listening to each other can, as it did here, identify new avenues to follow. In discussions about lessons learnt during the work, farmers reported that fewer epiphytes and moss (which reduce flowering and thus yield) grew on the trunks of trees sprayed under the rational pesticide regime. They commented that copper in the fungicide promoted epiphyte/moss growth, and less ran down the trunk with rational application. This observation struck a chord with CRIN scientists. It was consistent with results they had obtained in related research.

Impressed by this experience with FFR, CRIN has started validating the local knowledge it generated, and is keen to do more FFR, and to use it in training farmers. CRIN believes that this participa-



*Cocoa farmers and researchers involved in Farmer Field Research in Wasimi village, Ondo State (Janny Vos)*



tory approach to cocoa research will help overcome the problems it has traditionally encountered with getting new technologies through to farmers. Research is more quickly adapted to farmers' needs and taken up by the farming community when farmers and scientists work together.

### The Story's Just Begun

In conclusion, the efforts of the various government and international agencies to revamp the Nigerian cocoa industry are yielding positive results. In particular, CRIN sees the participatory approach as a giant step towards improving cocoa productivity. The farmers involved in the successful Pilot Project in Ondo State are highly motivated and enthusiastic to continue finding ways of improving cocoa production and profitability, and they have the support of a strong farmer organisation in the Tonikoko Farmers Union. This is a model that could be followed elsewhere. However, to sustain the momentum and ensure wider reach of the innovations to the other states now clamouring for them, there is a pressing need for sustained funding by government and development investors as well as a deeper involvement of the private sector in Nigeria's cocoa economy.

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## Casting Light on Shade Cocoa

Cocoa grown under shade trees hosts many species of bird, especially ones that migrate between North America and Latin America. So it is understandable that bird conservation groups like shaded cocoa. But by the late 1990s chocolate manufacturers and ornithologists had expressed concern that shaded cocoa was slowly but steadily being replaced with monocropped cocoa. They asked us to go to coastal Ecuador to find out why.

At first glance, shaded cocoa looks like it is growing in a natural forest. But usually, all the trees are planted. Of 21 farmers we interviewed, only one had any wild trees growing in his cocoa. Smallholder cocoa growers stressed that 20 or 30 years earlier, when they planted the cocoa, they planted the timber trees as well. Cocoa was rarely



Harvesting cocoa in full sun. Note the dense ground weeds (Eric Boa)



Heavily shaded cocoa can look like a forest, at least superficially (Eric Boa)

planted in the forest; rather it tended to replace crops like banana or sugar cane. Farmers showed us that the shade trees were usually planted in lines, in a grid. They were definitely not wild forest trees.

Even planted timber trees were not very common in Ecuadorian cocoa. For one thing, timber is hard to fell if it is growing among valuable cocoa trees, with their low, but spreading canopies. Once timber is on the ground, the boles are difficult to haul out from among the standing cocoa.

To avoid problems with timber, popular shade species include *guabo* (*Inga* spp.) and bananas, which yield fruit and can be easily removed when the cocoa is 3 or 5 years old and needs less shade. But actually, most of the species grown among cocoa are not shade at all. Some are tall and spindly, like coconut. Others are shorter than the cocoa itself, like citrus or papaya or even coffee, so essentially they are growing in the shade of the cocoa, and not the other way around.

In the ecological tradition of naming niches after roles in human communities, we called all of these trees, shade and non-shade, 'neighbour trees.' They are planted among cocoa because they provide products, especially fruit, which the family can eat and sell. Neighbour trees provide side benefits to the farm family; people plant them in the groves because cocoa can tolerate being intercropped.

Our main question was: what motivates farmers to convert to full-sun cocoa? It turns out to be a package deal. Full-sun cocoa is planted in a modern,

monocropped, high-yielding hybrid, with chemical fertiliser, herbicides and irrigation. In shaded cocoa, the shade trees substitute for chemicals and irrigation. The *Inga* leaves fall on the ground and fertilise it and discourage weeds. *Inga* also increases soil fertility directly because it is a woody legume. Nitrogen fixation has an important long term benefit for the cocoa. The shade keeps the soil moister, so there is less need for irrigation. Unfortunately, the shade also increases some of the fungal diseases, especially witches' broom (caused by *Crinipellis pernicioso*), and shade favours epiphytic weeds, which grow thick on the tree branches.

The old, shade-loving varieties of cocoa yield less, but they produce tastier, more aromatic cocoa. Until the 1960s, Ecuadorian buyers classified cocoa into quality categories, and paid more for the better beans. But that has gone. International buyers for candy makers required a constant quantity of cocoa at a certain



Many tree crops are intercropped with cocoa for their fruit, like this zapote (Eric Boa)



standard. When the buyers stopped rewarding farmers for growing the finer, traditional varieties, they paved the way for monocropped, chemical-intensive, high-yielding hybrids.

All the news is not bad. For one thing, migratory bird fans will be happy to know that Ecuadorian cocoa often replaces bananas or field crops, rather than cutting down the forest. And after all, the cocoa itself is a tree, even if it is monocropped.

The easiest way to promote shade trees is by demanding better chocolate, and by paying more for it. No doubt, some people would like to do their bit for the environment by eating some really good chocolate.

But there is no time to lose. While most of the cocoa in Ecuador is still in old-time varieties, surrounded by shade and other neighbour trees, most of the new groves are in modern hybrids, in full sun.

### For More Information

This note is based on the following article:

Bentley, J.W., Boa, E. & Stonehouse, J. (2004) Neighbor trees: shade, intercropping, and cacao in Ecuador. *Human Ecology* 32(2):241-270.

And on our final technical report:

Boa, E., Bentley, J.W. & Stonehouse, J. (2000) Cacao and neighbour trees in Ecuador: How and why farmers manage trees for shade and other purposes. Final Technical Report. CABI *Bioscience*, Egham, UK.

Although it is hard to find (and in Spanish), for an engaging history of cocoa in Ecuador, see:

Arosemena, Guillermo (1991) *El fruto de los dioses: El cacao en el Ecuador, desde la colonia hasta el ocaso de su industria, 1600-1983*. Editorial Graba, Guayaquil, Ecuador. 2 volumes.

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## Phytophthora Canker in Ghana

Although black pod disease is the best-known disease caused by *Phytophthora*, all parts of the cocoa tree are susceptible to *Phytophthora* infection. Unlike pod infections, the effects on root, stem and leaves are rather indirect and difficult to quantify, so both farmers and researchers often ignore their impact and importance. Cankers, the symptom of *Phytophthora* infection that develops on cocoa stem covered with matured bark, had long been described as the forgotten disease and its significance generally underestimated because its effect on yield is difficult to quantify. However, stem cankers are known to reduce tree vigour, destroy flower cushions and also provide a source of inoculum for infections of other plant parts. It is currently the most important *Phytophthora* disease of cocoa next to black pod disease in Ghana.

### Factfile

The earliest cocoa canker studies in Ghana date back to the 1920s but compared to black pod or cocoa swollen shoot virus diseases, little research attention has so far been devoted to it, probably because the disease was not considered serious. While black pod incidence in Ghana ranges from 18% to 27% for *P. palmivora* and 60% to 100% for *P. megakarya*, the incidence of canker was reported as 6.98% and 4.40% respectively (although these figures may be deceptive as the economic losses are difficult to assess).

A recent survey for cocoa diseases in the five cocoa-growing regions in Ghana found canker in all farms where black pod disease caused by either *P. palmivora* or *P. megakarya* was present. Reports by farmers of severe canker infections that resulted in the death of many cocoa trees, particularly in the *P. megakarya*-infected areas of the Western, Ashanti and Brong Ahafo regions (which produce the bulk of the nation's cocoa), suggest an upsurge of the disease. Many large and multiple canker lesions were associated with these outbreaks. Hitherto, cankers had been associated mainly with *P. palmivora* infections of flower cushions.

On peasant farms in Ghana where maintenance is generally poor, farmers tend to leave diseased pods, particularly in the tree canopy, unharvested. These rot, dry up and become mummified, and can remain on the trees for months. These should result in cankers, as the development of canker has generally been attributed to spread of mycelia of *Phytophthora* from an infected pod along the peduncle into the flower cushion. However, natural cankers have



Exposed canker lesions on the trunk of cocoa tree (H. C. Evans)

been found to be concentrated on the stem along the main trunk and rarely found in the canopy. The role of mummified pods in canker development is currently being investigated. Recent observations have also shown numerous canker lesions resulting from sources other than cushions. *P. megakarya* had been known to have a self-sustaining reservoir in plantation soils and has also been reported to cause multiple cankers, which coalesce to form large lesions, usually at the collar region of the stem. The lesions often extend below ground into the roots. The canker lesions may girdle the stem and result in the death of the whole tree. Cankers are also known to play a major role in the primary infection of cocoa pods. It is known that when canker girdles the main stem or branch, the pods that remain on the tree wilt, the leaves discolour and defoliate, the branches die back and eventually the tree dies.

The external symptoms of canker on the bark are largely greyish-brown or reddish-brown water-soaked lesions with dark brown to black margins. In some cases, reddish-brown liquid oozes from these lesions, usually through cracks in the bark. When the lesions are exposed, a scarlet discoloration, conspicuous and different from the colour of the bark can be observed. Symptoms of poor growth, including leaf discoloration, defoliation and dieback are sometimes evident in canker-infected trees. Broken canopies in plantations resulting from death of cankered trees are increasingly becoming a problem. Canker symptoms of *P. palmivora* and *P. megakarya* are similar; they tend to be more extensive along the trunk than across it.

Direct isolation of *Phytophthora* on artificial medium from cankered tissue always yields other fungi such as *Botryodiplodia* and *Fusarium* species. The appropriate method for isolation of *Phytophthora* is by inoculating green cocoa pods with infected stem pieces from a canker lesion and subsequent re-isolation from these pods.



### Phytophthora Canker Management in Ghana

Generally, cankers are found wherever black pod disease is prevalent. In Ghana, these occur on heavily shaded farms, where humidity is high and temperatures are low. On poorly managed farms, where farmers often leave diseased and rodent-damaged pods unharvested, the incidence of cankers was relatively high. As part of an extension package, cocoa farmers are advised to remove all infected and rodent-damaged pods during and in-between harvests.

At the early stage of development and under dry conditions, scraping the bark to expose the canker lesions or in addition painting the scraped surface with copper-based fungicides generally halts the advancement of the canker. However, under high rainfall and humidity, the canker may quickly girdle the stem

and kill the tree. Experiments to evaluate fungicide application on cankers without scraping showed that the method was ineffective as active canker lesions were observed beneath and beyond the sprayed surface.

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### Latest Word

#### Spraying Cocoa: 10 Essentials

A two-page colour-illustrated document\*, downloadable from the Dropdata website, is a handy reference for anyone wanting to know or explain how to optimize spraying in cocoa. But don't leave reading it until you are about to pick up the sprayer, for escaping the limitations of the 'spray and pray' approach takes knowledge and planning.

It starts by taking you out to look at the

trees, and at what you are going to spray against, to help you decide whether spraying is appropriate - and if not, what to do. Safety, efficacy and cost-effectiveness underpin messages about choice of product, minimum protective clothing and hygiene, spray equipment choice and maintenance, pesticide preparation and application techniques, and post-spray practices. The leaflet ends with an evaluation of how the spraying operation went, emphasising continuity in maintaining crop architecture and monitoring for pests.

\*See Cocoa pages on: [www.dropdata.net](http://www.dropdata.net)

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### Hot Off the Press

*Cocoa futures* (Flood & Murphy, eds; CABI Commodities) and *The genetic diversity of cacao and its utilization* (Bartley; CABI Publishing) are both now published. See *GRO-Cocoa No 6, p. 8* for details of how to order, or contact the newsletter editors.

## Spraying Cocoa: 10 Essentials

 <p><b>1. Keep tree height under control</b> Tall trees are difficult: ➤ to spray ➤ to monitor ➤ to harvest Prune trees regularly: tree surgery can make spraying easier: if you can wait for the next crop!</p>	<p><b>2. Know your target</b> What are you trying to control? so what product and how will you apply it? Examples:</p>  <p>Make sure it is not <b>too late</b> to spray.</p>
<p><b>3. What will you spray?</b> Choose and use the right pesticide : think safety first and efficacy <b>Read the label</b> is it the best pesticide for your problem?  this sign means the product is harmful</p>  <p><b>Do NOT use dangerous products</b> If you do not have special personal protective equipment (PPE): mask, goggles, gloves* etc  this sign means danger</p> <p>* <b>NOTE:</b> it is safer to use no gloves at all than gloves with holes in them!</p>	<p><b>4. Minimum Personal Protection</b></p> <ul style="list-style-type: none"> <li>✓ <b>Wear a hat</b> against falling droplets</li> <li>✓ Wear comfortable clothing that protects as much of the body, arms and legs as possible.</li> <li>✓ Some types of national dress are especially suitable</li> <li>* but never put on previously contaminated overalls or other clothing</li> </ul>   <ul style="list-style-type: none"> <li>✓ Wear trousers on <b>outside</b> of boots</li> <li>✓ If you use a <b>motorised mistblower</b> ear defenders are essential.</li> </ul>
<p><b>5. Is your sprayer working properly?</b></p> <ul style="list-style-type: none"> <li>□ Choose a robust sprayer and will you be able to find spare parts for it?</li> <li>□ <b>before</b> each spray operation <b>check</b> equipment using clean water: <ul style="list-style-type: none"> <li>➤ Are there any faults or blockages? Check pump, valves, filters and nozzle.</li> <li>➤ Are there any leakages? If spare parts are not available repair joints with PTFE (plumber s) tape or rubber seals (can be made out of old tyre inner tubes). Replace worn and leaking hoses.</li> </ul> </li> </ul>	<p><b>6a. How to treat the target?</b></p> <p>Where must the spray deposit be put? pods &amp; trunks shoots whole tree</p> <p><b>Select the right nozzle</b> if your sprayer has a variable hollow cone nozzle what setting should be selected? Variable nozzles are difficult to calibrate - it is better to select the correct nozzle for the job - more details are available from</p> <p>please see next page</p> 

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