GRO-Cocoa

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

Building Three Pillars

Sustainability continues to be the key goal in global cocoa production. In this issue we look at various aspects of the three pillars of sustainability – social, economic and environmental – that can contribute to a sustainable future for cocoa production, and long-term improvements in the livelihoods of smallholder farming communities.

A Cadbury–United Nations Development Programme initiative looks to address sustainability of cocoa production in Africa using a holistic approach to develop programmes that address all three pillars of sustainability.

In a similar vein, though using a different approach, Utz Certified seeks to promote sustainable cocoa production by developing a certification system which will ensure consumers and industry know the cocoa is produced sustainably and at the same time enable farmers to increase their incomes.

We have articles about two strands of research bringing hope for controlling insect pests and diseases in West Africa. An account of research in Ghana shows how weaver ants could be exploited to control cocoa mirids, thus reducing pesticide use and its associated impacts on human health and the environment. The article also considers the implications for yields and farmer incomes. The second article describes how CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement) identified new sources of disease resistance in wild cocoa in French Guiana, which is now being used by two projects to breed clones with better resistance for *Phytophthora megakarya* in West Africa, and for local strains of disease in French Guiana.

The much-heralded new European Union (EU) regulations concerning pesticide residues in food commodities are about to come into force. We include a report from a European industry-led project that has been focusing on understanding and addressing the implications of these changes for cocoa in West Africa; this includes a list of pesticides not approved for use in the EU and details on how to obtain more information on this vital topic.

Weaver ants fastening leaves together with larval silk to make a nest in the canopy of a cocoa tree. Encouraging ants to colonize cocoa farms could help control the insect pests they prey on (Monique van Kessel)

With these and other changes in regulations forcing changes in crop protection practices, most readers will be aware they really need to know more about pesticides and their use. We end this issue by highlighting a new manual from the International Cocoa Organization that meets this need.

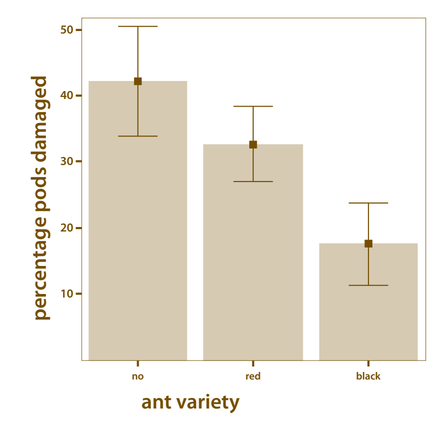
Ants: an Alternative to Insecticides

The Ghanaian government is currently facing a serious problem. Some of their largest international clients for cocoa are now reluctant to buy cocoa that has been sprayed with pesticides, yet this practice has become common in Ghana over the last six years since the government introduced the mass spraying programme via CODAPEC. Because they offer free spraying three times a year for every well kept farm, most farmers are having their farms sprayed and in this way increase their harvest. The increasing global consumer perception of the threat insecticides pose to humans and the environment causes a growing reluctance to buy products containing insecticide-treated cocoa. And even more difficulties are looming on the horizon if pest insects develop resistance to insecticides, which is very likely under current spraying regimes. Therefore a reliable alternative is needed.

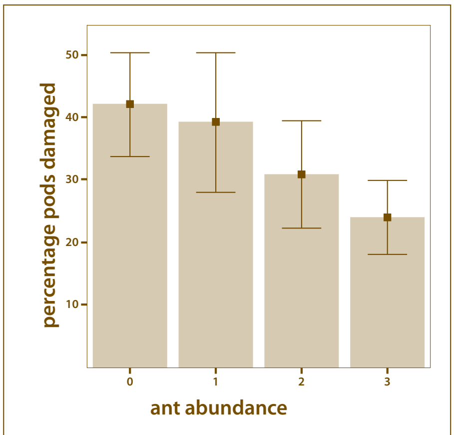
And who better to ask than the farmers themselves? During surveys, the two most workable alternatives scientists and farmers agreed on were the scientists' suggestion of using neem, as a botanical pesticide, and the farmers' suggestion of using *Oecophylla longinoda*, a very common weaver ant in Ghanaian cocoa farms and forests. Farmers regard the ant as both unwelcome, because of its painful bite, and beneficial, because its appearance coincides with reduction in pest damage. Because the production capacity and distribution infrastructure for neem

In This Issue

dragonprints



The effect of the ant Oecophylla longinoda *on the percentage of pods damaged by capsids/mirids per cocoa tree, with or without red or black ants*



The effect of the ant Oecophylla longinoda *on the percentage of pods damaged by capsids/mirids per cocoa tree for different ant abundances (0 = no ants; 1 = few ants; 2 = several branches with ants; 3 = ants covering most of the canopy)*

are still very limited, weaver ants seem the most promising immediate option, not the least because of their proven potential as biological control agents in other crops like citrus.

Weaver Ants

Oecophylla longinoda builds its nests in the canopy of trees using the silk secreted by its larvae to stick leaves together. It is not uncommon in cocoa to have colonies including over 30 nests, with each nest containing 3000 individuals on average. Trails usually lead through canopies of adjacent trees but, if ant numbers are high enough, they will start descending from the canopy, down the stems and over the ground, in the search for additional food. Ants from different colonies do not tolerate each other and start fighting if they encounter one another. There are two types of weaver ant, the red and the black; the black is commonly thought to be the more aggressive. To investigate the potential for biological control by weaver ants in cocoa, we set up a series of experiments.[*]

[*] A description of all experiments and results can be found in our MSc theses. For details please contact us.

Effectiveness

Though frequently abundant in cocoa plantations, *O. longinoda* is distributed rather patchily. On top of that, spraying reduces ant numbers. Our results indicated that ants needed to be highly abundant over a large area of a plantation to protect the cocoa adequately from pests. When ants are sufficiently abundant they descend from their primary habitat, the canopy, to cover the stems, where the pods are found. Our results show significantly reduced pest damage only when the ants were present around the pods. Small numbers of *O. longinoda* could provide some protection and reduce damage but not to the same extent as when ants were present in high numbers. Our results also indicated that the black type of *O. longinoda* seemed much more effective in reducing pest damage than the red one, probably due to its greater aggression and higher abundance within the territories of colonies in our experimental fields.

Introduction of New Colonies

We also investigated the introduction of new colonies into areas of a cocoa plantation that lacked weaver ants, although we knew there were a few colonies of *O. longinoda* present in other parts. Nests from colonies in nearby forests and plantations were cut and transferred in bags to areas where no *O. longinoda* were present. As our research covered only five months, no long-term results were obtained, but within that time span, three out of 12 introduced colonies survived. Although this may seem a low success rate, most of the non-surviving colonies were attacked by naturally occurring *O. longinoda*. Though the natural occurrence of *O. longinoda* was low at the start of the experiment, they proliferated extensively after the insecticide spraying was halted. In addition, a few of the introduced colonies were killed by naturally occurring enemies of *O. longinoda* – i.e. other ant species, which in some cases were able to extinguish the newly introduced, and therefore extremely vulnerable, colonies of *O. longinoda*. But *O. longinoda* is a dominant species, which works in its favour when introduced in sufficient numbers. As weaver ants occur throughout Ghana and have a tendency to establish quickly when newly introduced into areas, we feel the potential for their use is enormous.

Stimulating Colonies

Supplying animal or fish intestines to existing ant colonies could stimulate population growth or lure *O. longinoda* into adjacent, uncolonised trees, but this practice may also attract other ant

Transferring nests to uncolonised areas could increase ant density (Monique van Kessel)

species that are enemies of the weaver ant, so careful observation after feeding is needed and removal of the intestines is advisable when other ant species are attracted. Likewise, strings tied between trees with and without *O. longinoda* to try and facilitate the expansion of the colony into new trees could also provide bridges for other ant species to invade. Newly introduced colonies are especially difficult to stimulate when other ants are abundant. Only close monitoring of the population dynamics after either introduction or additional expansion measures can assure the farmer of a positive outcome.

Dealing with Ant Bites

To reduce nuisance from the ant bites, farmers themselves have already come up with several solutions. First of all, biting could be prevented by slightly adjusting the harvesting method. For example, waiting half an hour before collecting the pods after they have been cut allows time for the ants to abandon the pods and withdraw into the trees. Secondly, rubbing vulnerable parts of the body, like the hands, with charcoal reduces both the number and intensity of ant bites. After some discussion among themselves, the farmers became convinced that the bite of *O. longinoda* is not a problem that should prevent the ant being used for pest protection on a large scale.

Practicalities

No comparison was made between the effectiveness of *O. longinoda* and spraying with insecticides. But even though pest damage is reduced considerably by

Coating hands in ash deters ants (Monique van Kessel) weaver ants, they might never be as effective as pesticides. This limited efficacy, together with the fact that high coverage of a plantation with ants is difficult to establish, might suggest that the farmer would have to accept a lower yield. This is a very delicate issue, because the Ghanaian farmer does not have a large profit margin. There are several ways to provide additional incentives. One solution would be to increase the price paid to the Ghanaian farmer for cocoa, through a contract with a company interested in buying biologically produced cocoa. Another possibility is the use of neem alongside the ants. Neem shows no negative effects on *O. longinoda* in short-term studies, and there are no indications of long-term effects either, but this should be further investigated. Ultimately, ants and neem could be linked together in a cocoa pest management strategy since neem is a botanical pesticide and can be integrated in organic cocoa production.

Despite the drawbacks, we believe that weaver ants offer the best alternative to insecticides for the Ghanaian cocoa farmer today. As global demand for organic produce is growing and consumers express their readiness to pay a premium for it, biologically based methods have a fair chance of gaining wider acceptance with farmers, as well as among African governments. This method has the potential of bringing us one step closer to sustainable production of cocoa.

Further Reading

O. longinoda; *introduction and husbandry*:

Van Mele, P. & Cuc, N.T.T. (2003) Ants as friends: Improving your tree crops with weaver ants, CABI Publishing, 1st edition.

Communication with farmers:

Ayenor, G.K. (2006) Capsid control for organic cocoa in Ghana: results of participatory learning and action research. Wageningen University Doctoral Thesis.

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CIRAD Explores Wild Cocoa's Potential

Megakarya Resistance from French Guiana

Black pod caused by *Phytophthora* species causes substantial yield losses in all cocoa producing regions, but particularly and increasingly in West Africa – source of 80% of the world's cocoa – since the emergence of the virulent invasive species, *P. megakarya*.

Genetic resistance is a promising way of fighting the disease, but resistant clones have proved to be very few in number. Breeders have begun looking for new sources of resistance in wild cocoa in its South American area of origin. CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement) surveys in French Guiana and subsequent assessment of samples of material that had been collected in two river basins in 1987 revealed clones with resistance to the pan-tropical species *P. palmivora* – and one with resistance to *P. megakarya*, which suggested that the germplasm collected in the area merited closer inspection.

This has been confirmed in a recently published study carried out at CIRAD in Montpellier, France[1] which assessed resistance to an aggressive strain of *P. megakarya* (NS269 from Cameroon) among 59 clones derived from 13 wild populations of cocoa found in five river basins in French Guiana.

Results of laboratory leaf tests, used in place of slower field evaluation (see Box), indicated a high level of resistance, with 49% (29) of the clones classed as 'resistant' and 12% (seven) as 'highly resistant'. Moreover, 13 clones were more resistant than the reference resistant clone (IMC 47), and each of the seven highly resistant clones came from a different wild population.

French Guianan cocoa is therefore a new and important source of resistance to *P. megakarya*, and this could make a great difference in breeding programmes. A larger study will take place within the new Dicacao project (see below). Amongst activities under this project, local strains of *P. palmivora* will be tested against the wild local cocoa clones in the CIRAD collection. The most resistant of these will then be tested in Montpellier with *P. megakarya*. The ultimate goal is to transfer selected clones to Africa for incorporation into breeding programmes.

[1]Paulin, D., Ducamp, M. & Lachenaud, P. (2008) New sources of resistance to *Phytophthora megakarya* identified in wild cocoa tree populations of French Guiana. Crop Protection 27, 1143–1147.

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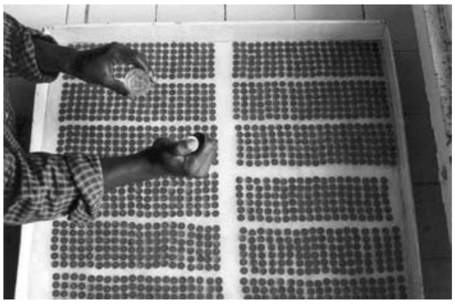
Dicacao: EU Supports Research on French Guianan Cocoa

Wild cocoa trees found in French Guiana have been identified as a source of resistance for fighting some of the world's worst cocoa diseases. Their potential will be investigated in a project aimed at supporting the country's own cocoa farmers.

Leaf tests for pod disease resistance? Why?



Leaf test in the lab (Mathias Tahi)

Speed and efficient use of resources are the key reasons for using the leaf disc test. Assessing resistance has traditionally mostly relied on either observing infection levels in the field, or artificial inoculation tests on attached or detached pods. A major drawback is the time lapse between new crosses and evaluation of resistance: 8–10 years for field observation, and 4–5 years for pod tests. Assessing resistance at an early stage is now a priority for most breeding programmes – and the need for this is particularly apparent for *Phytophthora megakarya* as it spreads inexorably though West Africa.

The leaf disc test is used beneficially for early selection of resistance to *Phytophthora*. The link between the leaf disc test and field results has been confirmed. Researchers compared resistance (a) scored in the laboratory by inoculating leaf discs with *P. palmivora* spores and assessing them seven days later and (b) indicated by percentage of rotten pods in the field assessed over a seven-year period[2]. They found significant genetic (0.71) and phenotypic (0.39) coefficients of correlation between the methods. The leaf test can be used to identify the most promising nursery progenies, which can be planted out for further evaluation.

[2]Tahi, G.M., Kébé, B.I., N'Goran, J.A.K., Sangaré, A., Mondeil, F., Cilas, C. & Eskes, A.B. (2006) Expected selection efficiency for resistance to cacao pod rot (*Phytophthora palmivora*) comparing leaf disc inoculations with field observations. *Euphytica* 149, 35–44.

The three-year Dicacao project, coordinated by CIRAD, has been launched with European Union (EU) funding through the French Guiana Regional Council – ERDF (European Regional Development Fund) Convergence Programme, a programme that supports growth in regions of the EU.

The project will build on CIRAD's previous work in the country[3]. CIRAD has been studying wild cocoa in French Guiana

GU 285: a clone from the Camopi river in French Guiana, in the CIRAD collection in Paracou-Combi, near Sinnamary (P. Lachenaud)

since the mid 1980s, and has established a reference collection of over 350 accessions, some 185 of them clones, from material it collected during three surveys, in 1987, 1990 and 1995. In addition to possessing agronomic and processing performances that sometimes exceed those of cultivated varieties, the wild cocoa trees proved to have high natural resistance to diseases. Tests conducted in a number of countries indicated promising resistance in some of the clones to diseases and mirid bugs[3]. In particular, many clones showed resistance to the pan-tropical species *Phytophthora palmivora* (and its virulent African relative, *P. megakarya* – see above), the cause of black pod, and *Moniliophthora perniciosa*, which causes witches' broom. The new funding will allow further surveys of wild cocoa material, and more extensive study of the clones in the reference collection.

As a first line of investigation, researchers intend to test all clones in this collection for resistance to local strains of the main three cocoa diseases in the country. As well as further research on *P. palmivora* resistance, the aim is also to identify clones resistant to witches' broom and ceratocystis wilt, caused by *Ceratocystis fimbriata* – potentially clones with resistance to all three diseases may be found. This should make it possible to offer French Guianan farmers clones with specific resistance to local disease strains.

A second line of research aims to investigate the potential for biological control of the main cocoa diseases by endophytes. Endophytes live symbiotically with wild cocoa trees, but are generally lost during the domestication process. In some cases where they have been introduced to cultivated cocoa they have boosted disease protection – in Ecuador and Panama in particular. Preliminary data from the upper Amazon Basin show that the endophyte groups there are radically different from those found in Panama. Moreover, they include species from groups not usually known as endophytes. However, current knowledge of the endophyte groups found on wild cocoa is still sketchy. The aim of the second part of the Dicaco project, in collaboration with the United States Department of Agriculture (USDA), is to identify endophytes associated with wild cocoa in French Guiana, and to compare them with those from other parts of the Americas. If laboratory results are positive, the endophytes could be tested further in field trials in French Guiana, by CIRAD and any interested local partners.

[3]Lachenaud, P., Paulin, D., Ducamp, M. & Thevenin, J.-M. (2007) Twenty years of agronomic evaluation of wild cocoa trees (*Theobroma cacao* L.) from French Guiana. *Scientia Horticulturae* 113 (4), 313–321.

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UTZ CERTIFIED Cocoa Programme

Utz Certified, a worldwide certification and traceability programme for responsible coffee production and sourcing, is extending its experience into other commodities which face similar economic, social and environmental challenges – including cocoa, through the 'Good Inside Cocoa Program'. But what difference will certification make to the cocoa industry? Will it be a paper trail to nowhere, or will it make a difference to the sustainability of the cocoa supply and the farmers that underpin it?

The organisation that is now Utz Certified began life as Utz Kapeh (meaning 'good coffee' in Mayan). Set up to be independent from producers and roasters, its aim was to create recognition for responsible coffee producers and tools for roasters and brands to respond to a growing demand for assurance of responsibly produced coffee. In the five years after its first office opened in Guatemala City in 1999, Utz Kapeh developed a code of conduct, a traceability system, independent verification and focused producer support, and in the process become one of the world's largest coffee certification programmes. In March 2007, Utz Kapeh updated its name to Utz Certified 'Good Inside', to reflect its expansion into other commodities.

In its new cocoa programme, Utz Certified is working with different stakeholders in the cocoa industry – Ahold, Cargill, Heinz Benelux, Mars, Nestlé and ECOM Agroindustrial – and local and international NGOs including Solidaridad, Oxfam Novib and WWF (Worldwide Fund for Nature) to develop a code of conduct that reflects minimum requirements for sustainable cocoa production.

The programme is founded on the premise that farmers cannot and do not instigate sustainable cocoa farming practices to improve the cocoa they produce because there is no financial incentive for doing so, and therefore they cannot afford to do it. They often lack the skills and knowledge needed to make changes key to increasing production and improving the quality of their product – but the bottom line is still financial. The goal of the Good Inside Cocoa Program is to develop a credible certification and traceability scheme to ensure both industry and consumers know the cocoa is produced in a sustainable, responsible and safe way. The Utz Certified Good Inside programme aims to improve the livelihoods of cocoa growing communities by creating opportunities for producers to improve their farming and business practices. Through implementing sustainable growing practices, Utz Certified helps farmers to achieve independently monitored criteria reflecting the three pillars of sustainability: social, environmental, and economic, and in doing so improve the vitality of their business. By helping farmers implement good agricultural and processing practices and professional farm management, the programme helps them become more professional farmers and better business men. This results in more efficient production processes, higher productivity, better bean quality, and increased yields, leading to better prices. On top of that producers receive access to new (sustainable) markets and can negotiate a price premium for their certified product based on the principle: a better price for a better product.

The programme is currently in its preparatory phase, with emphasis on organisational structure, development of a draft code, intensive stakeholder consultation and network building, and identifying requirements of a traceability system in cocoa.

- The first draft of the code of conduct was opened for public consultation in February 2008, and the feedback is being processed into a second draft, which will be tested by a limited number of producer groups in pilot projects in Côte d'Ivoire, and subsequently improved, based on the results of these trials to create a final version.

- In capacity building and networking, Utz Certified is working closely with partner Solidaridad, which coordinates support to groups of small-scale farmers to obtain certification.
- The development of a traceability system for tracking certified cocoa throughout the supply chain, from certificate holder to manufacturer, will start soon by tackling sector-specific traceability and chain of custody requirements.

Implementation of the final version of the code of conduct is planned for the first half of 2009, and at this point the first independent certifiers will be trained. The aim is to have the first producer groups certified by the end of 2009, representing some 10,000 farmers and a total volume of 8000 tonnes of beans per year.

Although the initial focus is on producer groups in Côte d'Ivoire, the intention is then to expand the programme to other countries, customising it for local circumstances where necessary.

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Cadbury/UNDP Partnership

A Cadbury-funded study in Ghana which showed that producers were achieving only 40% of their potential yield was the stimulus for the establishment of the Cadbury Cocoa Partnership. Announced in the capital Accra in January 2008, it marked the centenary of Cadbury Brothers' trading partnership with Ghana. The initiative is a long-term commitment to improving farmer livelihoods and farming communities in cooperation with the United Nations Development Programme (UNDP), the Ghanaian Government and other partners, and is designed to secure the sustainable livelihoods of a million farmers in cocoa growing communities across Ghana, India, Indonesia and the Caribbean.

Cadbury is to invest seed funding of US$2 million (UK£1 million) in 2008 to establish the Partnership, with annual funding levels rising to US$10 million (£5 million) by 2010. Seventy percent of the funds will be invested in small farming communities in Ghana. The Cadbury Cocoa Partnership is designed to improve the income of cocoa farmers by helping them increase their yields and produce top quality beans, introduce new sources of rural income through microfinance and business support, and invest in community-led development from schools and libraries to biodiversity protection projects and wells for clean water. The pioneering public–private model will be led from the grassroots up, with farmers, NGOs, governments and international agencies working together to determine how best to spend the money and turn plans into sustainable action.

Research by the Institute of Development Studies, Sussex, and the University of Ghana, Legon, into 'Sustainable Cocoa Production in Ghana', funded by Cadbury, showed that the average production for a Ghanaian cocoa farmer has dropped to only 40% of potential yield, with some farms producing only 4–6 sacks a year. In addition, the researchers found that cocoa farming has become less attractive to the next generation of potential farmers. The Cadbury Cocoa Partnership programme aims to address some of the root causes of these issues. It is investing in research, tools, education and training to help farmers understand how to get more cocoa from their trees, and to improve the quality of their beans, and aims also to attract the next generation into cocoa farming. The Partnership is beginning in Ghana by focusing on:

- Improving cocoa farmer incomes by helping farmers increase their yields and produce top quality beans.
- Introducing new sources of rural income through microfinance and business support to kick start new rural businesses and introduce additional income streams such as growing other crops. Most farms are only some 2–3 ha so making best use of the land is vital to maximising income. Some alternative crops can benefit from growing beneath cocoa trees, whilst coconuts will help cocoa production by providing beneficial shade.
- Investing in community centred development to improve life in cocoa communities, e.g. supporting education through schools and libraries, supporting the environment through biodiversity projects, and building wells. Cadbury will have built over 850 wells by the end of 2008, with each well providing water for around 150–200 people. The company has donated books and provided support to help a number of communities build libraries and education facilities. It has encouraged its UK-based staff at all levels to participate in on-the-ground work with cocoa farmers and biodiversity projects in Ghana [e.g. see *GRO-Cocoa* No. 6, p.9].
- Working in partnership to develop a pioneering model which will be led from the grass roots. Farmers, governments, NGOs and international agencies will work together to decide how the funding is spent and work with local organisations to turn plans into action.

Cadbury will have built over 850 wells in Ghana by the end of 2008

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New EU Pesticide Regulations & West Africa

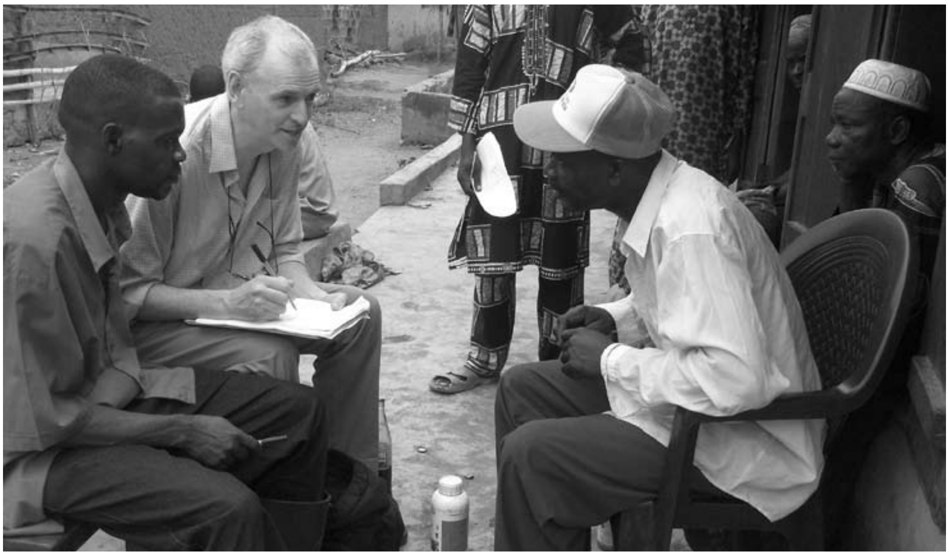
A European industry-led project has been focusing over the last two years on understanding and addressing the implications of new European regulations concerning pesticide residues on the use of pesticides for cocoa in West Africa.

Cocoa is affected by a range of pests, diseases and weeds which, under suitable environmental and cropping conditions, can be destructive and cause reductions in crop yield and quality. Notable amongst these in West Africa are black pod and cocoa mirids, constraints that must be monitored by farmers and managed through timely use of pesticides and good sanitation practices, in particular, to ensure that levels of production and quality are maintained. It is accepted that use of chemical pesticides, namely insecticides and fungicides, is an effective means of eradicating pests and diseases, or at least restricting their impacts to an acceptable level, during crop production, and for maintaining hygienic and pest-free storage areas. Similarly, the use of herbicides allows for eradication of weeds and reduces the need for labour intensive mechanical or hand weeding. Without these, damage inflicted on cocoa trees and beans intended for market may be excessive, leading to reductions in income which impact heavily on smallholder farmers.

There are, however, significant drawbacks with chemical pesticides, including health risks to farmers, retailers and others involved in their manufacture, supply and use. They may also cause damage to the environment, by harming, killing or contaminating other plants (including crops grown alongside cocoa), animals and microorganisms. Many of these non-target organisms, such as predatory beetles, pollinators and earthworms, are beneficial for keeping other pests and problems in check, and maintaining a balanced ecosystem suitable for crop production. Pesticides may contaminate the soil and waterways, resulting in long-term damage far beyond the locality in which they are used. Finally, and importantly, pesticides may find their way into cocoa beans, cocoa nibs and, ultimately, cocoa-based products such as chocolate and other confectionary, cocoa powder, biscuits and cakes, thus constituting another risk to the health of unsuspecting consumers, including children. These negative aspects must be given consideration before any chemical is purchased and used, bearing in mind that alternative control measures are often available. These alternatives can be as effective as chemicals, and are usually much less hazardous and less expensive. It is also possible, through careful consideration of products available, to select chemicals that are as effective, but much less hazardous, than others on the market.

In order to help safeguard the health of humans and animals, and prevent contamination of the environment, the European Union (EU) will shortly be implementing new regulations which will apply across the whole of the EU and, for the first time, will stipulate the maximum level of chemical residue (MRL) that is permissible in cocoa nibs imported into the EU. A specific MRL will be set for each of the key ingredients (known as 'active substances') present in chemical products, whose toxicity is responsible for control of the pest, disease or weed.

Cocoa consignments entering Europe are routinely checked at the port of entry for chemical residues. Where the level of a particular chemical in the nibs is found to exceed the MRL, it is likely that the shipment will be rejected. The regulations are primarily intended to protect consumers of cocoa products in Europe. However, by highlighting the need to use pesticides appropriately so that residue levels are not exceeded in cocoa destined for Europe, the regulations will also help to protect those involved in production, handling and processing of cocoa. As described below, direct support is also being provided by the European cocoa industry to help cocoa producing countries in West Africa meet the needs of the new regulations, which will come into force in September 2008. For further information and advice on the MRLs and the new regulations, see the article: 'Minimising impacts of EU pesticide regulation' in *GRO-Cocoa* No. 10, or contact ECA/CAOBISCO (the European Cocoa Association and the Association of the Chocolate, Biscuit & Confectionery Industries of the EU) or the ICCO (International Cocoa Organisation) (see below).



Interviewing a farmer in a village in Nigeria and recording responses as part of a survey of cocoa production and chemical use (Photo: S. Agbeniyi, Cocoa Research Institute of Nigeria – CRIN)

Appropriate Chemical Use: Identifying Problems and Raising Awareness

In West Africa, certain chemicals are authorised and approved for use on cocoa in each producing country. However, it is acknowledged that these are often used in an inappropriate and unsafe manner while other, non-approved and often highly toxic products are also accessible and are being applied by farmers and traders. Unfortunately, a lack of accurate and up-to-date information on precisely what products are being used, where and by whom has so far constrained efforts to effectively tackle such problems.

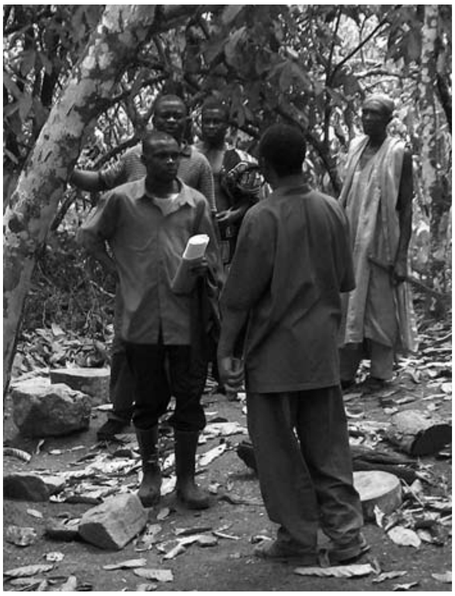
In 2007 a research project, entitled 'Safe cocoa, sustainable production: a concerted programme by the cocoa and chocolate industries to understand and address market changes regarding pesticide acceptability', was initiated to help resolve these problems. The project is funded by the Netherlands Ministry of Agriculture, Nature and Food Quality (via the Dutch Subsidy Scheme for Sustainable Development of the cocoa and chocolate sector) and jointly managed by ECA/CAOBISCO. CAB International (CABI) is providing technical expertise and coordinating research and development activities in each of four collaborating countries – Cameroon, Côte d'Ivoire, Ghana and Nigeria – the major producers and suppliers in the region of cocoa destined for the European market. ECA/CAOBISCO has formed a Pesticides Working Group comprising representatives of pesticide manufacturers, processors, research organisations and other sectors of the European cocoa industry. The Group's remit is to discuss and review issues relating to the new legislation and to negotiate with the European Commission (EC) to ensure that realistic and workable MRLs are established for substances considered necessary, and recommended and approved for, the cocoa trade.

The project has gathered, principally through stakeholder surveys, comprehensive and up-to-date information on the use of pesticides in each country by those involved in the production and onward transfer of cocoa to the local and international market. Key among those consulted were farmers, farmer associations, societies and cooperatives (these organisations often treat bulk consignments of cocoa following collection from their members), private licensed buying companies (LBCs) and exporters. The opinions of local chemical retailers were also sought with regard to products intended for use on cocoa, or known to be sold specifically to cocoa farmers and traders. The project sought to obtain data on all chemical products being used by cocoa producers and handlers, as opposed to those used specifically to treat cocoa, as their use may also, deliberately or inadvertently, lead to contamination of the cocoa crop. To support the in-country research, analysis of nibs obtained from cocoa consignments entering Europe has enabled chemical residues contaminating the nibs to be identified and quantified, also enabling actual residue levels to be compared with the MRLs the EU intends to set for each active substance.

The project has now reached a stage where a large number of chemical products supplied to, and used by, the various cocoa stakeholders has been identified, along with the active substances they contain. More than 50 different products, containing more than 20 different active substances, have been shown to be used by cocoa farmers and the various post-harvest cocoa trading organisations in Côte d'Ivoire. A similar number was found in Cameroon and Ghana. Approximately 40 products and 12 active substances have been recorded for Nigeria (data being finalised). Coupled with the findings from the residue analyses and current information on expected MRLs, it has been possible to identify those active substances likely to present a threat to future exports, if current pesticide use practices and consequent residue levels remain unchanged. Key points in the cocoa supply chain where contamination by particular active substances is likely to occur can also now be identified.

The Way Forward for Producing Countries

Ideally, and as a means of risk assessment and quality control, the occurrence of pesticide residues should be routinely monitored throughout the supply chain in producing countries or, at minimum, checked prior to a consignment being shipped. At the present time this is not feasible in West African countries or, at best, is constrained by a lack of suitable laboratory facilities and monitoring protocols.



Discussing cocoa production and chemical use with farmers in Nigeria (Photo: S. Agbeniyi, CRIN)

Active Substances Used on Cocoa but Not Approved for Use in the European Union

Active substance	Action*	Active substance	Action*
Acephate	I	Hexaconazole	F
Aldrin	I	Isoprocarb	I
Allethrin (Esbiothrin)	I	Lindane	I
Ametryn	H	Malathion	I
Amitraz	I	Metalaxyl (unresolved)	F
Atrazine	H	Methomyl	I
Azinphos-methyl	I	Methylbromide	I
Benomyl	F	Monocrotophos	I
Captafol	F	MSMA (methyl arsonic acid)	H
Carbaryl	I	Parathion-methyl	I
Carbofuran	I	Permethrin	I
Carbosulfan	I	Profenofos	I
Cartap	I	Promecarb	I
Cyhalothrin	I	Propoxur	I
DDT	I	Pyrifenox	F
Diazinon	I	Terbufos	I
Dichlorvos	I	Tetramethrin	I, F
Dieldrin	I	Triadimefon	F
Dioxacarb	I	Tridemorph	F
Diuron	H	Zineb	F
Endosulfan	I		
Fenitrothion	I	*** Action**	
Fenobucarb (BPMC)	I	**F = fungicide**	
Fenvalerate	I	**H = herbicide**	
Fomesafen	H	**I = insecticide**	

Based on our current understanding of chemical use, it is now vital that collective action is taken to address the supply and use of products containing problematic substances. This will largely be at the discretion of the producing countries, and may necessitate withdrawing, or further restricting, the use of certain products. In some instances the continued supply and use of products already prohibited for any purpose, or even for cocoa specifically, has been observed, a situation that must be addressed through more rigid enforcement measures. Steps must also be taken to ensure that products approved for cocoa are provided and used in an appropriate manner, to ensure that excessive residues do not accumulate in nibs and that the health and safety of suppliers and users is protected. Such improvements may be achieved by a variety of awareness raising activities, which form the focus of the latter stages of the project.

The project stakeholder surveys not only identified products and active substances, but also provided information as to the manufacturer and supplier, reasons for use, the manner in which they were applied and any safety precautions taken. As such, specific areas of inappropriate supply and misuse have been identified that may now be addressed as part of the awareness raising campaigns.

Information was also acquired as to whether training had already been received by, or provided for, the various stakeholder groups, how this was provided and which information resources are considered to be the most appropriate and accessible. For in-country awareness raising efforts to be successful and achieve sufficient impact, close collaboration will be required between the research community, agricultural extension services, chemical manufactures and suppliers, governmental departments responsible for authorisation of products, farmers, local trade organisations and exporters.

Although they can vary markedly in level of toxicity, all agricultural chemicals can be hazardous, especially if not transported, prepared, applied and disposed of according to what is commonly defined as 'good agricultural practice' (GAP). It is possible to reduce the level of risk associated with pesticides while still maintaining adequate pest, disease or weed control. In the first instance, and only if chemical use is considered essential, a pesticide suitable for the intended purpose should be selected and purchased. Secondly, clear instructions or guidelines on using the pesticide properly should be obtained and thoroughly checked to ensure that those using the chemical are able to fully adhere to the instructions. This may necessitate the use or purchase of special equipment, including safety equipment. In particular, where GAP is adhered to for use of a specific chemical for a specific crop or purpose, then the chemical will be prepared and applied as specified on the product label for that crop or purpose. As such, it should not present an unacceptable risk in terms of health, the environment or amount of chemical residue contaminating the agricultural produce.

Recommendations

The European cocoa industry strongly encourages efforts to avoid using pesticides that are not approved for use in the EU (see Box, p. 7) as the MRLs for most of these are set at the detection limit.

When applying a pesticide, the instructions on the label must be followed in order to protect the operator from safety risks and to prevent residue levels from exceeding the MRL. Following the instructions is of particular importance when using pesticides (insecticides) on beans during storage as the pesticides are sprayed directly on the beans.

Further Information

The ECA/CAOBISCO Working Group has been instrumental in initiating and overseeing the pesticides project described here, and in working with the EC to ensure that the needs of the industry, both in the cocoa producing countries and in Europe, are catered for. In some instances, and based on the underlying need for a particular pesticide, it may be possible for producing countries to apply for a revision (i.e. increase) in the MRLs being established by the EC. Given the close working relationship with the EC and understanding of the mechanisms underlining the new legislation, the ECA/CAOBISCO Working Group can provide advice and assistance where submission of an application for a revision is deemed appropriate.

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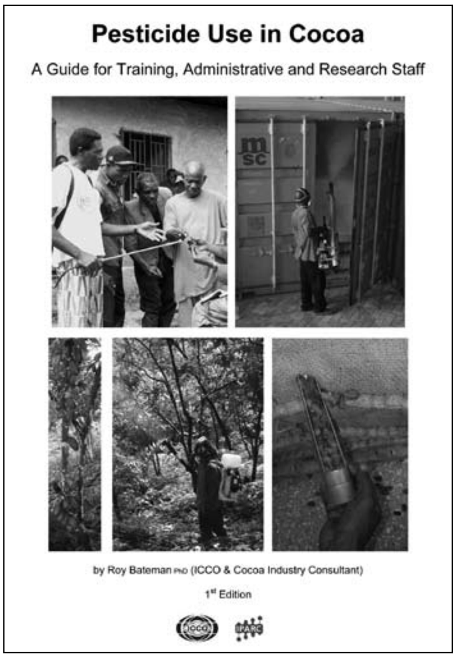

Pesticides in Cocoa: a Guide for All

Recent changes to legislation in the European Union (EU) and Japan have concentrated minds over crop protection practices in cocoa and other commodity crops – most people will have read the preceding article and concluded they need to know more about pesticides. A new guide to pesticide use in cocoa meets this need.

As the author Roy Bateman explains: from 1 September 2008, assessment of the quality of cocoa imported into the EU will include measurement of traces of substances used upstream in the supply chain, including pesticides used on farms or in storage. The crop protection activities of farmers and middlemen will therefore be of great concern to all in the cocoa trade, some of whom may have a limited working knowledge of pesticide science. Pesticides have a poor public image and are known to present dangers to both people and the environment. Nevertheless insects, diseases and other pests of cocoa must be controlled effectively as well as safely. Pesticides can provide useful control solutions, but must be approved for use on the basis of good agricultural practice (GAP). Unfortunately up-to-date GAP has yet to be established in many cocoa growing areas.

This manual is, as indicated by its subtitle, 'A Guide for Training, Administrative and Research Staff', and is thus aimed at everyone in the cocoa sector, however remotely affected by pesticide issues.

It begins with a summary of registration and legislation, followed by an overview of pesticide science that also addresses administrative and technical issues. It then helps define a 'road map' for establishing good crop pest control and storage and distribution practices for bulk cocoa. Further useful aspects include specific reference to compounds that are, or may be, used on cocoa, and emphasis on product selection and application by smallholders. The manual is completed by a list of relevant web-based, and other, resources.

The author welcomes all comments and suggestions, for future versions of this dynamic – in both senses of the word – document.

Bateman, R. (2008) *Pesticide use in cocoa: a guide for training, administrative and research staff. 1st Edition, June 2008*. ICCO/IPARC, London/Ascot, UK, 56 pp.

Download from: www.icco.org

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