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Public/private partnerships in agroforestry: the example of working together to improve cocoa sustainability

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Abstract

As information on the economic, environmental and social benefits of cocoa has grown, so has the understanding that only a coordinated effort by all stakeholders can ensure cocoa sustainability. This chapter describes how challenges to cocoa supplies brought seemingly disparate – if not competitive – groups together in unique public/private partnerships. While it is not meant to be an exhaustive listing of every initiative that has been developed, it provides an overview of how working across sectors has benefited all of those involved in the cocoa industry – corporations, governments, nongovernment organizations and individual farmers. The progress they have made and the lessons learned from these partnerships will help frame policies and practices aimed at ensuring a healthy future for all involved in the cocoa industry, and be a model for such initiatives for the development of other shaded perennial crops in agroforestry systems.

Introduction

Although cocoa (*Theobroma cacao* L.*)* has a history dating back some 2000 years, the full extent of its contributions to the global economy, its vital role to its surrounding environment, and its social impact on its farmers and their communities are only now being recognized. Approximately 3 million tons (3×10^6 Mg) of cocoa beans are produced annually, with an average market value of approximately $4 billion (www.chocolateandcocoa.org), but the supply is fragile.

Editors' Notes

Unlike the other chapters in this volume, this chapter is not a scientific review, but is a summary of reflections and experiences of leaders of research and development in industry and public institutions. Such information cannot be obtained from scientific literature. The rationale for including such an account in this volume is that public/private partnerships of this nature could be a promising strategy for development of other perennial cash crops such as coffee (*Coffea* spp.), black pepper (*Piper nigrum*), and tree spices that are grown in shaded-perennial agroforestry systems.

Most scientific literature uses the term 'cacao' to refer to the plant *Theobroma cacao* L., but the product of commerce from the plant is known as 'cocoa'. In order to avoid the confusion that may arise from repeated use of these two similar terms, the 'cocoa' is used in this chapter to refer to both the plant and its products.

Native to the upper Amazon basin, cocoa trees, the source of cocoa beans, require constant warmth and rainfall to survive – they grow only in tropical regions within 20 degrees of the equator. Because they need protection from sun and wind, they grow well as part of a multilayered agroforest, rather than in plantation-style cropping. When grown in the open, the full-sun environment initially increases yields but in the long term creates stress on the trees and makes them more susceptible to pests and diseases. Small family farms are the heart of the cocoa industry, with 5 million to 6 million smallholder farmers providing more than 85% of the world's cocoa bean crop (World Cocoa Foundation, www.chocolateandcocoa.org). Typically, each cocoa farmer owns less than 2 ha of land and may grow approximately 1000 cocoa trees. In ideal conditions, the trees can produce fruit for 75 to 100 years.

An estimated one-third of the world's cocoa crop is lost to pests and diseases every year, having potentially devastating impact on small-scale farmers whose livelihoods depend on healthy crops. Economic conditions and political environments of cocoa producing countries are sometimes uncertain and chaotic. And

many of the small-scale farmers lack the training and resources that can make them more successful.

Many groups have an interest in the issues facing cocoa: the chocolate industry needs a stable supply of raw ingredients, environmental groups seek to preserve the wildlife habitats that cocoa creates, development groups aim to raise rural incomes, and governments look to support domestic agricultures. Most efforts by these groups prior to late 1980s were limited in scope and not coordinated in any strategic or cohesive way. During the past decade, however, these varied interests have begun to unite. As cocoa stakeholders recognized that a sustainable agricultural system could meet current economic, social, and environmental needs as well as those of the future, they also began to recognize that a truly sustainable cocoa supply would require coordinated efforts of all interested parties. 'In the last several years, relationships have emerged, frameworks were created, and common goals established. Unique, successful public/private partnerships among industry, governments, international donor and development organizations, nongovernment organizations, and cocoa farmers now share knowledge and resources to build a sustainable cocoa supply chain. These are significant developments that have aided efforts to improve the economic and environmental sustainability associated with the global cocoa supply' (J. Lunde, pers. comm., December 2003)[1].

These cooperative partnerships were established with the following objectives:

- Raise the standard of living for small-scale cocoa farmers,
- Create stability in cocoa-producing communities,
- Improve surrounding ecosystems,
- Create jobs globally for cocoa producers and farmers of associated products, and
- Provide quality raw materials to satisfy consumer demand for chocolate and chocolate products.

Collectively, these efforts have shaped consensus around promoting the farming and marketing of quality cocoa, improving market access and income for small-scale producers, and creating systems that are environmentally friendly, socially responsible, and economically sustainable.

Early efforts to improve cocoa production

For almost a century, processors of cocoa and manufacturers of chocolate products in the developed world have formed cocoa- and confectionary-related trade associations, most of which funded and administered research, promoted chocolate to the general public, and advocated for the industry in dealings with government agencies. Several of these associations were tied to tropical research stations in cocoa-growing countries, which had ties with western countries dating from colonial periods.

In 1930, the International Office of Cocoa, Chocolate, and Sugar Confections (IOCCC) was created for efficient sharing of scientific, technical, and market research. Early members included most of the major manufacturing trade associations and represented the global reach of cocoa, such as the Chocolate Manufacturers Association of America (CMA); the Confectionery Manufacturers of Australasia; the Brazilian Chocolate, Cocoa & Confectionery Manufacturers Association (ABICAB); the Association of the Chocolate, Biscuit and Confectionery Industries of Europe (CAOBISCO); and the United Kingdom's Biscuit, Chocolate, Cake and Confectionary Alliance (BCCCA). Today, the IOCCC represents more than 2000 companies in 23 countries.

Coordinated efforts to improve cocoa cultivation began in the late 1940s. The American Cocoa Research Institute (ACRI), created by the CMA, helped establish a cocoa research and training center in Turrialba, Costa Rica, to teach farmers modern production methods. The center was associated with the Inter-American Institute for Cooperation in Agriculture (IICA), an agency of the Organization of American States (OAS). In the mid-1960s, ACRI began awarding annual grants to the Centre for International Cooperation for Agricultural Research and Development (CEPLAC), a cocoa research center in Brazil, to assist that country's efforts to improve cocoa production efficiency. As an ancillary effort, CEPLAC examined the social benefits that resulted from industrialization of cocoa. Also during this period, ACRI began participating in numerous cooperative activities with the U.S. Department of Agriculture (USDA), including establishing a cocoa varietal collection and protection station in Puerto Rico. In 1973, the International Cocoa Organization (ICCO) was established under the aegis of the United Nations to maintain cocoa price stability through buffer stocks. It has since grown to become a global forum for gathering and disseminating information on cocoa, as well as for promoting the findings of cocoa research, including economic studies of cocoa production, consumption and distribution.

Some of the international agricultural institutions that were established in the 1960s also had an interest

in, if not a mandate for, improving cocoa farming. For example, the International Institute of Tropical Agriculture (IITA) that was founded in 1967 at Ibadan, Nigeria, to conduct research to improve food production in the humid tropics and to develop sustainable production systems, had interest in improving cocoa farming systems.

In the early 1980s, as emphasis on genetics research increased, the Cocoa Research Unit (CRU) in Trinidad, aided by the BCCCA, obtained funding from the European Development Fund for a program focused on cocoa germplasm conservation. This became the International Cocoa Genebank, Trinidad (ICG,T), where nearly 3000 cocoa germplasm samples from around the world are stored. CRU and ICG,T are now supported by the governments of Trinidad and Tobago, as well as the BCCCA.

In the mid-1980s, another important partnership was formed among governments of cocoa-producing countries, national research centers, and IOCCC. This partnership set out to identify the best economic management systems for cocoa production in the presence of witches' broom fungus (*Crinipellis pernicosa*), a cocoa disease that can have devastating effects on the crop[2]. South American countries were the primary participants in the project, which successfully identified more stringent husbandry requirements for producing cocoa in a witches' broom area. In 2000, the World Cocoa Foundation (WCF) (www.chocolateandcocoa.org) was created by cocoa industry members to focus on cocoa sustainability issues, such as training smallholder farmers and stimulating global investment in crop production. ACRI continues to be devoted to research in all scientific areas related to cocoa and chocolate.

Global threats spur broader efforts at partnerships

These efforts proved insufficient, however, when in 1989, witches' broom broke out in Bahia, Brazil, the largest South American cocoa producer at the time. Damage to the crops was so severe that production dropped by more than 70% in less than 10 years, changing the status of Brazil from a major cocoa exporter to a cocoa importer. According to Lunde[1], 'No one had seen devastation like this before. We were thinking that if this spreads to Africa, the results would be catastrophic. Brazil's experience opened everyone's eyes to the fact that a global, cooperative effort was needed to protect cocoa.'

Other threats around the world emphasized that need. In Malaysia, cocoa production grew rapidly in the 1970s and 1980s, but dropped off significantly through the 1990s, mainly due to the insect pest, cocoa pod borer (*Conopomorpha cramerella*)[3]. Damage to the crops was so severe that the increased work required to complete a harvest nearly devastated the industry.

In West African countries, privatization was presenting its own challenges. The governments of the region's major cocoa producers, Cote d'Ivoire and Ghana, previously controlled the entire cocoa market from farmer to port, but state commodity boards were starting to give way to liberalized markets due to pressure from industrial countries, including the G-7 and the International Monetary Fund (IMF). The short-term effect was a general decline in the character of the cocoa market, creating undesirable effects such as the degradation of cocoa quality and increased risks for banks and international traders, which in turn reduced financing available for smallholder farmers.

On a worldwide scale, the decline in Brazilian production was temporarily mitigated by the rapid rise in Indonesian cocoa production, which grew steadily through the 1980s and 1990s. Indonesia enjoyed good yields, an efficient supply chain, and, significantly, farmers received a fair proportion of the world market price. Unfortunately, the cocoa pod borer (CPD) arrived in 1993, threatening to decimate the Indonesian cocoa sector just as it did in Malaysia. In response, ACRI, the United States Agency for International Development (USAID), and the Indonesian Cocoa Association (ASKINDO), organized a workshop in Indonesia to review research and approaches to controlling the CPB. As a result, another partnership was formed – ASKINDO, ACRI and the United Kingdom's Biscuit, Chocolate, Cake and Confectionary Alliance (BCCCA) joined together to establish the Cocoa Pod Borer Management Project (CPBMP) to verify the effectiveness of the workshop recommendations of pruning, frequent harvesting, and targeted spraying. Implementation of farmer-training and technology-transfer was underwritten through United States' food assistance funds, which are tied to loans made in the currency of the recipient country and to be used for food and agricultural assistance programs. To date, these funds have been used successfully to promote sustainable tree crop efforts, including cocoa, in Indonesia and Bolivia. 'Decision- and policy

makers in the cocoa and confectionary industry began to realize that the threats to cocoa were enormous – they were not going to wipe out one company, they were going to wipe out the industry.' 'By the mid-1990s, people started changing their vision. Their approach was moving from short-term individual projects to more long-term projects based on a common vision for the industry' (P. Petithuguenin, pers. comm. November 2003)[4].

As chocolate manufacturers worried about supply and governments worried about rural incomes in the developing world, environmental groups were taking notice of the effect of rainforest destruction on wildlife. For example, the Smithsonian Institute determined that migratory bird populations in North America had been declining for a decade, mostly due to farmers harvesting canopy trees for income and in related efforts to increase agricultural production (Smithsonian Tropical Research Institute, www.stri.org). The seemingly unlikely link between environmentalists and the cocoa industry was forged when it was reported that a newly discovered species of bird, the pink-legged graveterio (*Acrobatornis fonsecai)*, faced extinction, largely due to opening up the birds' canopy tree habitat to make up for cocoa production losses from witches' broom. 'Scientists at our Institute (Smithsonian Tropical Research Institute – STRI) have long been interested in understanding how tropical forests function – how the vast diversity of the tropics originated and is maintained. We were intrigued by research on traditional, small-scale, shade-grown cocoa plantations that implied that such farms could be effective in conserving much of the forest's natural diversity' (L. Barnett, pers. comm. November 2003)[5].

At the same time, breakthrough research on rainforest destruction was being conducted at STRI (T. Lovejoy, pers. comm. November 2003)[6]. Lovejoy believed that one way to save the rainforest was to encourage sustainable income-producing activities – such as growing cocoa. He introduced representatives from Mars, Incorporated, one of the world's largest chocolate producers, to researchers from STRI and the Smithsonian Migratory Bird Center, which had then conducted a workshop on sustainable coffee (*Coffea* spp.) production and its role in protecting migratory bird habitats. These introductions led to the so-called Panama Conference, which would later become recognized as an important event to date in the sustainability movement.

The cocoa community gathers at the Panama Conference

On April 2, 1998, the Smithsonian Migratory Bird Center and the Smithsonian Tropical Research Institute convened a conference in Panama at which 85 representatives from industry, environmental groups, foundations, universities, and agricultural research centers gathered to discuss sustainable cocoa production. 'The cocoa industry's need to protect cocoa trees aligned well with our research into ways in which naturally occurring, potentially beneficial fungi may contribute to plant growth and survival and specifically, may help keep plant diseases in check,' said Barnett of STRI (L. Barnett, pers. comm. December 2003)[5]. Officially named the First International Workshop on Sustainable Cocoa Growing, but referred to as the Panama Conference, participants embraced the idea that cocoa grown within a biologically diverse and environmentally sustainable agricultural system is capable of providing long-term economic, social, and environmental benefits to the millions of small-holder farmers who are uniquely better placed to cultivate cocoa.

The consensus statement of the Panama Conference established five principles, which currently guide the public/private efforts. Specifically, it said that sustainable production of cocoa will:

- Be based on cocoa grown under a diverse shade canopy in a manner that sustains as much biological diversity as is consistent with economically viable yields of cocoa and other products for farmers;
- Use constructive partnerships that are developed to involve all stakeholders with special emphasis on small-scale farmers;
- Build effective policy frameworks to support these partnerships and address the particular needs of smallholder farmers for generations to come;
- Encourage future cocoa production that rehabilitates agricultural lands and forms part of a strategy to preserve remnant forests and develop habitat corridors; and
- Maximize the judicious use of biological control, techniques of integrated management of pests, disease, and other low-input management systems.

Conference participants concluded that cocoa was a low-input small-farm crop, not a plantation crop; that cocoa could be a source of biodiversification, not a cause of rainforest destruction; that cocoa was essentially an 'orphan crop' that had not received the public

and private sector support as other major agricultural commodities such as corn (maize, *Zea mays*), wheat (*Triticum* spp.) and soybeans (*Glycine max*); and that a focus on improved cocoa cultivation required a multifaceted effort that included training, technology transfer, credits, and improved genetic materials.

'The public/private partnership got off the ground in a substantive way starting with industry engaging governments, research institutions, development institutions and conservation agencies. The goal was to develop a holistic, integrated approach for not only the environmental sustainability of cocoa bean production, but more importantly the economic sustainability of private sector-led growth in the rural areas, both on the farms and in the local markets' (J. Lunde, pers. comm. December 2003)[1].

As the cocoa industry, governments, NGOs and environmentalists discovered synergies, a number of participants from USAID, USDA, the World Bank and foundations met in 1999 to develop a comprehensive, integrated approach to cocoa research. Similar to the consensus achieved in Panama, the delegation concluded that cocoa was not adequately supported in terms of extension, farmer organization, research, technology transfer, and market access. The delegation ended with a major industry and government review in Paris that led to the 'Paris Declaration,' through which all stakeholders pledged to work toward a sustainable cocoa economy. 'The entire cocoa supply chain began recognizing the multi-dimensional benefits of cocoa and coming together in ways that we never imagined' (B. Guyton, pers. comm. November 2003)[7].

Other examples of partnership

The West Africa Sustainable Tree Crops Program (STCP) is another example of the industry coming together, in this case, to address the needs of cocoa farmers to improve the economic, social and environmental conditions of small-scale farmers (www.treecrops.org). Managed under the leadership of IITA, the STCP is guided by a steering group of stakeholders representing the cocoa-growing regions, research, government, NGOs, and the global chocolate industry. The four basic program components of STCP are research and technology transfer, grower and business support services, policy change and implementation, and market and information systems. The original focus of STCP was to increase incomes and wellness, as well as promote environmental protection. More recently, it has also been addressing the needs of children in cocoa-farming communities. STCP pilot projects are in progress to compare, test, and validate different approaches and interventions to develop sustainable and integrated agricultural production systems in Cote d'Ivoire, Cameroon, Ghana, Guinea, and Nigeria. The overall goal of STCP is to improve the livelihood of rural cocoa producers in West Africa by improving their ability to respond to the demands of global markets. 'Suddenly we had an integrated model that went beyond any single issue. By working with private industry, we were able to raise visibility of our efforts and become much more credible in terms of gaining support from the cocoa farmers, other interested parties, and from the general public' (S. Weise, pers. comm. October 2003)[8]. In one respect, the role and experience of the IITA in the STCP effort underlines the policy deficiencies in the current international agricultural research scheme, particularly in regard to sustainable tree crops traded as commodities. Although the IITA was given responsibility for the coordination of cocoa improvement in Africa in the absence of a dedicated international center, its role is limited to Africa in the short to intermediate term, and does not address global problems related to germplasm exchange, exploitation of genetic resources, and the provision of long-term credits. Additionally, the STCP initially suffered from a limited integration of existing public and private sector cocoa research programs. By working together, however, public and private stakeholders have addressed many of these issues.

A parallel effort, initiated in 1994 by the USDA, the (United States) Department of State, focused on the cash crop requirements of farmers in the Andean Region. Although initially oriented toward reducing cultivation of illicit *coca* (*Erythroxylum coca*), from which cocaine is derived, funding for this effort provided an impetus for Integrated Pest Management of cocoa diseases and a coordinated international genetic improvement effort. Originally focused on U.S. security concerns in South America, in fiscal year 2000, the U. S. Congress enlarged USDA's appropriations language to address the needs of smallholders in West Africa, which demonstrated a growing, broader recognition of the global importance of cocoa cultivation.

Goals of the public/private partnership

Because agriculture will likely continue to be the main source of economic growth for many developing countries in several decades to come, cocoa industry stakeholders are beginning to recognize that cross-sector partnerships are the only way to effectively improve all facets of the cocoa supply chain, including breeding, pest and disease research, productivity and quality, technology transfer, and marketing and market access. Specific roles for the private sector, governments, and donor community are envisaged in these partnerships.

Private sector

The private sector in any industry is concerned with ensuring adequate raw material supplies to produce the products for which it has created demand. This is certainly true in the cocoa industry, but the sustainability of public/private partnerships also has made chocolate manufacturers more sensitive to the broader issues surrounding their business. Consequently, the industry is embracing the notion that sustainability has economic, social and environmental dimensions that it must be aware of and actively address.

The private sector also brings a global perspective and knowledge of the efficient operation of worldwide cocoa markets, including a sense for the key quality drivers that differentiate chocolate brands and trends in consumer demand. The industry is also in a position to educate the consumer on issues faced by rural small-scale farmers. 'By tapping into the knowledge and experience of the private sector, we created much stronger efforts across the board. There was a new global realization that governments alone cannot solve all problems, and neither can institutions' (C.L. Brookins, pers. comm. November 2003)[9].

Public sector

In the public sector, governments are creating environments in which other stakeholders can cooperate. By acting as facilitators and organizers, governments and parastatal organizations, nongovernment organization (NGOs), and the private sector can work together to support community development activities and assist disadvantaged groups in gaining greater access to resources and markets. In a recent example, USAID acknowledged valuable lessons learned working with other commodities and created a framework for smallholder cocoa farmers to benefit from globalization, to access technological innovations, and become more competitive. The goal was not to create a new institution; rather, it was to create a network that allowed existing groups to communicate more effectively (J. Hill, pers. comm. September 2003)[10]. 'The U.S. government was able to work as an inter-country facilitator and bring together resources from a broad variety of groups. U.S. agencies brought fundamental knowledge and understanding of how to research the crop's diseases and implement disease control measures and we were able to learn from their experiences' (J. Lunde, pers. comm. November 2003)[1].

At the USDA, focus was on domestic production of commodity crops such as peanuts (*Arachis hypogaea*), cotton (*Gossypium* spp.), soybeans, and wheat. But as the global importance of cocoa sustainability became more apparent, the USDA adopted a more global view regarding cocoa that linked its production with maintaining economic stability for U.S. chocolate producers and producers of related commodities – dairy, sugar, and peanuts.

The USDA conducts its research through its Agricultural Research Service (ARS), which has more than 130 locations in the United States, Puerto Rico, and five other countries. Originally ARS tropical crops division targeted coffee, bananas (*Musa* spp.), and oil palm (*Elaeis guineensis*), with programs oriented toward the U.S. foreign aid effort in Central and South America. ARS has since expanded its tropical agriculture program to include a range of activities for pest management, genetics, and breeding, as well as noncommodity programs such as nutrition and endangered plant species.

Mars, Incorporated, the USDA/ARS and their international partners are currently involved in a cooperative effort to study ways to use integrated pest management systems that combat cocoa pests and diseases through natural bio-control agents. The effort is being conducted under a Cooperative Research and Development Agreement (CRADA), which allows the Federal government and non-Federal partners to optimize their resources, share technical expertise in a protected environment, share intellectual property emerging from the effort, and speed the commercialization of federally developed technology.

ARS was chosen 'because they have the research capabilities and mindset of a university and the problem-solving mission of the private sector' (J. Lunde, pers. comm. November 2003)[1].

Development/donor organizations

Until recently, many development organizations funded agricultural projects as a way to fulfill their goals of improving security, eliminating poverty, and protecting the environment in developing countries, but none had programs specific to cocoa. An example is the Consultative Group on International Agricultural Research (CGIAR) centers; IITA is one of the several such 'CG' centers (www.cgiar.org). CGIAR is an informal association of more than 40 governments and 15 international organizations and private foundations, created and committed to address food security needs of the poor in developing countries. As mentioned earlier, cocoa was not viewed as a priority in CGIAR programs, because the major emphasis was on commodities that are locally produced and consumed in developing countries, emphasizing a supply-oriented concern and effort to raise the availability of food.

That view began to change after an October 1999 meeting convened by the World Bank. Participants included officials from the United States, United Kingdom, France, Japan, the European Union, the United Nations, the Ford Foundation, and the Rockefeller Foundation. In a workshop on public/private partnerships in Africa, chocolate industry representatives explained their concern for needing a stable long-term supply of cocoa, which meant focusing on supporting small-scale farmers and stabilizing the tropical farm. The meeting resonated with the donor organizations, which saw an opportunity to improve lives of rural people in the tropics by improving cocoa production. 'There is a wide body of research from the World Bank and from ACRI demonstrating how integrated the agricultural sector is with other aspects of the world economy, so that any improvement in revenues going into improving agriculture efficiencies is going to have a multiplier effect in terms of reducing poverty and giving people choice and opportunity.' said Brookins (C. L. Brookins, pers. comm. November 2003)[9].

Early successes of private/public partnerships

In the five years since the Panama Conference, cocoa sustainability efforts have generated remarkable results.

Breeding programs

A number of breeding programs are underway around the world to develop cocoa varieties with resistance to various pests and diseases, such as the CRADA between Mars and the USDA centered at the National Germplasm Repository in Miami, Florida. Research and germplasm management continues at International Cocoa Genebank, Trinidad (ICG,T); the Tropical Agronomic Centre for Research and Education (CATIE), Costa Rica; the USDA National Plant Germplasm System; the International Cocoa Germplasm Database (ICGD) and facilities such as University of Reading and the CIRAD facility at Montpellier, France, where potential transplants are quarantined for safety precautions before being delivered.

Worldwide cocoa breeding also has been strengthened by projects such as the 'Project on Cocoa Conservation and Utilization: A Global Approach,' which was designed to help smallholder farmers achieve sustainable production of cocoa and to reduce their need for expensive inputs by developing better varieties and through more efficient conservation and use of cocoa genetic resources. The project was developed by the International Plant Genetic Resources Institute (IPGRI) and the ICCO and is supported by CIRAD, ACRI, BCCCA, CFC, and the University of Reading, UK. The cocoa producing countries involved in the project are Brazil, Cameroon, Côte d'Ivoire, Ecuador, Ghana, Malaysia, Nigeria, Papua New Guinea, Trinidad and Tobago, and Venezuela.

Also, to ensure that quality characteristics are not lost in the drive for disease resistance, research is being conducted to identify genetic markers for flavor and fat content, two factors that are essential to the marketability of cocoa on the world market.

Pest and disease management

Because cocoa is always under the threat of catastrophic losses from pests and diseases, developing pest resistant materials, and management strategies focused on increasing yields, improved quality, and benefits to the smallholder farmer will continue to be a priority. Primary efforts are being directed toward breeding, biological control, responsible chemical control, and good agronomic practices. One of the most successful projects to date was supported by Association of the Chocolate, Biscuit & Confectionery Industries of the EU, involving researchers in France (CIRAD), Trinidad (CRU), Côte d'Ivoire (CNRA) and Cameroon (IRAD) to develop genetic markers for black pod[11] resistance. These were the first disease-resistance markers developed for cocoa and will accelerate the development of more resist-

ant cocoa varieties for growers. Another example: the USDA, working under a formal cooperative research agreement with Mars, Incorporated, is currently studying ways to use Integrated Pest Management Systems that combat cocoa pests and diseases through natural bio-control agents. Recent field tests in Peru, while still preliminary in their findings, have shown a reduction of up to 50% in Witches' Broom[2] symptoms, and a corresponding increase in crop yields of up to 20%.

Farmer organization

While cocoa prices are presently high, farmers in certain growing regions often receive scarcely half of the world price for their crops. Using knowledge gained around the world, the industry is working to encourage cooperation among cocoa farmers in order to improve their participation in the world economy and receive a greater percentage of the price of cocoa. This effort has shown great success in Indonesia, where, by reducing production costs, raising productivity, and removing market and policy inefficiencies, farmers now earn more than 80 % of the world price. As incomes increase, so will opportunities for education, health care, nutrition and other social needs.

Farmer groups also facilitate the delivery of information, technology, and financial credit to farmers. In addition, cooperatives already are proven effective at communicating methods for improving quality, marketing cocoa better, and providing safer farm environments. 'By strengthening farmer organizations, we're creating leaders, bargaining power, and the capacity to really be partners in cocoa farming. Once farmers work together on something like managing their cocoa purchasing and marketing, they can build their own confidence and become more effective in taking hold of the destiny of their communities.' (C. Brookins, pers. comm. October 2003)[9].

Farmer training

After little change in the past 100 years, cocoa farming techniques are improving rapidly as a consequence of training programs developed to produce a more sustainable cocoa crop. These programs focus on improving soil nutrient supply, trimming tree canopies to increase light and nutrients, rehabilitating and rejuvenating older trees, developing integrated pest management programs that reduce use of pesticides, reducing post-harvest losses through processing and storage improvements, improving communication and cooperation among farmers, and diversifying farms to include other cropping systems such as coconut, rubber, oil palm, coffee, fruit trees, and timber trees.

New training techniques include farmer participatory approaches, which aim to give farmers the agroecological knowledge and the confidence to make their own crop-management decisions. Under the supervision of extension officers, farmers conduct their own experiments to evaluate or adapt new technologies, based on their individual needs and circumstances.

One example of public/private training is the Sustainable Cocoa Extension Services for Smallholders (SUCCESS) Project, a large-scale training program on Integrated Pest Management and pesticide-free control of the cocoa pod borer. Developed in conjunction with ACRI and BCCCA, Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance (ACDI/VOCA) is expected to train more than 26 000 farmers in Indonesia alone. 'When the productivity of cocoa does not increase for 30 years on a smallholder farm, something is wrong. The stream of innovations – technical, institutional, marketing, and policy – that were needed to stimulate productivity and incomes were not reaching farmers until very recently. Now that they are, farmers have the opportunity to see rapid improvements in a relatively short period of time. The emerging challenge is to scale these efforts up and ensure stability in the cocoa supply chain' (J. Hill, pers. comm. September 2003)[10].

Community development

The core purpose of the West African Sustainable Tree Crops Program (STCP) has always been to improve the well being of smallholder tree crop farming communities and to protect the tropical environment. Recently, new African government ministerial partners and major multilateral agencies have become involved in STCP programs, bringing an increased focus to the development of social services. Future programs are being developed that will increase vocational learning opportunities for young people beyond cocoa farming. 'It's profoundly important because we are teaching producers not just the institutional structures of coming together and coalescing, we are improving their abilities to manage their own money, and how to negotiate. These are the drivers of private-sector led growth – the small enterprises,' said Brookins[9].

Building trust among partners

As the cocoa stakeholders began to roll out programs, building trust among the partners was one of the early challenges. The decision on how to handle intellectual property issues not only demonstrated the way to clear that hurdle, but also became perhaps the most unique aspect of the cocoa sustainability public/private partnership: All of the activities conducted on behalf of the cocoa industry are shared so that all countries, manufacturers, and government agencies operate in an open, even environment.

Lunde states, 'Once you agree that you're not going to hold intellectual property over the head of someone that needs that material, then most of the issues of mistrust are over. Mars did not want to own the intellectual property rights on cocoa, just like it does not own cocoa farms. Information needs to be shared – whether it's a rich country, a poor, developing nation or a semiindustrialized nation, everyone competes on the same, even playing field. And that's the virtue of this public/private partnership. It is not giving anyone an advantage over anyone else, but together we all receive a benefit' (J. Lunde, pers. comm. November 2003)[1].

With information on research, development, marketing and cooperative extension activities available to all stakeholders, cocoa sustainability programs are currently underway in Indonesia, Vietnam, and Papua New Guinea in Southeast Asia; in Côte d'Ivoire, Nigeria, Cameroon, Ghana, and GuineaConakry in West Africa; and in Brazil, Ecuador, Peru, Panama, Mexico, Honduras, Guatemala and Costa Rica in Latin America. 'The common vision and commitment has been solid enough that it has helped all parties to grow together. The industry has learned a lot more about how we do business and we've learned a lot more about how business does business' (J. Hill, pers. comm. November 2003)[10].

The road ahead

Pests, diseases, and civil unrest remain legitimate threats to the global cocoa supply, but considerable progress has been made to recognize and develop programs to sustain the economic, environmental, and social aspects of cocoa in a relatively very short period of time (a little more than a decade). Thanks to unprecedented cooperation among diverse stakeholders, integrated, holistic programs now exist that not only work toward ensuring cocoa sustainability and its power to be an engine of economic development for farmers and farming communities, but can be used as a model for other tree crops.

As Brookins (C. Brookins, pers. comm. October 2003)[9] states, 'The cocoa public/private partnerships in place now can set the standard for other similar types of activities that combine science, public policy, finance, and business best practices. By lifting up the economic viability of cocoa producers – and ultimately other tree crop producers in some of the poorest developing countries – it is possible to build the kind of supply chain and institutional frameworks that engage all parties in providing any proven economic, environmental and social infrastructure.'

End Notes

1. John Lunde, Director of International Environmental Programs for Mars, Incorporated, USA.
2. Witches' Broom (*Crinipellis perniciosa*): witches' broom is a fungal disease that infects the trees and is spread by spores. It causes broom-like stems that grow from branches. The infected branches turn brown and die from the tip back toward the tree. Finally, small mushrooms grow on the dead brooms, releasing spores that infect other trees. Broom growth uses much of the tree's energy, causing production of lower number of pods as well as pods with inferior-quality beans.
3. Cocoa Pod Borer (*Conopomorpha cramerella*): Cocoa pod borer is an insect approximately 1 cm long that flies like a mosquito. It is common in Southeast Asia, especially in Malaysia and Indonesia. The female lays a tiny egg on the furrowed surface of the pod. After a few days the egg hatches, a larva emerges and burrows into the pod, spoiling the beans inside. The pod dries up after the larva has fed on the pulp and its entry hole allows infections to rot the pod. Approximately two weeks after hatching, the larva leaves the pod, usually producing a silk thread with which to reach the ground.
4. Philippe Petithuguenin, Director of Cocoa Programme, Centre for International Agricultural Research and Development, Montpellier, France.
5. L. Barnett, Development Officer, Smithsonian Tropical Research Institute, Washington DC, USA.
6. Tom Lovejoy, then Counselor to the Secretary for Biodiversity and Environmental Affairs at the Smithsonian Institution, Washington DC, USA.
7. Bill Guyton, President of the World Cocoa Foundation (WCF) and past Vice-President of cocoa research with ACRI.
8. Stephan Weise, Program Manager for West Africa Sustainable Tree Crops Program (STCP), US-AID, Washington DC, USA.
9. Carole L. Brookins, United States Executive Director for The World Bank
10. Jeff Hill, Senior Agricultural Advisor for USAID's Africa Bureau, USAID, Washington DC, USA.
11. Black Pod (*Phytophthora* spp.): black pod is a fungal disease affecting trees grown in humid conditions. There are two strains of the disease: (1) *Phytophthora megakyrya* that is the faster moving, and thereby the more dangerous, and is currently restricted to Cameroon, Nigeria and Ghana, and (2) *Phytophthora*

palmivora that acts more slowly and is thereby more easily controlled. Both strains attack all parts of the plant but this is most pronounced on the pods, which develop dark brown lesions, later becoming dusted with white spores. It is further spread by rain. Both strains may be controlled by selective pruning of diseased pods together with the use of copper fungicides.

Frosty pod is another fungal disease, which is caused by *Moniliophthora rereri* that attacks only young growing pods. It is difficult to detect in its early stages but once infected, the pods become irregularly swollen, then discolored and then grow spores on the surface which are released after rains for up to 10 months and can travel great distances on clothes and shoes. The spores are much smaller than those of witches' broom and are far more resistant to dry heat and intense, direct sunlight.