Partnerships for Rural Development in Sub-Saharan Africa

CASIN/SAA/Global 2000

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Steven A. Breth, editor

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Centre for Applied Studies in International Negotiations, 7, bis Avenue de la Paix, 1211 Geneva 1, Switzerland

Sasakawa Africa Association, c/o CIMMYT, Apdo. 6-641, 06600 Mexico D.F., Mexico

Global 2000 Program of The Carter Center, 1 Copenhill Road, Atlanta, GA 30307, USA

The workshop sponsors: The Centre for Applied Studies in International Negotiations, established in 1979 at Geneva, Switzerland, is a private, nonprofit foundation dedicated to helping resolve problems in a wide range of areas, including trade, the environment, agriculture, health, and human rights. The Sasakawa Africa Association and the Global 2000 Program of The Carter Center are joint sponsors of the Sasakawa-Global 2000 agricultural projects in sub-Saharan Africa. The primary aim of those projects is to promote more effective transfer of improved technology to small-scale farmers. Both the Sasakawa Africa Association and the Global 2000 Program were established in 1986, the former by the Nippon Foundation, Tokyo, and the latter by The Carter Center, Atlanta, Georgia, USA.

Abstract: This publication is the eleventh proceedings of a series of workshops that explore measures for improving sub-Saharan Africa's food security and other issues relevant to economic progress in the region. The chapters cover various approaches to forging partnerships among government, NGOs, and private businesses to achieve developmental objectives in Africa. The case studies discuss, among other topics, the spread of quality protein maize in Ghana, the establishment of cost-shared agricultural extension in Uganda, the introduction of conservation tillage in Ghana, creating a curriculum for mid-career extension workers, operating village savings and loan agencies in Benin, and organizing smallholders in Kenya to supply green beans to UK supermarkets.

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Foreword

It has been very rewarding to plan, program, and work for Workshop 1998. Indeed this workshop has highlighted the networks of partners that the Sasakawa Africa Association (SAA) and the Global 2000 Program of The Carter Center have built over their years of operation in Africa, the largest group being the several million small-scale farmers who have participated, directly or indirectly, in the food crop technology demonstration program.

Attempting to serve these emergent commercial food producers are a myriad of institutions that increasingly see the need to deepen existing partnerships between all stakeholders. There is a growing recognition that further advances in rural development will require stronger partnerships between all stakeholders.

The objective of this workshop was to review a series of organizational partnerships—many involving SG 2000—that link diverse organizations and thematic areas of agricultural and rural development. Case studies, involving agricultural research, technology generation and transfer; agricultural extension; market development for agricultural inputs and outputs; and promoting collective action among farmers were prepared to serve as foundations for constructive interaction and discussions aiming at strengthening our existing partnership work in these areas, as well as at learning about new experiences in which SG 2000 could become involved.

We hope this workshop will lead to many more partnerships all along the chain of food production and distribution.

I want to pay tribute to the Nippon Foundation without whose funding this very stimulating event could not have happened.

Finally, I would like to emphasize that the success of any workshop is the result of the effort and dedication of numerous people working behind the stage. I am referring particularly to the directors of the country programs and their staff on whom we rely heavily for contacts, local links, and, above all, field visits. I also want to express my gratitude to Chris Dowswell, who was instrumental in setting up and finalizing the program, to Gertrude Monnet, Sandra Vetter, Lisa Lundby, and Barbara Brechbuhl, who among others, saw to the smooth running of the workshop. I also want to acknowledge the important work of Steven Breth, the editor of this volume.

Jean F. Freymond
Director, CASIN

Glossary

ACDI/VOCA	Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance
Acosca	Africa Confederation of Savings and Credit Associations
ACI	Alliance Coopérative Internationale
ADB	Agricultural Development Bank
AESD	Agricultural Engineering Services Division
BCEAO	Central Bank of West Africa States
¢	cedi
CASIN	Centre for Applied Studies in International Negotiations
CGAP	Consultative Group to Assist the Poorest
CIDA	Canadian International Development Agency
CIMMYT	International Maize and Wheat Improvement Center
CREP	Caisse Rurale d'Epargne et de Prêt
CRI	Crops Research Institute
CVMSR	Caisses Villageoises de Mutualité Sociale Rurale
Danida	Danish Agency for International Development Aid
DAP	diammonium phosphate
DID	Développement International Desjardins
DiFOV	Direction de la Formation Opérationelle et de la Vulgarization
DOC	Department of Cooperatives
FDV	Village Development Funds
Fenacrep	Federation Nationale des CREP
GDP	gross domestic product
GGDP	Ghana Grains Development Project
GIFAP	Global Crop Protection Federation
GRATIS	Ghana Regional Appropriate Technology and Industrial Services

GTZ	Deutsche Gessellschaft für Technische Zusammenarbeit
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IER	Institut d'Economie Rural
IFDC	International Fertilizer Development Service
IITA	International Institute of Tropical Agriculture
JICA	Japan International Cooperation Agency
MAAIF	Ministry of Agriculture, Animal Industries, and Fisheries
MOFA	Ministry of Food and Agriculture
NARO	National Agricultural Research Organisation
NGO	nongovernmental organization
ODA	Overseas Development Administration
OPV	open-pollinated variety
PAPME	L'Agence d'Appui pour la Promotion des Petites et Moyennes Entreprises
PTP	production test plot
QPM	quality protein maize
SAA	Sasakawa Africa Association
SAFE	Sasakawa Africa Fund for Extension Education
SEP	Supervised Experience/Enterprise Project
SG 2000	Sasakawa-Global 200
SNV	Netherlands Organization for Development
Socodevi	Société de Coopération pour le Développement International
Sonapra	Société Nationale des Produits Agricoles
t	tonne
UCC	University of Cape Coast
UNB	Université Nationale du Bénin
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
UST	University of Science and Technology
WHO	World Health Organization
WIAD	Women in Agricultural Development

Meeting Summary

Opening Session

Launching the workshop, Yohei Sasakawa, president of the Nippon Foundation, reported the interest expressed by many African countries in collaborating with SG 2000. But, he said, the possibilities of significant expansion for SG 2000 are limited. "To sustain the momentum of SG 2000 and develop the program further, SG 2000 is now at the point where we need to expand our cooperation beyond government to include other organizations as well."

In his remarks, Norman Borlaug, president of the Sasakawa Africa Association, observed that after a decade in which SG 2000 and its partners have put out nearly 1 million farmer demonstration plots, the agricultural potential of African countries is no longer in doubt. A principal barrier to achieving that potential is government neglect. Mr. Borlaug admonished everyone who works in agriculture—in government, in the private sector, and in NGOs—to persistently voice concern about the neglect of agriculture. "Without this being repeated and repeated, no one hears us."

Keynote Address

The keynote address by Steve Obimpeh, former minister of agriculture, Ghana, chronicled the multi-layered partnerships of Ghana's government and farmers, on one hand, and various organizations, including SG 2000, on the other hand.

Effective partnerships, he stressed, require a common vision among the partners, which allows them to establish common objectives and plans. An important reason the link between SG 2000 and the government of Ghana has been fruitful was the interest and support of Ghana's president.

Mr. Obimpeh said that too often development agencies tend to dictate what they expect from participants in their activities. "The mismatch between what the rural people regard as development and what their partners expect them to do often impedes achievement of set goals."

Even agencies of the government operated on separate tracks until the recent past. With decentralization, Mr. Obimpeh noted, project implementation committees consisting of all stakeholders are being formed at the national level. And, within districts, the various ministries are working together as one development unit with the goal of improving the lives of rural people in each district.

Mr. Obimpeh praised the collaboration between the Ghana government and the Sasakawa Africa Association in the SG 2000 agricultural activities and between the government and the Global 2000 program of The Carter Center in health

activities. A central feature of these collaborations is the inclusion of a broad range of stakeholders. Moreover instead of running a parallel development system, these collaborators employed existing institutions to reach rural people. Consequently they built local capacity. In addition, these collaborators were not dogmatic—the types of activities they undertook evolved as changes took place in Ghana's rural economy.

Summing up, Mr. Obimpeh said that while the weak economies of African nations required help from development partners, their activities should dovetail into existing structures. And the development of rural areas "will depend on effective collaboration among stakeholders to facilitate the sharing of resources, experiences, skills, and knowledge to solve the inherent problem of food insecurity and poverty."

The Quality of Partnerships

Warning that partnerships are not an end in themselves, William Foege said the test is, how does the partnership help? "It is not worth the effort if we cannot see the outcome." Dr. Foege, senior health adviser of The Carter Center said productive partnerships require partners who have complementary strengths, who have broad interests and experiences, and who share a common view of the desired outcomes.

SG 2000's Partnerships

Christopher Dowswell, SG 2000's director for program coordination, outlined the types of partnerships SG 2000 has and hopes to have. One type of partnership that is not often discussed, he said, is advocacy partnerships. Partnerships of like-minded groups and individuals are important to counteract faddish opinions that would mire African small-scale farmers in poverty in compensation for excesses in rich countries.

A second type is broad strategic partnerships. These partnerships are not necessarily formal, but they bring together groups with complementary skills. For example, SG 2000 recognizes that, in the long run, raising agricultural productivity can only occur under economic conditions that give smallholders access to such things as a credit system and systems of marketing inputs and outputs. Partnerships with NGOs, donors, and private businesses that work in such areas can benefit SG 2000's program.

Finally, financial partnerships are becoming crucial for SG 2000. While SG 2000's own activities are adequately supported, many potential partners in areas of importance to SG 2000 lack funding. Dowswell concluded that finding ways to link donors with NGOs, or with private firms, is an area that needs exploration.

Quality Protein Maize

The partnerships behind the development of quality protein maize (QPM) varieties in Ghana and their adoption by 20 percent of Ghana's maize growers within 5 years of the first variety's release was examined by Stafford Twumasi-Afriye, formerly maize breeder at Ghana's Crops Research Institute (CRI).

In the late 1980s, CRI assigned Mr. Twumasi-Afriye to work on QPM. Ghana's leaders saw QPM as weapon against widespread protein deficiency in children.

But at the same time, in Mexico, CIMMYT, the world leader in breeding high protein quality into agronomically acceptable plant types, was in the process of shuttering its QPM program. Ironically, part of the reason was that breeding programs in developing countries had not

developed QPM germ plasm in local varieties.

In Ghana, a meeting between the Ministry of Food and Agriculture, CRI, and SG 2000 was crucial first step. The meeting "resolved looming institutional conflicts concerning roles and responsibilities," according to Mr. Twumasi-Afriye. CRI was designated as the lead institution and the roles to be played by each of the partners were established.

Other partners such as the Ministry of Health, the seed inspection service, the post-harvest development unit, and University of Science and Technology were brought in. These partnerships flourished because of direct interest by top leaders, starting with the president of Ghana.

Moreover funding to sustain QPM research was available from the Canadian International Development Agency as part of its support for CRI. And CIMMYT provided germ plasm and technical assistance.

Mr. Twumasi-Afriye attributed the rapid adoption of QPM varieties by Ghana's farmers to the inter-institutional collaboration. That collaboration made it possible to quickly develop an open-pollinated QPM variety that had the disease resistance and storage characteristics needed by Ghana's farmers. Widespread testing in farmers' fields acquainted farmers with QPM and fed valuable information back to researchers. Almost simultaneously, feeding trials, first with animals and then with humans, provided convincing evidence that QPM could significantly improve nutrition in Ghana.

Reorienting Research in Mali

Historically, Mali has had a two-tiered research system, in the view of Oumar Niangade, director of the Institut d'Economie Rurale (IER). Research on export crops and other agricultural products of interest to international donors was relatively well funded. Other research that attracted only government support was starved for funds.

And neither tier of research was influenced by the preferences of farmers.

IER began a process of reform that would bring together researchers and end users. Mr. Niangade said a key element in the reform was the creation of a consultation framework through which all research proposals had to pass. Researchers from each of the six regional research centers have to present proposals to a regional users' commission before the research can be funded. Regional users' commissions are made up of members from farmers' organizations.

Each commission meets to discuss the previous year's research results and to adopt activities for the coming year. The various commissions' conclusions are synthesized before presentation to the National Committee for Agronomic Research.

Mr. Niangade observed that through this process farmers are beginning to understand the role of a research institution and what it can do for them.

The next steps, Mr. Niangade said should be to improve the capabilities of farmer organizations and to bring extension services into the consultation framework.

Developing Small-Scale Equipment for Farmers

Leonides Halos-Kim, research specialist at the International Institute of Tropical Agriculture (IITA) explained the process IITA and its partners follow to develop and refine postharvest equipment to fit the needs of small farmers. These partnerships take a variety of forms.

Since 1994, one of those partnerships

has been with the Sasakawa Africa Association (SAA). "The collaboration aims to identify, develop, and disseminate appropriate postharvest technologies," Ms. Halos-Kim said.

In this partnership, IITA identifies, generates, and packages technologies based on needs assessment and available resources. It also trains extension personnel and manufacturers, and it provides quality control on fabricated equipment. SAA and government extension and small industry development agencies demonstrate the technologies and train farmers and agro-processors.

Manufacturers fabricate the equipment and make it available to customers. The SAA-IITA partners train manufacturers in fabrication methods and carry out quality control checks on the equipment produced.

Farmers and agro-processors take part in demonstrations and field testing. "Their participation and feedback on utility, adequacy, and profitability of the technologies are valuable guides for adapting the technology to the local environment," Ms. Kim said.

As a result of this activity, Ms. Kim stated, training has been provided to 83 machinists, welders, mechanics, and other technicians from Ghana, Benin, Burkina Faso, Ethiopia, Guinea, Mali, and Togo. In addition to sales within Ghana and Benin, manufacturers in those two countries report export sales to Mali, Niger, Burkina Faso, Côte d'Ivoire, Zambia, and Guinea.

Cost-shared Agricultural Extension in Uganda

J. Mubiru, Uganda's director for agricultural extension, explained the country's new demonstration and training program, which depends on the beneficiaries to share the costs of demonstration materials. This reorientation is part of Uganda's policy of shifting responsibility for extension to the districts and subcountries.

The model for training small-scale farmers was established by the Ministry of Agriculture, Animal Industries, and Fisheries (MAAIF) in partnership with SG 2000. In this model, Mr. Mubiru pointed out, there are three sets of stakeholders: the public sector for technology innovation and dissemination, the private sector for financing input marketing and production, and the development community for creating partnerships that increase the impact of technology transfer.

Part of the principles of good extension practice subscribed to by the MAAIF-SG 2000 partnership is that farmers' participation in testing improved technology should be based on their own convictions and supported with their own resources. Consequently, Mr. Mubiru stressed, farmers who take part in demonstration programs and on-farm training have to acquire demonstration kits containing seed and fertilizer through private stockists. Training itself is provided without charge.

Under this program, 12,000 maize technology demonstration plots were planted between 1996 and 1998. Demonstration plots with sorghum and cassava have also been planted. Seed of improved varieties has been multiplied by farmers. And the rural stockist system has been strengthened.

Mr. Mubiru argued that the decentralization makes extension services more field-focused and effective. He noted that NGOs can play a significant role as partners with the government in developing such approaches.

A Partnership to Introduce Conservation Tillage

A principal reason farmers plow the soil before planting is to destroy weeds

that might compete with the crop. Conservation tillage eliminates this rationale for plowing by controlling weeds with herbicides, leaving a mulch that reduces erosion and improves soil moisture retention. Many farmers in affluent countries have adopted conservation tillage using Roundup, a nonselective herbicide containing glyphosate, which is produced by Monsanto. J. B. R. Findlay described how Monsanto formed partnerships to make conservation tillage technology available.

Mr. Findlay said Monsanto recognized that to introduce the technology in Ghana, a wide range of expertise would be needed. Eventually it formed partnerships with SG 2000 in Ghana and with Winrock International in Senegal. The conservation tillage concept fit well with SG 2000's work in maize and Winrock's activities in rice.

In Ghana in addition to SG 2000, partnerships were formed with the Ghana Grain Development Program and the extension service. Mr. Findlay stressed that a key element was gaining the support of high level leaders, particularly the minister of agriculture. In addition, all partners had to accept that such a development program would be a long-term undertaking. The necessary phases were a period of research and learning, followed by familiarization and problem solving. Then the concept was promoted and farmers and extension workers were trained.

Conservation tillage is introduced along with other improved agricultural technology such as improved seeds and fertilizer. Mr. Findlay presented results showing that farmers who use conservation tillage sharply reduce the time, and hence the cost, of preparing land for planting. In many areas, conservation tillage allows farmers to seed a larger area of land than they could before.

Mr. Findlay urged governments to launch national conservation tillage awareness programs to combat environmental degradation. As the program expands, Mr. Findlay pointed out, the staff and financial support needs will increase. Although the private sector can fund this expansion from the increase in revenue from the sale of equipment and inputs, the government must also be prepared to raise its investment, or the effort will flounder. "To widely establish this farming practice, many trained people will be needed to demonstrate how farmers, the community, and the nation all benefit. The more extension officers doing the job, the faster the progress will be," Mr. Findlay concluded.

Partnership in Curriculum Innovation

Modifying university curricula to respond to changes in society is a widely praised objective, but one that is seldom attempted, especially in agricultural disciplines. Moses Zinnah, agricultural extension specialist, Winrock International, related how the University of Cape Coast (UCC) met the challenge with the Sasakawa Africa Fund for Extension Education (SAFE) program.

The SAFE program was started to address the lack of responsive training programs for mid-career extension staff who possess certificates or diplomas in agriculture or related disciplines.

Mr. Zinnah said that 5 years of experience with the SAFE program underscored the complexity of agricultural extension situations, but that the difficulties are often accentuated by institutional inertia and skepticism of some university administrators and faculty. The key to succeeding in changing the prevailing academic climate is adoption of a partnership approach instead of a single agency approach.

Mr. Zinnah explained that the only way to ensure the interest and commitment of the stakeholders is to involve them in the decision making. In establishing the SAFE program, the ministry of agriculture, NGOs, farmers, extension personnel, prospective students, and university staff were the stakeholders.

A second essential was effective communication facilities linking the stakeholders. But equally important, Mr. Zinnah stated, was presence of an individual within each organization who is committed to making sure that information gets to the main power actors within their organization and that important decisions are followed up.

Third, leadership is essential. "The vice-chancellor, the dean of the School of Agriculture, and the Academic Board of the UCC . . . were focused on and committed to the main priority—the need to offer a responsive extension training program for MOFA."

Fourth, for a curriculum reform initiative to succeed, willingness to change must be present. The participating organizations were flexible and accommodating so that the client-driven and learner-centered SAFE approach permeated each organization.

Finally, Mr. Zinnah stressed the importance of partnerships within the universities, as well as with other universities, NGOs, and government ministries. Partnership is necessary, he said, "because individual organizations lack the breadth of knowledge, skills, resources, and power needed to deal with the complex problems of agriculture and rural development including the training of agricultural extension staff."

Village Savings and Loans

In Benin, the village-level savings and loan banks (CREPs) sprouted from SG 2000 technology demonstration program. As outlined by Bernadin Glehouenou, SG 2000 coordinator for Benin, the demonstration program organized participating farmers into small groups to facilitate training in new production technology.

Initially, farmers were given credit for the seed, fertilizer, and other inputs that were the basis for the new technology. But after 2 or 3 years, Mr. Glehouenou observed, as participating farmers graduated from the demonstration program, they had little success in getting credit from conventional banks.

As a result, the idea of mobilizing local savings to support technology diffusion in rural area emerged. SG 2000, the Ministry of Agriculture, and a Nairobi-based network of savings associations agreed to work together to establish a series of CREPs.

CREPs were started using the framework of the groups that had participated in SG 2000 demonstration plots. A CREP's members live in the same village and regularly deposit savings to be used as a source of credit. The CREP is a nonprofit organization owned and managed by the members.

Mr. Glehouenou explained that during the pilot phase, 1992-94, 25 CREPs were formed. They had a total of 4,300 members. Sixteen of the CREPs were strong enough to start giving loans.

By 1998, 40 CREPs had been established and membership exceeded 12,000. Between 1993 and 1997, lending exceeded US$675,000, or 18 percent of total deposits. Mr. Glehouenou pointed out that the progress of the CREPs has attracted partners not only in the support of infrastructure and equipment but also in providing new services to members. One NGO is establishing a series of health centers as an adjunct to the CREPs. A private fertilizer importer is providing

fertilizers to CREPs on credit at wholesale prices. The CREPs have also facilitated the demonstration and introduction of small-scale agro-processing equipment. The CREPs give credit to members who individually or in small groups wish to purchase the equipment.

Recently, a national federation of CREPs was formed. The federation coordinates and manages the network structure and is a mechanism for providing training, managing credit and risk situations, and maintaining the accounts of the CREPs.

Output Market Development

Frank Hicks, program director, TechnoServe Ghana, described how TechnoServe organized a diverse group of partners to carry out a multipronged assault on economic constraints that shackle small-scale farmers.

TechnoServe is an NGO that focuses on marketing and business development. One of its activities in Ghana has been to establish inventory credit schemes. Inventory credit allows farmers to use stocks they hold off the market as loan collateral. When prices recover from the usual harvest-time depression, the farmer can remove his stocks from storage, pay off the loan, and sell the products at a sharply better price than was possible earlier.

According to Mr. Hicks, based in part on the success of inventory credit, TechnoServe was invited by the Ministry of Food and Agriculture to assess the potential of rural institutions such as cooperatives, agribusiness associations, rural financial institutions, and NGOs to spur agricultural growth. The central conclusion of the study was that a business-like, market-oriented approach is the key to rural growth. But the study also found that most private rural institutions lack the skills to implement such an approach. And few government agencies or private organizations were engaged in providing the needed training.
As an outcome of the study, TechnoServe and a several partners were asked to carry out a 1-year pilot study in advance of a larger project intended to strengthen infrastructure at the village level and to improve the capacity of local governments and stakeholders to sustain the infrastructure investments.

In addition to TechnoServe, the pilot project involved SG 2000 and other NGOs, government agencies, the Agricultural Development Bank, and four rural banks. The goal was to improve postharvest handling and marketing of grain in Ghana's Maize Triangle.

The partners brought a broad range of experience to the pilot project: storage and marketing of grain, crop production methods, mechanized tillage and transport, mechanized agro-processing, management of cooperatives, inventory credit, and bookkeeping.

Mr. Hicks said that pilot project showed that the monthly interaction of the government agencies and NGOs improved the coherence of the information provided to farmers. More farmers participated in the project than had been expected and the volume of maize stored exceeded targets. The farmers used inventory credit to pay off input loans more rapidly and completely than before.

On the other hand, the pilot project revealed a variety of shortcomings. The quality of program reporting and accounting was not high. Mr. Hicks noted that TechnoServe should have provided more orientation and training to the collaborating agencies. The failure of discussions between the Agricultural Development Bank and the rural banks limited the amount of lending to farmers. Further-

more, the partners approached farmers groups with various new technologies, "without apparent regard for the total debt commitments that the groups incurred or detailed analysis of their ability to repay their debts and make reasonable profits," Mr. Hicks said.

Based on the pilot project, Mr. Hicks offered three recommendations. First, working groups should be formed consisting of private firms active in agricultural commodity markets along with research, extension, and community development and donor organizations to identify opportunities for market growth and where the bottlenecks lie.

Second, as part of the process of decentralizing Ghana's government, training in market-driven approaches to agricultural development should be provided to personnel of the district assemblies.

Third, to become more effective in rural lending, financial institutions require training in developing new financial products as well as in financial management, more generally. These institutions also need access to loan funds to increase their capital levels.

Small Farmers as Suppliers to UK Supermarkets

The mutual benefits of partnership between smallholder farmers and Homegrown (Kenya) Ltd., one of Kenya's leading horticultural exporters, was explained by R. K. Evans, the company's joint managing director.

Since the early 1980s, Homegrown has become Kenya's largest grower and exporter of horticultural products, particularly beans and flowers. Homegrown accounts for almost a third of Kenya's bean exports. Homegrown has a joint venture with an airfreight carrier, which every night fills an air cargo plane with Homegrown produce destined for UK supermarkets.

Mr. Evans reviewed the rapid changes that have taken place in marketing to UK supermarkets. As a result of increasingly rigorous food safety regulation, supermarket chains now demand detailed documentation on where and how the produce was grown and handled. In addition to seeking value, quality, continuity, and reliability, supermarkets require the supplier to provide information on the welfare of workers, responsible farming practices, and protection of the environment.

As Mr. Evans pointed out, these marketing requirements favor large commercial farmers.

Nevertheless margins for horticultural exports are extremely thin. Because of this, Homegrown has increasingly moved into value-added activities like prepacking beans and salads. In addition to gain economies of scale, Homegrown must handle large volumes. But Homegrown itself could not supply 55 tonnes of green beans a week, Mr. Evans said. Homegrown turned to small-scale outgrowers.

Mr. Evans outlined the advantages of outgrower green bean production for the farmers and for Homegrown. Some examples: (1) Green beans can be harvested soon after planting, giving the farmers a steady source of cash income. (2) The small fields of outgrowers tend to be separated from other fields of green beans, reducing the chances of disease spread. Also, crop protection practices are easier in small fields. (3) The geographic dispersal of small farms reduces the risk that a unexpected local event (such as a rust attack caused by unseasonably heavy rainfall) could destroy the entire supply.

Homegrown's contracts with UK supermarkets provide the outgrowers with an outlet for the crops. Homegrown

and the supermarkets program the supply needs a year in advance, and Homegrown organizes the outgrowers into regular planting regimes that smooth the peaks and troughs of supply.

Homegrown gives farmers technical assistance on growing, harvesting, and handling the crop. It supplies seeds and inputs on credit and uses its buying power to purchase inputs in bulk for the outgrowers. Homegrown collects the farmer's beans 6 or 7 days a week and pays the farmer weekly.

As part of the due diligence required by the supermarkets, Homegrown enforces a code of practice that ensures the safety and quality of the produce Homegrown buys from outgrowers. The code also ensures the safe use of pesticides by farmers. It specifies what facilities the outgrower must have, such as a grading shed, field toilets, area for washing spray equipment, and an identifiable pesticide disposal area.

Outgrowers and their field hands receive training in safe use of pesticides. Farmers are taught to spray when conditions require, rather than routinely. They have to keep precise records of when pesticides were applied, who did the spraying, and the fact that the sprayer showered and washed his clothes after completing the job.

Other records cover such subjects as planting schedules, daily weather, daily hygiene, and cleaning of facilities for handling the produce. Mr. Evans observed that because Kenya has introduced compulsory education up to the age of 13 years, farm families have members, even children, who are capable of doing the required record-keeping.

The Homegrown medical personnel visit farms periodically to emphasize the importance of personal hygiene in handling foodstuffs.

Summing up, Mr. Evans said Homegrown contributes to the rural economy by directly employing 6,400 people. Also, under Homegrown contracts with outgrowers, over 600 people are employed. In all, Homegrown invests over US$1.5 million annually in rural areas of Kenya.

Transforming Extension Delivery in Ethiopia

Ethiopia's vice-minister of agriculture, Getachew Teklemedhin, traced the evolution of extension in the country. A major departure occurred, Mr. Getachew said, when SG 2000 came to Ethiopia.

SG 2000 started with improved technology already available but which had never moved far from the experiment station. SG 2000 made the farmers the focal point, teaching them how and why to use inputs. Mr. Getachew emphasized that the demonstrations were done on plots large enough to make the advantages of the technology clearly evident.

Mr. Getachew said that SG 2000, as an NGO with limited means, understandably moved gradually. But "the government was impatient." After few years, the government was impressed with the results and decided to implement the program on a national scale.

The government built on the SG 2000 model, bringing together input deliverers, seed enterprise, and fertilizer suppliers with farmers and extension agents to develop the program. In the first year, the government expanded the program from the 3,000 demonstration plots SG 2000 had mounted to 32,000 plots.

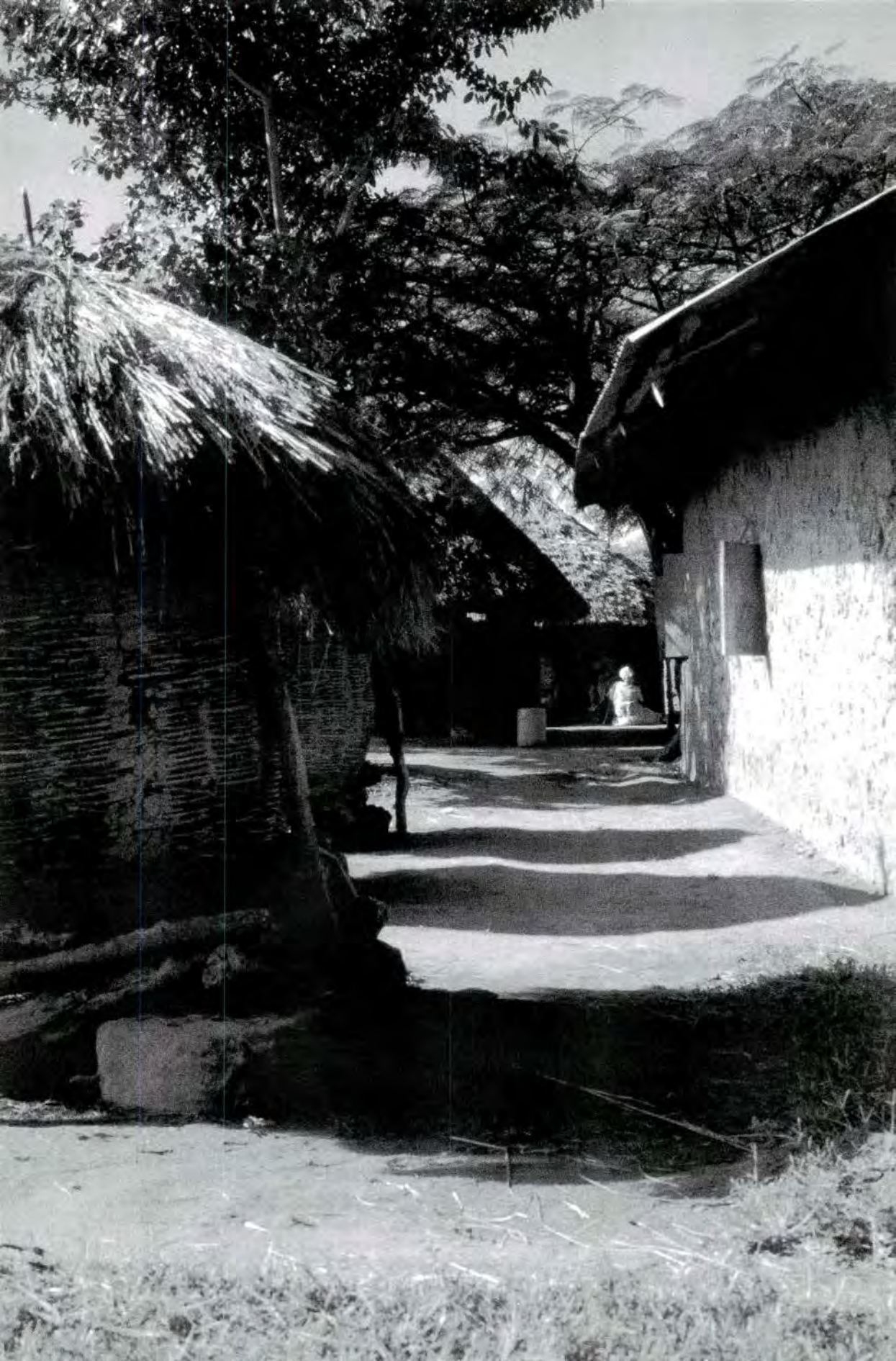
Mr. Getachew related that the program initially was developed centrally, but in the following year the planning responsibility was passed to the regions. And the program was expanded to 320,000 demonstration plots.

The government also withdrew from supplying credit for the program, and banks took over this activity. In 1998 the government established a goal of 650,000 plots.

As a result of such rapid change, a number of problems confront Ethiopia that require immediate attention, Mr. Getachew said. Output marketing—postharvest technology, marketing, and storage—does not function well. Similarly input delivery systems, especially for seed, are not well developed. Credit is available, its sustainability is not certain.

To resolve pressing problems, Ethiopia is seeking two types of partnerships. One is internal: partnerships among research institutions, extension, input and credit suppliers, etc.

The other is external, with organizations like the World Bank, FAO, and NGOs like SG 2000. Mr. Getachew concluded, "To realize successful partnership, one has to define the objectives and set goals, identify proper partners, work out areas of partnership, develop practical mechanisms, and avoid violating partners' identities. Every partner has to have its focus. The big test is the joining of forces rather than overlapping."



Introductory Comments

Yohei Sasakawa

When Norman Borlaug, president of the Sasakawa Africa Association, visited to Japan recently, we took the opportunity to discuss our program with the ambassadors of African embassies in Tokyo. We were gratified that so many of the ambassadors expressed their support for the SG 2000 program. There were some among them who inquired why we had not yet initiated similar projects in their countries. One even handed me an official letter asking us to start a program in his country. In responding to them, I emphasized that the greatest factor in determining the success of SG 2000 has been the commitment of the host government. It has been their strong political will and leadership that have allowed Dr. Borlaug and the dedicated country directors to forge their programs successfully.

We at Sasakawa Africa Association are limited in what we can do. It must be the farmers and the governments themselves who bring about green revolutions in their countries. One of the best examples of such dedication and cooperation can be seen in the Ethiopia project. The government led by Prime Minister Meles Zenawi has made such a big difference. In fact, I can say that the secret of our story in Ethiopia has been the ideal partnership enjoyed between the government and SG 2000.

However, to sustain its momentum and to develop the program further, SG 2000 is now at the point where we need to expand our cooperation beyond government to include other organizations as well. In this year's workshop, we are focusing on the subject of cooperation among partners. Recently, the words ownership and partnership have become keystones to success in African development efforts. Projects that fail to incorporate these concepts would surely have problems when it comes to sustainability. I am proud to say that we made partnership and ownership integral parts of our program from the very beginning.

In this workshop, various cases of actual cooperation efforts in African development will be presented. They will include examples of partnership, not only with SG 2000 but also with various other organizations. You will be asked to

Yohei Sasakawa is president of the Nippon Foundation, Tokyo.

evaluate these cases and discuss their merits and demerits, and how the partnership might be improved in each case. This should prove to be a mutual learning process, and it is my hope that, through this workshop, we will each gain a better idea of partnership that can be put to work in our respective endeavors.

As I have often said, SAA is a mere NGO with limited financial and human resources. Therefore, we need to partner with the World Bank and other multilateral and bilateral donor agencies, international research institutes, NGOs, and private firms that have a stake in African agricultural development.

From our experience, however, obtaining cooperation among different organizations is easier said than done. Usually, we can agree on general principles, but the devil is in the detail. It is in defining implementation guidelines where good intentions on both sides are so often stalemated. In Japanese we have a saying: "Ignore small differences to achieve the large common interest." Let us discard minor differences in order to achieve our major common goal of African agricultural development.

There is another subject that I cannot ignore, which is the unhappy war over the border between Ethiopia and Eritrea. SG 2000 has projects in both these countries. We know how successful our Ethiopian project has been, and our Eritrean project has been going so well that we expect success there as well. I am very saddened by this misfortune: without peace there will be no agricultural development. During the Second World War, thousands of people died of hunger in the war-ravaged Ukraine, despite the fact that it was known as Europe's breadbasket. If war could inflict such a tragedy on a fertile area like the Ukraine, how much more devastating it can be for countries in Africa, which have a far less favorable agricultural environment.

We have just had such an example in a central African country. We had a very promising SG 2000 program in that country when civil war broke out, and virtually all our efforts went for nothing. I beg all politicians not to repeat this kind of folly but rather to let reason guide them when they are faced with problems to solve.

Lastly, I have good news to share with you. General Obasanjo, a member of the Sasakawa Africa Association Board of Directors, was released in June after 3 years imprisonment. In the coming months and years, I expect that General Obasanjo will do a great deal of good work, both for SG 2000 and for Africa.

I am very proud of our SG 2000 project. This project has brought about real changes in Africa while showing to everyone who is interested how successful agricultural development can be achieved on this continent. In forming partnerships, we will welcome any person or organization who wishes to join us in this vital effort.

Opening Statement

Norman E. Borlaug

Let me say at the outset that there would not be any SG 2000 program had it not been for the late Ryoichi Sasakawa, father of Yohei, and the continued interest of Yohei to permit us to have economic support. This has involved not only financial support but also the spirit behind it, which allows us to try to show what can be done in the African nations.

When the SG 2000 program began, there were many who said, "Yes, something happened with the green revolution in Asia, but Africa was different." Now, after a decade in which almost 1 million quarter-hectare to half-hectare plots have been put out on farmers' fields in 12 African countries, the evidence is the same: there is great agricultural production potential in all of these countries south of the Sahara. However, you cannot eat potential—you have to convert potential to food production on a continuing basis.

Hopefully, we are close to attaining that goal. The clinching factor will be when two countries suddenly have surplus food supplies. Perhaps then we will gain support for improving infrastructure and other basic organizational changes in African countries. This will permit the conversion from the potential to the actual, not only in food production but in public health and in education, which is one of the real barriers to continuing progress in all countries, not just Africa.

When we were about to initiate SG 2000, after that first workshop in Geneva in 1985, the feeling of the group was that insufficient research explained why agricultural production in Africa was not changing. Then, as we traveled—the two Sasakawa's, father and Yohei himself, and President Jimmy Carter, the Director-General of ICRISAT, and me—to universities and ministries of agriculture in five countries we found that a good deal of information had been accumulated, but nothing was going to farmers' fields. There was no linkage between research and extension, nor between extension and farmers' fields. The extension people were all too often criticized for not being effective, when the truth was that they had no information passed on to them in

Norman E. Borlaug is president of the Sasakawa Africa Association.

an organized way that could be transmitted to farmers' fields.

When we saw this, we decided that instead of working in research we would try to raise extension to a level where it could effectively transfer research from both universities and experiment stations to the farmers' fields. Most of SG 2000's effort has been in this direction. That does not mean that we have not tried to be involved in a small way, with limited funds, in trying to stimulate research. Our staff of about 10 all came through research, and it has therefore been easy for our country directors to work effectively with the research programs, even though our efforts center on extension.

Demonstration plots, now approaching 1 million, have clearly indicated that, with few exceptions, you can at least double, generally triple, and often quadruple the yields, compared with the traditional, with modest inputs. There are barriers that prevent this from happening, and government neglect is one in particular. There has to be real commitment from the heads of government of the countries south of the Sahara, which is where the crisis has been the worst and where the situation continues to deteriorate. This is not something that has happened recently. Over the last two and a half decades per capita food production has been going down. We have to reverse this trend.

We have clearly demonstrated that the potential is there. It is up to all of us together—government heads, heads of universities, experiments stations, and ministers of agriculture and finance. Ministers of agriculture all too often have their hands tied by lack of funds. Ministers of finance are the people who have to be convinced perhaps even more than the ministers of agriculture. It behooves all of us who are working in agriculture to continue to express these concerns. Without this being repeated and repeated and repeated, no one hears us.

In closing, let me say that the two countries that are in the best position to shock the world by achieving a green revolution are Ghana and Ethiopia. This does not mean that others might not sneak up and pass those two if they get the right support from their governments. I can truthfully say that all the places where we have worked have the ability to produce the food that is needed now and on a continuing basis for the next several decades, if their programs are realistically organized and financed and supported by their governments. The Nippon Foundation, will continue to support and try to help in every way possible within those limitations. However, we have to remember that the needs for financing are far greater than what can be supported by one foundation. We have to have support from many different agencies and organizations.

KEYNOTE ADDRESS

Partnership: Perspectives from a Ministry of Agriculture

Steve Obimpeh

I consider the theme of this workshop—partnership for rural development in sub-Saharan Africa—to be very appropriate. Rural development in Africa requires concurrent development in agriculture, good health facilities, portable water supply, education—especially female education—energy and telecommunication systems, and so on. However, the economy of rural sub-Saharan Africa is dependent to a large extent upon agriculture, upon which the facilities and services mentioned above impact. Agriculture in sub-Saharan Africa employs over 65 percent of the labor force, accounts for over 40 percent of GDP, and contributes over 40 percent of foreign exchange earnings. Agricultural development, therefore, is paramount in improving the living standards of rural Africa. Agricultural development means not only meeting the needs of rural people, but also contributing to the growth in incomes that will enable them to access other services for better livelihoods.

In Ghana, for example, rural areas have problems of food insecurity, a high incidence of disease, high illiteracy rates, poor housing, and general deprivation. This is true of rural areas in much of sub-Saharan Africa. Nevertheless, the rural areas offer significant opportunities for growth through the proper harnessing of human and fiscal resources. Therefore all stakeholders should work together to address these problems so that meaningful improvement in the living conditions of rural people can be achieved.

However, we cannot overlook the complexity of agriculture and rural development, which requires a closely woven relationship between governments, public and private institutions, professional groups, cultures, and different levels of leadership. A successful rural development program, therefore, calls for establishment of good working relationships between all the development partners. That is the aim of this workshop: how to ensure effective partnership between all the identifiable actors in rural development in sub-Saharan Africa.

From my experience, an effective or beneficial partnership exists when stakeholders work with a common vision and understanding, establish common objectives and plans, and are dedicated to

Steve Obimpeh is the former minister of agriculture, Ghana.

achieving a common goal. This is possible only if a strong and committed leadership exists. In Ghana, for example, the partnership between SG 2000 and the Ministry of Food and Agriculture was possible because of the leadership provided by the president of Ghana, His Excellency Flight Lieutenant J. J. Rawlings.

In the context of agricultural development, this partnership implies an interrelationship between such groups as farmers, extensionists, researchers, commercial agencies, importers, manufacturers, and traders. In Ghana, one can identify different levels and mixes of partnership—to achieve the purposes of agricultural development—including community social groups, community development agents, interministerial committees, government-to-government programs, donor agencies, and community-donor-NGO alliances.

The people who do all this in Ghana belong to social networks through which they receive productive or welfare support. One such partnership is working parties called *lobwa*, in which members—usually relatives or friends—share labor on each other's farms on a rotational basis. Through this arrangement, members solve their labor problems and save on labor costs. It also allows members to meet to exchange information about their operations. However, all members cannot work at the same pace. Disputes sometimes develop around the issue of equity in the amount of work done.

There is also cooperation between development agencies and rural dwellers. In this arrangement, the former support rural development by transferring knowledge and financial input and sometimes providing infrastructure support. This relationship is often perceived as top-down in nature, and development agencies have the tendency to dictate what the rural dwellers should or should not do. The mismatch between what the rural people regard as development and what their partners expect them to do often impedes achievement of set goals.

An example is the partnerships of farmers and extension workers in which extension workers transfer technologies to farmers. These technologies may be adopted less fully than expected because they may not address the needs of beneficiaries.

Partnerships between government ministries, such as agriculture, environment, local government, and education are meant to improve synergy in implementing the various developmental programs in rural areas. In Ghana, however, until the recent government decentralization, these ministries tended to work separately and lacked a common objective in confronting rural developmental issues. The result was duplication of efforts and waste of resources.

To address this problem, the minister of food and agriculture established project implementation committees at the national level consisting of all stakeholders. At present, in this assembly structure the various ministries are working together in the district as one development unit, with the purpose of improving the lives of rural people in their respective districts.

There are numerous governmental partnership programs in Ghana. Among the agencies supporting agricultural and rural development are the European Union, USAID, GTZ, Danida, CIDA, JICA, and ODA. Most of these partnerships involve the provision of financial and technical assistance, which is vital for the development of the rural economy. However, in most cases these agencies determine (1) what their resources must be used for and (2) where logistics can be procured. This makes it difficult for the

government to direct a system to its own priority areas.

The World Bank, the International Fund for Agricultural Development, and other donors have supported many of Ghana's efforts in agriculture and rural development over the years. They have provided financial support to specific projects aimed at assisting rural areas by improving food production and marketing and hence the income and standard of living. Some of the ongoing projects include the National Agricultural Extension Project, the National Agriculture Research Project, the National Livestock Sector Improvement Project, and the Fisheries Subsector Capacity-Building Project. These funding agencies have also supported the development of infrastructure such as roads, electricity facilities, hospitals, clinics, and schools in rural areas.

Even though this form of assistance is much appreciated, the projects so funded, especially in the agricultural sector, have limited time-frames. From my experience, the benefit of these projects is short term. Because of the weak economy, the government is frequently unable to sustain them after the donor's financial support ends.

To ensure ownership, government and sometimes the rural folks, are obliged to contribute a third of project costs, which is called counterpart funding. However, due to government budgetary constraints and farmers' low incomes, this condition is seldom met on time, thus making it difficult to utilize borrowed money. Furthermore, most of these projects employ technical experts from outside the country at great cost. Sometimes the difference in perception between the technical experts and the outlook of counterparts with regard to what should be done in the name of development delays project implementation.

Ghana has also enjoyed a good working relationship with nongovernmental organizations over the years, including SG 2000, Global 2000 of the Carter Center, TechnoServe, and World Vision International. Most of these NGOs work in agriculture, health, and poverty alleviation in rural areas. They help rural people find answers to their needs. However, some NGOs work without effective collaboration with local administrative structures. This commonly leads to overlapping activities and creates problems when the project ends and local authorities have to take over the facilities.

Under community-government-NGO partnerships, special mention must be made of the partnership between our government and the Sasakawa African Association in all phases of their operations. This partnership is of great significance to me personally because SG 2000 activities in sub-Saharan Africa first began in Ghana in 1986. During my tenure as the minister of food and agriculture, I had the honor of being the signatory to the memorandum of understanding that spelled out the responsibilities of SG 2000 and my government.

In the early stages of the project, the partnership focused on production of maize and sorghum. The scope was later expanded to cover crops such as cowpea, cassava, and soybeans. This was a joint effort between farmers, extension agents, researchers, and SG 2000. Participation in the program expanded from 40 farmers selected for production tests in 1986 to 80,800 farmers by 1989; yield increases ranged from 675 to 900 kg/ha in 1986 to 2,250 to 2,700 kg/ha in 1989.

Moreover a credit scheme for small-scale farmers was initiated linking farmer groups to banks—especially the Agricultural Development Bank of Ghana. There was the linkage of farmer groups to

private import distributors for seeds, fertilizers, and other agro-chemicals. There was the promotion of on-farm post-harvest management through the construction of narrow cribs and drying patios. There was promotion of improved post-harvest agro-processing technology and support for research to develop quality protein maize (QPM). Production of QPM and its utilization country-wide is seen as resolving the protein deficiency problems experienced with other varieties of maize grown in the country.

There has been support to the Ghana seed industry to develop sustainable seed systems and seed growers' associations, as well as support for development of mid-career extension staff. Under the latter project, a partnership was developed with the Ministry of Food and Agriculture, the University of Cape Coast, the Sasakawa African Association, and Winrock International in 1993 to launch a B.Sc. agricultural extension program for mid-career officers who possess a diploma in agriculture or related field.

Also, as minister of health, my ministry entered into partnership with the Global 2000 Program of the Carter Center to work on eradicating guinea worms that plagued the rural areas of Ghana. This partnership has led to near eradication of the guinea worm in Ghana. And in areas where guinea worm has been eradicated, a remarkable increase in food production has occurred.

Although no partnership or social system can be perfect, it is noteworthy that our partnership with the Sasakawa Africa Association and Global 2000 has been successful. This success story can be attributed to collaboration among major stakeholders at all levels, backed by strong and committed leadership from both partners. This collaboration embraced all stakeholders such as farmers, construction agents, researchers, financial institutions, and the private sector including input dealers, universities, and other institutions that have a stake in rural development.

Instead of running a parallel development system, the Sasakawa Africa Association and Global 2000 made use of existing institutions and structures to reach rural people. The process, if supported by existing structures, can help to build local capacity. SG 2000 programs were not static or cast in concrete: the activities undertaken evolved with time in response to changing trends in the rural economy. The programs we started with an emphasis on improving maize productions evolved to include soybean and cowpea, the storage of legumes, the development of quality protein maize, and improvement in seed production.

The flexible and innovative nature of the partnership enabled it to address the relevant issues and needs of rural people at that time. SG 2000 has periodically updated its partnership with countries and organizations through international workshops.

As stated earlier, agriculture and rural development is complex, crossing many disciplines and activity areas. Sustainable development of rural areas therefore requires effective collaboration among all stakeholders—the rural people, government agencies, multinational and bilateral donors, NGOs, and the international community. I see this collaboration as an arrangement in which stakeholders participate in the planning, implementation, and evaluation of development programs. This is, no doubt, the notion of participatory development, which:

- enables everyone to be seen and heard in the development process
- helps stakeholders to learn to develop common understanding of problems and interventions

- improves decision-making through cross-fertilization of ideas
- gives rural people greater control over program design and implementation
- enables rural people to take ownership of the programs

To ensure continuity and sustainability of programs emanating from these partnerships, all activities should dovetail into existing structures. I reiterate that African rural economies are weak, hence the need for support from our development partners. However, it is no exaggeration to say that conditions imposed by some partners make it difficult to attain rural development objectives. The question is whether these conditions cannot be made more flexible in the interests of rural people.

Ensuring judicious utilization of resources meant for rural development requires democratic governance that ensures transparency, accountability, and probity at all levels. There must also be mutual trust and respect for people's opinions and views. No development partner should pre-determine what should be done, and how it should be done. Rather, there should be continuous dialogue among the partners to enable them to respond to the changing needs and conditions of the rural areas.

In conclusion, I would emphasize that efforts to develop the rural areas of Africa are not an option but a must. The rural areas house and feed most of the population of sub-Saharan Africa. We all agree that agriculture, which is the lifeline of rural Africa, is not fulfilling its vital function of feeding the people, providing other basic commodities, and generating stable income to enhance and improve living conditions.

My experience, from working with the rural people of Ghana, shows that the development of these areas will depend on effective collaboration among stakeholders to facilitate the sharing of resources, experiences, skills, and knowledge to solve the inherent problem of food insecurity and poverty.

The success story of Sasakawa Africa Association and Global 2000, in Ghana among other countries, is a good example of effective partnership that should be encouraged in the fight against poverty and deprivation in our rural communities. I would reiterate that any meaningful partnership in sub-Saharan Africa has to thrive on democratic governance, transparency, probity, and accountability. Sub-Saharan African countries are making efforts to establish these democratic processes, which will create a conducive environment for effective partnership in rural development.

Good Partnerships and Productive Partnerships

William Foege

Partnerships always sound good, but are they really? The question to ask is, how does a partnership help? It is not worth the effort if we cannot see an outcome. In medicine, specialization has become important to maintain a comfort level for the practitioners and for patients. However, we all know that you cannot deal with just specialists. You have to have generalists who figure out who should be on the team and how to integrate and interpret.

The same thing is true in development: we need specialization. But without the generalists who see the big picture, we do not get what we need. The difference between good and great development programs will rest on how broad the interests and the perspectives of the practitioners turn out to be.

It is often said these days that the leaders of today and tomorrow will be the people who know how to put together coalitions. But coalitions have always been important, not just recently. When I hear academics in the United States talk about how great the science is in their university—as if they had started it themselves—I think about these coalitions over time and over space.

Many scientific ideas originally came from Asia through Persia and Samaria to Greece and to Rome. Think of the partnerships required. Monks actually copied many of these manuscripts, being told that for every line one sin would be forgiven. A thousand years ago, these manuscripts went from Greece to the Muslim world, where the Muslims, who were interested in everything, put them into Arabic. Then many of the original Greek manuscripts were lost, and a group of Jewish translators translated them from Arabic to Latin and Hebrew, and the manuscripts went to universities around Europe. People like Roger Bacon caused a renaissance of science based on Greek texts that had been lost, that had gone into Arabic, back to Latin, and into European languages. What a history of unplanned partnerships there has been. What we could do if we actually planned these things!

The management sage Peter Drucker recently gave a talk on organizations of the future. He said that organizations should be seen as a tool and not an interchangeable tool. In any tool-kit there

William Foege is senior health adviser, The Carter Center, USA.

are many kinds of tools. Drucker says a cathedral, a prison, a hotel are all buildings, but they are not the same. Likewise organizations are all very different, and one has to make the tool for the task: special-purpose tools. Partnerships allow one to make special-purpose tools.

However, Drucker says there are two key questions as you form new organizations: What is the purpose? And, how do you organize to achieve that purpose?

So we ask, what is the purpose? We all want to work with people of good will, but it is shared purpose that becomes the basis for partnerships. I once taught a vocational guidance class for teenagers. I had them all write their obituaries first. I said if you can write what you hope people will say about you when you die, then you have an idea of what you have to do in life. If you know what you have to do in life, you know what skills and knowledge will be required to do that. If you know the skills and knowledge, then you have a good idea of what courses you have to take, and that leads you to figure out which schools you go to. So that is what we have to do: we have to look at the end. What is it that we want at the end? The key is to understand destination.

Going back to Peter Drucker, he once said, "If you know where you are going, there are many ways of organizing how to get there; if you don't know where you are going, it doesn't matter how you are organized." This advice would keep us from partnerships that simply feel good but that are not productive.

What outcomes would we like to see? I start from the premise that any purpose, any outcome, any product that we are involved in must be seen against the backdrop of the biggest problem the world faces today, which is the population-environment nexus. There are a number of desirable outcomes, but I will list eight that I believe are very important today: reduction of birth rates, good nutrition, good health (as you see, already these things start interrelating, because if you have good nutrition you greatly improve the chances of having good health; if you have good health, you increase the ability to provide for good nutrition), productivity, reduction in poverty, improvement of literacy, a protected environment, and sustainability.

This list suggests some priorities for partners. We want to provide good nutrition to the people who are living, and we quickly want to reduce birth rates so that we do not have so many people in the future. We still have a chance in Africa. There are large areas where population density is still quite low, so we have a chance to make a difference. But it is almost an emergency; it takes very quick action.

We now know that there are three programs that can be shown to reduce birth rates. One, of course, is family planning programs themselves. However, a second, which always seems like a paradox, is child survival programs. The highest population growth rates in the world have traditionally been in the areas with the highest infant mortality. If one wants to reduce birth rates, therefore, one of the best predictors is declining infant mortality. The third is education of females. We are all aware of the World Bank report a few years ago stating that female education yields the single best return on investment in the world today. One more program that everyone assumes will reduce birth rates—although full proof is not yet in—is microfinance, especially for women.

We do not have to be experts in each of these fields. If we could link agricultural programs so that they partner with child survival, family planning, education, and

microfinance, we could speed up the process. If we put these things together, it is likely that the synergy would cause birth rates to plummet in one generation.

Two examples of partnerships in health are worth mentioning. In 1984 Jonas Salk and Robert MacNamara had the Rockefeller Foundation get a group together in Belagio, Italy, to ask the question: how do we improve world immunization rates? At that time, less than 15 percent of the world's children were being immunized. A partnership of WHO, UNICEF, UNDP, World Bank, and the Rockefeller Foundation was developed, and this partnership so spurred immunization that the rates of coverage reached 80 percent 6 years later. This phenomenal achievement was not done by health departments alone. James Grant of UNDP was a master at getting heads of state involved in childhood immunization. Rotary International gave over US$400 million. Schools, churches, entire communities participated. It is a good example of global, national, and local partnerships for an agreed goal.

The Mectizan program is the second example. Mectizan was developed by Merck & Company as a veterinary drug for heartworm in dogs and some other animals. In the 1980s Mohammed Aziz of WHO had the idea that this drug might have a favorable effect against onchocerciasis (river blindness) in humans. He went to Roy Vacelos, who was head of research for Merck at that time, and asked for money to do research in Africa. Vacelos already knew this drug would not be a big money producer for Merck, but he went ahead and allocated the money. It turned out to be a miracle drug—a drug that, if given once a year, will prevent blindness in humans due to onchocerciasis. So the drug was developed for human use. When Merck did the benefit-cost analysis, they found out it was too good a drug. If you only have to use it once a year for the poorest people in the world, you cannot make a profit. So they decided to give it away. They have now given away US$300 million worth of that drug. Last year 20 million people were treated with it.

Here is the important point for our discussion today. This is a program where there is no central structure. Twenty million people are being covered because WHO, UNICEF, Merck, the World Bank, 28 ministries of health, all kinds of NGOs, and all kinds of medical mission groups share a goal. The only thing that holds it together is that they have to apply to a committee that approves their application. I believe it is the most remarkable program in global health today just for that reason—it is totally partnerships.

This model has been so successful that other pharmaceutical companies are now doing similar things. Glaxo Wellcome has developed a drug against malaria called Malarone, and because of Merck's example, Glaxo Wellcome is willing to ask the question: can we balance market needs and social needs? When a new antimalarial drug or antibiotic is released, the market causes it to be used to the maximum, and that means misused, and resistance develops. So Glaxo Wellcome is asking, could they control the use? And in Africa they are trying to figure out how to get it to the right people, and then give it only under direct observation. So they are taking a big risk to see whether they can make this happen.

SmithKline Beecham has recently agreed to give free albendazole for lymphatic filariasis. They expect to give away US$500 million worth of this drug. Now the Carter Center is working with some pharmaceutical companies to see how to tie the donation to the actual results, so that the better the results in a country, the

larger the donation to that country. So many creative things are happening that are all due to partnerships.

There is a need for partnerships, and we now have examples that they can work. We frequently want to do something about development but we just cannot get over the inertia to do it. That is the way we are with development: there is so much that we want to do, and we just do not get ourselves organized.

What are the steps? Once we have the outcomes, we have to ask who could actually be interested in those outcomes, and then develop a program around a shared goal. Gary Wills has a book called *Certain Trumpets*. He takes the title from a bible verse: "If a man hears an uncertain trumpet, will he gird for battle?" In *Certain Trumpets*, Wills says: "The key to leadership is to find the shared goal because then you have something people want to sign on to." Agree on that goal, work out the milestones, figure out how you are going to review them, how you are going to revise the milestones as needed, how you change your plan as you go.

In late 1970s in the United States, we realized that many countries had health plans and we did not. So in 1978 we developed a health plan for the year 1990. We brought all kinds of groups in to ask what would be a reasonable goal by 1990. We came up with 220 objectives for 1990. They were not very good, but it did not matter—a process had been started. When people came together for the 2000 goals, it turned out much better—there were better partnerships. Now we are working on the 2010 goals, and every day the partnerships get better.

So the bottom line and the lesson of history is that it may not be easy, but it is possible to plan a rational future. Why? Because this is a cause and effect world; it is not a fatalistic world. If that were not true, we would not be meeting here. The future never just happens. As someone said, it is created and the only way to predict it is to create it. Jonas Salk used to say: "Evolution will be exactly what we want it to be."

In public health, we often talk about an ounce of prevention being worth a pound of cure, but a man by the name of Paul Frame said: "That may be true, but an ounce of prevention is a ton of work." Developing partnerships for development is a ton of work.

SG 2000's Partnerships—Present and Future

Christopher Dowswell

I want to look at some of the types of partnerships SG 2000 has had and ones that we hope to develop in the future. Keep in mind that our program is primarily a field program to support and demonstrate improved technology with smallholder farmers working through ministries of agriculture. It is also a policy-intervention program in which we use the skills, knowledge, and prestige of President Jimmy Carter, Dr. Norman Borlaug, and Prof. Edward Schuh to try to influence agricultural policy both in national governments and in donor agencies.

One type of partnership that SG 2000 has, although we do not often think of it explicitly, is advocacy alliances. These are partnerships with organizations and individuals with whom we share a vision about agricultural development—a commitment to diffuse science-based technology for the small-scale farmer in Africa. These advocacy partnerships are important because there are many groups and individuals who have a distorted vision of African agricultural development. With progress in information technology, e-mail and so on, we have an opportunity to share information more easily than we did before. Workshops like these also help. Also, op-ed articles by President Carter and Dr. Borlaug and papers by Prof. Schuh inform and influence public opinion on key issues of agricultural development.

We see a lot of anti-science, anti-technology people out there. They are making big mistakes in seeing problems—sometimes imagined, sometimes real—in the developed countries and then shifting the solutions for those affluent countries to Africa where the problems may not exist at all. Fertilizers are a perfect example. Countries where fertilizers are applied at 400 or 500 kg/ha may have a nitrate problem, but it is a fallacy to say that African farmers should not use inorganic fertilizer because in some Western countries too much is used. So we need to work with those who share a vision in advocacy alliances to try to educate the public, to inform national policy makers, and to influence investment decisions in donor agencies.

A second type is strategic partnerships that SG 2000 has with other organizations,

Christopher Dowswell is director for program coordination, Sasakawa Africa Association.

and often that they have among themselves, in which we may not be directly involved, where there are complementary skills. The partners have to recognize that they need each other, and they have to respect each other and each other's potential contributions.

SG 2000 is a group of agricultural scientists, but we are concerned about the much larger circle of agricultural development issues. So in areas like enterprise development, microfinance institutions, improving adult education, and getting universities more involved in the development process—particularly upgrading the skills of extension workers and those serving in the ministries of agriculture—we need partnerships. We need to work on partnerships and promote them among the different groups.

Today, we hear more and more that the private sector will solve everything. In SG 2000 we believe in the private sector, but we believe that there must be a partnership between the private and public sectors. Under "private," one might include NGOs and foundations, in addition to businesses, and under "public" are government organizations, as well as multilateral and bilateral donor agencies. We look to find partners with business skills so we can focus, with the ministry of agriculture extension and research people, on the technical aspect of improved productivity, and others can work on organizational issues, business development, accounts, business plans, etc.

In the NGO world, we have links with TechnoServe, Self-Help Foundation, ACDI/VOCA, and Winrock International. In the private sector, we have worked with half a dozen of the big transnational companies. This is, therefore, an important new area. We are trying to see what sort of partnerships we might be able to put together that will involve private business people, NGOs, and government organizations. We hope that from this meeting and working together we will find more effective ways to make these partnerships bear fruit.

Other types of partnerships are financial alliances. Until now, SG 2000 has preferred to be a broker in partnerships where we are trying to bring together ministries, donors, and NGOs, or perhaps private firms, which are also potential donors. We play a facilitating role but do not seek funding for ourselves. Until now, our donor, the Nippon Foundation, has given us sufficient financing so we have not had to seek funding for our own activities, but we are very interested in how we can better promote financial partnerships. One problem we find is that institutions, particularly other NGOs, that are well-equipped to complement our technical skills often do not have funding. In some cases, we have been able to share some of our funding in a partnership way.

We work with Winrock International in the Sasakawa Africa Fund for Extension Education to build innovative degree courses for front-line staff from the ministries, and we are able to put some funding into that. We put funding into IITA, which has developed agro-processing technology prototypes, and we are more involved the extension of agro-processing equipment. We have been able to provide a small amount of assistance to IFDC's work on fertilizer-sector development issues. And previously we also had some small financial relationships with TechnoServe and ACDI/VOCA in group development.

The issue of how to finance partnerships is an important one because SG 2000 has limited ability to share its funding with others. Yet there are a number of the groups that have the special skills and that we would like to work with, but for us to

develop a program of cooperation they will need to find funding.

I would like to stress that our organization is highly decentralized. If there are any kings in our organization it is the country directors, and the responsibility for most decisions and planning in our organization rests with them. For example, in developing a partnership between Monsanto and SG 2000 in conservation tillage, Wayne Haag played the key role. Thus, as we look to develop partnerships with each other, keep in mind that it is nice to talk to our headquarters staff, but the people to convince and with whom to work out arrangements are the country directors in a particular country of interest. They will consult with headquarters, especially if they commit the organization and its resources, but the decisions rest mostly with them because they are the ones who are going to implement the relationship.

How to link donors with NGOs in an effective way, or donors with the private sector in an effective way, needs to be explored much more. SG 2000 has been working to develop a partnership relationship with the World Bank, the biggest player in agricultural development in Africa. We have had many meetings and attend each other's workshops, but it has been difficult, largely because they are so big and we are so small, to influence their decisions in investment based on our much smaller pilot efforts as an NGO. One challenge will be to find ways donors can work with NGOs in a mutually beneficial relationship and one of mutual respect to get the synergies that we are looking for in development activities.

Quality Protein Maize in Ghana: A Partnership in Research, Development, and Transfer of Technology

Strafford Twumasi-Afriyie, Wayne Haag, and Evangelina Villegas

TWUMASI-AFRIYIE

In Ghana, cereals are the major source of calories and protein in the national diet and constitute the predominant food for children. Among the cereals, maize is the most important, accounting for 60 percent of cereal production from 1987 to 1989. In coastal regions of Ghana, maize supplies 90 to 95 percent of the calories in diets.

The widespread dependence on cereals contributes to malnutrition, particularly among children. According to the Ministry of Health, children in Ghana grow well during the first 6 months of life, but when the mother's breast milk ceases to be sufficient to sustain the child's rapid growth and weaning begins, malnutrition becomes widespread. Typically the first weaning food fed to children is a thin gruel made from maize or millet. Few mothers supplement this cereal diet with other sources of protein, such as beans, fish, or milk due to ignorance about proper nutrition, high cost, or lack of time.

Diets that are based largely on cereals tend to be low in some essential amino acids, which cannot be synthesized by humans or other monogastric animals. Even though maize normally has about 10 percent protein, not all of it is usable by monogastric animals because the protein is low in the amino acids lysine and tryptophan. Infants fed normal maize, without a better balanced protein supplement, often develop the malnutrition disease kwashiorkor.

Worldwide efforts to develop cereals that have improved protein quality began in 1963 with the discovery of the recessive mutant maize gene opaque-2, which produced protein that was twice as nutritious as the protein of ordinary maize. However, early efforts to breed varieties that were acceptable to farmers and also possessed high protein quality encountered several problems including low grain yield potential, unacceptable chalky grain type, high moisture at harvest, and high susceptibility to stored

Strafford Twumasi-Afriyie was formerly maize breeder, Crops Research Institute, Ghana, and now is with the International Maize and Wheat Improvement Center (CIMMYT) in Ethiopia. **Wayne Haag** was formerly country director, SG 2000, Ghana, and is now SG 2000 country director, Mozambique. **Evangelina Villegas** is researcher emeritus, CIMMYT, Mexico.

grain insects and disease attacks.

As the result of several decades of research, particularly at CIMMYT (International Maize and Wheat Improvement Center) in Mexico, maize germ plasm became available that had high protein quality plus a grain yield potential and agronomic characteristics comparable to those of normal maize. It was developed by accumulating opaque-2 modifier genes through breeding supported by laboratory analysis of protein quality. The outcome of this research, a normal looking, hard-endosperm grain type, was called quality protein maize (QPM).

Genesis of QPM in Ghana

In Ghana, an intensified program to develop high and stable yielding QPM varieties, to demonstrate their nutritional advantages, and to promote their production, marketing, and utilization was started in 1989. At that time, the Ghana Grains Development Project (GGDP), supported by the governments of Ghana and Canada, had nurtured multidisciplinary research on maize and legumes for a decade. GGDP was executed jointly by the Crops Research Institute (CRI) of Ghana and CIMMYT.

Under the project, the National Maize Program had enjoyed relatively strong financial and material support. The maize breeding program had developed and released eight normal maize varieties. All had improved grain yield and agronomic advantages over previously released varieties and local farmers' varieties. Farmers' confidence in new varieties from CRI was high.

Before 1989, CRI had made no systematic effort to develop a QPM variety, though for a number of years CRI had collaborated with CIMMYT-Mexico in international trials of QPM, as CIMMYT continued to refine QPM germ plasm. However in 1989, for the first time, the CRI maize breeding program had three maize breeders at post. That made it possible for CRI to assign one breeder to QPM development.

Also, in 1989, QPM received national attention when SG 2000 held a review seminar in Ghana. President Jimmy Carter, Mr. Ryoichi Sasakawa, and Dr. Norman Borlaug introduced the concept of QPM as a nutritious food to the President of Ghana, His Excellency Flight Lt. J. J. Rawlings.

Even though these events augured well for QPM, the fulfillment of the promise still seemed far-fetched. In Ghana, as elsewhere, a debate raged on the usefulness and relevance of QPM in the real circumstances of the small-scale farmer and target consumers. The debate was most heated at CIMMYT, even though most of the scientific work needed to turn this dream into a reality had been made by CIMMYT. Ultimately CIMMYT chose to phase out QPM research because the demand for QPM germ plasm from national programs, which were to serve as stepping-stones to farmers, was not strong. Furthermore, the few attempts that had been made to introduce QPM to farmers had been only marginally successful.

Thus, Ghana decided to intensify its effort with QPM during the same period that CIMMYT, its main partner, was in the process of dismantling its QPM program. It was a challenge for Ghanaian researchers to propose directing scarce resources to QPM in Ghana within the framework of a project in which CIMMYT was one of the executing agents.[1]

To chart the way forward, a meeting on QPM was sponsored by SG 2000 in Accra in 1990. The meeting involved Ministry of Food and Agriculture (MOFA), CRI, and SG 2000. The meeting first resolved looming institutional conflicts concerning

roles and responsibilities in QPM research and dissemination. CRI was recognized as the lead institution in variety development; MOFA, particularly the extension service, was recognized as the lead institution for dissemination to farmers; and SG 2000 was recognized as the facilitator for both research and extension.

Before this meeting, SG 2000 had already started multiplying some QPM populations in one region of Ghana and planned further testing in farmers' fields. CRI felt by-passed and was unhappy that an untested variety, susceptible to streak virus, was about to reach farmers. CRI worried that this action might erode the farmers' hard-earned confidence in new maize varieties. Once before, in the 1950s, the premature release of a flint maize variety had brought improved maize varieties into disrepute in Ghana. During the meeting, it was agreed to form a QPM Working Group at the technical level, which would bring together all scientists, extensionists, and other stakeholders directly involved in QPM research and extension. The working group initially involved the nucleus institutions, but it gradually expanded to include other institutions.

Inter-Institutional Approach

It was important to formalize the inter-institutional cooperation so that it received encouragement from all levels, rather than being viewed as suspect and clandestine. QPM research and development in Ghana was multi-institutional, involving CRI, MOFA, the Ministry of Health, the University of Science and Technology, seed growers and input suppliers, SG 2000, CIMMYT, and the Canadian International Development Agency (CIDA).

CRI led variety development with close collaboration and financial support from SG 2000. This partnership became a key factor behind the growth of QPM in Ghana.

MOFA provided special extension and seed production support to QPM. Ghana's first QPM variety, Obatanpa, was demonstrated by the extension service under high yield conditions (fertilizer, good agronomy, etc.) using the mechanisms of extension test plots and farmer production plots. The Grain and Legume Development Board was the producer of maize foundation seed. The Ghana Seed Inspection Unit of MOFA helped private seed producers to produce and market good quality seed including that of QPM. The Post-Harvest Development Unit of MOFA helped farmers to store their QPM. SG 2000 participated in planning and in providing logistic and financial support to the relevant departments of MOFA for these activities.

The Ministry of Health collaborated with CRI, MOFA, and SG 2000 to demonstrate the nutritional importance of QPM in infant feeding.

The University of Science and Technology, Kumasi (UST), collaborated with CRI and SG 2000 to show the relevance of QPM in animal feeding (pigs and poultry). This was important also to make believers out of all the team.

The Ghana Seed Growers Association was developed when MOFA, CRI, and SG 2000 nurtured private individuals and farmer cooperatives to take over maize seed production and distribution after the Ghana Seed Company closed in 1989. Until then, the company had been the sole government agency charged with seed

[1] When the closing of the CIMMYT QPM program was formally announced in 1991, the final blow to the miracle of QPM seemed to have been delivered. However, the QPM germ plasm CIMMYT had already developed was placed at the disposal of interested national programs, and Ghana was among a few that took up the QPM crusade.

production and distribution. Soon viable small-scale seed producers emerged (e.g., Fufuo Cooperative in Ashanti Region, Tom Ahima in Brong-Ahafo Region, and the Somanya Cooperative in the Greater Accra Region). A Seed and Agricultural Chemicals Sellers Association also emerged, which marketed QPM seed at locations throughout Ghana.

SG 2000 served as the facilitator for QPM research and dissemination. It facilitated the activities of the working group members by supplementing their institutional support for QPM development and providing funding in support of travel and facilities. It also provided material and financial support to the extension, seed, and post-harvest programs of MOFA, animal nutritionists at UST, and human nutritionists in the Ministry of Health.

Despite the controversy over QPM at CIMMYT headquarters, the deputy director of CIMMYT's maize program and CIMMYT's representative in Ghana supported the Ghanaian initiative. This facilitated matters.

The opinion of the Canadian International Development Agency (CIDA), as the major donor to Ghana's maize program, was important. They also respected and supported the Ghanaian initiative. Thus, CIDA's 17 years of funding maize research in Ghana provided the springboard for QPM success in Ghana.

Scientists from these institutions who were involved in Ghana's QPM program met regularly to share ideas as the QPM Working Group.[2] Group research paper presentations were also given at various forums, such as the Ghana Animal Science Meetings. Members were also sponsored by SG 2000, to present papers at an international symposium on QPM in Brazil in 1994.

Variety Development Process

The QPM germ plasm used to start the program was collected from CIMMYT, Mexico. Because maize streak virus disease was an important biotic stress in Ghana. The International Institute of Tropical Agriculture's streak conversion facilities in Nigeria, were used by Ghanaian scientists to breed resistance into susceptible CIMMYT materials. The husk covering of QPM germ plasm was improved and the lodging tendency reduced. Irrigation was employed to grow about three crop cycles per year in an accelerated improvement program.

The first QPM variety released in Ghana was given a name, Obatanpa, that could be associated with both maternity and child nutrition. Obatanpa means "the good nursing mother." This name was well received and was an important factor in publicizing the variety.

Ghanaians prefer white dent grains for making local dishes because of their relative softness. Obatanpa was much softer than other previously released normal maize. Housewives easily adapted it for making popular local dishes.

The potential contribution of Obatanpa to child nutrition in Ghana and the nutritional superiority of processed QPM compared with normal maize diets has been documented (Ahenkora et al. 1995).

A hybrid development program was also initiated. Inbreeding by self-pollination and early generation testing, through topcross evaluation, were used to develop several inbred lines. Diallel crosses and evaluations were used to determine the combining abilities of advanced inbred lines. Several single and three-way hybrids were developed. All varieties and hybrids were first tested at research stations located in the major agro-ecological zones of Ghana. Those that performed well on-station were further tested in

farmers' fields throughout the country. Three QPM three-way hybrids were released in 1996.

In 1995 and 1996, the CRI maize program put together the QPM International Hybrid Trial for evaluation by interested national programs. The 10-entry trial consisted of six QPM three-way hybrids and two open-pollinated maize checks—Obatanpa (QPM) and Abeleehi (normal)—and two local checks nominated by each participating national program. The QPM hybrids were GH2328-140T, GH110-28, GH110-5, GH110-88, GH2328-88 and GH132-28. CIDA and SG 2000 sponsored the trials. Seventeen countries in Africa, Asia, and Central and South America participated in the international testing. The QPM hybrids developed in Ghana performed well in these trials.

A QPM laboratory was established at Fumesua with the financial and technical assistance of SG 2000. The biochemist in-charge of the laboratory was trained at CIMMYT. Further, a former CIMMYT food scientist and biochemist served as a consultant in installing the laboratory and making it operational. The laboratory supported the QPM breeding effort by providing data on grain protein and tryptophan levels on QPM materials on timely basis to aid the selection process.

Animal Feeding Studies

Collaborative research studies on pigs, chickens, and rats were conducted to ascertain the nutritional advantages of QPM in feed and food. These activities were also a joint effort involving GGDP, SG 2000, UST, and the Ministry of Health, with funding from CIDA and SG 2000.

QPM was used as a feed ingredient for pigs. Fourteen starter pigs, from two litters (8.4 kg average weights) were divided into two equal groups (each containing three females and four males). They were fed similar diets (ad libitum) for 16 weeks. One diet contained 91 percent QPM (Obatanpa) and the other contained 91 percent normal maize (Okomasa). Mineral and vitamin supplement constituted the remaining 9 percent of the diets. Results clearly demonstrated the nutritional superiority of QPM (Osei et al. 1994c).

To assess the value of QPM in poultry feed, Obatanpa was used as a feed ingredient in a series of three trials with broiler chickens conducted in 1992 and 1993. One study focused on using QPM or normal maize as the sole source of protein and energy. The other studies determined the feasibility of reducing the levels of fishmeal in the commercial diets when QPM replaced normal maize. Broiler chicks were fed starter and finisher diets in which QPM substituted for normal maize. These studies also confirmed the nutritional superiority of QPM, which led to cost savings (Osei et al. 1994a, 1994b).

QPM for People

Kenkey

Kenkey is a popular local food made from fermented maize dough and eaten nationwide. The effect of processing and food preparation on the nutritional quality of kenkey made from normal maize and QPM was studied. Weaning rats were also fed ad libitum for 28 days on kenkey-based diets made from QPM and normal

[2] The key members of the QPM Working Group: *CRI:* S. Twumasi-Afriyie, maize breeder, M. Owusu-Akyaw, entomologist, E. A. Asiedu, seed technologist, Kwaku Ahenkora, biochemist, and Ben Dzah, agronomist and maize breeder; *SG 2000:* Wayne Haag, country director, SG 2000 Ghana; *MOH:* Abena Akuamoah-Boateng, Ashanti regional nutrition officer; *MOFA:* L. L. Delimini, head of Ghana Seed Inspection Division, V. K. Ocran, head, Ghana National Seed Service; *GLDB* (MOFA): R. Asuboa, seed technologist; *UST:* D. B. Okai, and S.A Osei, Department of Animal Science.

maize in which maize served as the sole source of protein and amino acid. Again, Obatanpa proved to be nutritionally superior to normal maize when processed into foods (Ahenkora et al. 1995).

Agricultural Technology/Nutrition Impact Study

The extension service introduced Obatanpa in the Ejura-Sekodumasi District of Ashanti Region in 1992-93 as part of a maize production package that also included fertilizer and good agronomic practices. Extension and the Post-harvest Development Unit provided the post-harvest support. The Nutrition Division, Ministry of Health, assessed the nutritional impact of QPM. This community-wide study was a multi-institutional effort involving CRI, the extension service, the Post-harvest Development Unit, the Ministry of Health, and SG 2000. The objective of the study was to assess the impact on farming practices and the nutritional status of the children in the area from agricultural technology transfer involving QPM. Although Obatanpa was being promoted nationally, this project created an opportunity for in-depth observations. The Ejura-Sekodumasi District was chosen because of its low nutritional status. People in the area mainly consume maize and are net exporters of maize.

Baseline demographic data (health and nutrition statistics) and survey data on the farming practices in the study area were collected. Farm families who participated in the study were given production credit, consisting of seed of Obatanpa or the normal maize variety Abeleehi, plus fertilizer and a grain storage insecticide. These farmers were also provided extension support. Participating farmers were also given assistance in building improved maize storage cribs, as well as cement drying and processing patios, as part of a post-harvest intervention.

In the major and minor seasons of 1993, 444 farmers cultivated 384 hectares of maize, with about 50 percent receiving Obatanpa (QPM) and 50 percent receiving Abeleehi (normal maize). Three-day dietary assessments were carried out on children equally distributed within the two maize variety groups at 6-month intervals. In another study, 120 infants up to 15-months old were randomly divided into two groups and provided with 100 g/kg body weight/day of maize dough on a weekly basis. This simulated the common practice of rural mothers who mill maize grain once a week and make a dough from which they prepare *koko*, the main weaning food. The studies and observations indicated that QPM-fed children were healthier, suffered less fatalities, and had better growth rates.

Breaking the Myths about QPM

Activities, experiments, and demonstrations were planned to dispel lingering questions about QPM:

Would QPM produces less grain yield than normal maize? The program demonstrated that QPM varieties could produce as well as, or better than, normal varieties in Ghana (table 1) and elsewhere.

Would lysine and tryptophan, which are heat labile, be destroyed during processing, thus lowering QPM's nutritional advantage

Table 1. Yield (t/ha) of Obatanpa (QPM) and medium-maturing normal maize varieties tested at six to eight locations per year, on-station, in Ghana, 1991–95.

Year	Obatanpa	Abeleehi	Aburotia	Farmer's
1991	5.1	4.7	4.1	2.6
1992	6.0	5.2	5.0	3.8
1993	4.7	4.7	3.0	2.7
1994	4.3	3.9	4.3	3.0
1995	5.9	5.4	–	4.2

Source: GGDP 1991-95.

in prepared local dishes? An experiment demonstrated that the nutritional advantage was sustained when QPM was processed into the most popular local dishes (Ahenkora et al. 1995).

Because QPM is conferred by a recessive gene with modifiers, would QPM gown in small farm fields lose its nutritional advantage? In one study, 0.4 hectare of a white QPM variety was surrounded with a yellow endosperm, normal maize variety. The two varieties had similar flowering periods and were allowed to cross freely. Results from 2 years of trials at several locations showed a maximum of 10 percent contamination by normal maize. The contamination only reached that level within 12 meters of the normal maize and in the portion of the field corresponding to the prevailing wind. Based on a rat-feeding study, the nutritional quality of the bulked grain from the most contaminated lot was still not significantly different from the noncontaminated QPM. In another experiment using physical mixtures, it was shown that the superior nutritional quality of QPM was sustained up to 20 percent inclusion of normal maize in QPM grain lots.

Would QPM be difficult to store at the farm level? A laboratory study in which weevils were introduced into grain of normal maize or QPM showed no difference in the extent of damage. Both normal maize and QPM were rapidly destroyed. Moreover, it was clear that existing post-harvest handling practices were very poor in Ghana and that the available improved post-harvest technology, if adopted, would enable farmers to store both normal maize and QPM without damage. Consequently, the Post-Harvest Development Unit of MOFA, supported by SG 2000, trained farmers who grew improved maize, including Obatanpa, to build the recommended narrow cribs and drying patios, to clean their grain, and to treat it with a recommended insecticide. Other studies demonstrated that Obatanpa was no different from other varieties in susceptibility to larger grain borer attack.

Would marketing be difficult because QPM lacked visible identity that could be used to sell it to offset additional costs of production? In fact, there was no additional cost of production of Obatanpa. It produced a higher yield than the normal varieties it was replacing. Agronomic performance, per se, became an incentive for growing the variety, supplemented by the knowledge of its nutritional superiority.

Special marketing channels were developed for Obatanpa. Private purchasing agents surfaced to market Obatanpa, encouraged by the demand of some commercial users. The private purchasing agents linked up with producers to assure the quality of Obatanpa for the users. Examples of such users were Nestle Ghana Ltd., Vitalmix (infant feed producers), the Greater Accra Region Poultry Farmers Association, and the Catholic Relief Services (table 2). Poultry farmers such as Asare Farms, Kumasi, also used contract outgrowers to obtain their supply of QPM.

Some block farmers such as Aiyinase Cooperative Farm and Somanya Block Farmers cultivated only Obatanpa to take advantage of the special market. Several

Table 2. Specialized use of QPM in Ghana by various groups.

Agency	Mode of utilization
Nestle GH Ltd.	Infant formula, maize grits
Famidus GH Ltd.	Infant formulas
Agrimat	Dried fermented flour
Catholic Relief Services	Relief donations
Kumasi Children Welfare Clinic	Feeding of malnourished infants
Poultry farmers	Poultry feed
Guinness Brewery	Malt production

villages became almost saturated with Obatanpa because virtually every farmer began cultivating the variety. These situations offered special marketing opportunities.

Significant QPM Events and Milestones

An experiment and demonstration was conducted in which Obatanpa was compared with Okomasa, the most popular normal maize variety at that time. The comparison was done in a same-litter pig feeding experiment in which maize served as the sole protein source. This experiment, nicknamed the "QPM Pigs" served as a proof to many of the nutritional advantage of Obatanpa. During the experiment, open days were held to expose seed growers, farmers, food processors, and other users to the potential of QPM. The extension test plots and farmer production plots of SG 2000 and MOFA, in which input credit for seed, fertilizer, and insecticide were given to farmers, were used as extension tools. This served to move Obatanpa to farmers more rapidly. Special agricultural TV programs, produced by MOFA, focused on Obatanpa and gave significant publicity to the variety.

Presidential Endorsement

QPM featured among the subjects discussed by President J. J. Rawlings of Ghana and former U.S. President Jimmy Carter while the latter was on official visits to Ghana in 1989 and 1994.

During the 1992 farmers' day durbar at Ejura, President Rawlings took special interest in the "QPM Pigs," which were sent as a CRI/UST exhibit. He interrupted his formal speech and invited the CRI maize breeder to explain the experiment to the gathering. The president later recommended the variety to the gathering. He then directed that the pigs be loaded on a pickup truck and shown around the durbar ground. The event was given a wide national TV coverage. By then seed producers had multiplied Obatanpa, and the incident served to launch the seed sales.

President Sam Ndjoma of Namibia, while visiting Ghana in 1993, learned of Obatanpa and requested some seed. Later, he had some planted in his palace garden and took a photograph with the maize, which was given publicity in Ghana.

Madam Lissouba, First Lady of Congo Brazzaville, learned of Obatanpa while on a visit to the Carter Center in the United States. She asked for assistance in introducing the variety into her country. Subsequently, the First Lady, the president, and ministers of state gave an audience to the CRI QPM breeder during the first of his four visits to provide technical assistance.

Industrial Interest

Food processors and poultry feed producers were the first industrialists to accept QPM in Ghana. In 1994, Guinness Brewery Worldwide, London, expressed interest in testing the malting quality of the Ghanaian QPM hybrids for possible use for brewing in Nigeria. The import of barley malt had been banned in Nigeria, and only maize or sorghum malt were being used. Two hybrids were selected, and Guinness funded the production of 2 tonnes of seed of the hybrids in 1995. Subsequently, Guinness produced 50 hectares of one of the hybrids for commercial brewing tests that confirmed those done in the laboratory. Nigerian seed companies also expressed interest in producing Ghana's QPM hybrids, but no agreement has yet been reached.

Table 3. Quantity of certified seed produced in Ghana, 1991-97, and the percentage of QPM (Obatanpa).

Year	Quantity (t)		QPM
	All improved seed	Obatanpa	(%)
1991	326	0	0
1992	448	75	17
1993	565	317	56
1994	863	528	61
1995	1,042	597	57
1996	717	638	89
1997	1,360	1,045	77

Seed Production, Marketing, and Distribution System

The national seed system was reorganized at the same time the accelerated development of QPM began in Ghana. Certified seed production and sale were transferred from the public to private sector. The release of Obatanpa in 1992 was used by the private sector to launch their seed production and sales because of its unique characteristics and consumer preference. The seed growers were assisted by MOFA/SG 2000 in promoting Obatanpa through posters, special T-shirts, and car stickers. By 1997, certified seed sales of Obatanpa had reached 77 percent (table 3) of the annual sales of all improved seeds.

Estimated Area Covered By QPM

By the end of 1996, over 2,700 tonnes of certified seed of Obatanpa had been injected into the farming system through the Certified Seed Growers Association of Ghana alone. However, the greater proportion of improved seed reaches farmers through the informal channels, such as the demonstration plots of SG 2000/MOFA and farmer-to-farmer seed transfers. Currently, therefore, it is estimated that at least 130,000 hectares (20% of Ghana's maize area) is planted to Obatanpa, with an expansion rate of about 50 percent per year.

Problems and Limitations

Although the QPM effort will continue to progress, there are significant limiting factors.

- Maize breeding strength at CRI: The head maize breeder has left the program and is now employed by CIMMYT. He has been replaced, but there are costs of transition.
- Resources: Government funds are always scarce, and SG 2000 resources are being reduced, hence resource constraints will become more limiting. There are no alternative donors in sight.
- Hybrid seed production: The seed growers and the public support system have little experience with hybrid seed production. Skills and experience must be gained.
- Inability to more effectively spread technology from Ghana: Ghana has barely enough resources to run its own program. Hence it is difficult for Ghana to conduct outreach activities.
- Inability to exploit the capacity of the Wecaman/IITA network to move QPM in West and Central Africa due to lack of resources available to Wecaman scientists.
- Weak seed programs in other countries limits the spread of QPM: The Ghana seed production and distribution model is not being duplicated in other countries. We have not sold the model to other donors, etc.

Literature Cited

Ahenkora, K., S. Twumasi-Afriyie, W. Haag, and B. D. Dzah. 1995. Ghanaian kenkey from normal maize and quality protein maize: Comparative chemical composition and rat growth trials. *Cereals Communications* 23:299-304.

GGDP (Ghana Grains Development Project). 1991-1995. *Annual reports*. Kumasi, Ghana: Crops Research Institute.

Osei, S. A., C. C. Atuahene, A. Donkoh, K. Kwarteng, K. Ahenkora, B. D. Dzah, W. Haag, and S. Twumasi-Afriyie. 1994a. Further studies on the use of quality protein maize as a feed ingredient for broiler chickens. *Proceedings of the Ghana Animal Science Symposium* 22:51-55.

Osei, S. A., A. Donkoh, C. C. Atuahene, D. B. Okai, A. K. Tua, W. Haag, B. D. Dzah, K. Ahenkora, and S. Twumasi-Afriyie. 1994b. Quality protein maize as a broiler feed ingredient. *Proceedings of the Ghana Animal Science Symposium* 22:45-49.

Osei, S. A., D. B. Okai, K. Ahenkora, B. D. Dzah, W. Haag, S. Twumasi-Afriyie, and A. K. Tua. 1994c. Quality protein maize as the main source of energy and amino acids in the diets of starter pigs. *Proceedings of the Ghana Animal Science Symposium* 22:31-36.

A Research Partnership with Farmers in Mali

Oumar Niangade

These days, agricultural research, especially in West Africa, faces many challenges—technological challenges, challenges of sustainable management of natural resources, and financial challenges. My presentation aims to show you how the Institut d'Economie Rurale (IER), the largest research institution in Mali, confronted those constraints by getting closer to the users of the research findings.

It is not an approach that came spontaneously. IER dated from the colonial period when there were highly specialized institutions in the region. Oilseeds, cotton, animal production, and so forth, each had its own research institution. At the time of independence, all these disciplines had to come together so that they could be managed as a single institution.

When IER was set up, it was a centralized institution. Seventy-five percent of the researchers were based in the capital.

With development, we witnessed the arrival of two-tiered research. Some projects were developed and financed by international donors, and others were essentially financed by the government. So some projects were doing well because of their regular financing, while other projects—those financed from the national budget—had difficulties making ends meet.

In addition there was little consultation with the beneficiaries of research. Programs were designed in the office. The beneficiaries were involved only when they were asked if the choice that had been made for them conformed to their requirements. Consequently, as many studies showed, the level of adoption was low. Farmers were just witnesses, rather than participants, in the implementation of the different policies.

Nor was there a consultation framework. In all the strategies until now, projects were set based on the large agricultural irrigation projects, and the government did not have a clear strategy for establishing priorities for agricultural research.

So the Government of Mali decided to prepare an agricultural policy declaration that sets out the main orientations of agricultural research. Under this declaration, IER is an applied research institution working toward development.

IER began a process of institutional reform through regionalization of re-

Oumar Niangade is director of Institut d'Economie Rurale, Mali.

search. Our aim was to bring together the researchers and the end users of the research. By defining the constraints with these different partners, the goal was to jointly implement a research policy that corresponded to the partners' concerns and that focused on finding solutions to the constraints.

We also felt that fragmentation caused by two-tiered research could not continue. Researchers whose work was financed externally were well motivated, and those whose research was financed by the government were not. We needed the whole system to be equally motivated. But this cannot be achieved without give and take. If you demand to be motivated in what you do, you must commit yourself to fulfilling the demand. There had to be a contract between the executant and the beneficiary. A consultation framework had to be created to start the partnership process.

Mali has many rural organizations that function with difficulty. These organizations were sometimes consulted, but they were never involved in the actions of IER. So that the beneficiaries would be party to technology generation, we created a consultation framework through which any research proposal would pass before financing was arranged.

The government adopted a strategic plan that allows all the partners to be informed. It must be stressed, however, that this strategic plan is based on the thorough participation of the beneficiaries of research. This project is currently under review with the support of the FAO and with the participation, on a regional basis, of the end users.

Factors of Success

Regionalization means decentralization, the disengagement of the state, and privatization. In the Mali, we have created six regional research centers. Following the example of East Africa, these centers have not been located on an eco-regional basis, but on the basis of administrative regions, because that is the prevalent organizational form. The state representation is on a regional basis, and therefore we conform to the administrative division of the country to keep relationships simple.

Planning and assessment organizations have also been set up in each region. They are responsible for the part of the strategic plan related to their area.

Consultation Framework

In each center, we have created a Commission Régionale des Utilisateurs (regional users' commission). This commission, with the support of the Fondation Rurale pour l'Afrique de l'Ouest, helps us find partners who are willing to take part in this experiment. It has been a challenge to tell researchers who were accustomed to developing their own research proposals that, henceforth, they had to discuss them with farmers, many of whom often could not even speak French. We had many researchers who, in their presentations to farmers, talked about coefficients of error and standard deviations. They often had difficulty explaining why they chose this material and not that one. We may have proceeded too fast. Researchers must get down to earth with the producers that we are serving so that they can understand the research process, enabling us to go further toward fulfilling their needs.

A regional commission is made up of farmers' organizations, and it allows each research project proposal to be discussed with the different partners. All partners are consulted in the planning stage, and we also have a system for follow-up assessment of all the activities.

Program Cycle

At the regional level (everything is essentially at the regional level), there is first of all a preliminary commission comprising the heads of the program, the producers, the extension team, and the thematic researchers. Their task is to examine and discuss the research results and to assess proposals for new research and new activities.

This leads us to the regional technical committee, comprising the director of the regional center, the regional agricultural organization, the regional extension services, and the regional end users' commission. The committee members present and discuss the previous year's research results and adopt activities for the coming year. All this is presented to a scientific and regional college to synthesize the results for presentation to the National Committee for Agronomic Research.

The mechanism is somewhat cumbersome, but when you try to change the way things have been done for decades, time must be spent to change attitudes.

Regionalization has been stimulating for regional organizations. We have seen farmers, who knew nothing of the research process, start to understand what a research institution is, what its role is, and what can be done. This process is reinforced by the field days organized at each station. They have enabled strong partnerships to be formed between producers and researchers in all the stations.

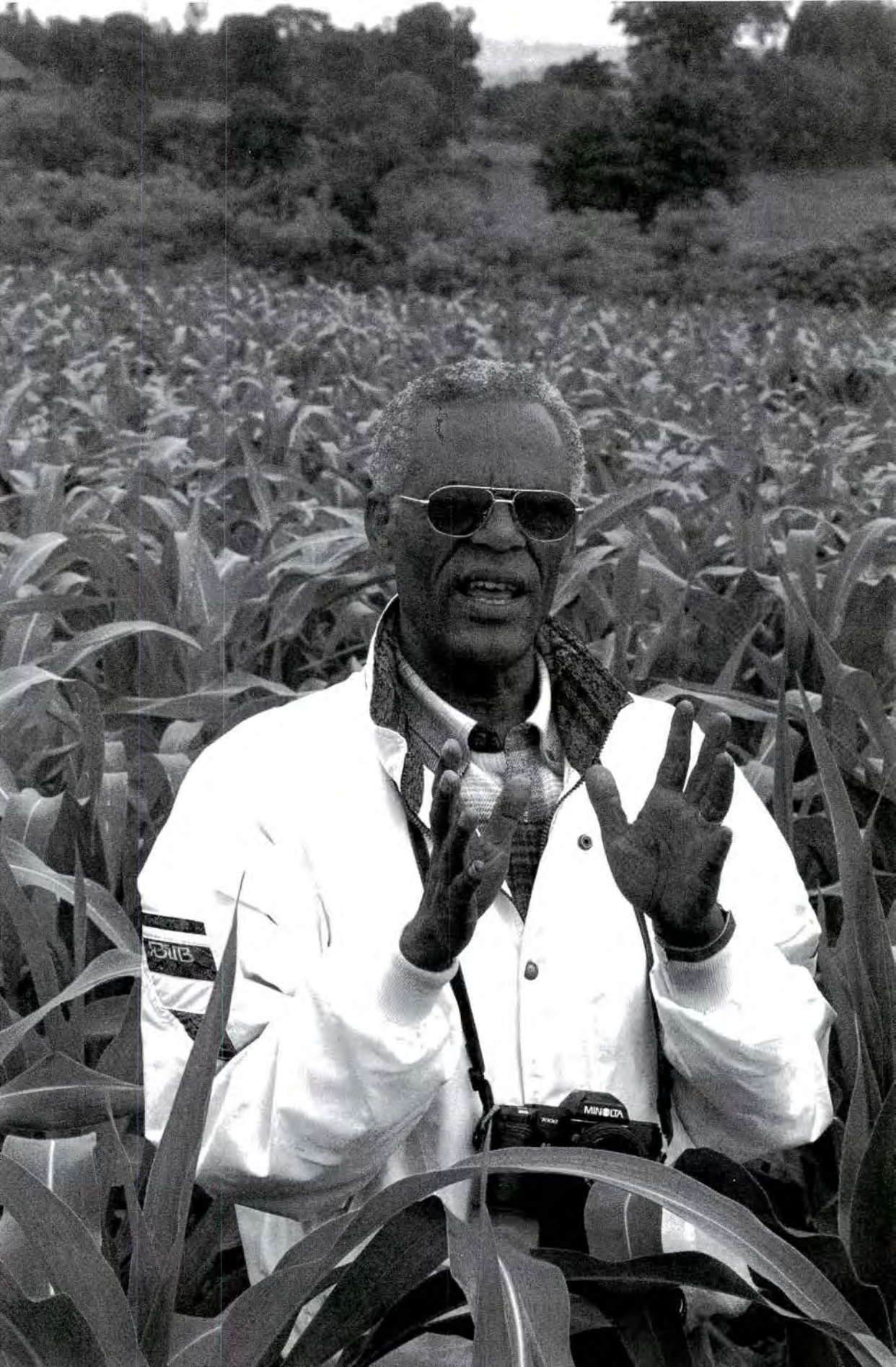
Another element of our successes is regular assessment of our achievements. With the national agricultural extension program, ICRISAT, and Novartis, we have assessed the impact and the adoption rate of all the technologies.

Future Challenges

In all the proposals that we have looked at, donors' support has gone essentially to the public sector. It is high time to start reinforcing farmers' associations. We hear of a lot of success stories. But the question is, what do we do next? We think partners in the public sector should start strengthening the capacity of the farmers' organizations. It is also time to improve the links between direct and indirect beneficiaries. For instance, in the extension services, until a certain date, everyone did their own planning, there was no consultation. It is time for this link to be reinforced.

We must not stop at saying we are close to the producers. We must generate technologies with the producers' participation. Until now, it was thought that the only people with knowledge were the researchers. We realize now that there is also a traditional knowledge on which we can build, through our scientific knowledge, new approaches to enable the farmers to take charge of themselves. These days, researchers and the public sector provide a service to the farmers.

Finally, we must enter into contracts more and more. It is not a matter of realizing a project and making money. We must be accountable for the projects. And these contracts must specify the existing commitments. Until now, funds have been given, but have rarely been accompanied by a form of contract.


MINOLTA

A Partnership in Developing Postharvest Technology for Small-Scale Farmers

Y. W. Jeon, T. Mado, and L. Halos-Kim

L. HALOS-KIM

Farmers' adoption of improved growing techniques has resulted in increasing volume of production as well as problems in post-production systems such as costly losses, high labor requirements, inappropriate facilities, and poor product quality.

The problems have been aggravated by the fact that forces of supply and demand for these crops affect the marketable produce and the forms of products available for consumption. Without the proper infrastructure to process the crops on time, the production gains have less economic benefit.

In the past, research and development institutions were guided by models for agricultural development that focused on production. Few institutions stressed post-production (postharvest) research and development until the gap between production and post-production systems caused imbalance in the system, retarding the whole agricultural development process.

In Asia, postharvest problems were seriously felt with the advent of the green revolution in rice production, especially because the bulk of harvest coincides with the rainy season. A common scene during the harvest was piles of rice surrounding the warehouses. This was a clear sign of the lack of processing, drying, and storage facilities. Since late 1970s, substantial investments have been made to tackle the problems associated with post-production handling of the crops. A number of new techniques and technologies resulted.

Africa follows a similar history of agricultural development. Increasing production through improved varieties and techniques went way forward with little attention to improving the postharvest system. Although postharvest technologies were introduced earlier through foreign aid, their application has often been limited because the designs did not fit users' needs and technical capabilities.

As a research and training institution with the mandate to improve the produc-

Yong Woon Jeon is postharvest technologist, International Institute of Tropical Agriculture (IITA), Nigeria. **Toshiro Mado** is program officer, Agro-processing Project Sasakawa Africa Association. **Leonides Halos-Kim** is research specialist, IITA.

tion of food crops in sub-Saharan Africa, the International Institute of Tropical Agriculture saw the urgency of improving the postharvest system so that yield-increasing technologies can be better appreciated and adopted. An efficient postharvest system stimulates production because it facilitates processing and marketing of the produce and expands the utilization potential.

IITA works with the national research and extension systems in the region in disseminating its research results. One weakness of this collaboration, however, is the limited mobility and capability of national agricultural research systems to link to end-users. IITA now operates using the principle of open partnerships. These partnerships are organized through formal and informal consortia, networks, eco-regional and system-wide programs, and informal scientist-to-scientist associations, many of which incorporate the participatory involvement of clients and other consultative approaches to research planning and implementation. The partnerships are based on the need to maintain two-way continuity along the research-development continuum and on the desire to fully exploit the capabilities and complementarities (comparative advantages) of each participating partner.

The role of NGOs in technology sourcing and dissemination is increasingly important. For example, the Sasakawa Africa Association (SAA) has made a significant impact through its various projects in sub-Saharan Africa. SAA teamed up with the Global 2000 program of the Carter Center to form the SG 2000 partnership. The partnership works to transfer appropriate food crop production and postharvest technologies through government programs to pursue its objectives and programs.

In the decade since the inception of SG 2000, adoption of improved production technologies has spread widely, but it is often constrained the effect of poor post-production technologies on the handling of the larger harvests.

In 1993 SAA initiated an agro-processing project to introduce improved technologies for postharvest handling of food crops and to increase the income of rural processors, particularly women. Aware that IITA had a number of improved postharvest technologies ready for dissemination, a team of SG 2000 staff visited IITA to seek assistance in identifying appropriate postharvest technologies that could be introduced in their country projects.

Consequently in 1994, SAA and IITA signed a memorandum of understanding, which provides IITA with a special grant to support its agro-processing project. The memorandum establishes a partnership to make technology dissemination more effective based upon the complementary roles of research and development by IITA and technology transfer by SAA. The collaboration aims to identify, develop, and disseminate appropriate postharvest technologies, working initially in Ghana and Benin. Specifically, the objectives of the partnership are to:

- promote human resource development
- source, test, and disseminate appropriate agro-processing technologies
- promote effective utilization of research results to raise the income and productivity of farmers and agro-processors, particularly the women
- establish a support mechanism to manage and sustain the technologies

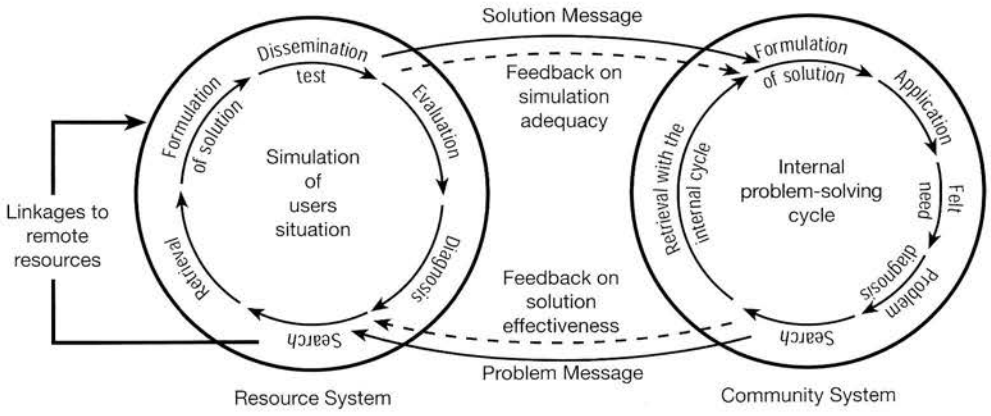


Figure 1. Model for postharvest technology generation and introduction (Jeon and Halos-Kim 1997).

Research and Technology Development

Strategy

Learning from past experiences in postharvest research and development, IITA follows a model based on the hypothesis that the postharvest system is a subsystem within a community system affected by social, cultural, economic, and technical factors, which are difficult to dissociate. The conceptual model for this research and technology development is presented in figure 1. It is further assumed that people within the community system try to solve their problems themselves through needs assessment, identification of resources, formulation of solutions, and application. They also seek outside help from government agencies and development organizations. These agencies have the capability to offer more systematic approach to problem solving and to provide links to other resources. Working in a participatory manner with the community system, the agencies define and analyze the problems, identify resources, and offer alternative solutions to the community for verification. The process is cyclic and continues until a satisfactory solution is attained.

The solution-seeking process requires some basic research that is conducted at IITA. Information generated and field data are used in developing and evaluating technological options. Field testing and evaluation are done to test the viability of alternative solutions, which are then the basis for adaptation or adoption of technologies.

Design Considerations

In developing postharvest technologies, the important factors considered were the socio-cultural, economic, and technical characteristics of the users and their environment. In sub-Saharan Africa, the socio-cultural factors are far more important than the technical requirement of any process designed for. Incorporating a gender perspective in addition to technical and socio-economic factors in postharvest technology design is imperative because the work differs among men and women, depending on whether the production objectives are consumption or marketing.

An analysis of the crop and food production system in Africa showed that the following characteristics are critical to the development of postharvest technologies:

Crop and food processing pattern. Mixed crops are planted in small fragmented

farms, mostly for family consumption. The crops are processed, in small quantities, into indigenous forms (foods) requiring special preparations unique to any given region.

Labor requirement. Most postharvest operations use traditional methods, which are time-consuming. Labor input for harvesting, handling, drying, and processing is provided mainly by the family members. Women contribute 87 percent of the time required to process food for family consumption, and they are also involved in harvesting and handling. Therefore increasing production places a heavy burden on women and children who normally do most of the work.

Handling efficiency. Qualitative and quantitative postharvest losses are high (estimated at 30% to 50% for cereals and grain legumes and about 45% for cassava). These losses result from field and environmental conditions, varietal characteristics, untimely harvesting, improper drying, insect damage, consumption by livestock, operators' attitudes, and lack of processing tools and equipment.

Gender roles in crop and food production. Men and women perform distinct roles in crop and food production. Men are generally involved in production activities, while post-production activities, in addition to household chores, are reserved for women. The woman's role in processing is dictated by social and cultural norms. Also, farmers tend to differentiate the tasks by the type of crops grown. Maize is considered a cash crop and is controlled mostly by men from production to marketing. Sorghum, millet, and cowpea are crops grown by women for family consumption. In many cases, women and children provide the labor required from crop care and management to processing.

The losses and labor inefficiencies within the post-production system are mainly due to lack of appropriate tools and equipment for processing. These can be overcome through the introduction of appropriate tools and equipment, system arrangement, and investments in training farmers and agro-processors. Therefore IITA has focused on the development of simple, low cost, labor-saving devices and equipment that can be fabricated from locally available materials. These innovations were intended to minimize losses, increase labor productivity, improve product quality, and reduce drudgery, especially for women processors. Consequently, the technologies offer opportunities to increase the income and save the time of processors, which can then be devoted to other productive activities.

Improved Postharvest Technologies

The improved technologies developed include equipment and processes that increase efficiency in handling and processing the major food crops in Africa. Over the last 10 years, IITA had developed 60 sets of postharvest tools and equipment that feature simple design, multi-crop application, mobility, a wide range of capacities, and minimum repair and maintenance requirements. These technologies can be packaged for different levels of operation targeted toward specific user groups.

The family-based processing package consists of manually operated equipment designed for women and children responsible for family food preparations. It is recommended for a hamlet-based operation that three to five family units can use in turns.

The technology package for women's group processing is designed to reduce the drudgery of individual processing and to encourage women to invest collectively. It is partly mechanized to process family

food and at the same time to provide an opportunity for women to generate income. It is intended to be operated for food exchange, contract processing, and product marketing.

The technologies for small- and medium-scale enterprises are more mechanized and designed for enterprising men's and women's groups, community associations, or private individuals, primarily to generate income.

Technology Transfer

As a consequence of the participatory approach adopted, improved technologies were actually introduced at the same time as technology generation. From 1991 to 1994, IITA, with funding from the Ford Foundation, pursued a model village development project in Nigeria in an effort to hasten the technology transfer process. The strategy was to introduce and demonstrate different packages of improved postharvest technologies selected on the basis of needs assessment in selected villages to verify technology for further development and to monitor technological impact. The strategy had a tangible impact on villagers' way of life. That is, increased processing activities encouraged production of more crops using improved varieties, thus improving the villagers' economic and social circumstances.

Although the project involved research and extension officers from national research and extension system, there was no established linkage to further the technology transfer. The project was biased to IITA's research and development goals leaving the partner national research and extension system fully responsible for dissemination, although aware of their weaknesses. For one thing, IITA can allocate resources for technology extension activities only when the initiative incorporates its research and development mandate. So despite the positive feedback from farmers and agro-processors, the rate of adoption and diffusion was slow due to the weak extension infrastructure and lack of trained staff.

The SAA-IITA partnership forged in 1994 attempts to bridge this gap—so that the technologies reach the end-users where and when needed—and to establish a support mechanism to sustain the demand and supply, and utility continuum of the technologies.

Operational Strategy

The SAA-IITA partnership operates to provide information on postharvest technology opportunities and training. The partnership extends to government agencies, other NGOs, manufacturers, farmers, and agro-processors. Each collaborator has a vital role to play from the development to the marketing of technologies.

IITA

IITA identifies, generates, selects, and packages technologies based on needs assessment and available resources, it trains development and extension officers and manufacturers, and it provides quality control on fabricated equipment.

The postharvest technologist designs and develops postharvest and agro-processing technologies, in addition to existing designs, based on needs and resources communicated by the target users. A testing and evaluation engineer evaluates the technologies before, during, and after their introduction and monitors the utilization and impact of the technologies. IITA takes the lead in the training courses conducted by the project.

National Partners and SAA

The partner national research and extension systems and SAA field staff

conduct an awareness campaign through field demonstrations, initiation and establishment of partnerships, monitoring the utilization and impact of technologies, organizing and implementing training programs, and providing feedback to researchers.

In Ghana, IITA and SAA work with the Ministry of Agriculture through the Agricultural Engineering Services Division (AESD), the Women in Agricultural Development (WIAD), and the Ghana Regional Appropriate Technology and Industrial Services (GRATIS).

AESD designated an agricultural engineer to work part-time in demonstrating and testing the technologies. WIAD also assigned one rural development officer to work full-time in demonstrating the technologies and in training farmers and agro-processors. GRATIS mobilizes the manufacturing infrastructure in its regional offices and supports the manufacture and servicing of machine prototypes used in demonstration activities. The Food Research Institute has recently joined as another partner.

In Benin, IITA and SAA work with Direction de la Formation Opérationelle et de la Vulgarization (DiFOV) and the Université Nationale du Bénin (UNB). DiFOV, the government arm for rural development, assigned two rural extension officers to support demonstration and testing of technologies and to assist in monitoring the utilization of the technologies. UNB collaborates in process and product development for expanded utilization of food crops.

Manufacturers

Local manufacturing enterprises participate to supply the demand for improved postharvest technologies. They are engaged in the fabrication of the agro-processing equipment and make it available locally with the associated services needed to maintain the functionality of the equipment. Their commercial activities give farmers access to industrial products and services at each location.

Local manufacturers are trained in manufacturing and servicing of selected postharvest equipment. SAA-IITA staff conduct quality control checks on equipment manufacturers have fabricated before it is delivered to customers. Continuing training and information exchange on equipment design and management keep manufacturers updated on recent developments and market demand while enhancing their capability and increasing their productivity.

Farmers and Processors

The farmers and agro-processors who are the ultimate beneficiaries influence rural agro-processing enterprise development and support the manufacturing industry while increasing their own capacity. Their participation and feedback on utility, adequacy, and profitability of the technologies are valuable guides for adapting the technology to the local environment.

There are no specific criteria for the selection of farmers or agro-processors. Different user groups (individuals, private entrepreneurs, women's groups, community organizations) are encouraged to participate in demonstrations and field testing activities. Their participation can stimulate their interest in investing in the technology.

The operational funds for the project are provided mainly by SAA. IITA shares the cost of one senior staff member and use of facilities for developing or adapting technologies and for testing new or modified prototypes. The collaborating partners from each country project share the costs in-kind, such as the provision of

staff services and use of local facilities in developing, testing, and demonstrating technologies.

Role Sharing and Capacity Building Among Partners

SAA and IITA believe that strengthening the existing capacity of the national development partners is crucial to fostering more active participation in project implementation. This view is embedded in the following technology transfer activities.

Training

Training is provided to development and extension workers as well as end-users to equip them to manage and sustain the technologies. The training follows a learning-by-doing approach. Three types of training programs for different groups of beneficiaries are being implemented.

One type is training on design, development, and management of improved postharvest technologies. It is designed to strengthen the skills of personnel who are expected to oversee the sustainability of the technologies in the transition from a project-based system to a processor- or farmer-managed system. The training imparts basic understanding of strategies for technology generation and transfer, design features, and management aspects of the technologies.

Collaborating national research and extension systems staff, including engineers, food technologists, sociologist, economists, and extension officers, receive formal training. In addition informal specialized training continues through participation in project activities. These activities include optimizing operational performance of machines, trouble shooting, survey, and data collection. A team-training approach is favored because problems in postharvest system encompass a wide range of issues and constraints requiring interdisciplinary inputs.

A second type of training is on manufacturing and servicing of postharvest equipment. It is aimed at enabling local manufacturers to meet the demand for improved agro-processing equipment and to provide after-sales services. It is intended for small and medium-scale manufacturers selected on the basis of the viability of their present business and their expressed commitment to dissemination of agro-processing technologies. Manufacturers from different geographical areas are trained so that farmers and agro-processors will have better access to technologies and associated after-sales services.

This training has been decentralized and is being conducted in-country to promote the local manufacturing industry. Decentralization encourages the use of locally available materials and services to reduce manufacturing costs and eliminate exportation costs, thus making the technologies more affordable to the users.

To tap local resources and adapt technology design to existing capacity, the training is conducted in a selected local workshop. The trainees are skilled artisans (welders, machinists, mechanics, carpenters) nominated by the manager of the collaborating manufacturer.

The training output is workable agro-processing equipment. The choice of equipment to be fabricated is based on projected demand in the area in consultation with SAA and IITA. Depending on the type of equipment chosen, the training can last 2 to 4 weeks. Materials required for the training are procured by the manager of the host workshop. The output then becomes a property of the workshop and is used as the prototype for commercial production.

At the end of the training, the manager of the host workshop invites local partners and government authorities to a demonstration of the equipment fabricated, creating business opportunities at the same time.

The third type of training covers operation and management of technologies. It is intended to enable operators, farmers, and agro-processors to optimize the utilization of the technologies and enhance the value of their investments. The training includes actual operation of equipment, analyses of advantages and disadvantages of the technologies, and tips for successful agro-processing enterprise management.

The training utilizes the set of equipment procured by the users. There is no specific duration of the training; it is continuing on-site, depending on needs. The training should be able to establish a viable and sustainable crop-processing enterprise.

Usually this type of training is conducted by trained partners from the national agricultural extension units and the manufacturers. Consequently, the extension officers increase their contacts with the farmers and agro-processors, which improves their credibility. For the manufacturers, it is part of their after-sales services.

Field Demonstrations

Field demonstrations are quick ways to show any new development to potential users as well as to policy makers. The aim is to promote awareness in improving the handling and processing of farm produce and expose the available technologies.

Demonstrations provide an opportunity for extension officers and manufacturers to get direct responses from farmers and processors on the suitability of the technologies being introduced. Farmers and agro-processors are allowed to operate the equipment during the demonstration, giving them immediate exposure to the technology. This process stimulates interaction and generates information on design, make, and performance of technologies. The information is relayed back to the workshop or researchers to use in further refinement or adaptation. Feedback was a missing link in many of the technology transfer mechanisms applied earlier.

Establishing Model Processing Centers

Parallel to the demonstration activity, model processing centers are established to showcase improved postharvest (agro-processing) technologies and their associated benefits. The center set-up is based on a system dynamic in which all factors affecting and affected by the technologies are present.

Unlike field demonstrations, which are done occasionally, the centers function under the actual circumstances related to technology operation, management, and profitability. The centers also serve as a training venue for researchers and extension workers while providing more information on utilization potentials and constraints that are used to fine-tune the different technologies.

The centers are established with the active participation of farmers and agro-processors in different agro-ecological environments to test alternative technologies. The sites are selected on the basis of crops and cropping patterns, volume of production, nature of crop processing and utilization, accessibility to markets, availability of extension services, etc. The expressed willingness of the farmers and agro-processors to participate is also an important selection criteria.

The users (farmers and agro-processors) initially contribute about 30 percent

of the cost of the equipment and installation. The users pay for the equipment. This strategy was adopted to instill the notion of ownership among users, which was hypothesized to have a direct effect on the sustainability of the system.

Multilateral Information Exchanges

The development process takes time and requires multilateral information exchanges among agencies involved to optimize utilization of their limited resources. Developing an agro-processing industry, for instance, is affected by national as well as international policies, which are formulated and implemented by various agencies. This process can impede the information flow and cooperation among the potential partners. One of the key roles that NGOs (like SAA in this case) can play is to stimulate multilateral information exchange and cooperation. This effort can create a consensus that developing an agro-processing industry must be a joint effort of the several stakeholders, each one having a unique and complementary role to play.

Achievements

The SAA-IITA partnership continues in Ghana and Benin. Its outstanding accomplishment is building up the capabilities of the partners and strengthening the human resource base in each country, recognizing the comparative advantage of the local partners in dealing with the end-users.

Before the dissemination activities (demonstrations and training), the partnership had already produced trained collaborating partners who were responsible and confident of their roles in technology development and transfer. Through the activities in the model processing centers, partners from national agricultural research systems and other agencies learn to identify and analyze constraints to productivity, apply strategies for development and extension of technologies, and are better able to communicate the technologies effectively.

The activities of the partnership expanded in 1997. On recommendation of SAA, IITA, and SG 2000/Guinea, the Guinea Ministry of Agriculture took steps to improve postharvest systems by creating a postharvest unit, which is being based in Mamou Region.

Another achievement is the training of manufacturers and coordinating their activities so that the technologies are supplied with quality services. One of the constraints to adoption of new postharvest technologies is the scarcity of spare parts and services. The after-sales component of the training makes the local manufacturing industry more viable and attractive.

Since 1994, 83 technicians (welders, machinist, carpenters, mechanics) from collaborating manufacturers in Ghana, Benin, Burkina Faso, Ethiopia, Guinea, Mali, and Togo have been trained and or re-trained in fabricating different types of agro-processing equipment (table 1). This broadened geographic spread of the technologies allows users to procure equipment locally and be assured that repair and maintenance services are available.

Sales of equipment by collaborating manufacturers (table 2) have extended beyond Ghana and Benin. In 1996 and 1997, manufacturers from Benin sold multi-crop threshers and grain cleaner/sorters to Mali, Niger, and Burkina Faso. Manufacturers in Ghana reported sales of grating machine to Côte d'Ivoire, Zambia, and Guinea. Buyers were women groups, individual entrepreneurs, and development organizations.

The model processing centers established in each country project have proven

Table 1. Key manufacturers, number of technicians trained and training projects.

Company	Type	Technicians trained (no.)	Projects/product specialization
Benin			
Camemec Sarl, Godomey	Private	2	Grater, double screw press, in-field cart, multi-crop thresher, grain polisher
C.F.T.S., Ouidah	Semi-private	2	Grater, double screw press, multi-crop thresher,
Cobemag, Parakou	Government	4	Multi-crop thresher, grain cleaner/sorter, grater, double screw press
Burkina Faso			
C.N.E.A., Ouagadougou and Bobo-Dioulasso	Government	2	Multi-crop thresher, grain cleaner/sorter
Ethiopia			
Agr. Mechanization Research Division, NRC, Nazareth	Government	2 +1 engineer	Multi-crop thresher Grinder, polisher
Ghana			
ITTU-GRATIS, Regional offices[a]	Semi-private	17 + 36[b]	Multi-crop thresher, grain cleaner/sorter, grater, chipping machine, grain polisher (also palm oil digester/kernel cracker)
Entesel, Tema	Private	4	Multi-crop thresher, grain cleaner/sorter, in-field cart, chipping machine, wet-type grinder, grain polisher (also palm oil digester/kernel cracker)
R.T.T.C., Mampong	Private	8[b]	Grater, double screw press, bagging stand, fermentation rack, sifter, chipper
Guinea			
SOMATA, Kindia	Private	2	Multi-crop thresher, grain cleaner/sorter
Mali			
I.M.A.F., Bamako	Government	2	Multi-crop thresher, grain cleaner/sorter
Togo			
Famezio, Tsevie	Private	2	Grater, double screw press, chipping machine, multi-crop thresher

a/ Cape Coast, Sunyani, Ho, Tamale, Koforidua, Takoradi.
b/ Training conducted by trained WIAD, AESD, and SAA field staff.

to be an excellent way of demonstrating the technological hardware as well as a means of uncovering the tangible benefits and unforeseen consequences of technology generation, transfer, and utilization. The centers, which are equipped with appropriate postharvest technologies, are self-sustaining crop and food processing centers and also serve as sites for demonstration, development, and training.

The impact of the activities of the SAA-IITA partnership is seen in the spread of improved postharvest technologies in many parts of West Africa. Among the features of the equipment that led to ready adoption are adaptability to various crops, a range of capacities, ease of operation and maintenance, and use of locally available materials.

Recommendations

While the experiences discussed here relate to development and transfer of postharvest technologies, the strategy adopted can be applied to any agricultural development project. The immediate impact of the technology transfer activities encouraged many other rural development agencies to participate or adopt our strategy.

The partnership should be formed with recognition of the comparative advan-

Table 2. Postharvest equipment: Type and number fabricated and sold by collaborating manufacturers in Benin and Ghana (Sept. 1995 to May 1998).

Type of equipment	1995	1996	1997	1998	Total
Grating machine	9	7	59	18	97
Double screw press	7	12	33	7	59
Fermentation racks	3	3	10	2	18
Cassava mash/'gari' sifter	2	3	5	2	12
Bagging stand	2	1	10	5	18
Chipping machine, manually-operated	–	25	1	4	30
Chipping machine, motor-driven	–	–	–	1	1
Root crop slicer, motor-driven	–	–	1	1	2
Wet-type grinder	–	–	3	1	4
Grain polisher[a]	1	–	7	13	21
Multi-crop thresher	2	3	15	13	23
Grain cleaner/sorter	2		4	2	8
In-field cart	3	3	–	1	7
Groundnut decorticator	–	–	–	–[b]	–
Maize sheller, manually operated	–	–	–	–	>200[c]

a/ Also a palm oil digester.

b/ Currently generating demand. Some orders were received by manufacturers as of May 1998.

c/ Estimated over 200 units in Ghana alone. Sales record not complete.

tages, strengths, and weaknesses of participating institutions. Capacity-building among partners should be a concern of every stakeholders so that active participation can be expected.

To develop and sustain an effective partnership, it is essential that partners commit to share roles, resources, costs, and benefits based on mutual objectives. It is also important to find a mechanism that can provide an opportunity for each stakeholder to bring their resources and information to share.

The key issues in creating viable partnerships are role-sharing and funding.

Roles of international, Regional, and National Organizations

A factor that needs to be recognized in the design, management, and coordination of effective partnerships is the variability and instability of both the general and specific strengths of participants. This applies particularly to national agricultural research systems, but also to collaborating international agricultural research centers and NGOs.

In putting collaborative teams together, the emphasis is on the comparative advantages of different partners in addressing the priority problem. The major advantage of the national agricultural research systems is their detailed local knowledge and expertise. IITA with its global mandate and interdisciplinary ability to address research problems is well suited to assist in developing alternative technological solutions to the national problems identified by national agricultural research systems. And NGOs, because of their direct contact with the end-users, and private firms (suppliers, manufacturers), because of their commercial drive, are playing increasingly important roles in technology transfer.

National agricultural research systems should have a lead role in designing national development programs in Africa. The national government should create a body that monitors and guides external projects. To avoid duplication of efforts and the waste of investments that results, development agencies must be

required to consult with this body before launching any new venture.

To improve the delivery of postharvest technologies, the national government should be committed to supporting the program and should provide incentives to allied industries through legislation (for example, on importation of machinery) and control of market prices for both raw materials and products.

Funding the Partnership Initiative

The challenge in front of us is to reduce the cost of forming the network of agro-processing industry to make it sustainable. For example, the cost of field demonstrations and operator's training to fill a gap between farmers and manufacturers are mainly covered by SAA. Operator's training should in fact be considered as a part of manufacturers' cost of customer care. Manufacturers need to evolve their business operations to adopt the cost in order to maintain their linkage with the customers.

Further effort is required to forge more partnerships and find a way to structure the work of partnerships. A simple information management system is also vital to sustain the partnership and to enable all stakeholders to play its role effectively. Again, the key to successful partnership is the recognition of the comparative advantages of each stakeholder. This will fill the missing link in bringing improved technologies to the target users—rural farmers and agro-processors.

Literature Cited

Jeon, Y. W., and L. Halos-Kim. 1997. Improving postharvest technology development in Africa. In *Women, agricultural intensification, and household food security*, ed. S. A. Breth. Mexico City: Sasakawa Africa Association.

Developing a Technology Demonstration Program Based on Cost-Sharing with Farmers in Uganda

J. Mubiru, F. Ojacor, L. Yiga, and A. M. Foster

J. MUBIRU

In Uganda in 1996, the Ministry of Agriculture, Animal Industries, and Fisheries (MAAIF) and Sasakawa-Global 2000 began a collaborative program to develop a technology demonstration program. A key tenet of this demonstration and training program was that the beneficiaries (small-scale farmers) should share the costs of demonstration materials.

Background

The evolution of extension management in Uganda has had at least three distinct stages. Prior to the first attempts to manage the dissemination of production technologies, farmers exchanged information, germ plasm, and tools informally. The first formal system, established during the colonial period (1900-1962), was biased toward cash crop production and was implemented by a strict regimentation with the backing of local by-laws. Coercion, rather than persuasion, was the modus operandi during this phase.

After independence, the second stage (1963 to 1993) emphasized extension as an administrative conduit for a multiplicity of social development goals The result was multiple and separate command lines for delivering extension messages. The competition for resources placed a strain on government and staff. Also, rural dwellers were bombarded with a stream of uncoordinated visits and messages that were sometimes contradictory if only because priority setting was impossible.

The third stage of extension in Uganda has been the unification of these separate chains of command into a single one that provided varied agricultural services to farmers. It entailed the establishment of a systematic message-based extension management system. Embodied in this approach was a regular training program intended to improve the professional skills of staff and enhance their knowledge across disciplines.

A more recent reorientation (1997) has involved use of participatory procedures that hope to involve farmers more fully in identifying and addressing their needs. Meanwhile administrative changes

J. Mubiru is director for agricultural extension, **F. Ojacor** is director for Research Liaison Unit, and **L. Yiga** is deputy commissioner for crop production, Uganda. **A. M. Foster** is SG 2000 country director for Uganda.

imposed by decentralization of government has shortened the chain of command for extension services by cutting off the implementing role at the national level.

Policy directions to restructure and down-size MAAIF have been issued recently. Initiatives are therefore under way to devise alternative mechanisms of coordinating extension services under the new arrangements. It is expected that the responsibility for providing extension services will be partly divested to National Agricultural Research Organisation (NARO) and two new directorates in MAAIF. Most of the responsibility of extension will go to districts, and even then there will be a stronger sub-county focus. NARO will be responsible for backstopping extension services, and MAAIF will provide policy regulation to set standards for extension practitioners. Meanwhile districts will devise and coordinate their own extension programs that will be funded directly by a national institution that is charged with the responsibility for oversight.

SG 2000's intervention in Uganda was within the framework of a message-based extension management system. Food production per capita was steadily decreasing, and rural dwellers in parts of the country were intermittently experiencing hunger. The principal cause of the decline was low agricultural productivity due in part to increasing soil infertility. In spite of numerous attempts to reverse the falling per capita food production, yields of farmers remain stubbornly low (1.1 t/ha for cereals). Family incomes have therefore been low and poverty has been widespread despite a tremendous potential to increase earnings from agriculture.

SG 2000's approach to alleviating food insecurity and rural poverty is to help accelerate the dissemination of improved production technologies for staple foods on small farms. SG 2000's strategy is first to achieve food security through increased availability of food and then to generate additional family income from the sale of surplus food. SG 2000 contributes financial resources to enhance the operational capacity of extension services to help reach these goals. It also provides technical leadership to establish a hands-on demonstration-plot program for food crops as a tool for technology dissemination. SG 2000 therefore promotes demonstration plots as the principal teaching tool of its collaboration with MAAIF.

Principles of Good Practice

The MAAIF-SG 2000 program is based on principles of good extension practice, which have universal application:

1. Extension messages should be delivered to farmers as a package rather than as isolated individual interventions.
2. Improved production technology should demonstrably and significantly increase yield and productivity on the farm so that its financial benefits to the farmers are measurable in farmers' terms (bags).
3. Demonstration plots should give farmers a first-hand opportunity to test improved production technologies on a commercial scale in their own fields.
4. Inputs required for adoption of improved technologies should be pitched at levels that are affordable and accessible through the private sector in rural areas.
5. Extensionists should not be responsible for handling credit or inputs.
6. Farmers participation in testing improved technology should be based on their own conviction rather than on the promise of credit for inputs or coercion. Farmers should therefore be encouraged to use their own resources for demonstrations from the outset.

7. The impact of the MAAIF-SG 2000 program should be broadened through partnerships with other NGOs, the private sector, and rural finance institutions. This may be achieved through strengthened linkages between farmers and improved rural agricultural services such as stockists, marketing of produce, and savings and credit institutions. Any government intervention in support of the program should not contravene its policy of privatization and liberalization of the agricultural sector.

Genuine partnerships between SG 2000 and other organizations should promote the adoption and broader application of these principles of good practice among institutions of government and development agencies. All too often, there are conflicting practices of free gifts of agricultural inputs to rural communities in nonemergency situations. Such gifts erode the community's spirit of endeavor and serve to further entrench inertia against positive change. Furthermore, distorted priorities (usually determined by externally motivated concerns) shift emphasis away from more productive farm enterprises to minimalist approaches that require little or no investment beyond family labor.

Program Model

SG 2000, in collaboration with MAAIF, established a program model for training small-scale farmers. The model has three parts that represent the main groups of stakeholders: the public sector for technology innovation and dissemination, the private sector for financing input marketing and production, and the development community for creating partnerships that increase the impact of the technology transfer process (fig. 1). A simple mechanism for coordinating of MAAIF-SG 2000 program activities was devised based on the roles and responsibilities of stakeholders. The coordination mechanism aims to minimize bureaucracy by simplifying the administrative process required to support field implementation. Funding is channeled directly to field operatives. Overhead costs are also reduced by carrying out field program activities within the existing framework of extension services. This implies that any resources contributed by SG 2000 to extension services are supplementary to those budgeted by MAAIF and local governments. The MAAIF-SG 2000 model is therefore neutral of any established extension management system or methodology. Although its approach is flexible, it is strictly focused on increasing operational efficiency, improving the technology content of extension messages, and enhancing effectiveness of the technology transfer process.

The program's organizational structure includes a national team led by a country director and district teams led by district extension coordinators. The country director consults with national policy makers and heads of institutions to

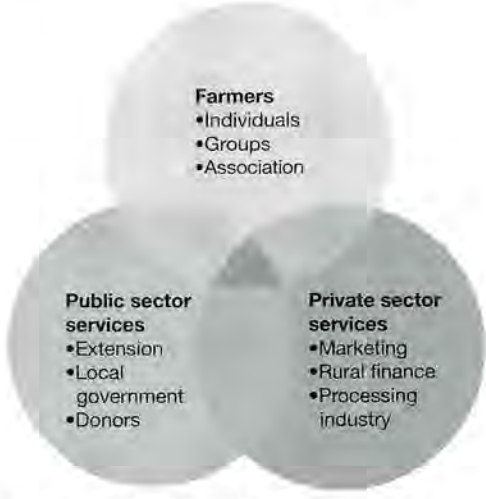


Figure 1. MAAIF-SG 2000 technology transfer model.

develop a country program that contributes to greater food security and increases opportunities for generating farm income. A national coordinator, an employee of MAAIF, helps district teams to plan and carry out their field programs with rural communities at the village level. District coordinators ensure that sub-county extension staff carry out their work programs successfully. Subject-matter specialists and researchers provide the backstopping needed to train field staff and maintain productivity of production technologies under changing field environments and policy situations.

The MAAIF-SG 2000 model has focused its field program on four main components:

- demonstration of on-shelf and "best bet" production practices for staple food crops
- demonstration of labor-saving devices for production and processing of food crops
- teaching improved postharvest practices that reduce grain losses and enhance marketing of produce
- promoting establishment and expansion of rural agricultural services to make improved technologies more readily available to other small-scale farmers.

Implementation

Farmers in rural communities were recruited by extension workers and community leaders to participate voluntarily in the demonstration program. The campaign consisted of physical visits to hundreds of parishes followed up by radio programs.

Farmers were recruited in groups based on expressed interest in the available production enterprises. A fraction of the farmers mobilized were treated as demonstration farmers. Demonstration plots on their farms served as reference points for performance of improved production technologies in a given area. Demonstration farmers help explain the obligations and benefits of using improved production technologies to other farmers. They will help MAAIF-SG 2000 to gain acceptance for program policies that require farmers to pay in advance for demonstration kits, whether they are used for demonstrations or production.

Demonstrations are designed to teach farmers about recommended production practices for a variety of food crops in a range of farming systems, e.g., maize, sorghum, millet, and cassava production systems (table 1). Arrangements have been made for suppliers to pack inputs needed for demonstrations in commercially acceptable quantities.

Maize demonstration kits were packed for 0.1 hectare (one-quarter acre) at a total price of US$10 per kit. The kits include the bare essentials of improved seed and a modest amount of mineral fertilizer to be supplemented with any available organic manure. The maize demonstration kit includes 2 kilograms of Longe-1 OPV seed, 5 kilograms of DAP, and 5 kilograms of urea. The soil fertility management regime targeted the first incremental steps of crop response to nitrogen application.

All demonstration kits are sold to farmers through rural stockists as a product line. The low cost of the demonstration kit is designed to permit relatively small-scale farmers, who have limited resources, to test the recommended technology in their own fields. Technical guidance is provided by extension service at no cost to the farmer, although arguably farmers pay the salaries of extension workers through taxation. In areas where intercropping is a common practice, recommended packages included companion crops for the dominant cereal. For

Table 1. Recommended production packages for demonstration plots.

Crop	Seeding rate	Fertilizer (kg/ha) Basal	Topdressing	Weeding
Maize	25 kg/ha (50,000 plts/ha) 0.8 x 0.5 x 2 seeds	N: 7.5 P_2O_5: 19.2	N: 19.2	1st at 3–4 leaves; 2nd at 8–10 leaves
+ Groundnuts	33 kg/ha (83,333 plts/ha) 0.8 x 0.15 x 1 seed	0	0	shared as above
or				
+ Beans	33 kg/ha (83,333 plts/ha) 0.8 x 0.15 x 1 seed	0	0	shared as above
Sorghum (Serena)	7.5 kg/ha (111,111 plts/ha) 0.6 x.15 x 5 seeds	0	N: 19.2	1st 2–3 wks thin to 1 plt/hill; 2nd at 6–8 wks
+ Pigeonpea	3 kg/ha (3,333 plts/ha) 6 x 0.15 x 2 seeds	0	0	as above
Finger millet	6 kg/ha broadcast within 6m band	0	0	as above
+ Pigeonpea	as above	0	0	as above

example, groundnuts are grown in association with maize in demonstration plots in Tororo district, and beans are grown with maize in Masaka district. Pigeonpea is grown in association with sorghum- or millet-based production systems in Lira.

Demonstrations are carried out in accordance with accepted participatory extension practices. Animators involve demonstration farmers, their immediate neighbors, and the whole farming community in a parish or village.

Strict supervision is provided by national and district extension coordinators to ensure that:

- all operations for demonstration plots are conducted on time
- all the extension activities also involve other farmers in the community
- policy makers and civic leaders are made aware of the dynamics of changing farmers' attitudes and the need for added support to expand the impact of the demonstration plots
- other donors and development agencies are encouraged to support expanded use of improved production technologies by promoting investment in the use of these technologies

Mobilization of Extension Services and Farmer Groups

The MAAIF-SG 2000 program successfully mobilized and partly equipped some 140 extension staff to support the field program. These extension workers have in turn extended improved production technologies for maize and sorghum to hundreds of farmers in nearly 100 sub-counties. They have also assisted in the multiplication of over 81 hectares of improved cassava varieties tolerant to cassava mosaic virus. A minimum of 12,000 0.1-hectare maize-technology adoption plots have been planted as a direct result of production campaigns in hundreds of village-level meetings and over 20 hours of radio airtime.

Specialized training programs on cost-reducing technologies have also taken off. Training on improved animal traction techniques has involved over 50 pairs of oxen and more than 250 farmers. Up to 100 units of more efficient animal traction equipment have been purchased by farmers, and training of more oxen and farmers is continuing.

Over 51 training centers for post-harvest grain handling have been added to those existing in several villages. An

additional 600 farmers are estimated to have been trained using these new facilities. Fabrication of agro-processing equipment has begun with four local manufacturers. Four cassava grating machines have been commissioned and completed. Several women's groups have been trained on their use and are now operating their own processing enterprises.

Mobilization of Rural Stockists and Capacity Building

In 1997, 30 rural stockists were successfully mobilized to sell inputs (improved maize seed, fertilizers, and ox-drawn implements) to farmers. In 1998, the number of stockists increased to 74 (table 2). This was achieved because SG 2000 and IDEA, a USAID-funded program, combined their stockist development programs. SG 2000 maintained its focus on village-level stockists in rural areas. IDEA strengthened stockist training programs and conducted over four training sessions for rural stockists in each growing season. Through this collaborative effort, packaging was standardized and improved, and competition among suppliers reduced the cost per kit from US$10 to US$9. SG 2000 has initially subsidized the cost of packaging in smaller units until economically viable threshold numbers are achieved. The seed and fertilizer, however, reaches farmers at commercial prices; distortion of market prices has been avoided. Demand for seed and fertilizer is firming significantly although supplies have been hindered by overall low levels of demand and high transportation costs.

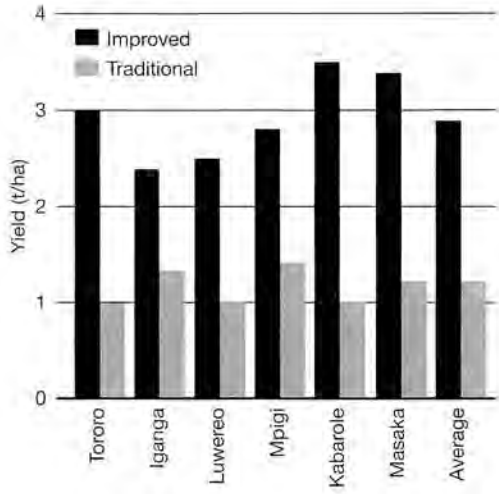


Figure 2. Yields of improved and traditional maize production technologies in six districts of Uganda.

Comparative Performance of Demonstrated Technologies

Improved production technology for maize increased grain yield two- to three-fold compared with the traditionally managed fields (fig. 2). More than 80 percent of demonstration plots showed significant yield gains compared with farmers' traditionally managed fields. The yield increase on demonstration plots was due to a combination of improved maize variety (Longe-1), higher nutrient application, and better timing of key production operations such as plowing, planting, weeding, and harvesting.

The superior performance of improved production packages on demonstration plots was also associated with increased profits compared with the traditional practices (table 3). Companion crops of legumes expanded profit margins further

Table 2. Summary of field program activities.

Year	Extension workers (no.)	Farmers (no.)	Demo plots (no.)	Maize demo kits sold (no.)	Cassava multiplication plots (ha)	Implements (no.)		Stockists (no.)
						Oxen units	Cassava graters	
1996	56	140	125	1,500	0	0	0	13
1997	56	1,063	542	3,000	14.6	50	2	30
1998	140	8,700	790	10,000	81.0	50	2	74

Table 3. Partial budget analysis for maize production package (sole maize), per hectare basis: Improved vs. traditional technology. Except as indicated, all values are Uganda shillings (US$1.00 = U sh 1,100).

Item	Improved	Traditional
Adjusted yield (t/ha)	3.0	1.1
Price/kg	120	120
Gross benefit	360,000	132,000
Variable costs		
Fertilizer/manure		
Basal dressing: 40 kg DAP	28,800	
Topdressing: 40 kg urea	19,200	3,750
Seed: 25 kg Longe-1 OPV	30,000	
Insecticides	10,000	
Labor[a]	105,000	75,000
Total	193,000	78,750
Gross margin	167,000	53,250
Returns to labor	1,590	1,538
Marginal costs	114,250	
Marginal returns	113,750	
Marginal rate of return (99%)	0.99	

a/ 105 laborer-days at U sh 1,000/day. Labor usage figures derived from Agricultural Secretariat statistics B.O.U 1997.

where they were grown as an intercrop with maize. Where beans were grown in association with maize at low densities, an average of 0.4 t/ha of beans was harvested as a bonus crop in addition to 3 t/ha of maize.

In some cases groundnuts were grown in pure stand as a rotation crop, adjacent to the maize demonstration plot. Farmers harvested an average of 1.2 t/ha of shelled groundnuts.

The animal traction technologies demonstrated a major avenue for reducing labor costs for production (table 4).

Table 4. Comparison of costs per hectare for modes of tillage in maize production (U sh 1045 = US$1).

	Cost (U sh 000/ha)		
Activity	Hand hoe	Animal traction	Tractor
Primary tillage #1	90	37.5	75
Primary tillage #2	90	37	75
Planting	20	10	30
Weeding (hired)	50	32	40
Total	250	117	220

Farmers reported that weeding by animal traction saved up to two-thirds of the time normally used for weeding with hand hoe. It also permitted greater timeliness of operations and provided additional household income from hire services. Repayments for equipment are up to date and above expected rates after the first year (at 50% recovery the first year and 100% the second year).

Lessons Learned

The results obtained from the MAAIF-SG 2000 demonstration program show that increased yields and profits can be achieved by small-scale farmers when interventions are made in an integrated and focused manner. Farmers can therefore adopt improved production technologies more rapidly and comprehensively than most imagine. Farmers have proved that they are not opposed to change if there are clear opportunities for increased farm income through technologies that are readily accessible.

The public extension system can be an effective means of technology transfer when programs are clearly focused and have a transparent management system that is committed to achieving results. NGOs and other donor organizations can work more effectively if they focus on channeling resources to field operatives more directly and with less bureaucracy. The sustainable use of the demonstrated technologies is contingent on policies that maintain their profitability and access to these technologies. The development of rural marketing systems for agricultural inputs and produce was critical to the adoption of a high productivity package.

Someone, however, needs to invest in this development process until such time as it can be an attractive proposition. A concerted effort by all development agencies is needed to increase national levels of productivity by a significant margin. Individual projects cannot achieve this magnitude of impact in isolation. The government of Uganda should therefore work to consolidate the efforts of all agricultural development programs around a common theme.

The framework provided by the agricultural modernization effort can increase the impact of the MAAIF-SG 2000 program if SG 2000's approaches and program activities are fully adopted within mainstream extension programs.

Strategy for the Way Forward

The decentralization of extension services offers an excellent opportunity to have more field-focused and effective extension services that are financed partly by farmers, their local governments, national governments, and development agencies. NGOs can play an increasingly significant part in piloting such extension and development approaches with rural communities. The MAAIF-SG 2000 model is an example of how farmers can access technology more effectively through a demonstration and training program that they partly pay for. More important, it is a model of how true partnerships of rural communities, their local governments, NGOs, and other development agencies can be forged. These partnerships recognize an essential truth: it is only through the principle of collaborative efforts that significant long-term change at national level can be achieved.

Secondly, piloting such collaborative efforts on specific field programs permits us to derive the most effective mechanisms for meeting the tremendous institutional and operational challenges that achieving impact at the national level calls for. MAAIF-SG 2000 is gratified that USAID's PL480 Title II program has agreed to fund a joint proposal to expand intensification of agriculture among small-scale farmers by increasing access to seed and fertilizer for the poorest farmers. It will also increase draft power available for small-scale production through broader and more efficient use of animal traction equipment. We anticipate an investment of US$300,000 over 2 years.

We also hope to build on this effort to develop similar partnerships in support of expanded post-harvest improvement, agro-processing, and the input procurement and marketing systems. MAAIF-SG 2000 already has pilot activities on agro-processing of cassava as a rural enterprise. Business plans for at least four women's groups are being developed, and fabricators in provincial towns have made cassava graters.

Similarly, a program is being developed for stockists that want to graduate to purchasing grain from farmers. Four storage cocoons have been purchased, and these will be used to assess the feasibility of having rural stockists barter inputs for

grain with farmers. We hope this activity will overcome the mismatch between timing of harvests and arrival of inputs. It could also help to overcome the cash-flow constraints of farmers and stockists. In situations where farmers are not compensated in full by inputs taken, there is a possibility to share in the rising price of grain during the period of storage.

MAAIF welcomes any partners that have interests in any of these areas to join the on-going collaboration with SG 2000. MAAIF-SG 2000 operations are highly flexible, accommodating, and effective in reaching small-scale farmers. Above all we operate on the principle that we are developing systems that will outlive these joint efforts.

Development of Conservation Tillage in African Countries: A Partnership Approach.

J. B. R. Findlay and N. C. Hutchinson

J. B. R. FINDLAY

Man developed the plow about 2,000 years ago for seedbed preparation and for weeding. It was only with the discovery of effective herbicides in the 1940s that weed control changed from hand hoeing and mechanical methods. Since more effective and efficient herbicides have been progressively developed. In the early 1970s, Monsanto launched Roundup, a foliar applied, nonselective herbicide containing glyphosate that has very favorable environmental characteristics. One of its great potential uses is to replace plowing for weed control. This concept is widely known as conservation tillage or no-tillage. This is a fundamental change in widely accepted farming practices. In the words of that great environmentalist, Charles Darwin, "It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change." Continual plowing has led to the destruction of soil structure resulting in soil loss and poor crop yields. In sub-Saharan Africa there must be a fundamental change in crop production methods to those that conserve the soil and its environments to enable food production to be sustainable and create wealth within the farming communities.

Within the concept of community involvement and betterment, Monsanto formulated The Developing Countries Goal (DCG), a plan to make a contribution to transferring modern farming technology to underprivileged small-scale farmers. Since the expertise within Monsanto is worldwide leadership in conservation tillage practices, the emphasis of the DCG is to introduce conservation tillage systems to benefit small-scale farmers and to halt agricultural environmental degradation.

Why Conservation Tillage?

When rain falls on bare soil, the force of the raindrops compacts the surface, preventing moisture penetration and causing water run-off and subsequent soil erosion. In contrast, when a soil is covered by a mulch or living plants, such as a grass pasture, and has a good structure containing organic matter, which allows for moisture penetration, water run-off is minimal with virtually no soil erosion.

J. B. R. Findlay is on the staff of Agricultural Resource Consultants, Parklands, South Africa. **N. C. Hutchinson** is with Monsanto Company, Belgium.

In areas that have been continually plowed for many years, there is no organic matter in the soil and the inversion of the soil by the implements has destroyed all structure and left a layer of nutrient-deficient and largely lifeless soil. The absence of crop residues or a mulch on the soil surface further compounds the problem. With poor soils and limited or no supplementary fertilizers, the nutrient quality of the soil will continue to decline and ensure low crop productivity and poverty.

Both large-scale commercial farmers and small-scale farmers have experienced the benefits of building up the soil structure by ending plowing and maintaining crop residues on the soil surface to protect it. Some of the advantages are eliminating the expense of large mechanical equipment or animals to plow, easier and faster planting, improved moisture utilization, less risk of damage from drought, reduced time required for management and labor, the possibility of planting a larger area without expanding the labor force, better yields especially in dry years, and lower crop production costs, resulting in a better profitability.

The principles are simple—do not destroy the soil structure with plowing or disking and keep a crop residue mulch on the surface to give at least a 30 percent coverage. Occasional ripping to break old compaction layers in the soil is acceptable and can also be used to ease planting. The system is flexible and can be adjusted to fit almost any crop production system.

But creating an environment that is beneficial to the crop is advantageous to other plants as well. Consequently, weeds become the most important crop-reducing factor. It is essential to control weeds within this system and this has only become practical with the advent of herbicides. There are many herbicides with different characteristics that can be exploited to fit into a conservation tillage system but generally a pre-planting Roundup spray followed by a pre-emergence residual herbicide such as Lasso at planting will give excellent weed control and a corresponding yield response.

The Plight of Small-Scale Farmers

Certain political and cultural issues, such as limited land ownership, communal lands for the grazing of livestock, after-harvest grazing of livestock on crop residues, the concept of producing enough food to feed a family only, the lack of incentives to produce a surplus for sale, illiteracy, poor access to information and modern technology, and the scarcity of certified seed and fertilizer, have hampered the growth of incomes in the farming community. When farmers are wealthy, the nation is wealthy, and seldom is a country wealthy if the farmers are poor.

Generally, African governments have not been good at creating agricultural development and food surpluses, with the result that international organizations have had to implement numerous food aid schemes to avert famine. The Sasakawa Africa Association (SAA) is an organization that has appreciated that Africa is capable of feeding itself and having surpluses for export and wealth creation. This organization has put management and skills in certain countries to ensure the transfer of technologies that will be beneficial to the small-scale African farmer. In the words of Norman Borlaug, the president of SAA, "World peace will not be built on empty stomachs and human misery. Deny farmers access to modern technology, and the world will be doomed, not from environmental degradation, as some would have us believe,

but from starvation and social and political chaos."

By making information, equipment, and essential inputs available to the farmer, by showing him how to use these effectively, and by encouraging entrepreneurs to process and market the farm produce, wealth can be created. Governments must emphasize that farming is a legitimate business and ensure that farmers are recognized as making a very significant contribution to society. The common belief in Africa that all small-scale farmers are poverty stricken must be seen to change.

Introducing Conservation Tillage to Small-Scale Farmers

With the development of conservation tillage among large commercial farmers, many of the potential problems were addressed and solved by the farmers, research institutes, Monsanto staff, and others. Since weed control is perhaps the most important issue within this system, herbicide programs were developed to reduce or neutralize the effects of weeds on the crops. By promoting Roundup-based programs, Monsanto made technology available to these large-scale farmers who experienced the value that this product brought to their crop production system. By using Roundup, the farmers were getting increased profitability. By developing conservation tillage in this market, where farmers were financially independent or had access to credit, Monsanto could market and promote the concept with the knowledge that the farmer, distributors, and Monsanto would benefit, and the economic issues were acceptable largely due to a sophisticated supporting infrastructure.

To get this technology to farmers who are disadvantaged in virtually all aspects of modern society became the challenge for the Monsanto DCG team and the conservation tillage team. It was quickly recognized that Monsanto could not do this alone. Partnerships had to be formed to gain a wide range of expertise. Various organizations involved with the improvement of agriculture in Africa were contacted, and eventually Monsanto formed partnerships with SG 2000 in Ghana and Tanzania (and more recently, Ethiopia and Mozambique) and with Winrock International in Senegal. Both SG 2000 and Winrock had established infrastructure for managing their projects in close cooperation with local agricultural research institutes and extension services as well as having the political support of the governments. The Monsanto proposal to introduce conservation tillage based on herbicides to small-scale farmers fit in well with existing SG 2000 maize development programs and the Winrock rice development program.

Action Plan

In 1993 the Monsanto team formulated an action plan for getting conservation tillage established in Ghana in partnership with SG 2000, the Ghana Grain Development Programme at the Crop Research Institute (CRI) in Kumasi, and the Ministry of Food and Agriculture (MOFA) extension service team.[1]

One of the most important aspects of attempting a program that requires the assistance of local state organizations is to have political support from the minister of agriculture and other senior members of the ministry. With support at the top, the message is clear to subordinates that this project must be taken seriously. In most instances, SG 2000 has developed excellent relationships with the relevant political leaders in agriculture. The partners—Monsanto, SG 2000, the research institute, and the extension services—meet regu-

larly (three to four times a year) to review the project and plan for the next phase. Because the extension services and the extension officers are in close contact with the farmers and are responsible for implementing the demonstrations, it is important for them to receive support in all possible aspects by all team members.

All members of the partnerships contributing to such a development program must accept that it is a long-term undertaking. An initial phase of research and learning is followed by a period of familiarization and resolving problems. That leads to training and spreading the word of conservation tillage, and then adoption by the innovative and creative farmers who then influence other farmers to convert. This process requires a commitment of at least 5 years to get the technology established and probably 10 years for general acceptance. However, most farmers appreciate progressive concepts, and if they experience the advantages of conservation tillage, they generally adopt part or all of the system relatively quickly.

Development Program

In Ghana, the development program was started with trials established in the 1993 season to determine the efficacy of Roundup Dry, a 420 g glyphosate/kg formulation packed in easy-to-use sachets, for controlling Ghanaian weeds. Trial protocols and guidelines aimed at establishing dosage rates were drawn up by Monsanto and discussed with the CRI team who then implemented the trials with material support from SG 2000. From 1994 onwards, CRI conducted trials with Roundup to establish dose rates on numerous weeds and to evaluate the conservation tillage systems, especially no-tillage, under various local conditions with maize and beans. The trial data were then used for training extension service field officers who carried out their own series of demonstrations designated as extension test plots and farmer production plots. Initially, conservation tillage was emphasized in the high rainfall areas of Ashanti and Brong Ahafo, but it has now been expanded to the northern areas of Ghana where it is administered by the University of Development Studies at Tamale and is implemented by the extension services supported by SG 2000 and Dizengoff Ghana, Ltd., the local distributor of fertilizers and pesticides.

In the development program, Roundup Dry was the formulation chosen, based on its ease of use. This formulation is packed in sachets, and experience had shown that doses of two sachets (for annual weeds) or three sachets (for perennial weeds) in 15 liters of water per knapsack sprayer are sufficient to treat about 1,000 square meters. As farmers become familiar with use of the herbicide, it will be advantageous for them to change to the Roundup solution formulation (360 g glyphosate/l) due to availability, pricing, and packaging.

Working within the SG 2000 strategy, the project developed multiple transfer-of-technology objectives. Farmers were encouraged to use certified seed. That meant that reliable seed producers were needed, and soon the Seed Growers Association of Ghana was formed. The quality protein maize variety Obatanpa was introduced to reduce the incidence of nutritional diseases in Ghana. Information on use of herbicides and fertilizers was diffused. Another objective was the introduction of conservation and no-tillage systems to reduce or eliminate slash-and-burn practices, thereby improv-

[1] The details of the partnerships and program development are given below in detail for Ghana, but a similar pattern has been followed in Ethiopia, Mozambique, Senegal, and Tanzania.

ing soil conditions and raising labor productivity. A further objective was the development of local expertise within the research and academic institutions and the extension services. Another objective was to enlist private distributors to ensure that the farmers could find the necessary inputs locally. In addition, thought had to be given to how farmers would handle larger harvests with their limited resources.

Demonstration Program

The extension services are the logical conduit for getting the farmers exposed to conservation tillage. It became clear early on that demonstration plots had to be large enough to plainly show the advantages to the farmer when compared with his existing methods. To obtain direct comparisons, we used plots of at least 1,000 square meters, both for the farmers' "standard practice" plot and for the conservation tillage plot. This size was also convenient for application with a knapsack sprayer that is calibrated to use 15 liters of water on 1,000 square meters, i.e., 150 liters spray volume per hectare, which would take about 30 minutes. For planting by hand, 1,000 square meters requires about 3,000 maize seeds and 1 day of labor by a single farmer. Fertilizer is applied manually at planting using 10 kilograms of a formulation such as 12-24-12 or what is available (in Ethiopia, for example, only DAP and urea are available) and 4 to 6 weeks later a topdressing of 10 kilograms of urea is applied, which is equivalent to 100 kg/ha of each fertilizer. The herbicide program is the use of Roundup for pre-planting weed control, followed by seeding 7 to 14 days later when the residual Lasso EC (for maize, legumes, transplanted seedlings, etc.) or Lasso + atrazine SC (for maize and sugarcane only) is applied. Any weed escapes within the crop should be removed by hand. All demonstration plots should be planted with certified seed.

For this program, SG 2000 supplied administrative and office support, vehicles, and financing. Monsanto gave a grant to the CRI to cover project costs, provided funds to employ a full-time demonstrator, and supplied herbicides and technical support. Both parties, together with Dizengoff Ghana, have sponsored farmer days and training sessions for extension officers and farmers. In the initial stages of this program, farmers were given Roundup. Subsequently it was decided to supply sufficient seed, fertilizer, and herbicides for the demonstration plots at a nominal cost to ensure that the farmer had an interest in applying it correctly. Financing and access to credit has been a limiting factor, but many farmers have been able to overcome this to a certain extent. Unfortunately, financial institutions do not regard small-scale farmers as potential customers and have chosen to neglect them.

Traditionally farmers prepare the seedbed and control weeds by hand hoeing or using animal traction, and then they plant home-grown seed without fertilizer. The slash-and-burn rotation system requires a fallow period when the land is not planted to a crop—and weeds and indigenous vegetation take over the area. Within this system, all organic material is either burned or destroyed during land clearing prior to planting. Consequently the soil becomes low in organic material and nutrients and develops poor structure. The fallow requirement of the slash-and-burn system also means that in every planting season a large proportion of the land is nonproductive.

The demonstration program contrasts the time required to do traditional land

preparation with the time needed for the continual cropping system based on conservation tillage and herbicides, and it shows the ease of weed control, the benefits of having a mulch for water utilization, and the yield at the end of the growing season, giving improved profitability.

To introduce such a concept, it has proven beneficial to form a group of three to five farmers in a village. They will be able to discuss the various issues and provide each other with mutual support. As a group, they are also be better equipped to promote the system to nearby communities. Since conservation tillage deviates considerably from what is accepted as the norm, a single farmer practicing it can come in for criticism by his neighbors, and this pressure often results in him reverting to traditional methods and rejecting conservation tillage.

Extension officers are responsible for establishing demonstrations with their farmers. In the first season, an extension officer must receive training and then implement about five demonstrations to gain experience, which will enable him to become more ambitious in the following season. Failures and mistakes must be openly admitted and discussed with the groups to ensure that everyone understands what went wrong and why, which helps others avoid the same mistakes.

It is of value to record the details of each demonstration to ensure that information is readily available for training and preparing guidelines. A standard demonstration data sheet has been prepared, and the extension officer is responsible for completing it in as much detail as possible. All problems and constraints must also be recorded so they can be rectified. The last item on the data sheet is a calculation of the farmer's cost of production, his income from the specific crop, and the resulting profit.

Table 1. Number of reduced and no-tillage demonstration plots conducted per year in each of the focus countries on maize, legumes, and rice, 1994-98.

Country	1994	1995	1996	1997	1998
Ethiopia	–	–	–	–	98
Ghana[a]	77	600	170	321	261
Mozambique	–	–	105	147	n.a.
Senegal	28	8	60	250	n.a.
Tanzania[b]	14	22	15	23	198

a/ Trials started in 1993; 1994 was the first commercial year.
b/ Roundup Dry registered in 1997 after 5 years of government trials.

In Ghana, SG 2000 supports two MOFA members and one employee to coordinate the conservation tillage field programs, to arrange training by CRI staff, and to ensure that the demonstration program is implemented. The SG 2000 staff have other project responsibilities as well.

While the demonstration program is under way, the research programs are conducting replicated trials that contribute to the overall knowledge of the team and are used for training. (The numbers of demonstrations conducted by extension officers and Monsanto/SG 2000 team members in the various countries is shown in table 1.) Due to cost and time constraints, these demonstrations are often concentrated in a region. In Ghana the emphasis has been in Ashanti and Brong Ahafo.

Results

Time Saving

Using a Roundup pre-planting weed control spray, a farmer takes approximately 2 days to prepare and plant 0.1 hectare with maize (20 days/ha) compared with 14 days (140 days/ha) using traditional hand hoeing for clearing the land and for in-crop weeding (table 2). In areas where weed pressure is not as severe as after a long fallow, the time required to

Table 2. Time required to prepare seedbed and plant maize on a 0.1 hectare demonstration plot.

Practice	Traditional	No-till
Hoeing: seedbed preparation	8–10 days	–
In-crop weeding	4 days	1 day
Pre-plant herbicide spray	–	30 min
Planting	1 day	1 day
Fertilizer application	40 min	40 min
Post-planting, pre-emergence herbicide spray	–	30 min
Total	14 days, 0.7 hr[a]	2 days, 1.7 hr

a/ About 10 days (100 days/ha) in light weed infestations.

clear and plant by traditional methods will be reduced to about 10 days per plot (100 days/ha). By using the pre-planting herbicide spray system, about 6 hectares can be cropped by one person in the time that it would take to produce maize on 1 hectare if all preparation and weeding is done by hand.

In Senegal, the time saved in rice production was 53 to 60 percent when a pre-planting herbicide was used in place of manual labor (table 3).

Crop Yields

In Ghana, in 32 closely monitored CRI plots, the traditional slash-and-burn technique was compared with reduced tillage, as indicated by yields achieved with maize hybrids and the quality protein maize cultivar Obatanpa. The seeding and fertilizer rates were standard over all plots. Table 4 shows that with a pre-planting herbicide application, maize yields can be 39 to 55 percent higher than yields farmers obtain traditionally, and by adding a residual herbicide treatment, yield increases of up to 79 to 92 percent can be obtained.

Crop Costs and Profitability

In Ghana in the CRI tillage comparison plots, where the seed, planting, and fertilizer costs were standard, the treatment that gave the best weed control was a complete pre- and post-planting herbicide program, which gave a net profit of US$713/ha. That is almost double the profit from the traditional method, for an additional outlay on herbicides of US$29/ha (table 5).

In rice production demonstrations in Senegal in 1994, an outlay of US$25/ha above the cost of manual seedbed preparation and in-crop weeding resulted in a yield increase over the manual method of 1.2 t/ha, worth an additional US$198/ha income, giving a net profit of US$695/ha or 40 percent above the accepted standard (table 6). In 1995 this trial was repeated, and the rice yield was 40 percent higher

Table 3. Labor requirements for rice planting-bed preparation and in-crop weed control in 5 trials and 23 demonstrations. Senegal 1993 and 1994.

Treatment		Trials				Demonstrations	
Type	Rate (g ae/ha)	Bed preparation (worker-days/ha)	In-crop weeding (worker-days/ha)	Total (worker-days/ha)	Labor reduction (%)	In-crop weeding (worker-days/ha)	Labor reduction (%)
Manual only	–	30.1	24.4	54.5	0	9.4	0
Roundup dry	714	11.4	14.1	25.5	53	6.5	31
Roundup dry	1,050	10.7	12.9	23.6	57	–	–
Roundup dry	1,428	10.0	11.8	21.8	60	–	–

a/ Roundup Dry pre-planting sprays were at either 714 or 1,050 g ae/ha.

Table 4. Average maize yield from 32 demonstration plots prepared with "slash and burn," with Roundup pre-planting, or with Roundup pre-planting and a residual herbicide, all with one handweeding. Crop Research Institute, Ghana, 1997.

	Yield (t/ha)		Increase (%)	
Treatment[a]	Hybrid	Obatanpa	Hybrid	Obatanpa
Slash and burn	3.79	3.33	–	–
Roundup + hand weeding[b]	5.28	5.15	39	55
Roundup + Lasso + atrazine[bc]	6.79	6.39	79	92

a/ All plots were planted with certified seed and received fertilizer at planting and as a topdressing.
b/ Roundup Dry at 15 sachets.
c/ Lasso + atrazine SC at 5 l/ha.

than the yield of the standard treatment, and the net profit was US$1,116/ha, 65 percent higher than the standard treatment.

In Tanzania, the yields of no-till maize and rice were increased by only 12.7 percent and 6.0 percent over the conventional manual method, but the overall income per hectare was increased by US$112 (24.5%) for maize and US$165 (11.0%) for rice (table 7).

Progress

The data from Ghana shows that introducing conservation tillage to small-scale farmers is possible and that this concept together with the use of certified seed, fertilizer, and herbicides can lead to higher yields, greater productivity and increased income. Cooperating farmers have seen the benefits over a number of years and have adopted this system on most of their land. Due to the relatively large number of demonstrations concentrated in specific areas, many other farmers have learned about conservation tillage through word of mouth, farmers' information days, or seeing the roadside demonstration plots. Nevertheless, it must be appreciated that it will take many years to reach all farmers, which means that there must be a continual driving force in the promotion of conservation tillage by extension officers in particular and the members of the partnership in general.

It is not easy to measure success in a program that is based on the long-term benefits of the system, however, there are encouraging signs that the farmers are adopting conservation tillage.

- In April 1998, in the rural areas around Kumasi, a number of fields could be seen that had been sprayed with herbicide for pre-planting weed control that were not in the planned demonstration program.
- Dizengoff (the distributor of Roundup and Lasso herbicides) has reported a significant increase in herbicide sales in the area. There has also been a substan-

Table 5. Variable costs and profit of maize production under three tillage systems in 32 comparison plots. Crop Research Institute, Ghana, 1997.

	Variable costs[b]	Net profit	
Treatment[a]	(US$/ha)	US$/ha	%
"Slash and burn"	56.25	360	100
Roundup + hand weeding	76.50	567	158
Roundup + Lasso + atrazine	85.75	713	198

a/ Equal costs for labor, seed, planting, and fertilizer.
b/ Labor, weeding, herbicide, spraying, etc.

Table 6. Returns from manual seedbed preparation and weed control for rice compared with a Roundup pre-planting weed control spray (avg of 5 trials and 23 demonstration plots). Senegal, 1994.

Treatment				Gross		
	Rate	Cost	Yield	income	Net profit	
Type	(g ae/ha)	(US$/ha)	(t/ha)	(US$/ha)	US$/ha	%
Manual only	–	52.78	3.5	575	497	100
Roundup Dry	714	63.52	3.7	596	533	107
Roundup Dry	1,050	71.28	3.9	637	566	114
Roundup Dry	1,428	77.76	4.7	773	695	140
Propanil + Weedone	–	98.25	3.7	572	473	95

tial increase in the sales of knapsack sprayers.

- The Ghana Seed Grower's Association has adopted no-tillage in virtually all its multiplication fields.
- The CRI farm has planted all crops using conservation tillage techniques.
- Some farmers who are now in their fourth season of the program have seen their maize yields increase from 1.5 to 7.0 t/ha, and this is coupled with an increase in area planted.

Researchers and extension officers have gained confidence in the system and are able to answer farmer's queries and concerns with most knowledge coming from field experience. The CRI and extension officers have the expertise to support and promote this concept so the transfer of conservation tillage technology to Ghana in particular has been successful. Part of this success is because CRI has been practical, rather than academic, in its education of all concerned. There is an enormous amount of information available on conservation tillage, which covers the many issues involved. When embarking on such a program, there must be an element of restraint to avoid doing research and academic studies on issues where the answer is well known and solutions are readily available. Ghana now has experienced conservation tillage field staff who are promoting the concept in several regions.

Constraints

In some African countries, conservation tillage has been regarded as a complicated new technology that requires local research institutions to devote much time and effort in doing numerous trials, which invariably illustrate what is already known. There must be a development of local expertise within a country's institutions, but it must also be recognized that conservation tillage has been researched and developed and is a commercial reality on millions of hectares in other areas of

Table 7. Average maize and rice yields from demonstration plots comparing four manual hoeings for seedbed preparation and weeding with a Roundup pre-planting no-till system. Tanzania, 1994–97.

Treatment	Variable costs (US$/ha)	Yield (t/ha)	Income (US$/ha)	Net benefit[a] (US$/ha)
	Maize (28 sites)			
4x hoeing	118.50	4.2	459	0
Roundup + 1x hoeing	74.00	4.7	526	112
	Rice (46 sites)			
4x hand hoeing	177.00	2.4	1,505	0
Roundup + 1x hoeing	107.00	2.5	1,600	165

a/ The profit above that obtained with hand hoeing only.

the world. Africa desperately needs conservation tillage—its introduction should not be delayed to satisfy academics and researchers. There is a wealth of information on conservation tillage available. The challenge is to identify it and transfer it as rapidly as possible to the farmers of the continent.

The average extension agent in Africa is starved for up-to-date information on new developments in agriculture. Many research institutes and academics fail to transfer research findings and technical information to the people responsible for keeping the nation's farmers informed about ways to improve their productivity. Examples of this are governments' tendency to depend on the private sector to introduce a concept such as conservation tillage or to introduce pest control programs with new products. The transfer of information and technology to all people in the extension services from internal and external institutions and from industry must become a priority. When necessary, industry can be asked to present short courses on topics such as fertilizers, pesticides, and application techniques, which is a system that works well in many countries.

There is a need to educate everyone including farmers about environmental issues that are a national problem such as water saving, watershed management, and maintenance of indigenous biodiversity. This is a government role that is neglected. As a result farmers are blamed for the degradation of the environment. Soil is not a renewable resource, and there is no urgency by politicians to acknowledge this.

The involvement of commercial distributors of seed, fertilizers, and pesticides is essential, but these business enterprises have been slow to recognize the small-scale farmer market. They have not helped to develop local retail outlets, which has made essential inputs difficult to come by. Distributors should be involved in the program from the start. As a partner in developing and supporting the project, distributors more quickly grasp the potential for business, giving them an incentive to make sure that the needed inputs are readily available to farmers.

Many traditional crops such as cassava, cocoyams, groundnuts, and potatoes can benefit from conservation tillage, but do not contribute to the overall improvement of the soil due to the nature of harvesting. Areas should be set aside for these crops or they should be very carefully managed within the system. Inter-cropping with these crops is not recommended.

As the goal of creating surplus crops is achieved, there is a need for organized processing, packaging, and marketing of the produce as a service to farmers and the community. Apart from a few crops such as cocoa in Ghana, there is little infrastructure to support the farmer in the disposal of his crops at fair market prices.

The principle of conservation tillage is to have a mulch on the soil surface. But there are many influences that make it difficult to maintain a mulch:

- Uncontrolled grazing by communal cattle can remove all vegetation, as well as damaging the soil structure.
- Many areas have such low yields that crops do not produce adequate cover.
- A hot, rainy climate leads to rapid breakdown of the organic matter.
- Often farmers use the crop residue for fuel.
- Termites may destroy the entire crop residue layer.

Thus there must be continual and effective management to maintain the conservation tillage areas in an acceptable state. Unfortunately, this is neglected at

present, but there is an awareness that something must be done.

Traditionally, livestock are an integral part of African farming, and yet there are virtually no planted pastures. Crop residues are used for animal feed rather than as a mulch that is beneficial to the soil. Governments and research organizations must encourage the planting and management of pastures as well as protecting them with fencing. Crops should be for humans and pastures for livestock.

Animal traction can have a role in conservation tillage, but the expenses of maintaining animals for 12 months a year while only being productive or contributing to the farming enterprise for 2 months is a financial liability. Also crop residues used to feed draft animals are unavailable for mulching the soil.

Governments must create an environment where policies encourage rather than penalize farmers. Central government purchasing of agricultural products seldom addresses farmers' needs and also stunts the development of private enterprise.

For sustainable small-scale farming, the government must develop irrigation systems where possible. Conservation tillage and no-tillage technologies give the best results under irrigation.

Many academics and researchers work on projects with obsolete technology such as plowing. The emphasis should be on up-to-date technology that will revolutionize and advance small-scale farming. The advantages of conservation tillage systems will be emphasized even more when linked with biotechnology advances. Apart from the introduction of new technology, research should also address the farmer's problems and should be done with farmers to validate the benefits of the results.

Conclusions

The process of introducing conservation tillage and achieving wide adoption by small-scale farmers requires a long-term program of education and demonstrations. In Ghana approximately 1.8 million small-scale farmers must be reached and convinced that they should adopt some form of conservation tillage and other progressive farming practices. This is a program to which that the government should give maximum support, making saving the soil a matter of national importance, i.e., a national conservation tillage awareness program. The support for the program by the parties currently involved should continue for at least another 3 years.

As the program expands, the staff and financial support needs will increase. For the private sector, this growth can be funded from the increase in revenue from the sale of equipment, fertilizer, seed, and pesticides. However, the government must also be prepared to raise its investment rather than relying wholly on the private sector and donor organizations.

The existing conservation tillage team must continue to expand into new areas to show farmers what can be done. At the same time, the areas where farmers have adopted this system cannot be neglected, because there will be new farmers trying the technology and others that need advice. Extension officers should be able to promote the concept, but they will require support from time to time. The enthusiasm and momentum of adoption must not be allowed to diminish.

New staff must be recruited in various regions to aggressively promote conservation tillage. These individuals can be from the research institutes, extension services, or the private sector, but their purpose should be clear and focused to promote conservation tillage.

The development of equipment, seed, and pesticide distribution systems are essential to give farmers easy access to inputs. Currently this is taking place slowly. It should be of great concern to the government that the fertilizer industry is poorly developed. Support services such as soil and crop analyses need to be developed to ensure the correct use of fertilizer.

The partnership of MOFA, SG 2000, and Monsanto in Ghana should continue to function well for the foreseeable future. The coordination and administration by SG 2000 has been one of the major factors in the success of the program to date. Any additional partners should make a significant contribution to accelerating the farmers' adoption of conservation tillage by whatever means are available, e.g., funds, people, vehicles, organizational structure, etc.

Perhaps the key to broader adoption of conservation tillage is for the government to recognize that the severe soil and water losses from present farming systems are not acceptable and that by means of education, legislation, and penalties, conservation farming must become a national way of life. Organic material must protect the soil, grazing by livestock must be managed.

To widely establish this farming practice, many trained people will be needed to demonstrate how farmers, the community, and the nation all benefit. The more extension officers doing the job, the faster the progress will be.

Bringing African Universities into Development: The SAFE Program at the University of Cape Coast

Moses M. Zinnah and Deola Naibakelao

MOSES M. ZINNAH

One of the major challenges in improving agricultural extension services in sub-Saharan Africa is the need for well-trained agricultural extension practitioners. Of the 150,000 extension staff who currently work in ministries of agriculture, parastatals, and NGOs in sub-Saharan Africa, less than one-fourth posses university degrees (Winrock International 1998; Swanson 1990). Moreover, most of them are trained only in technical agriculture, with little exposure to the important human side of agriculture, including rural sociology, communication, problem-solving and critical thinking skills, and the capacity to work as a team.

African universities have important roles to play in improving agricultural extension services, particularly in developing responsive training programs for mid-career agricultural extension staff. They have a duty to develop training programs that match the curricula with the actual work environment of extension staff. However, outside the walls of African universities, especially agricultural universities and colleges, there is a general sense of unease that their agricultural development roles are being neglected because their curricula fail to address the fundamental problems faced by rural dwellers, most of whom are farmers.

Many African universities have been preoccupied with upholding "academic rigor," rather than responding to the real needs of the society within which they are based. In addition, their programs and teaching-learning approaches are usually departmentalized rather than interdisciplinary. Since farming is basically an integrated enterprise requiring an integrated, pluralistic approach that cuts across disciplines, agricultural universities and colleges must adopt a pluralistic academic culture.

The majority of African universities were established in the 1950s and 1960s after independence. The mandates given them at independence, particularly the need to train individuals for the civil service, have outlived their usefulness and

Moses M. Zinnah is agricultural extension specialist, Winrock International Institute for Agricultural Development, and Joint Coordinator, SAA/Winrock Ghana SAFE Program, University of Cape Coast, Ghana. **Deola Naibakelao** is representative, Sasakawa Africa Association, Accra, Ghana.

require reassessment as a result of changes in the world and in the universities themselves (Saint 1992). Although academic programs have proliferated in many African universities, there are serious questions about their quality, relevance, and responsiveness to the needs of the larger society. African universities, especially agricultural universities, are facing serious systemic problems that need urgent remedy:

- Most administrators do not acknowledge the need for change in their universities and therefore are not willing to change as often as necessary.
- There is a lack of clear vision about training programs that will prepare graduates to deal with the changing and complex nature of the agriculture sector.
- There is a lack of consensus about the types of curricula required to train individuals to deal effectively with rapid changes.
- The curricula are bloated with too many courses that are not connected with one another and that are not relevant to the real world of work.
- There is the lack of practical off-campus training opportunities.
- Student numbers are growing rapidly in the midst of dwindling resources for public education at the tertiary level.
- Students are not trained to learn how to learn upon graduation.
- The numbers of graduates in charge of teaching, research, and extension activities who are not trained to see agriculture as a system is increasing.
- There is an exodus of qualified lecturers from universities and colleges owing to poor working conditions.
- Libraries and laboratories are poorly equipped.
- Institutions' lack of commitment to resource-poor clientele.

Of course, universities in other parts of the world are not exempt from the problems listed above. Agricultural universities, in particular, are not living up to their mandates (Schuh 1984; Badwen and Macadam 1990; Lunde et al. 1995; Kuckel, Maw, and Sakes 1996). Some critics have even gone further to say that agricultural universities are completely off track and have lost their way (Schuh 1984).

Aims of the SAFE Program

To address the lack of responsive training programs for extension staff, the Sasakawa Africa Association launched the Sasakawa Africa Fund for Extension Education (SAFE) in 1992. It is being implemented in collaboration with Winrock International, a U.S. nongovernmental organization. The SAFE initiative has four main complementary aims.

The first is to create opportunities for outstanding male and female mid-career extension staff who possess certificates or diplomas in agriculture or related disciplines to receiving training that will improve their technical and human relations skills. For example, in Ghana over 85 percent of extension services field staff have those academic qualifications. They are being targeted because of their large numbers and because they have the highest propensity to yield substantial payoffs in both the short and long term. Furthermore, because they will be on study leave from the Ministry of Food and Agriculture, these staff will return to their duties after completing their studies. They will not need to seek jobs.

The second aim is to help reform agricultural extension curricula in selected African universities. In addition, participating universities are assisted in acquiring relevant instructional materials and in networking with other participating universities to build strong pan-African

academic partnerships.

Developing agricultural extension leaders for extension organizations in sub-Saharan Africa is the third aim. This aim does not necessarily imply training extension staff to occupy high positions within the extension organization but, instead, helping them to develop new, positive attitudes toward their work and responsibilities and to become systems thinkers, catalysts and facilitators, and effective managers of change within their organizations.

The fourth aim is to foster long-term institutional change in African universities, not only through the development of responsive agricultural extension curricula, but also through the reform of the institutions themselves. Thus, the SAFE initiative strengthens the capacity of African universities to become adaptable organizations, to develop client-focused training programs, to acquire relevant core instructional materials in agricultural extension and related fields, to mobilize internal and external resources to sustain the programs, and to forge partnerships with local and international institutions and agencies.

Evolution of the SAFE Program at the University of Cape Coast

The extension curriculum reform program at the University of Cape Coast (UCC) started in October 1993. Significantly, the program was not started as a result of a conscious effort by the university to launch a new program. Rather, the Ministry of Food and Agriculture (MOFA), in collaboration with Sasakawa Africa Association (SAA) and Winrock International, approached the university about offering a need-based B.Sc. degree program in agricultural extension for the staff of MOFA who possess diploma or certificate credentials.

Several factors leading to the start of the SAFE program at the UCC were crucial. First, there was a strong partnership between MOFA, UCC, SAA, and Winrock. All the partners agreed that change was necessary to ensure the relevance of extension training programs in Ghana. Therefore, discussions by the representatives of the partner organizations about the preparation and review of the curriculum and the eventual start-up of the program were frank and open-minded.

Second, the Academic Board of UCC was flexible and accommodating in reviewing and approving the new program. It was willing to risk offering the need-based, responsive degree program for the extension staff of MOFA despite concerns that the staff might not perform up to the expectations of MOFA, SAA, and Winrock and despite the university's acute shortage of qualified teaching staff in agricultural extension.

Third, MOFA promised to send its staff into the program on study leave with full pay and to be responsible for providing accommodation for its candidates. The ministry also agreed to meet the university's academic standards for admitting students and to assist the university with instructional materials to facilitate the teaching-learning process.

Fourth, SAA agreed to provide initial support, including placing an agricultural extension specialist at UCC to lead the start-up of the program and to provide instructional materials and funds for implementing the off-campus, farmer-focused Supervised Experience/Enterprise Projects (SEPs).

Finally, Winrock International agreed to partner with SAA in providing the leadership in the development and implementation of the SAFE human resource development initiative. It sec-

onded one of its agricultural extension specialists to UCC to coordinate the program.

The stakeholders agreed upon the following requirements for the admission of candidates into the program:

- Each candidate should be nominated by their employer (MOFA) and be screened and selected by UCC based on the minimum admission requirements of "O-Level" passes in five subjects including science and mathematics.
- Each candidate should have at least 3 years of practical field experience.
- Each candidate should possess a post-secondary school certificate or diploma in agriculture or related fields.
- At least 25 percent of the places in student intake should be reserved for qualified females to redress the gender imbalance and insensitivity in agricultural extension in Ghana.

The SAFE curricula reform program stresses experiential learning—the combination of theory, experience, critical reflection, and practice. Experiential learning provides learners with the opportunity to develop lifelong learning skills, and it builds their confidence and commitment, so that they can work with farmers in participatory ways.

To nurture the philosophy of experiential learning, the SAFE initiative places great emphasis on the off-campus, farmer-focused SEPs. After a period of training on the university campus, students undertake off-campus SEPs, which take 6 to 8 months to complete. The SEPs facilitate experiential learning (Kolb 1984) as well as linkages between the major subsystems of the agricultural knowledge system: the farmer subsystem, including agribusiness; the extension/education subsystem; and the research subsystem. The SEPs component of the SAFE initiative is what makes it different from other academic programs. The SEPs narrow the gap between the intentions and beliefs (espoused theories) and actions/practice (theories-in-use) of the students (Argyris and Schon 1996). Because the SEPs are based on real farm-level situations, they are inevitably multidisciplinary. The choice of topic for each student's project is highly influenced by the beneficiaries—farmers, employers or sponsors of the students, and the students themselves.

A model curriculum for training mid-career agricultural extension staff is difficult to develop and almost impossible to follow owing to the diverse nature and contexts of agriculture. Therefore, the process for developing each agricultural extension curriculum has to be country-specific and based on input from various stakeholders—both in the training institution and the external community.

The SAFE curricula development process at UCC was cyclical and consisted of six main steps: (1) A decision was made by the main stakeholders that change was necessary for training mid-career extension staff; (2) informal discussions were held among the stakeholders to help them to comprehend the need for training mid-career extension staff and to clarify the vision for a responsive extension training program; (3) formal extension training needs assessment was conducted, focusing on both quantitative and qualitative information to justify the need for training mid-career extension staff; (4) a workshop was held for the main stakeholders to discuss the findings of the needs assessment and other related issues in order to reach a consensus about the structure and content of the curriculum and to find a balance between theory and practice; (5) development of the curriculum itself followed the workshop; and (6) a strong

network of institutions and agencies committed to the reform of extension training curricula was established.

This pluralistic, joint decision-making approach, which involved the stakeholders, was intended to:

- ensure the responsiveness and relevance of the curriculum
- facilitate local resource mobilization and management of the training programs by the stakeholders
- give the stakeholders, especially MOFA, a sense of ownership of the program

Current Status

Scope

UCC runs a two-tier program. The basal tier is a 4-year (eight-semester) B.Sc. program for holders of a post-secondary school certificate in agriculture or related fields. The top tier is a 2-year (four-semester) B.Sc. program for holders of a post-secondary school diploma in agriculture or related fields. Currently, 79 students (35% females) are enrolled in the program at UCC—27 are post-diploma students, 25 are third-year post-certificate students, and 27 are first-year post-certificate students.

Stakeholders

The main institutional actors of the SAFE program at UCC are MOFA, UCC, SAA, SG 2000, and Winrock International. They are all making contributions to the implementation of the program.

Beneficiaries

All the institutional stakeholders mentioned above are beneficiaries of the program at UCC. However, the main beneficiaries are:

Front-line extension staff. Without such a program, extension staff of MOFA had little or no opportunity to pursue a degree at the B.Sc. level or higher because their diploma or certificate credentials were not perceived as mainstream qualifications for direct admission into universities.

Farmers. The SEPs are focused on farmer-driven problems. The projects to date have ranged from activities that empower women farmers (introduction of improved meat-smoking technology for pig farmers, use of improved maize storage options, and training in the processing of soybean into spices commonly used in local sauces) to the integration of bee-keeping into plantation farming and introduction of woodlots as fuelwood sources for cottage industries.

UCC. The program is enhancing the university's influence outside its walls. The university is forging relationships with MOFA, farmers, and extension staff. The university is also getting recognition from both national and international institutions for its leadership and responsiveness in starting the innovative program.

Achievements

A major achievement of the SAFE program is that all 24 students (21% females) in the first batch successfully completed their studies in 1996. Twenty-five percent of the students graduated with First Class honors. The graduates now have important roles with high responsibilities in the agricultural extension organization in Ghana. The second batch of students will complete their program in October 1998.

Also there is now closer and better working relations between UCC, MOFA, SAA, and Winrock International. For example, a seven-member Consultative Committee, consisting of representatives from MOFA, UCC, SAA/Winrock, and farmer/agribusiness, has been set up to provide recommendations, including mechanisms for fund-raising, which are

deemed important to the smooth running of the SAFE program at UCC.

There is a greater degree of interaction between field staff of some bilateral agencies and NGOs and the students during the implementation of their SEPs. Some of these organizations have provided funds and other logistical support for SEPs that cut across their field activities in Ghana.

In addition, lecturers associated with the SAFE program at UCC now have greater exposure to the farming communities across the country through the off-campus SEPs. The SEPs provide lecturers with the opportunity to travel to various parts of Ghana to supervise student projects. These visits allow lecturers to match theory with real-life experiences in the diverse contexts of agriculture in Ghana. These visits also give lecturers the opportunity to interact with farmers and extension staff. In addition, lecturers in the program have received support from SAA to attend professional workshops and conferences outside Ghana.

Another important achievement is that, consistent with a major goal of the SAFE program—gender-sensitive admission of students—the proportion of women in the program has increased from 21 percent in 1993 to 35 percent in 1998. As a result, the number of trained female extensionists available for leadership positions in the extension system in Ghana has expanded.

Finally, as a result of the SAFE program, UCC has a modern center for Continuing Education in Agriculture, which was constructed with contributions from MOFA, U.S. Agency for International Development, UCC, and SAA and dedicated in 1995. Named the Sasakawa Center, it was built to solve the accommodation problem during the inception of the SAFE program. The Sasakawa Center has a 25-room facility capable of housing 75 students enrolled in the program. It includes an excellent conference center for 75 participants and two small group discussion rooms. The center also has four staff offices for the Department of Agricultural Economics and Extension.

Challenges to the SAFE Initiative

Qualified Core Staff

The limited number of qualified core staff is a major constraint to the successful implementation and long-term sustainability of SAFE. The B.Sc. agricultural extension program at UCC currently has only two full-time qualified Ghanaian lecturers in agricultural extension and one short-term foreign lecturer. This is too few for the smooth running of the program.

The experiential learning approach emphasized by the SAFE program is staff-intensive and requires competent and committed staff. It is becoming apparent that for continuity the SAFE initiative requires not only must attract high caliber, committed staff, but must also have an environment that motivates them to remain at their universities for many years to nurture their programs. This means that top priority should be given to providing the staff with appropriate incentives and rewards. However, the declining budgetary allocations for tertiary institutions and poor working conditions in many African countries pose a serious threat to the sustainability of the SAFE initiative.

UCC has increased the quota of the staff for the Department of Agricultural Economics and Extension to overcome the shortage of qualified lecturers in agricultural extension. It is hoped that when these positions are filled with competent lecturers, the program's long-term staff requirement will be solved.

Financial Constraints

Any innovative training program such as the SAFE program at UCC, which places a premium on off-campus, farmer-focused learning, requires funds. Universities in Africa have been accused of producing theoretical experts who have little job-oriented training in the relevant fields of agriculture. However, an issue that is easily overlooked is that practical training that includes off-campus activities has increased costs for transportation, lodging, and per diem for the supervisory staff. In Ghana, diminishing budgetary allocations for tertiary education pose threaten the SAFE program at UCC.

To overcome the funding problem, the principal stakeholder of the program, MOFA, is working out plans for including the cost of running the SAFE program in its annual budget. The program will benefit from an annual budgetary allocation from MOFA to ensure its smooth running.

Orientation of Academic Staff and Administrators

A curriculum, such as the SAFE initiative, that is built around a systems approach enhances learning by students, lecturers, and other stakeholders alike because it requires joint course planning, teaching, and assessment by individuals from diverse academic disciplines. However, developing a systems approach to teaching-learning is a stern challenge because many African universities are still largely departmentalized with little integration of the courses and programs. This means that academic staff and administrators, the majority of whom are products of the traditional departmentalized, top-down teaching-learning approach, may themselves require thorough reorientation to appreciate the benefits of a systems approach and how it can be used in designing and implementing academic programs.

One way this problem is being addressed is by involving lecturers in the other academic departments in the SAFE program through team teaching of courses as well as joint supervision of students' off-campus SEPs. This approach is proving to be very beneficial to the lecturers and students in the program. It is forging and nurturing a co-learning spirit in the School of Agriculture at UCC.

Duration of the Post-Certificate Program

Results from a 1997 internal review of the program revealed that MOFA, current students, and potential students in the field consider the 4-years required for post-certificate program too long a time for mid-career staff to be away from their extension duties. Consequently, MOFA, in collaboration with UCC, SAA, and Winrock International, is planning to launch a 2-year diploma program in agricultural extension at Kwadaso Agricultural College for certificate holders. The program will be affiliated with UCC and will complement its B.Sc. program. Once the diploma program commences, UCC will focus mainly on upgrading the diploma holders from Kwadaso Agricultural College to the B.Sc. level and higher.

Promoting Diversity

Another challenge is the small number of women among the mid-career extension staff in Ghana who could be admitted to the SAFE program at UCC. Although the SAFE program reserves 25 percent of each intake for female candidates, it may be difficult to fill this quota in the future.

Of the entire MOFA staff, women make up only 9 percent of the senior staff and only 15 percent of the junior staff (Tetebo 1995). Such low numbers of female staff

jeopardize one of the long-term goals of the SAFE program—training more female extension staff who could become leaders in addressing women and their unique problems.

This serious challenge must be confronted. In Ghana, as in most African countries, few young women pursue science or agriculture courses in high school. Lacking the proper academic background they are precluded from pursuing advanced studies in agriculture or related sciences in agricultural colleges and universities. The scope of this issue is so broad it cannot be adequately addressed by UCC or the Ministry of Agriculture alone. It requires a national approach that promotes women's education in the sciences from primary school level to the tertiary level.

Recommendations

Consultation and Dialogue

The experience of the SAFE program at UCC during the past 5 years clearly indicates that the interest, enthusiasm, and commitment of the stakeholders can be assured if they are part of the decision-making process. Farmers, officials of MOFA, NGOs, extension professionals, prospective students, and university administrators and lecturers all participated in making decisions on matters affecting the programs.

Owing to the dialogue between the stakeholders, the notion that universities are "ivory towers" is gradually being dismissed in the minds of stakeholders outside the campuses. The SAFE program has demonstrated that genuine dialogue and consultation between the university, public and private agricultural institutions and agencies (i.e., ministries of agriculture and NGOs), and farmers can lead to the development of jointly agreed-upon responsive training programs. It is also evident that training programs developed by universities as a result of dialogue with various stakeholders gain strong commitment and support, especially from administrators and support staff.

Effective Communication

Communication between individuals in UCC and other organizations and institutions, both within Ghana and elsewhere, is crucial for the implementation and sustainability of the SAFE program. Communication networks (including telephone, fax and internet facilities) are vital to enable academic staff and administrators to contact their colleagues and exchange ideas on enhancement of teaching, applied research, and practical outreach programs.

However, the availability of communication facilities does not guarantee information will flow effectively between partners. One pitfall in strengthening partnerships is the assumption that once an idea has been communicated within an organization or from one organization to another, then the information has been filtered to all the key individuals within the organization. The experience with the SAFE program in Ghana indicates that it is critical to have committed individuals within each partner organization who will take responsibility for ensuring that information gets to the main power actors within their organizations as well as following up to speed the implementation of important decisions. This is a continual challenge in the process of strengthening partnerships because it involves personal sacrifices on the part of certain individuals.

Committed Leadership

Leadership is a major need for implementing any innovative program. The vice-chancellor, the dean of the School of Agriculture, and the Academic Board of

UCC provided strong leadership in establishing the SAFE program in Ghana. They were focused on and committed to the main priority—the need to offer a responsive extension training program for MOFA. They did not waver even when concerns arose the mid-career extension staff might not being able to live up to the rigorous academic standards of UCC.

Need for Organizational Change

For a curriculum reform initiative to succeed, it is important for each of the main participating organizations (e.g., MOFA and UCC) to introduce a flexible and accommodating mode of operation to ensure that the client-driven and learner-centered approach that undergirds the program permeates the entire organizations. Being willing to adjust or change program direction when the need arises is characteristic of successful extension training programs. Such a systemic organizational change should include key people working at different levels within the organizations. Their involvement will encourage individuals to view the program as integral to the overall programs of their organizations rather than as a tangential activity.

Partnerships with Other Organizations

The SAFE initiative demonstrates the importance of forging partnerships both within the universities themselves (across faculties and departments) and with other universities, NGOs, and government ministries, both within and outside the country. To nurture the innovative nature of the SAFE program, partnerships with other agencies and organizations who are concerned about the same problems is one of the most important ingredients for sustainability.

When the SAFE program at UCC was launched, only a few organizations were involved. The past 5 years has made it clear that the success of the SAFE program in the years ahead will depend largely on partnerships with other private and public organizations and agencies. Only through partnerships can the multifaceted problem of training extension staff in sub-Saharan Africa be solved.

One of the main reasons for the failure of agricultural extension efforts in sub-Saharan Africa during the past three decades is the tendency of organizations to work alone. They operate in competition rather than in partnership or cooperation. However, it is now apparent that individual organizations lack the breadth of knowledge, skills, resources, and power needed to deal with the complex problems of agriculture and rural development, including the training of agricultural extension staff. Merged strengths (i.e., partnership) are the way to ensure future success. Partnership is necessary because closer ties between individuals, groups, and organizations can contribute fresh perspectives and resources that can create effective new strategies to resolve complex problems (Miller, Rossing, and Steele 1992).

Therefore, to achieve greater impact in the coming years, it is important to follow a pluralistic approach. The SAFE program needs genuine partnerships with donor agencies, organizations, and institutions that are committed to the vision of developing responsive training programs for agricultural extension staff. SAA, Winrock International, UCC, and MOFA cannot do it alone. They need the cooperation and support of the other institutions and donor agencies that are involved in the reform of agricultural extension systems in Africa. In this regard, Winrock International and SAA have prepared a proposal entitled "Partner" (Promoting a Responsive Training Network for Extension

Revitalization) to seek long-term funds to support the revitalization of extension training programs in sub-Saharan Africa (Winrock International 1996).

The Partner initiative is geared toward promoting an intensive agricultural extension education program over a 10-year period to strengthen selected African universities and colleges. This will help African universities become more active partners with farmers, extension staff, researchers, and officials of the ministries of agriculture and NGOs in some of the poorest regions of Africa. It will also enhance the capacity of the participating universities to provide innovative agricultural extension programs that focus on farmer-driven field problems similar to the SAFE initiative.

The Partner initiative is consistent with the consensus of opinion in the field of agricultural education and extension about the value of institutional pluralism—a combination of private, public and NGO efforts (Ameur 1994; Bagchee 1994; Miller, Rossing, and Steele 1992; Badwen and Macadam 1990). It is universally recognized that institutional pluralism in the development of extension services contributes to success.

Based on the institutional strengthening experience of the SAFE program at UCC, the Partner initiative will seek to raise the capacity of selected African universities and colleges to deliver agricultural extension programs that improve the competence of mid-career extensionists working in both the private and public sectors through:

- enhancement of agricultural extension curricula
- development of organizational learning capabilities
- advancement of institutional linkages or partnerships
- acquisition of state-of-the-art instructional materials in agricultural extension

Conclusion

Much has been written on the need for agricultural universities to change both their curricula and the institutions themselves in order to respond to the changing needs of the larger society on which they depend. However, few educational institutions in the world have risked systemic change of their traditional agricultural curricula.

The experience gained in the SAFE program demonstrates that agricultural extension situations are complex and problem-oriented. The difficulties are accentuated, in some cases, by institutional inertia and skepticism on the part of university administrators and academic staff. But the SAFE program at UCC has shown that substantial progress can be made if a partnership, rather than a single-agency, approach is adopted.

The process of partnership or collaboration between stakeholders is an evolving one. It is really never fully completed: it is continual. This concept conforms to the philosophy of experiential learning, continuous learning, or the lifelong learning that underpins the SAFE program. Based on the 5-year experience of the SAFE initiative, the learning process approach is an asset because it reduces stakeholders' tendency to become complacent. It also breeds new and sometimes controversial ideas that are necessary for improving the partnership.

But the big question, as Nelson (1996, 3) succinctly puts it, is: "When all is said and done, will more be said than done?" It is hoped that more will be done than said, and that other partners, especially the donor community, will join the SAFE initiative to help reform training programs

for agricultural extension staff in sub-Saharan Africa.

Literature Cited

Argyris, C., and D. A. Schon. 1996. *Organizational learning II: Theory, method, and practice.* New York: Addison-Wesley.

Ameur, C. 1994. *Agricultural extension: A step beyond the next step.* World Bank Technical Paper No. 247. Washington, D.C.: The World Bank.

Badwen, R. and R. D. Macadam. 1990. Towards a university for people-centered development: A case history of reform. *Australian Journal of Adult and Community Education* 30(3): 38-153.

Bagchee, A. 1994. *Agricultural extension in Africa.* Africa Technical Department Series No. 231. Washington, D.C.: The World Bank.

Kolb, D. 1984. *Experiential learning: Experience as a source of learning and development.* Englewood Cliffs, New Jersey, USA: Prentice Hall.

Kuckel, H. O., I. L. Maw, and C. L. Sakes. 1996. *Revolutionizing higher education in agriculture: A framework for change.* Ames, Iowa, USA: Iowa State University Press.

Lunde, P. L., M., Baker, F. H. Buelow, and L. S. Hayes. 1995. *Reshaping curricula: Revitalization programs at three land grant universities.* Bolton, Massachusetts, USA: Anker Publishing.

Miller, L. C., B. E. Rossing, and R. M. Steele. 1992. *Partnerships: Shared leadership among stakeholders.* Madison, Wisconsin, USA: The University of Wisconsin.

Nelson, A. G. 1996. Making change decisions: Deciding to change colleges of agriculture. In *Revolutionizing higher education in agriculture: A framework for change,* ed. H. O. Kuckel, I. L. Maw, and C. L. Sakes, 102-112. Ames, Iowa, USA: Iowa State University Press.

Saint, W. S. 1992. *Universities in Africa: Strategies for stabilization and revitalization.* World Bank Technical Paper No. 194. Washington, D.C.: The World Bank.

Schuh, G. E. 1984. *Revitalizing the land grant universities.* Colloquium. Minneapolis, Minnesota, USA: Strategic Management Research Center, University of Minnesota, USA.

Swanson, B. E. 1990. *Report of the global consultation on agricultural extension.* Rome: FAO.

Tetebo, R. 1995. Strategies for attracting and maintaining women in agricultural extension training programs in the faculties and schools of agriculture in Ghana. In *Proceedings of a National Workshop on Supervised Enterprise Projects (SEPs) in Agricultural Extension,* ed. M. Zinnah and S. A. A. Boakye, 28-30. Cape Coast, Ghana: University of Cape Coast.

Winrock International. 1996. The Partnership Consortium: Promoting responsive training network for extension revitalization. A grant proposal to strengthen African agricultural extension education institutions. Morrilton, Arkansas, USA. Duplicated.

Winrock International. 1998. An assessment of strategic opportunities for sustainable agricultural intensification in sub-Saharan Africa. A Survey Team Report Commissioned by The Carter Center and USAID. Morrilton, Arkansas, USA. Duplicated.

Village Savings and Loan Banks in Benin

Marcel Galiba and Bernadin Glehouenou

BERNADIN GLEHOUENOU

An important question about agricultural development in sub-Saharan Africa is whether technology or credit should come first to break the cycle of poverty? Technology advocates believe that bringing innovation and know-how is the key to moving toward prosperity. But credit proponents claim that untapped local knowledge needs only financial means to burst out and defeat poverty. Everyone involved in rural development sooner or later has to face this question.

SG 2000 started its agricultural initiative in Africa in 1986 to help small-scale farmers to achieve higher food productivity through science-based practices. The choice was clear—SG 2000 was betting on sound and adapted technologies to improve the lot of African farmers. However, there was a big hurdle. How could farmers take part in a nationwide demonstration program to get acquainted with pertinent innovations and acquire new skills and know-how without outside support? The issue of credit loomed. The field staff was forced to tackle day-to-day realities by devising a field strategy with a built-in credit component. Was access to seeds and fertilizers through in-kind credit the initial push to move outside the cycle of poverty? Was it enough? What would happen after the demonstration program moved on? Where would participating farmers be in terms of capacity building, awareness, knowledge, and ability to keep on using recommended technologies?

This paper on CREPs (Caisse Rurale d'Epargne et de Prêt), the village savings and loans banks of Benin, is the story of SG 2000 and thousands of small-scale farmers engaged against the status quo and willing to find a lasting way for a better future.

Genesis of the CREPs

The SG 2000 agricultural project started in Benin in 1989. By that time, in Ghana, SG 2000 had more than 90,000 farmers participating in its technology-oriented demonstration program. Starting a program in Benin after the Ghana experience involved one major shift: moving

Marcel Galiba is the SG 2000 country director for Benin, Togo, Burkina Faso, and Mali. **Bernadin Glehouenou** is the SG 2000 national coordinator for Benin.

from individual farmers to groups, associations, or cooperatives.

Benin has a long tradition of farmer cooperatives. The former Marxist regime compelled farmers to be part of village groups (*groupement villageois*) or cooperative-like revolutionary groups (*groupement villageois á vocation coopérative*). Many of these groups collapsed after the demise of the Marxist rule in 1989. The few that survived were mainly in the cotton belt, e.g., districts like Nikki and Kalale of the Borgou region.

SG 2000 decided to take advantage of the situation by inviting farmers to form groups or associations on a voluntary basis. Sixty-three farmers formed into groups started the production test plot (PTP) program during the rainy season of 1989. The program aimed to demonstrate recommended agricultural practices related to food crops, mainly maize and sorghum, to as many farmers as possible. The use of improved varieties, moderate amount of fertilizers (74-46-28 kg/ha for maize; 60-23-14 kg/ha for sorghum), and good husbandry were key factors in the field strategy.

Participating farmers received basic inputs (seeds and fertilizer) on a credit basis to be repaid in kind or cash after harvest. The in-kind recovery was later dropped because of problems related to logistics and commodity prices at harvest time. At the end of 2 years, participating farmers were graduated from the PTP program. By 1992, there were 3,150 farmers in 138 groups. Ninety-four percent of farmers had paid their membership fee and social share. Loan recovery was above 95 percent. The technologies demonstrated were paying off. The average yield of maize cultivars such as DMR-ESRW, TZBSR, and TZB ranged from 2.5 t/ha to 3.4 t/ha.

But the rising numbers of graduate farmers could not get needed support to keep on using the technology. Formal banks were seldom willing to give loans to small-scale farmers because of high operation costs related to such small loans, lack of guarantee or collateral, and of the risk inherent in production of subsistence crops. Consequently the idea of mobilizing local savings to support technology transfer and diffusion in rural areas was slowly growing. SG 2000, the Ministry of Rural Development, and Acosca (Africa Confederation of Savings and Credit Associations) based in Nairobi decided to join hands to build an efficient savings and loans network at the village level.

A survey of 345 farmers in the SG 2000 program was conducted in January 1992. The results showed that 92 percent of farmers used a hoe and cutlass to till the land. The use of a tractor was exceptional, and animal traction, though a reality in the cotton belt, was only around 7 percent nationwide. Farmers strongly expressed their need to improve their production methods and to get away from back-breaking husbandry. Savings either in kind or cash were found to be common: 71 percent of the cash was saved at home, despite the risks involved. Farmers complained about the absence of nearby financial institutions. Ninety-nine percent embraced the idea of having a local bank managed and run by themselves. Ninety-one percent preferred the bank manager to be from their village. It became obvious that the idea of village banks came at the right time for SG 2000 farmers who, after 3 years of learning, assessing, and trying the recommended agricultural packages, wanted better access to animal traction, improved seeds, fertilizers, postharvest equipment, and more. The formal banking system was not paying much attention to poor rural folks and if it happened to do something, it was untimely, expensive,

and riddled with bureaucracy. Farmers were ready to play a major role in putting their hard-earned savings together and fighting to fill the gap left by formal financial institutions.

Definition of a CREP

A CREP is a financing cooperative whose members live in the same village and who regularly deposit savings to be used as a source of credit. It is a nonprofit organization owned and managed by the members, who are all shareholders. The major objective is to improve members' standard of living by developing a spirit of solidarity, encouraging savings, promoting beneficial loans with reasonable interest rates, and fighting moneylenders and middlemen.

A CREP is formed to serve members' needs in the framework of durable development. It follows the same principle of any legal cooperative in the sense that management, administration, and control are collective and democratic. Three bodies form the organization: the General Assembly, the highest organ composed of all members; the Management Committee, which is in charge of administration and management and is elected by the General Assembly; and the Commission of Control, which is in charge of audits.

A CREP must comply with the following principles:

- A democratic structure—anyone in the village can be a member on a voluntary basis. After paying a membership fee ($1) and one social share ($4), a member is eligible to vote. No matter how many shares are owned, the rule is one person, one vote. There is no discrimination as to race, gender, religion, or political convictions.
- Service to members or shareholders in the domain of savings and loans, e.g., the interest rate is decided by the General Assembly for both savings and loans.
- Search for financial viability to guarantee continuous and permanent services to the community.
- Continuous information and training for shareholders—active education of leaders, managers, and members (with a literacy program if needed) is required for general interest, respect for democracy, principles of self-reliance, and good governance.

Advantages

A CREP offers many advantages at the village level, but safety and security are the primary ones. By keeping their money in a CREP, members are protected from misfortunes like fire, theft, and, not least, the propensity to spend their savings unwisely. Members appreciated the convenience of not having to travel long distances to deposit their savings. And as little as US$1.00 can be deposited. The amount of savings is less important than the signs of a new attitude among villagers, who steadily move down the road to freedom and human dignity.

The days and hours the CREPs are open are based on farmers' cycle of resting and market days in order to fit their needs. The greatest breakthrough is that shareholders become "somebody"—they feel their voices count, and they take pride that they are co-owners of their village bank. The member is no longer merely an account number in a far-away place manipulated by uninterested white- collared bureaucrats in their air-conditioned offices jammed with computer printouts, who may have never seen a sorghum or millet field. The shareholders get back their dignity and feel empowered.

Table 1. CREPs in Benin, December 1992.

Department	CREPs (no.)	Members (no.)	Amount (US$) Social capital	Savings	Total
Borgou	5	375	760	761	1,521
Atacora	5	358	575	520	1,095
Zou	5	189	645	150	795
Ouémé	4	358	515	890	1,405
Mono	4	227	630	1,230	1,860
Atlantique	2	43	135	105	240
Total	25	1,482	3,260	3,656	8,321

Table 2. CREPs membership, capital, and savings, 1992-94.

Year	Members (no.)	Amount (US$) Paid-in equity	Deposits	Withdrawals
1992	1,482	3,260	3,654	2,887
1993	2,126	5,874	119,829	85,078
1994	4,348	13,828	545,965	425,853

Pilot Phase

From May to November 1992, 25 CREPs involving 1,482 members were set up in the six departments of Benin (table 1). Results obtained after 6 months were not spectacular; only 66 percent of total shares were paid off. In fact US$5,928 was supposed to be collected for 1,482 members. The mean savings per person was a meager US$2.45. It took weeks of savings mobilization to bring villagers to understand the need for certified deposits or time deposits.

Until 1994, the program was in a pilot phase, and the number of CREPs was held at 25. By the end of 1994, an evaluation was conducted to assess performance and members' opinions. All surveyed members expressed their satisfaction; they were happy to have their own bank in their village, managed by an insider, a son of the village. However, shareholders expressed a need for more loans. Loans were primarily used for agricultural activities; loans for petty trading, mainly for women, were the next most important. Between 1993 and 1994, membership doubled, paid-in equity (social capital) rose 135 percent, and deposits increased by 350 percent (table 2).

In 1993 seven CREPs were strong enough to start giving loans; by 1994 there were 16 lending CREPs with a total portfolio of US$17,883 and 356 beneficiaries. At the end of 1994, the 25 CREPs were divided into five performance groups based on deposits (table 3). Nearly half were considered to be lagging, and though they were found in all six departments, the majority were in the cotton belt. The three best performing CREPs were all in the south where maize is the staple cereal.

In part these results might be explained by more frequent visits and support from SG 2000 staff in the south closer to Cotonou, the capital. But also the north has more financial institutions, which are involved in marketing cotton. The lack of infrastructure in many villages was a

Table 3. CREP grouping, December 1994.

Performance	CREPs (no.)	Deposits (US$)
Great	3	> 16,000
Good	2	8,000–15,999
Fair	4	2,000 – 7999
Emerging	5	1,000 –1999
Lagging	11	< 1,000
Total	25	

Table 4. CREP infrastructure, June 1998.

Department	CREPs (no.) Total	With buildings	With safes	With buildings and safes
Borgou	13	11	13	10
Ouémé	8	6	8	7
Zou	7	5	6	5
Mono	5	2	3	2
Atacora	4	2	3	2
Atlantique	3	2	2	2
Total	40	28	35	28

handicap; 6 out of 10 CREPs had neither a building nor an iron safe. A CREP that possesses a safe inspires confidence in potential members. Among the 12 poorest performing CREPs, 11 lacked a safe.

On the other hand, some CREPs became too big. In Gbowime, Zou Department, the CREP had 1,732 members and had to be reorganized. The vast majority of members were still waiting for a loan. Solutions were needed for all these problems to preserve obtained results and move the network further along to achieving its foremost objective: supporting small-scale farmers in their fight against poverty.

The SG 2000 CREPs

Establishment and Infrastructure

Today 40 CREPs have been created with the support of SG 2000. Forty percent are in southern Benin (Atlantique, Mono, Ouémé) where cotton is not planted. Infrastructure—a building and an iron safe—has been significantly improved: 88 percent of the CREPs have a safe, and 70 percent have both a building and a safe (table 4), as compared with 40 percent in 1994.

Membership and Social Capital

Membership increased 185 percent between 1994 and 1998; 96 percent of social shares were paid. CREPs from the North (Borgou, Atacora) account for 34 percent of total membership (table 5).

Savings and Withdrawals

From 1992 to June 1998, savings and withdrawals evolved similarly. The ratio of withdrawals to savings is 76 percent for the period (table 6).

Time deposits paying 6 percent a year were not precisely estimated in the whole network. Members often deposited money in their accounts without making withdrawals for up to a year. Unfortunately they could not be paid any interest because they did not open the accounts as savings accounts. Campaigns of informa-

Table 5. Membership and social capital, June 1998.

Department	Members (no.)	Social capital (US$)
Borgou	3,287	10,160
Ouémé	3,212	10,840
Zou	2,393	7,667
Mono	2,047	6,807
Atacora	876	2,733
Atlantique	576	1,641
Total	12,391	39,848

Table 6. Cumulated savings and withdrawals, 1992-98.

Departments	Amount (US$) Savings	Withdrawals
Borgou	1,351,897	1,173,093
Ouémé	1,107,826	821,061
Zou	609,639	349,732
Mono	514,623	423,829
Atacora	128,266	58,083
Atlantique	19,206	10,038
Total	3,731,457	2,835,836

tion and savings mobilizations were launched in 1998 emphasizing time deposits as a major and sure source of loans for members.

Credit

To get a loan, a member must

- be a member for at least 6 months
- pay the membership fee
- pay for at least one social share
- have a deposit worth 20 to 30 percent of the requested loan
- have real guarantees bolstered by group joint solidarity
- accept the nominal interest rate of 15 percent a year

Loans from Members' Deposits

From 1993 to 1997, the CREP network gave 6,874 loans amounting US$677,946, or 18 percent of total deposits. The average loan was US$99. For 1998, 2,262 loans worth US$214,787 were disbursed making an average credit of US$95 (table 7).

Loans from Outside Financing

The purpose of PAPME (L'Agence d'Appui pour la Promotion des Petites et Moyennes Entreprises), an institution created and financed by the World Bank, is to give multidimensional support to local private enterprises. After auditing CREPs in five departments, the PAPME decided to give 1,211 loans totaling US$122,448 (table 8). The average loan from outside funding is US$101.

The rate of repayment is above 98 percent. However, no distinction was made between repayment and recovery rates. Outstanding loans have brought managers and credit committee members to act swiftly to press borrowers to pay off their loans. Group solidarity has been effective in preventing loan losses from local funds so far.

Impact and Partnership

The CREPs have had a snowball effect. Rather than waiting for SG 2000, farmers from other villages organized and created, on their own initiative, what can be called informal CREPs. Today 53 informal CREPs are found in all six Benin departments. The construction of buildings for informal CREPs is entirely financed by members. Despite outside support with some safes, infrastructure and equipment needs are enormous (table 9). If a building and a safe were a requirement to become a formal CREP, only 10 percent of the informal CREPs would be eligible.

Total membership is 5,707, or 107 members per informal CREP compared with 309 members for SG 2000 CREPs. Paid-in equity is at 98.5 percent illustrating members' enthusiasm. However, the ratio of withdrawals to deposits is 85 percent, showing the volatility of the deposits (table 10).

Informal CREPs have also given loans from their own funds. The portfolio for 1998 is US$113,146 for 1,169 members,

Table 7. Loans from members' savings, 1998.

Department	Loans (no.)	Amount of loans (US$)
Ouémé	837	115,164
Zou	723	42,185
Borgou	303	38,300
Atlantique	213	9,958
Atacora	181	8,850
Mono	5	330
Total	2,262	214,787

Table 8. Loans from outside financing, 1998.

Department	Loans (no.)	Amount of loans (US$)
Ouémé	315	50,000
Zou	982	39,166
Borgou	259	25,833
Atlantique	88	4,116
Mono	28	3,333
Total	1,211	122,448

Table 9. Infrastructure of informal CREPs.

	CREPs (no.)			
Department	Total	With buildings	With safes	With buildings and safes
Zou	20	4	2	2
Ouémé	16	2	2	1
Borgou	6	0	1	0
Atacora	5	0	0	0
Atlantique	4	0	0	0
Mono	2	2	2	2
Total	53	8	7	5

giving an average loan of US$97. PAPME also audited the best performing informal CREPs and extended a credit line of US$33,333 for 653 members in the Zou, Borgou, Mono, and Ouémé departments. PAPME support to informal CREPs is a significant encouragement for these structures to grow.

The whole CREP network has improved since 1992 despite very limited financial means. As time went by and because of members' dynamism and efforts, other partners joined SG 2000 to support the construction of buildings and purchase of safes: Acosca, FDV (the Village Development Funds) financed by GTZ (Germany), and SNV (the Netherlands Organization for Development). Their contribution totals US$13,933 (table 11).

Financial Analysis and Prudential Ratios: The Kpakpaza CREP

The CREP of Kpakpaza in the Zou department has 611 members, and its performance is average. Balance sheet analysis for 1994 to 1997 shows a steady increase in equity, rising from US$15 in 1994 to US$7,004 in 1997. Income statement analysis shows an increasing net operating profit after 1994, reaching US$2,195 in 1997 (non-operational income was not included in calculating the net operating profit). After 2 years of difficulties and hard times, the CREP of Kpakpaza can be considered profitable: operating income exceeds operating expenses.

The computation of prudential ratios shows that Kpakpaza is well in line with the norms required by the BCEAO (Central Bank of West Africa States). The risks are within the admitted limits for all ratios except portfolio held by the 10 largest debtors (table 12). That ratio should be reduced to around 15 percent. It is worth noting that the CREP management is very much under the limits allowed for obtaining loans.

Capitalization

The progress achieved by the CREP network has attracted partners not only in the support of infrastructure and equipment but also in providing new services to members.

Health Centers

Social security does not exist in rural areas. Primary health care is administered with difficulty, and its quality leaves

Table 10. Informal CREPs in Benin.

	Members	Amount (US$)	
Department	(no.)	Savings	Withdrawals
Zou	1,836	347,616	265,005
Ouémé	1,175	277,998	270,415
Borgou	1,125	252,878	224,885
Atacora	862	81,305	68,411
Atlantique	396	12,978	7,083
Mono	313	1,514	772
Total	5,707	974,289	836,571

Table 11. Supporting partners of the CREP network.

Organization	Type of support	Period	Amount (US$)	Note
ACECA	Safes	1992	5,600	Subsidy
FDV (GTZ-Germany)	Building	1992	3,333	Subsidy
SNV (Netherlands)	Building	1995	5,000	Subsidy
Total			13,933	

much to be desired. The NGO France-Benin decided to link health centers with the CREPs. The CVMSR (Caisses Villageoises de Mutualité Sociale Rurale) is meant to deal with daily health problems that rural folks face. The objectives of this project are to:

- take in charge health expenses of members and their families
- provide a quality of health care members can expect
- equip centers and get competent staff to deliver good services

The pilot phase started in January 1996 in three departments with one health center per department. The CREPs chosen were Assrossa in Ouémé, Gbowimé in Zou, and Biguina in Atacora.

At the end of 1996, an evaluation was conducted to better understand the health situation and to assess beneficiaries' satisfaction. The positive results encouraged the French Cooperation Mission to fund the construction of fully-equipped health centers in selected CREPs. The CVMSR today has 1,500 members. Each member's family, up to 11 members, can have access to health care at a yearly cost of US$42. The CREPs have allowed members to take a loan in order to join a CVMSR, which uses the same structures for managing and administration. The French Cooperation Mission subsidy is US$108,333. This initiative is expected to be extended to the whole network.

Farmers' Input Supply

Access to agricultural inputs is one of the keys in the adoption of new technologies. Sonapra (Société Nationale des Produits Agricoles), a semi-private company and the main importer and distributor of fertilizer, has since 1996 provided fertilizers at wholesale prices to the CREP network on credit. During three growing seasons, 2,042 tonnes of fertilizers worth US$578,333 were managed by the CREPs and sold to members. In conformity to package recommendations, 3,705 hectares

Table 12. Analysis of prudential ratios of the CREP of Kpakpaza.

Year	Portfolios of largest debtors[a] (%)	Risk limitation[b]	Expenses /income[c]	Mgt loans[d] (%)	Single borrower risk[e] (%)	Liquidity[f] (%)
1994	38.4	0.84	4.25	0.2	4.3	80.8
1995	31.4	0.81	0.33	1.0	10.5	90.9
1996	29.6	1.00	0.56	0	6.9	99.5
1997	22.0	1.08	0.39	0.2	8.2	106.0

a/ Proportion of the CREP loan portfolio held by the 10 largest borrowers.

b/ Risk limitation supported by the CREP. The risks cannot be greater than twice members' deposits.

c/ Mid- and long-term engagements must be supported by stable resources–the ratio of operating expenses to operating incomes must be less than or equal to 1.

d/ Loans to CREP leaders cannot exceed 20% of the deposits.

e/ Loans to a single largest borrower cannot exceed 10% of the deposits.

f/ Short-term assets must always represent at least 80% of liabilities and outstanding signed obligations.

of maize and 2,908 hectares of rice were fertilized. An average yield of 2.7 t/ha of maize and 2.9 t/ha of lowland rice were achieved. With perfect repayment rates, Sonapra has promised to increase the quantity of fertilizer in order to meet increasing demand from farmers.

Processing of Agricultural Products

SAA in collaboration with IITA (International Institute of Tropical Agriculture) has set up a demonstration program related to improved agro-processing equipment. The CREP network has been used to support individuals or group members who wish to acquire the equipment.

The simple principle consists in providing the CREP a set of equipment on a credit basis. The CREP being the guarantor of the payment gives the equipment to the borrower and pays SAA/IITA one-third of the total amount at the delivery date. The repayment, without interest, of the balance is spread over 2 to 3 years.

Women's groups, shareholders of the CREP, have benefited greatly from this equipment. It allows them to reduce processing operations, to raise their productivity, and to improve product quality. Fifty-five motorized graters used for cassava and 28 screw presses have been sold. Members have also acquired 40 multipurpose threshers (millet, sorghum, maize, rice).

Procurement and Marketing Stores

Supply and marketing stores have been built to give villagers a commercial outlet capable of providing essential products while generating income. In the partnership, SAA provides

- a subsidy of 50 percent of the building cost
- working capital of US$1,667 to be paid in 1 year without interest
- accounting expertise for stock management
- training for the manager

The responsibility of the CREP is to

- bear half of the building cost
- commit itself to repaying the working capital within the allotted time
- ensure that the store is regularly restocked
- appoint the manager

Currently supply and marketing stores exist in two villages—Assrossa, Ouémé, and Sirarou, Borgou. The experience will be extended to other villages if the pilot phase in these villages proves successful.

Professionalization

Although the CREP network has grown, it still has enormous needs. The dichotomy between the formal CREPs and the informal ones should disappear. Innovations and services to members already started need to be pursued. The CREP network should be consolidated through a federation evolving in a well-defined legal and regulatory environment.

Legal Framework

Decree 98-60 of February 9, 1998, bearing on the application of the new law governing savings and credits mutual institutions calls for the creation of unions or federations for entities that accept savings and give loans. Consequently in 1998 the Constitutive General Assembly of CREP regional groups created Fenacrep (Federation Nationale des CREP). The aim of the Fenacrep is to run the CREP network in Benin. As such, it ensures the orientation, coordination, and management of the activities of the network.

Fenacrep (fig. 1) is a cooperative structure with financial autonomy. It is important to stress that the regional and the subregional levels are professional

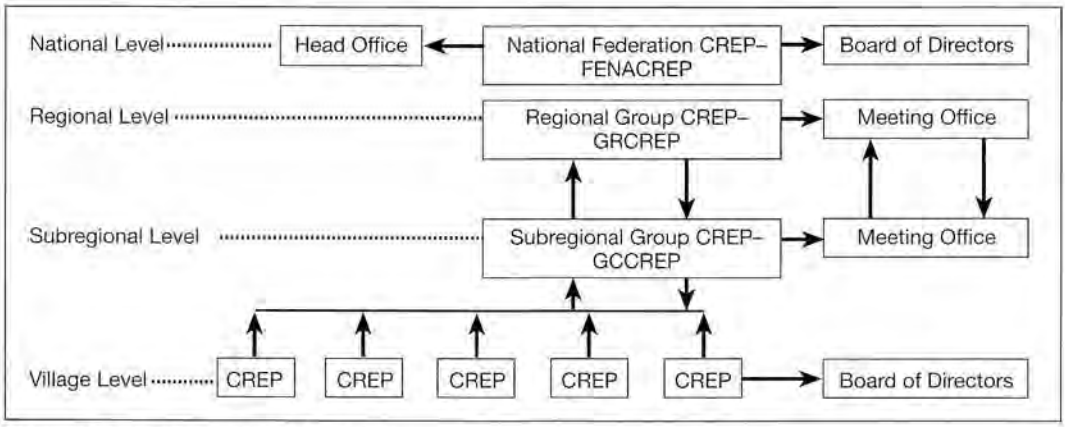


Figure 1. Fenacrep organization chart.

settings for consultation with offices in charge of the coordination and management of the group sessions.

Functional Duties of the Fenacrep

The Fenacrep is the professional representation of the CREPs. Thus, it ensures the coordination and the management of all the network structures, such as Fenacrep's technical services, CREP regional groups, CREP community groups, and the base banks.

In addition to the definition of the network strategies, the technical duties of the Fenacrep are:

- recruiting personnel
- posting staff based on the actual needs of the network
- organizing training sessions
- managing insurance contracts and consulting contracts
- managing relationships with financial partners
- searching for outside funding
- elaborating and implementing computerization
- preparing and implementing the annual budget
- managing credit and risk situations
- keeping the accounts of the CREPs and the federation
- launching new products within the CREPs

Fenacrep faces several difficulties. The network must organize itself so that all CREPs have a building and a safe. The itinerant accountants and the managers must be provided motorcycles so they can carry out their duties properly. The absence of a vehicle pool handicaps the liaison between the national level and other levels. Information dissemination and training of the CREP members and particularly elected officers (board of directors and supervision council) are priorities, along with setting up accounting procedures and appropriate audits.

In spite of these difficulties, Fenacrep is seeking support from partners willing to contribute to the reinforcement of the young federation. Following many meetings and seminars, several donors expressed their agreement in principle to join the efforts already made by SG 2000 with the support of SAA (table 13).

Conclusion

The development of CREPs in rural areas was an urgent need. Through efforts made by members over 6 years, positive changes are occurring in villages today. Two major objectives must, however,

Table 13. Partners pledging support to the CREPs.

Partners	Nature of support	Period	Amount (US$)	Note
DID[a]	Rent paying	1999 & 2000	31,200	Subsidy
DID[a]	Training	1999	40,000	Subsidy
CGAP[b]	External audit	1999	10,000	Subsidy
ACI[c]	Training	2000	10,000	Subsidy
FAO	Institutional support	1999 & 2000	to be determined	Subsidy
Socodevi[d]	Training	2000	to be determined	Subsidy
Danida[e]	Credit	1999 & 2000	to be determined	To reimburse
PAPME[f]	Credit	1999	400,000	To reimburse
Sonapra[g]	Inputs	1999	400,000	To reimburse
Swiss Cooperation	Internal audit	1999 & 2000	15,000	Subsidy
French Cooperation	Health centers	1999	60,000	Subsidy

a/ Développement International Desjardins, Canada.

b/ Consultative Group to Assist the Poorest, World Bank.

c/ Alliance Coopérative Internationale, Burkina Faso.

d/ Société de Coopération pour le Développement International, Canada.

e/ Danish Agency for International Development Aid.

f/ L'Agence d'Appui pour la Promotion des Petites et Moyennes Entreprises, World Bank.

g/ Société Nationale des Produits Agricoles, Benin.

mobilize the whole network: financial efficiency and viability. The network must reach a significant number of beneficiaries—the poor and particularly women—with quality service (high productivity and low costs), and it must become independent from donors and subsidies. This double objective is a long-term struggle, which can be won only by having a professional federation for the network. The financial analysis of Kpakpaza shows that it is possible. The young federation must with rigor and discipline get all needed instruments to fulfill its duties: an appropriate management information system, effective accounting and auditing procedures in line with BCEAO, viable interest rates, and reasonable staff and consultant costs. Technology and credit must move together. If we want to protect the environment, combat desertification, and improve soil fertility, the main actors—small-scale farmers—must no longer live in abject poverty. The protection and the future of our blue planet runs inevitably through the hands of the poor. Let us make access to know-how and credit a human right.

Agricultural Outputs: Market Development

Frank Hicks

Over the past decade, Ghana's economy has grown impressively, averaging 5 percent a year, but agriculture has been largely stagnant, growing only 2 percent annually since 1983. Despite recent efforts by the government to construct feeder roads and extend electricity to various parts of the country, agricultural extension, input supply, food processing, transportation, and marketing remain inefficient. As a result the agricultural sector continues to suffer high post-harvest losses (approximately 30% for all produce) and low farm-gate prices for staple food crops.

Small-scale farmers make up 60 percent of the Ghanaian farming population, and their production represents nearly half of the country's GDP. Yet, smallholders do not enjoy any real market power. They remain classic "price takers"—generally isolated from market information and profitable market opportunities.

Most smallholders cannot afford, nor can they reliably access, improved seeds, fertilizer, and other production inputs, and therefore most experience low crop yields. With immediate cash needs and limited post-harvest technologies and storage facilities available, smallholders must sell the bulk of their production to traders shortly after harvest, at the bottom of the seasonal price cycle. Although domestic commodity prices usually rise substantially during the lean season, small-scale farmers are unable to hold their crops after harvest for later sale at the higher prices. Many families end up buying back the same basic foodstuffs that they had produced earlier in the year, paying two or three times the price they received. Cash-poor again by the planting season, they are often unable to purchase agricultural inputs, and the negative cycle continues.

Although agriculture in Ghana generally been stagnant, some sectors, notably nontraditional exports, have experienced impressive growth. Unfortunately, few smallholder farmers or microenterprises are currently engaged in this sector in Ghana. The experience of commercial producers and exporters who have sought to establish outgrower schemes with

Frank Hicks is program director, TechnoServe, Ghana. Parts of this case study draw upon a TechnoServe report on inventory credit by Steve Londner, George Kwadzo, and Frank Hicks.

small-scale farmers has been disappointing. All too often, the farmers, after receiving advice and agricultural inputs on credit from the commercial producers or exporters, have sold their produce to other buyers who offered a higher price at harvest time, leaving the producers and exporters in debt and unable to fill their orders. Similarly, exporters who are willing to advance funds for the purchase of crops grown by small-scale farmers often find the funds being diverted for other purposes and experience difficulty in obtaining the export volumes they require.

Small-scale farmers and food processors also lack ready access to credit for agricultural inputs, post-harvest technologies, and enterprise capital. Most commercial banks are reducing their lending to the agricultural sector. Many of the nation's rural banks have low capital bases and liquidity constraints. Few nonbank finance or microfinance institutions are active in the rural sector. And those rural entrepreneurs who are able to borrow from formal financial institutions can only do so at prevailing interest rates (38-42% annually) that are high relative to inflation and for short periods (usually no longer than a year).

Furthermore, while the formal financial institutions are largely responsible for the shortage of rural credit, most microenterprises and small enterprises are not able to develop convincing business plans or to submit bankable financial proposals. They also do not have the collateral that most banks require to secure loans. Many microenterprise owners lack basic education and management skills and have difficulty determining the potential viability of business options. Often, such persons are unable to calculate accurately their true costs of production, let alone develop business plans and keep simple records. Therefore, few are attractive to bankers and other financiers. Also, many banks have experienced poor recovery rates on agricultural loans and are understandably reluctant to increase their risk exposure.

Due to these circumstances, smallholder farmers are compelled to borrow from local moneylenders or local traders to obtain the necessary agricultural inputs. Moneylenders charge about 10 percent per month, while traders are repaid in kind with produce at harvest time at prices significantly below the already low seasonal market rates.

As a result of these factors, most small farmers and food processors continue to grow and process a limited variety of traditional crops in a generally inefficient and unprofitable manner.

TechnoServe's Approach

TechnoServe believes that the key to promoting dynamic growth in the agricultural sector in Ghana is to develop viable small- and medium-scale rural enterprises, based on a thorough understanding of international and domestic market realities. TechnoServe believes that small-scale producers will be motivated to increase their production and productivity and to supply products to local industries and exporters only if they are confident that they can sell their produce at a reasonable profit to dependable buyers. While this statement may seem obvious, there are few organizations promoting such linkages in Ghana today.

TechnoServe and its development partners in Ghana believe that the following services are essential to overcome the constraints to improved market linkages and increased growth:

- in-depth analysis of potential agricultural subsectors to determine appropriate commodity or product focus and

interventions, based on detailed market information
- development of viable, replicable business models, based on such analysis
- practical advice and assistance to small-scale farmers and processors on how to improve the efficiency and quality of production to meet local industry and international standards
- increased access to post-harvest technologies to improve enterprise productivity and the quality of goods
- training for microenterprise owners and staff in business management and simple record keeping
- development of innovative financial mechanisms that can provide credit, advances from the private sector, and venture capital to rural entrepreneurs at relatively low cost and with low risk
- training and incentives for relevant financial institutions to operate such financial schemes
- formation or strengthening of producer and business associations in order to supply larger-scale dependable buyers in a reliable and cost-effective manner

TechnoServe also believes it is essential for potential business owners to demonstrate strong commitment to the process of enterprise development. Therefore, it requires prospective rural clients to make up-front contributions, in the form of cash or in-kind payments such as land, labor, materials, or produce. In addition, prior to any TechnoServe assistance, enterprise owners or members are required to attend regular meetings to plan enterprise operations and sign a management agreement, which includes a commitment to pay a modest management fee to TechnoServe. This is done not only to underscore the mutual commitments involved, but also to prepare the businesses to pay for outside services when TechnoServe eventually discontinues its support.

Finally, TechnoServe also believes that in many instances these businesses will be best positioned to grow and prosper if they are able to establish marketing agreements with larger, more dependable buyers and firms. In this regard, TechnoServe seeks to act as an honest broker to ensure that such linkages provide positive incentives for both parties and can therefore endure and grow.

In Ghana, TechnoServe is providing assistance to small-scale farmers and food processors in nontraditional exports, with a focus on cashew nut, shea nut, kola nut, and pineapples; palm oil processing, with a focus on oil for local food consumption and traditional soap manufacturing; and grain storage and marketing, with a focus on community-level storage for local food sales and consumption. TechnoServe is currently assisting 177 community-based rural enterprises with a combined total membership of over 7,600.

TechnoServe's Collaboration with SG 2000

In the mid-1980s, SG 2000, working closely with the Ministry of Food and Agriculture (MOFA), successfully demonstrated the ability of small-scale farmers in Ghana to double and even triple their yields in major grain crops by using bank credit to obtain improved inputs and technologies. While government and farmers were initially enthusiastic, several unanticipated commercial and marketing constraints subsequently emerged.

Despite the dramatic evidence of increased productivity, relatively few farmers adopted the use of improved inputs after the initial promotional efforts ceased. SG 2000 had expected that the private sector—seeing new business

opportunities—would step in to provide inputs to small-scale farmers, as it had in Asia. But it soon became apparent that a strong private-sector response was not forthcoming in Ghana.

Similarly, SG 2000 had expected that increased production would readily find profitable market outlets as it had in Asia. However, this too proved problematic as several bumper crops instead resulted in depressed local prices and reduced farmer incomes. Largely as a result, but also due to problems with effective monitoring, the initially impressive loan recovery rates declined sharply as the scheme expanded.

In 1988, TechnoServe began working with SG 2000, the Agricultural Development Bank (ADB), and the Ministry of Employment and Social Welfare's Department of Cooperatives (DOC) to address the commercial and marketing problems that had become evident after SG 2000's early successes.

The initial focus of the collaboration was to help farmers in Ghana's Central Region develop multipurpose service cooperatives to get production credit for the continued purchase of agricultural inputs and mechanized farm services, as a means to expand crop production. The assumption was that as the supply of crops increased, the demand would grow. SG 2000 supplied agricultural inputs such as seeds, fertilizer, and other chemicals to help increase yield; TechnoServe provided the farmers with technical, managerial, and marketing assistance.

Unfortunately, weather problems in the first year resulted in poor crop yields and loan defaults. In addition, many farmers did not take the commitment of loan repayment seriously. They intentionally defaulted on the agreement between themselves and the lenders. This compelled TechnoServe staff to act as debt collectors for the ADB, instead of as business advisors to the cooperatives. The realities of cereal marketing in Ghana and the lack of options available to farmers became apparent to TechnoServe staff as they followed-up with farmers to repay their loans.

Based on that experience, TechnoServe decided to discontinue its efforts in production credit and focused, instead, on helping farmers in the Central Region obtain loans to store and market grains as a means of earning greater profits and improving their food security. TechnoServe refers to this form of lending as inventory credit. As the program became increasingly profitable, it was expanded to the Volta Region, Eastern Region, and the Brong Ahafo Region where the majority of maize is produced.

Although the development of inventory credit grew out of TechnoServe's early collaboration with SG 2000 in 1989, interaction between the two organizations continued at a fairly minimal, informal level in the ensuing years, with each organization focusing on separate activities. The relationship took a new turn in 1995 when both organizations entered into a more formal dialogue that led to the development of a pilot project designed prior to the implementation of a major donor-funded initiative in Ghana—the Village Infrastructure Project. Before turning to the pilot project, a description of inventory credit is necessary.

Inventory Credit

Inventory credit is the use of securely stored, seasonal agricultural produce during harvest-time as collateral for commercial loans. Participating farmers form groups of 20 to 50 members to store their produce until the lean season when prices are at their peak—75 to 250 percent above harvest-time prices. In doing so farmers maintain the flexibility to exercise

one of two options: They can decide to sell their produce through the group, using the proceeds to repay the bank for its credit and the group for the use of storage facilities, typically earning a net profit ranging from 40 to 100 percent. Or they can buy back their own produce from the group to use as food, repaying the bank loan and the group's storage costs, yet still saving a substantial amount by avoiding high lean-season food prices.

Figure 1 schematically depicts the typical annual price swings of maize in Ghana. It reflects the major-season harvest, which takes place between June and August, and the minor-season harvest, which normally occurs November through January in the southern half of the country, where the majority of Ghana's maize is produced.

The rationale behind the inventory credit program is to reduce risk for banks skeptical of lending in rural areas, to enable small farmers, potentially, to take advantage of price swings otherwise captured by traders, to help smallholders accumulate capital that could be invested in more productive technologies, and to enhance food security for participating farmers.

The program is profitable only when the increase in the value of the stored goods exceeds the costs of storage and of the borrowed funds (i.e., loan principal plus interest payments, bank fees, etc.).

Inventory credit is essentially a speculative activity and requires close monitoring of grain quality and market price trends and fluctuations. If the program is managed carefully, farmers can profitably hold commodities for later sale when prices are higher, or small-scale food processors can purchase and store inventories of seasonally available raw materials. Farmers can also sell some of their stored produce to finance land preparation and planting, thereby avoiding or reducing the need to borrow from moneylenders and traders.

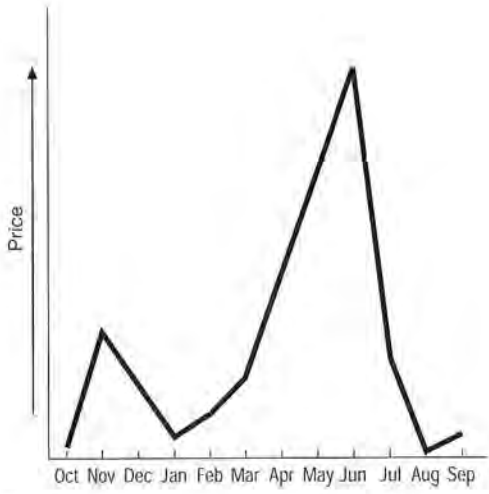


Figure 1. Typical maize price trend in Ghana.

Procedures

The mechanics of inventory credit work as follows. In advance of the harvest, TechnoServe staff assess interest from community group members in the program, and a credit facility is arranged with a lender, often the ADB. After harvest, the storer/borrower deposits grain, meeting previously determined quality standards, in a designated community storage facility. In collaboration with staff from MOFA's Post-Harvest Development Unit, TechnoServe helps participating farmers to dry, clean, and store the products in a safe, well-ventilated warehouse. The commodity collateral manager (usually a designated group member or committee) issues a receipt to the storer/borrower. This person then presents the receipt to the lender, who in turn releases the loan. The borrower is free to use the loan funds for any purpose, i.e., to pay school fees, buy inputs, etc. Overall management of the stored products is performed jointly by TechnoServe, the farmers, and the

bank. As a rule, the stored grain is marketed collectively by the group or society of farmers in order to attract larger traders and better prices.

The loan amount is pegged to a proportion of the current market value of the stored grain, usually 70 to 80 percent of the prevailing market price. This limits the lender's risk should the price rise less than expected. Because the farmer still anticipates additional payment for his or her commodity, the partial payment also encourages the farmer to take responsibility for the stored grain as well as the eventual sale of the grain. This increases the involvement of farmers in the storage and sales transactions.

Since the inception of inventory credit, TechnoServe has refined the model and expanded its application to other areas in Ghana. TechnoServe is currently facilitating access to inventory credit for over 100 farmers' groups. For almost a decade the participating farmers have maintained a 100 percent on-time loan repayment record. They have also significantly increased their incomes and agricultural production, reduced post-harvest losses, and accumulated capital to invest in other agricultural activities. Figure 2 shows the average benefits that participating farmers have enjoyed in the Brong Ahafo Region.

TechnoServe views inventory credit as a means to an end rather than as an end in itself. In future, as agricultural markets become more efficient in Ghana, the interseasonal price swings of commodities will diminish to the point that inventory credit is impractical. TechnoServe, therefore, encourages farmers in inventory credit programs to invest their accumulated capital in technologies that can enable them to diversify and add greater value to their agricultural production.

During the most recent inventory credit season, 1997/98, TechnoServe assisted 41

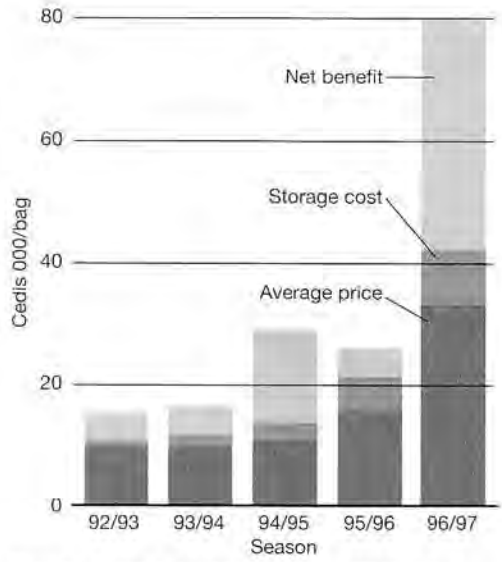


Figure 2. Annual differences in harvest price, storage costs, and post-harvest prices of maize, Brong Ahafo Region, Ghana, 1992/93–1996/97.

groups in the Brong Ahafo Region in borrowing ¢200 million (approximately US$85,106) from the ADB to place a total of 780 tonnes of maize into community storage facilities. Similarly in the Upper West Region, where there is only a single harvest and food insecurity is more pronounced, TechnoServe staff helped 92 farmers' group members to borrow ¢100 million ($42,553) from the ADB to store 292 tonnes of maize, peanuts, rice, and millet. TechnoServe staff are currently helping various farmer groups to form an association that can improve their collective ability to interact with commercial and governmental organizations.

Impact

Although the inventory credit scheme resulted in significant benefits for participating farmers, the adoption of this system has not been as rapid as TechnoServe had expected for several reasons.

First, many small-scale farmers in Ghana are indebted to moneylenders or

traders, so much of their crop is already spoken for at harvest time. They therefore have limited ability to store excess production using the inventory scheme.

Second, most farmers have immediate cash needs after harvest, whether they are in debt or not, and they are not able to wait several months before the grain can be dried sufficiently (to a moisture content of 12%) to be placed in storage.

Third, there is a scarcity of vehicles for transporting grain from farm to village and from villages to warehouse facilities.

Fourth, there is an acute shortage of appropriate community-level warehouses and storage facilities, and many farmers are not willing to use the government-managed grain stores due to negative experiences in the past.

Fifth, farmers who can afford to wait for several months to receive payment, and who have learned how to store grain securely through participation in the scheme, tend to store as much maize as possible on their farms to avoid taking loans and incurring storage and handling expenses. This tendency increases over time as farmers are able to expand their production and become more familiar with the modalities of the scheme.

Sixth, farmer groups are reluctant to admit new members or to promote the scheme with other farmers. They tend to resent others who want to share the benefits but have not previously contributed to, or believed in, the scheme. The members also regard the bank credit available as being limited and do not want to undermine their continued access to the scarce resources by having others participate.

Finally, the ADB and other financiers still rely completely upon the small TechnoServe staff to select and train the groups and to disburse, monitor, and recover the loans extended. The ADB has offered to pay TechnoServe a 2 percent commission for its efforts, which would be added to the interest rate paid by farmers, but TechnoServe has declined because the interest rates are already high and the fee would only cover a portion of the costs involved. In addition, the ADB approves the total volume of the inventory credit loans centrally and then instructs individual branches to disburse the respective amounts. This often causes confusion about the scheme and delays in loan disbursement. It also reduces the involvement and commitment of local bank staff to the scheme.

Fortunately, in 1996 TechnoServe/Ghana was able to secure donor funding that enabled it to significantly increase the staff and resources involved in grain storage and marketing. ADB has also been willing to increase the loans for inventory credit. As a result, the size of the program has expanded significantly. Perhaps more important, the ADB has taken the concept and applied it to other crops and commodities. In 1997 alone, the ADB extended over ¢12 billion (US$6 million) for inventory credit, albeit mostly through larger traders and companies, rather than to smallholders. Also, for the first time, the government's 1998 budget included provision for ¢40 billion to be used for inventory credit.

These developments are encouraging, but it is doubtful that sufficient logistical and managerial structures and procedures are in place to allow such a rapid expansion of inventory credit. Also, the expansion of the scheme should be implemented so that the majority of small-scale producers, rather than the traders and larger commercial actors, receive most of the benefits and are motivated to increase production and reduce post-harvest losses, thereby spurring broader agricultural growth and development.

Village Infrastructure Project

In 1995, partly as a result of the positive experience with inventory credit, TechnoServe was commissioned by MOFA, with the financial and technical support of the World Bank, to assess the potential of private rural institutions—cooperatives, farmers' and women's agribusiness groups, rural financial institutions, and NGOs—to spur agricultural growth and development in Ghana. Four of the study's key findings:

1. Government policy and private-sector initiatives (with the rural institutions mentioned above) have frequently suffered from a concept of agricultural sector growth as conditioned almost exclusively upon increasing the productivity of farming, whereas the sector consists of a long chain of interrelated economic activities, all of which must develop in parallel.
2. Agricultural marketing systems, in particular, have not received the attention they deserve in terms of support for research, extension, and other critical services, such as market information, standardized weights and measures, standards and grades for agricultural produce, packing materials, handling facilities, and food quality control services.
3. Where significant growth has occurred at the community level, several types of private rural institutions have typically collaborated to address separate but complementary aspects of agricultural production, processing, marketing, and finance.
4. The common elements of the most successful private rural institutions were highly literate executive members, engagement in marketing or processing (not just agricultural production), some access to credit—based in part on equity in their businesses or members' group savings—and access to professional management assistance.

The study's central conclusion was that a business-like, market-oriented approach to agriculture is the key to successful rural growth and development. However, it also noted that the majority of the private rural institutions surveyed lack the skills and education required to successfully implement such an approach. The study also observed that few government agencies or private organizations currently train or assist small-scale rural producers and enterprises in business management, marketing, rural finance, and other market-oriented disciplines.

After completing this study, TechnoServe, MOFA, and the World Bank discussed how to apply the lessons that emerged. Given the clear implications that robust rural growth would only occur when issues of production, processing, marketing, and access to finance were addressed simultaneously, TechnoServe subsequently entered into dialogue with SG 2000, Sasakawa Africa Association (SAA), the ADB, and others about more concerted collaboration. These discussions led to a proposal to collectively implement a pilot project to inform the Village Infrastructure Project (VIP), a US$80 million 5-year project that was being designed at the time. VIP is being funded by the World Bank, the International Fund for Agricultural Development, Kreditanstalt für Wiederaufbau, and the Government of Ghana.

VIP aims to reduce rural poverty in Ghana by increasing agricultural productivity and enhancing rural employment opportunities both on-farm and off-farm. A major goal is to increase transfer of technical and financial resources to develop and sustain basic village-level infrastructure. In addition, the project

seeks to strengthen the capacity of local government and beneficiary groups to sustain these investments. VIP will finance civil works, equipment, and technical assistance in four broad thematic components: post-harvest, rural water, rural transport, and institutional strengthening.

Multi-Institutional Collaboration

TechnoServe has coordinated a 1-year post-harvest pilot project to improve the implementation of that component of the larger VIP. The pilot project was implemented in conjunction with SG 2000, SAA, Self-Help Foundation, MOFA, DOC, ADB, and four rural banks in Ghana's so called Maize Triangle located in the Brong-Ahafo and Ashanti regions. The various organizations involved have each provided a range of promising technologies or services to farmers and food processors.

TechnoServe provided basic business skills development and record keeping training with groups that accessed inventory credit loans from the ADB to store and market maize. TechnoServe also helped the groups calculate their storage and handling expenses, monitor market trends and prices, and negotiate with buyers to sell their stored grain.

SG 2000/MOFA promoted the use of a package of agricultural inputs—improved seeds, fertilizer, Roundup herbicide—and trained participating farmers to plant in rows and to construct on-farm maize storage cribs and drying patios (with partial financial support provided as an incentive for crib and patio construction).

Self-Help Foundation provided access to multi-purpose power tillers (including trailers and other attachments) for a smaller number of farmer groups. The groups used the power tillers to prepare land, transport produce, and to operate maize-threshing and other processing equipment. Self-Help Foundation also trained participating farmers and local mechanics in the use and maintenance of the equipment to.

SAA promoted a range of small-scale post-harvest technologies developed by the International Institute of Tropical Agriculture. The main technologies provided were cassava grating and pressing equipment and maize threshers and shellers.

DOC provided training in cooperative principles and bookkeeping to participating cooperatives.

ADB gave loans for agricultural inputs and inventory credit. The agricultural inputs were provided by private dealers identified in the project area. The dealers received payment for their goods from ADB once MOFA staff certified that participating farmers had received the input package. ADB then extended a loan to groups of participating farmers who are obliged to repay the input loans after harvesting their crops. ADB also provided inventory credit funds to participating farmer groups recommended by TechnoServe.

Participating rural banks were to receive training in providing loans for agricultural inputs, inventory credit, and equipment to farmer and processor groups. The ADB agreed, in principle, to wholesale loan funds through the rural banks to increase the funds they had available for rural lending.

The underlying assumption of the pilot project was that when these services are provided in concert to address various aspects of the production and marketing chain, they can have a significantly greater impact on rural growth and development than when offered in isolation.

Government Reforms

Two recent developments in Ghana promise to have a major bearing on the Village Infrastructure Project and future rural development initiatives.

One is decentralization. The government is in the process of devolving authority and responsibility to the 110 local government districts in the country. District assembly elections have been held to choose local government representatives, and each district assembly has been helped to draw up district development plans. In addition, each district has been assisted by the national government in establishing a common fund to finance the various development activities and, in return, is required to generate local revenues to support future district-level activities.

As part of this process, the front-line staff of several ministries, including MOFA and DOC, have been transferred to the district assemblies and now report directly to the district executives. In addition, MOFA has appointed district officers to plan and coordinate all district-level extension activities and to be in contact with regional and national MOFA staff.

The second related development is that MOFA is modifying its agricultural extension approach to focus increasingly on "nucleus" farmers at the district level. These farmers will be selected based on their ability to engage in larger scale commercial agricultural activities and to provide a range of services to neighboring smaller farmers. While this new system is still being elaborated, it is envisioned that the nucleus farmers will be helped to gain access to a range of production and postharvest technologies that they will own and operate to provide services to other farmers on a fee-for-service basis. These farmers will also purchase raw or semi-processed agricultural produce from smaller farmers, which they will then market individually.

Scope of Activities

The specific objectives of the 12-month post-harvest pilot project were to:

1. Develop an integrated system of technical assistance that links agricultural production, postharvest handling, processing, marketing, and rural finance for selected smallholder groups in the Maize Triangle.
2. Identify approximately 600 small-scale farmers and organize them into groups, and help them to increase their incomes through improved timing in the sale of their produce, thereby providing motivation to adopt the productivity-enhancing technologies being promoted by MOFA, SG 2000, SAA, and Self-Help Foundation.
3. Train at least 30 farmers' groups (with at least 15 members each) to invest in and manage the post-harvest technologies being promoted by MOFA, SAA, and Self-Help Foundation.
4. Assist at least four rural banks and one ADB branch in developing and providing appropriate savings and credit products to participating farmer groups, focusing on credit for agricultural inputs, inventory, and equipment processing.
5. Provide a loan guarantee to increase the willingness of the participating rural banks to extend credit to farmer groups under the pilot project.

6. Oversee the construction of 30 community-level warehouses (50-tonne capacity) to facilitate grain storage and marketing.
7. Provide a forum where collaborating private and government organizations and farmer groups can share results and lessons learned to support widespread adoption of the methods and technologies under VIP.

Progress

Despite delays in the release of funds and the official commencement of activities, which hampered initial momentum, the VIP post-harvest pilot project has recorded a number of achievements.

The monthly interaction of staff of MOFA, DOC, and the NGOs and their joint field visits significantly increased the consistency and coherence of information provided to the farmers groups and resulted in generally improved coordination and timing of assistance provided by the various agencies.

The number of participating farmers and the volume of maize placed in storage exceeded the targets, even though the number of farmers' groups assisted was less than anticipated.

Most farmers who received inventory credit used it, in part, to retire the input loans they had received previously from the ADB, which resulted in much more complete and rapid repayment of input loans than before.

The farmers were enthusiastic about the input and inventory credit, community warehouses, power tillers, and food processing equipment provided under the pilot project.

Preliminary, field-based analysis of the financial viability of the various technologies and post-harvest equipment being promoted is encouraging, though more time is required to reach a firm conclusion.

There were also various shortcomings:

TechnoServe, with a few exceptions, overestimated the planning and reporting skills of the various collaborating agencies. In retrospect, TechnoServe should have devoted more attention to orientation and training for the collaborating agencies. And it should have involved the district assemblies much more centrally in the planning and implementation process. In general, the quality of program reporting and accounting left much to be desired.

There was a also general lack of information on the financial viability of the food processing and transportation equipment provided (including expected revenues and operating, maintenance, and repair expenses).

ADB provided little documentation to groups that received loans. As a result most of the farmers were confused about the loan terms and repayment schedules.

And, despite protracted discussions and negotiations, the ADB and the four participating rural banks were unable to agree upon a system to allow the ADB to wholesale loan funds to the rural banks.

As a result of the breakdown in negotiations, the rural banks were not able to provide loans to farmers as anticipated, given their limited liquidity. The training they received also was curtailed because without additional funds they would have been unable to implement any of the new financial products and services that they would have been trained to provide.

Another shortcoming was that ADB's payments to the agricultural input supply companies were greatly delayed, leading the major supplier in the area to withdraw from the program.

There was also a tendency for the same farmer groups to receive the full complement of technologies provided by the various collaborators, without apparent

regard for the total debt commitments that the groups incurred or detailed analysis of their ability to repay their debts and make reasonable profits. The equipment provided was also offered at different interest rates and terms, which was confusing to the farmer groups.

Furthermore, the district assemblies in the Maize Triangle were not sufficiently involved in planning and implementing the pilot project, which reduced the impact of the activities.

Finally, the farmers were not very enthusiastic about the use of maize cribs and drying patios and expressed mixed views about the efficacy of Roundup herbicide, although it is not clear if this is due to the technologies themselves or to the manner in which they were promoted.

Constraints

Several major constraints have impeded market linkages between small-scale producers and the commercial sector in Ghana, both in general and under the VIP post-harvest pilot project:

Insufficient involvement of the private sector in the design and implementation of agricultural growth programs. In general, there has been little effort to engage the private sector and to solicit private companies' views, interests, and participation in efforts to spur rural growth in Ghana. This is unfortunate as many of these firms suffer from problems of obtaining adequate supplies of raw and semi-processed materials to meet their domestic and export needs. To increase demand for farmers' products, the bottlenecks that these firms currently experience in increasing their production and profitability should be addressed. Had the views of the private sector been surveyed more vigorously under the VIP pilot project, for example, a more effective system for ensuring payment of input suppliers would likely have been developed.

Critical shortage of rural development personnel with business skills and market orientation. Most front-line extension staff and rural NGO personnel have been trained and employed to help farmers improve the production of a narrow range of staple crops. Few have been trained to help farmers understand market demand for goods and to effectively meet that demand. Even fewer seem equipped to help farmers calculate their costs of production and devise realistic strategies to increase their incomes. This assistance should include helping farmers and food processors to change the mix of crops and invest in post-harvest technologies that will enable them to diversify their sources of income and capture greater value locally, while participating in more lucrative markets with growing international demand.

Lack of performance-based incentives for government front-line staff and NGO personnel. Rural development personnel of government and NGOs rarely have their remuneration, promotions, and access to transport and other limited resources tied to their success in achieving tangible results. While this is a complex issue, it is at the heart of why agriculture has stagnated in Ghana. With the recent devolution of authority for the management of government front-line staff to district assemblies and the provision of the districts with funds to support local development through NGOs and other community-based associations, it should now be possible to hold such personnel accountable for achieving agreed targets. There is a currently a serious lack of planning and management capacity at the district level to effectively guide and assess the impact of such personnel. Still, there is a great opportunity to work with

the districts to develop ways to evaluate and reward the personnel that they employ and the organizations they support financially—realistic, market-based agricultural development targets, practical management information systems, and performance-based incentives. This effort will take years of hard work, but it will hopefully result in a much more demand-driven and effective extension system.

Insufficient financial analysis of new technologies, and limited support for capital equipment purchases and operations. Although many technologies appear to be appropriate for small-scale farmers and food processors, there is a lack of credible financial analysis to guide investment decisions by rural entrepreneurs. Information often is available on the capacity and features of the equipment, but not on operating, maintenance, and repair costs, based on sustained use of the equipment by typical clients under normal field conditions. If this information does exist, TechnoServe's experience suggests that usually it is not readily available to would-be investors and promoters. Without such analysis, it is difficult to make informed decisions about the suitability of the technologies for small rural enterprises or to develop sound business plans to present to potential financiers or investors. Technologies for which such information is not readily available in Ghana include grain dryers, maize threshers, maize cribs, drying patios, maize mills, cassava graters and presses, power tillers, and shea butter processing equipment.

In addition, few financial institutions are willing to provide longer-term financing for capital equipment purchases for small-scale business. And, those that do offer such loans usually do not provide much needed associated working capital. Few of the leasing companies in Ghana are active in rural areas. And most have a minimum capital investment cost of US$50,000, which is far beyond the possibilities of small rural enterprises. Similarly, few manufacturers are willing to provide their equipment on a hire-purchase or lease basis.

Inadequate rural financial services. As mentioned earlier, most commercial banks in Ghana are moving away from lending to agriculture, and the ADB is relatively uninvolved in the loan approval, disbursement, monitoring, and recovery process for small-scale borrowers. At the same time, the extensive network of rural banks and the growing number of microfinance institutions in Ghana are strapped for funds to provide to their customers, and most of these have limited agricultural credit portfolios. As a result, there is a dearth of financial services available to the rural populace.

Although the efforts under the VIP pilot project to have the ADB to wholesale its funds to the rural banks were not successful, there is a need to explore other means to help rural banks and microfinance institutions to increase their capital base and strengthen their institutional capacity to provide effective agricultural credit to rural entrepreneurs.

Recommendations

The following recommendations apply to the Village Infrastructure Project and to efforts to promote markets for agricultural markets and agricultural growth more generally.

1. *Promote industry working groups to respond to critical constraints and opportunities in selected commercial markets.*

Development organizations need to identify products and markets that have growing domestic and international demand and good potential for small-

scale producers to earn reasonable profits. They also need to convene working groups of leading private firms active in those markets and relevant research, extension, community development, and donor organizations to identify bottlenecks to, and opportunities for, market growth. The various industry stakeholders can then develop plans to address the identified priorities, which industry, government, and donors can fund collectively. This approach can help to ensure that research, extension, and development activities are focused, practical, and relevant to the various stakeholders' needs.

This working group approach is being adopted with promising results in the cotton, rubber, and cashew industries in Ghana and has good potential for wider application. Thus, for example, under the VIP, a working group could be supported to address critical constraints and respond to opportunities in the grain storage and marketing industry. The membership of such a group would include large commercial grain traders, feed millers, food and beverage companies, collateral management companies, transport companies, agricultural input suppliers, grain drying and storage equipment manufacturers, relevant research and extension agencies, MOFA and Ministry of Trade and Industry representatives, ADB, commercial and rural banks, donors, and relevant NGOs. This group would meet regularly (once a quarter for example) to identify critical areas for common investigation and action, such as measures for reducing post-harvest losses, lowering transportation and handling costs, instituting grain grading standards and procedures, etc.

Over time, the actions of such groups should result in tangible improvements in industry productivity and competitiveness and the production of more complex, higher value goods for the domestic and international markets. This, is turn, should spur rural community-level growth and development not only through increased demand for grain, but also for related drying, storage, handling, and transport facilities and services.

2. *Provide training and assistance to increase the capacity of district assembly personnel to promote market-driven approaches to agricultural development.*

This long-term strategy will be challenging given the generally low levels of human resource capacity at the district level currently. If successful, however, it could significantly increase the impact of agricultural extension and development in Ghana.

In the short term, there is a need to work with district assemblies to develop clear agricultural development goals, based primarily on analysis of the potential to produce higher value crops and goods in their areas. Insofar as possible, the selection of initial district assemblies to receive such assistance should be done in consultation with industry working groups, or at least major agricultural companies, identifying priority areas within those districts for crop production and processing and other commercial operations. Local business persons, such as agricultural input suppliers and transport operators, should also be involved in developing these plans as much as possible. This will help to ensure that there is a dependable market and the technical expertise to produce and sell the final products.

District executives also need help in developing and implementing staff training programs in basic business skills, marketing, and post-harvest technologies to complement existing training in agricultural production systems. The districts

should also seek to hire extension staff who already have these skills and should establish linkages with relevant NGOs, research institutes, and management consultants with expertise in these disciplines.

In the medium term, district extension staff will need to be trained to work with farmers' groups and individual entrepreneurs (particularly the nucleus farmers currently being identified in each district) to develop realistic agricultural production, processing, and marketing business plans that are in keeping with the districts' identified development objectives. At the same time, district executives and planning officers will require assistance in developing practical management information systems that can track the performance of front-line staff in achieving the districts' agricultural development goals and in helping farmer groups and entrepreneurs to achieve the plans developed together with them. In a related vein, the districts will require assistance in developing performance-based salary and incentive systems to motivate the front-line staff who are able to meet and exceed development objectives.

3. *Promote more effective rural financial services.*

Rural banks, cooperative credit unions, leasing companies, and microfinancial institutions need to become more active in providing savings and credit services to farmers and rural entrepreneurs. Their ability to do so will depend in large part on the development of new, relatively low risk, financial products that the financial institutions can adopt. Inventory credit linked to production loans is one such product. Loans for the purchase and operation of food processing equipment would appear to be another, provided that such loans can be supported by solid financial analysis demonstrating the profitability of the equipment under normal field conditions. Other models and products need to be developed.

To become more active in rural lending, financial institutions will require training not only in the new products, but also in financial management more generally. Like the district assemblies, many of these organizations have relatively weak human capacity. But with training and assistance, they are more likely than commercial banks to see rural clients as valued customers and to provide relevant, cost-effective services. Fortunately, the capacity to provide such training already exists in Ghana and is improving through the efforts of a number of organizations and donors.

These financial institutions also need access to loan funds to expand their operations, given their current low capital levels. Access to such funds, provided by the Bank of Ghana and donors, should be tied to financial institutions' performance in implementing recommended management and reporting systems and in making progress toward financial self-sufficiency. In addition, efforts to promote the wholesaling of funds from the ADB and other large financial institutions need to be redoubled to overcome the current barriers.

Finally, these strengthened financial institutions should be encouraged to develop direct linkages with agricultural input suppliers, private equipment dealers and manufacturers, and other local businesses to facilitate the provision of agricultural inputs and machinery on credit to financial institutions' customers. Such direct relationships are likely to be more effective and sustainable than the current practices, which rely on multiple third parties.

From Small Farms to Supermarkets

R. K. Evans

In this case study, we intend to demonstrate how Homegrown (Kenya) Ltd., having recognized the movement toward supermarket dominance in the United Kingdom, still saw a niche market and developed it with small-scale farmers. The success of this business has been in conjunction with Kenya government agencies, the Horticultural Crop Development Authority, and international agencies in our field, such as the Safe Use Project and GTZ.

To follow this development, it is important that we outline the phenomenal growth of the horticultural business in the country, led in many respects by Homegrown.

Kenya's Horticultural Exports

Kenya is one of the few countries on the rapidly changing continent of Africa with a long history of stability. Traditionally, European countries have been the destination for most of Kenya's exports. Due to colonial links, Britain is one of Kenya's oldest trading partners. In the horticultural sector, it was imperative that Kenyan exporters developed close ties with the U.K. supermarkets, which in the last 10 years have come to dominate retail sales of fresh produce.

Kenya sits astride the Equator and consequently does not suffer the seasonal variations experienced in many parts of the world. Year-round production of a wide range of horticultural produce is possible. About 80 percent of Kenya's land surface is classified as arid or semi-arid.

The bulk of horticultural production is in the southern and western parts of the country, including the Rift Valley, the foothills of Mount Kenya, Thika, Machakos, and close to the capital, Nairobi.

Kenya has a population of 30 million, and unemployment and poverty are the major challenges for the country today. Nearly 25 percent of the people able to work are unemployed, however, there are many subsistence farmers who are not included in this figure. It is estimated 80 percent of the population currently lives in rural areas, and 70 percent of the labor force is employed in the agricultural sector.

Kenya has had a high population growth rate. In the 1970s the average

R. K. Evans is joint managing director of Homegrown (Kenya) Ltd.

childbearing woman had eight children. By 1995, this number had fallen to 5.4 (brought about by a commitment to family planning and AIDS awareness programs). However for those who have jobs, there is still enormous pressure from the extended family. The fact that there is no welfare state results in the unemployed having to live off workers within the family. Over the last 10 years, the government therefore has encouraged the growth of the labor-intensive agricultural sector to provide jobs and food.

Tea and coffee have traditionally been the mainstay of the Kenyan economy, along with tourism, and have been valuable foreign-exchange earners. However, the horticultural sector has grown rapidly (58% from 1991 to 1996). Among the reasons has been the decision by the government to encourage the private sector, which has proved to be enormously successful.

Fresh horticultural exports now account for 10 percent of Kenya's total export earnings and are the third most important agricultural export after tea and coffee.

Kenya's horticultural exports totaled 85,000 tonnes in 1996. One of the fastest growing horticultural exports has been cut flowers. Beans, however, account for over 20 percent of these horticultural exports and are the second most important export, ahead of avocados and mangoes (both of which are grown in many cases by smallholders).

Homegrown is Kenya's largest grower and exporter of horticultural produce and accounted for 10 percent of the total Kenyan exports in 1996. Homegrown accounted for 30 percent (5,400 tonnes) of the total Kenyan bean exports. Two-thirds of this was runner beans grown on our own farms.

Homegrown green beans in 1996 amounted to 10 percent of the total Kenyan green bean exports, and all of this was all grown by small-scale farmers under the control of the Homegrown crop protection unit.

The Business of Homegrown (Kenya) Ltd.

Homegrown started in the early 1980s when the current chairman financed a friend to grow export produce in the Naivasha area for third-party exporters. However, relying on middlemen (exporters) to collect and market the products (mainly French beans and courgettes) brought financial and other problems. This experience provided invaluable insight into the business. In August 1982, Homegrown commenced exporting and marketing its own products. Subsequent experience allied to the knowledge of the pitfalls of basing the business on production only, led to the formulation of the Homegrown Triangle, a statement of the fundamental factors required to run a successful horticultural business from the third world—production, airfreight and logistics, and marketing.

Production

Efficient production of a high quality product is essential to compete with other growers within Kenya and from other countries such as Zimbabwe, Zambia, Egypt, and Guatemala. Cost-effective production can only be done on well-managed farms or farming units, such as those owned by Homegrown or run by outgrowers under Homegrown control.

As the trend toward supermarket domination of horticultural sales in the U.K. escalated, it was clear that the product had to be grown to exacting standards and had to be well presented. This inevitably led to added value and

prepared product at source. Through this focus on quality, Homegrown secured the support and orders of U.K. companies.

Air Freight and Logistics

Homegrown's early experience with involuntary "off-loads" at the airfreight loading depot at Nairobi International Airport underscored that reliable air freight is vital. Without this component of the triangle, a quality product would not reach supermarket shelves. After years of hard work and attention to detail, Homegrown reached the critical mass needed to establish a joint venture with an airfreight carrier, MK Airlines. Every evening MK Airlines provides a freighter to the United Kingdom securing continuity of supply, control, and reduced costs for Homegrown and making it more competitive.

In addition, Homegrown's fleet of well-maintained cold chain vehicles bring the fresh product to centrally located cooling and packing stations ensures that Homegrown ships top quality products with a good shelf life.

Marketing

Homegrown seldom grows anything unless a supermarket has programmed it. This process normally begins with basic trials followed by sampling and discussion leading to pilot commercial trials and more samples. The customer then provides seasonal programs. This procedure has been achieved for virtually the whole range of Homegrown products. Nothing is sold on a commission basis. Hence, planned costs and planned income can determine viability and profits.

As a result, Homegrown has developed an extremely successful infrastructure with technical back up that ensures value, quality, and traceability, which provides the customer with the comfort of due diligence.

The Homegrown ideal has allowed those outgrowers who are prepared to work with us to benefit from our experience and investment.

When Homegrown realized the growing influence of the supermarkets in the chain, it started to deal directly with both the technical and commercial departments of these companies. As a result was that Homegrown is now at the cutting edge of the growing horticultural business and has developed an integrated supply chain controlling all aspects from growing, packing, cooling, transport, air freight, and distribution in the U.K.

Supermarkets

In the United Kingdom, supermarkets dominate sales of horticultural produce, taking an estimated 70 to 90 percent of African exports, a proportion that is likely to increase. In 1989, 33 percent of the value of fresh fruit and vegetables was sold by supermarkets, compared with 70 percent now.

Supermarkets exercise considerable control over the consumer but at the same time respond to their demands for year-round produce, continuity, and convenience. The supermarkets therefore also dictate quality standards for produce exports from the countries from which they buy.

The UK Food Safety Act 1990 placed the responsibility squarely on the importer for due diligence. That means importers must know exactly where and how the crop has been produced and must have documentation to prove it. Supermarkets require value, quality, continuity, reliability, traceability, due diligence, welfare of the workers, responsible farming practices, and protection of the environment. This favors large commercial farmers.

Small-Scale Farmers

Small-scale farmers would be unable to survive in the highly competitive horticultural export market on their own. The constraints are

- availability of quality seed and other inputs
- expensive inputs, and lack of economies of scale
- unavailability of farm-financing loans
- irregular visits by exporters
- nonremunerative prices
- unreliable information on market trends or scheduling of planting to meet export market needs
- poor transport
- harvest and post-harvest losses

With the cost of airfreight and competition among various supermarkets, profit margins for horticultural produce across Europe are extremely thin. It has become apparent that added value must be the focus of the business. As a result, Homegrown was the first to develop prepacked beans in bags, top and tail beans, flowers, runner beans, prepared products, and salads—all labeled at source. These developments required investments on a scale that would be beyond the reach of the smallholder.

However, Homegrown could not supply 55 tonnes of French beans a week from its own land. Organizing outgrowers therefore makes sense. Homegrown recognizes that the small-scale farmer has some distinct advantages over the commercial farmer, particularly in the growing of green beans:

- There is a relatively short period from planting to harvest, allowing the crop to be a welcome source of steady cash income.
- The green bean requires protection after germination. Small-scale farmers, unlike commercial farmers, usually have small fields, which means that the plots and plants usually are more easily protected.
- Smaller beans fields have less disease and pest pressure because fields of other crops separate them from infected fields.
- Costs are lower on the small-scale farm. The farmer may not need irrigation.
- Labor will, in many instances, be provided by the family, and hired labor may be brought in only during peak harvest or planting.
- The diversity of locations of small-scale farmers provides flexibility. Homegrown can guarantee continuity in supply, whereas large commercial farms may be vulnerable to localized events, e.g., heavy rainfall that triggers a rust attack that could destroy the crop.
- The green bean provides an good rotation with the staple crops of small-scale farmers—maize, onions, tomatoes, cabbage, bananas, and in some instances baby corn, which has also been introduced as a cash crop.
- To grow commercial volumes of green beans, the commercial farmer would need large areas of land. (Homegrown's small-scale farmers plant over 20 hectares per week.)

However, to be successful, the small-scale farmer needs assistance.

Homegrown has developed close ties with the international agencies in our field such as GTZ, which concentrates on such issues as seed varieties and chemical usage with the small-scale farmer. This work has helped the farmers attain better yields and use less chemical inputs.

Our medical team cooperates closely with NGOs on AIDS awareness and family

planning to assist with the general well-being of the family and farm laborers.

Farmers receive help from dedicated Homegrown staff covering technical input, seed procurement, pesticide control, cooling techniques, handling, and transport.

Financing is obtained in the form of seed and inputs supplied directly by Homegrown. Repayment at cost is secured only when production starts and therefore income is available.

The outgrowers need economies of scale in purchasing seed, chemicals, fertilizers, and protective clothing. Homegrown helps by purchasing in bulk for the outgrowers.

The outgrowers benefit from the programs secured with the supermarkets by Homegrown. These markets would be beyond their reach in normal circumstances. The programs are issued by the supermarkets annually, and the Homegrown crop protection unit organizes the outgrowers into regular planting regimes that smooth the peaks and troughs of supply. This in turn ensures a steady cash income to the small-scale farmer.

Collection is carried out 6 days a week, and in some areas every day, by the Homegrown fleet of vehicles. The farmer knows that the crop will be collected and that payment will be made at the end of every week. Transport is covered by Homegrown with all the expenses involved.

These simple points give the farmer a dependable stream of cash for purchasing farm inputs and to cover school fees and other household expenditures.

To ensure the product provided by the small-scale farmer is acceptable to the supermarkets, the Homegrown standards have to be maintained. This has been achieved by introducing a code of practice, which is strictly policed.

The Homegrown Code of Practice

So that farmers meet the requirements of the market, particularly with respect to due diligence and traceability, Homegrown has drawn up a comprehensive code of practice that deals specifically with each issue that may arise. The purpose of the code is to ensure the safety and quality of produce grown for Homegrown by contracted growers. In addition this code provides a method of production that ensures the safe use of pesticides by farm operators.

The code requires the following literature to be available on the farm: approved list of pesticides, list of banned and restricted pesticides, the Homegrown Code of Practice, GIFAP safe use of pesticides booklet, GIFAP posters, and first-aid procedures.

It also requires the presence of the following basic facilities:

- grading shed
- charcoal cooler
- Hessian cooler
- picking tray and crate storage area
- areas designated for washing picking trays
- field toilets, with facilities for washing hands
- pesticide store
- shower facilities
- area for washing spray equipment
- waste disposal pit
- identifiable pesticide disposal area

Training is arranged for the owner/manager plus the key spray men to attend a safe-use course that covers:

- Pesticide use—for personal protection.
- Knapsack calibration—to avoid over- or under-application, thereby reducing costs.
- Scouting techniques—the farmers do not spray routinely, but are encour-

aged to consult the Homegrown crop protection unit, once infestation reaches 10 percent of the crop.
- The importance of records.
- Personal hygiene—the Homegrown nurse arranges visits to the farms to emphasize the importance of personal hygiene when handling foodstuffs, particularly for export.

Through regular monitoring of the mixing of chemicals, spray techniques, and use of protective clothing, the work force is healthier. The time spent on health care with personal cleanliness and simple instructions to boil water prior to drinking results in a fitter, more energetic work force.

Documentation is kept on the farm of all the people who have attended the courses and their data. Regular refresher courses are encouraged.

Pre-harvest losses are reduced by supplying tested seed, much of it imported from recognized suppliers with varieties accepted by the supermarkets. Pre-harvest losses are also reduced by the agronomic input from both the Horticultural Crop Development Authority and the Homegrown agronomy team. They provide guidance on field spacing, watering regimes, seed dressing, calibration of equipment, and use of suitable chemicals to tackle a specific problem, giving further cost savings through use of more modern chemicals.

Post-harvest losses are reduced by training pickers in proper handling of the beans in the field (picking into trays rather than plastic bags) and by the introduction of wet-wall technology, which provides the rudiments of a cold chain, a better product on the supermarket shelf, and a better yield for the farmer.

The farmer is instructed in detail on how to record data on the various forms supplied by Homegrown. In many cases, the owner of the land may be elderly and not necessarily literate. However, because Kenya has introduced compulsory education up to the age of 13 years, many of the children and younger wives have the ability to record data. The records cover the following:

Planting schedules. The procurement manager provides the farmer with the amount of seed he needs for weekly planting so that it fits in with what he feels he can manage over the 12-month period. The land is measured by Homegrown using a pedometer and assigned to blocks. This ensures that chemical applications and plant densities are correct.

Farm seed. To ensure that the farmer knows what was supplied, when it was used, and the balance left, Homegrown acquires the seed and supplies it at cost.

Scouting. Each block is measured and numbered by the crop protection unit. The farmer is instructed on scouting methods using a matrix to ensure that sprays are only applied when required and not arbitrarily applied due to the weather or the actions of a neighbor.

Spray and production records. These records allow the farmer and the crop protection unit to closely monitor the sprays applied at emergence and beyond to ensure the harvest intervals are adhered to. It also allows the farmer to track his yields from each block.

Knapsack operation and calibration. Following written training and careful monitoring by the crop protection unit, the farmer must ensure that the machinery is being operated properly, saving money by not wasting sprays.

Spray operators. To monitor how long and how often a spray man is involved in this type of work, a log is kept of his activities. Homegrown rotates its spray-

ers on a monthly basis but the small-scale farmer generally carries out this task himself, which may only entail 2 or 3 days a month. The record ensures the sprayer regularly washes his overalls and showers immediately after application.

Equipment loan. Sometimes the farmer may lend equipment to a neighbor, and even this activity is monitored.

Daily hygiene. Lists the number of employees on a daily basis and records their general state of health and their compliance with the code's hygiene standards.

Cleaning. Records are kept of when the grading shed, toilets, picking trays, and crates are cleaned so that the schedule can be monitored.

Glass control. For areas with electric bulbs or glass-covered certificates, a record is kept to ensure that no breakage occurs that may contaminate the product.

Daily weather reports. Provides the crop protection unit with historical records and may provide information on the quality of the beans in that area, i.e., rain or cold could result in a higher incidence of rust, therefore poorer production and yields.

A monthly summary is kept as a precis of the month. Each time a member of the Homegrown crop protection unit visits the farm, it is recorded at the back of the file for reference if a problem should arise at a later stage.

A simple audit, which is a basic check-off list, is carried out on a monthly basis. This is marked and measured against a maximum score, which allows Homegrown to monitor the performance of the farmer.

Implementation and Logistics

Homegrown has created a crop protection unit and a bean procurement team,. The crop protection unit is made up of five graduates who each monitor and audit 13 farms, on average. Each farm is visited at least twice a week with further visits from the senior staff once a month. In addition to the graduates, a Homegrown employee stationed on the farm monitors and reports to his team leader on the day-to-day activities. He is also ensures that the beans are graded for quality in the pack shed. In many cases, he acts as a watchdog and reports any irregularities to the team leader, who in turn informs the procurement manager.

Farmers often approach our staff seeking to become a Homegrown outgrower or alternatively part of a cooperative, established in conjunction with the Horticultural Crop Development Authority. Farmers in the cooperative have the advantage of cost sharing the more expensive inputs.

Prior to enrolling a new farmers, the procurement manager visits the farm to assess the following: size and suitability for green beans, capability of the manager, accessibility, water source, availability of labor for peak periods, and ability to comply with the code of practice. Once the procurement manager is satisfied that the farmer has the required attributes to supply green beans, he will, assisted by the team leader, carefully talk him through the code of practice and the requirements therein—supply of seed, planting density, water, pesticides, scouting—arrange for courses, and provide a planting schedule.

Homegrown has an incentive scheme for farmers based on the monthly audit. A bonus of 15 percent on the price of beans is offered if the farmer achieves the maximum score. If he fails to comply with all the rules, he immediately forfeits his bonus. The immediate suspension of business may result if there are any serious transgressions, e.g., use of chemicals not approved by Homegrown, failure to abide by the harvest intervals, or

continuous failure to carry out simple safety procedures while spraying.

The procurement manager is in constant communication with the graders and the crop protection unit through strategically placed radios and telephones or through the drivers of the 10 trucks that are utilized on a daily basis to collect the beans.

The green beans collected by Homegrown's dedicated fleet of vehicles generally arrive at the Homegrown depot at Jomo Kenyatta International Airport, Nairobi, between 2000 hours and 2300 hours on the day they were picked. The beans are then immediately checked and placed directly into dedicated cold stores. Early the following morning, trained Homegrown employees proceed to regrade the beans and prepare the product for export. Twenty-four hours after the beans were picked, they have been prepared, packed, and labeled and are in the air on the way to supermarkets in the United Kingdom.

Conclusion

The green bean as an export crop has developed rural employment on a large scale. Homegrown alone directly employs 6,400 people. Government statistics indicate that each employed person has an average 7 to 10 dependants. This results in roughly 50,000 people relying upon the labor force that work on the eight Homegrown farms.

Furthermore Homegrown contracts with 38 small-scale farms ranging from 10 to 37 hectares and three cooperatives. These small farms provide employment for 620 people, resulting in support for roughly 6,000 dependants.

For green beans alone, Homegrown annually invests US$1.6 to US$1.8 million in the rural areas, stimulating the development of the rural economy.

Ethiopia's Experience in Partnerships

Getachew Teklemedhin

In the 1950s, the first international cooperation in agricultural development with Ethiopia was the Oklahoma State University program. The focus was on training—instruction, research, and extension. The three activities were under one department of the Ministry of Agriculture.

Later when Ethiopia had its own agricultural university, research did not remain with the Ministry of Agriculture. But after a few years, the ministry established its own research institution.

Most extension workers had no agricultural training because there were no agricultural high schools or agricultural colleges. Other disciplines, mainly in teaching, took in those people and retrained them to be extension agents.

I was one of the early students in agriculture. I used to observe extension workers going to the field. They had little knowledge or material to take to the farmer. Among the first introduced inputs were Rhode Island cockerels—heavy ones. Every time the extension agent wanted to go to the farm he used to carry this big chicken! It was not very popular with the farmers.

Then we started a more comprehensive type of package. All the research, extension, and inputs were concentrated on farmers within a small area, so it was manageable. But the government found it too expensive to duplicate that model throughout the country. The government turned to another strategy—the minimum package in order to reach many farmers with a small amount of inputs and advice.

There was also a project approach. It suffered from the drawback that the interventions were so frequent that it was difficult for one institution to handle, so we needed separate institutions. Then the problem was coordinating those institutions. There were frequent arguments between extension and agricultural research. The agricultural research people said they had a number of research outputs, but there was no systematic way for testing them with the farmers.

In fact extension demonstration plots existed, but most farmers did not think the techniques shown in the plots were within their capacity. They also often considered the management required for those plots to be uneconomical. Usually they ob-

Getachew Teklemedhin is Ethiopia's vice-minister of agriculture.

served, but did not adopt. So squabbles between the extension and the research continued for about 15 years.

Then T&V arrived. It was supposed to be the most effective extension methodology, but it was a piecemeal approach. It was exclusively knowledge based; no inputs were delivered with it. You had one extension system for natural resource conservation and another extension system for livestock and others. In fact, there was sometimes conflict between the development workers, and the farmers used to get confused, so again no effective breakthrough was found.

There was also political change in the process. In the socialist approach, individuals were not allowed to expand their economic activities. Even the state organizations had to be specific to a service or to production. The institution established to market output was not supposed to go into input marketing; the producer was not supposed to be a marketer. So, parastatals took over a lot of the activity especially in providing services like input delivery. Their experience in free market economic activity has been minimal.

Before SG 2000 arrived, research stations had nearby demonstrations. But they had never been expanded; they were kept close to the research center. When the SG 2000 came to Ethiopia, as Dr. Borlaug has said, technology was already there. SG 2000 started with the technology available, mainly on maize and wheat. Later other crops were included. SG 2000 made the farmer the focal point. Farmers learned how and why to use inputs. Furthermore, demonstrations were done on a larger area, a half hectare, which clearly indicated the advantage of the technology. Instead of only transferring knowledge, SG 2000 ensured that farmers had access to credit and that inputs were delivered.

SG 2000 gradually spread this comprehensive approach to more and more farmers.

Fortunately, the present prime minister visited some of the plots. He was so impressed by the results that this program was totally adopted by the government, even though there was no formal agreement between SG 2000 and Ethiopia about when to phase out and phase in!

The government was impatient. It could not continue gradual development. While NGOs understandably limit their activities, the government cannot wait because, if the outcome is successful, the demand will explode.

The SG 2000 model had to be expanded rapidly. In the first year, the government was so convinced that it set aside ฿400 million for this purpose.

The first thing we had to do was to clearly identify the objectives and work in partnerships to develop the program. We built on the experience of SG 2000. At that time, researchers were not supposed to go to the farmers, and extension agents were not supposed to go to the research areas. They came together, developed a program. Not only the researchers, but the input deliverers, the seed enterprises, the fertilizer suppliers all were involved in developing the program. All the requirements—the credit, the inputs, the modalities—were worked out. At that time, SG 2000 had 3,000 demonstration plots of half a hectare; the government decided to expand 10-fold—to 32,000 plots.

These partners had a clear objective, and their task was clearly identified. Initially, because there was no developed marketing scheme for inputs or outputs, we formed a committee from the federal level down to the smallest administrative unit in Ethiopia. All the heads of these institutions met under the chairmanship of the minister of agriculture to show those enterprises the potential and the

opportunities—where they could dispose of or sell their product.

Extension agents were trained in the technology. The training started with developing manuals and teaching the top-level regional extension experts and then retraining down to the level of the agent. The political support was immense.

After the program was developed, all the regional presidents and intermediate officials were invited to a seminar to discuss the objectives and the strategies. Because self-sufficiency and improving the living standard of the people is a concern for everyone—the political as well as the technical people—there was agreement on the objective.

I was one of the technical people who drafted the strategy. The strategy called for trucks, motorbikes, station wagons, etc., and the government set aside funds to purchase them and to provide credit. Fortunately the planting season came before we purchased the trucks, the motorbikes, and the other facilities except the seed and fertilizer. Because of this we realized we did not need the trucks—the commercial truckers had done the job. We also did not need the motorbikes. We put the development worker close to the farmer rather than transporting him from his urban housing to the rural areas.

The program, initially, was developed centrally, and we distributed it to the regions. The next year, however, we met to evaluate and discuss the outcome. Because the outcome was very successful, the regions were given the responsibility for developing their own program—with some assistance from us—using their own research areas. The decision was again made to increase the half-hectare demonstration plots 10-fold, to 320,000. That would have required ₿4 billion, which would have kept us from expanding this program.

Instead of allocating government funds for inputs and credit, the banks came into the picture. There are two types of bank credits: one for the package, another for the extension activity. The objective of the banks was to lend money and get interest. In that way 320,000 demonstration plots were executed, and the next year the program was doubled to 650,000 plots.

Where are the partnership here? The partnership started with the researchers, all the extension people—from the federal to the lower echelons—and then the suppliers of fertilizer, seed, and chemicals. The technical calculations were made, but the provision of inputs to the farmer was left to the individual dealers. A committee was formed to discuss the problems they had and how to help each other, especially at the regional level. The committee has been effective.

However, there are always bottlenecks. Our biggest problem was providing seed of high yielding varieties. The farmers were also involved in growing seeds. In our third year, with good weather and all these participants having played important roles, we were close to food self-sufficiency.

This year, it is not only the extensionists who are teaching farmers: some regions are systematically exploiting farmer-to-farmer exchange of information. We plan to have almost 2.5 million farmers participating in cereals. In 3 years, about 7 million Ethiopian farmers will be participating by direct contact or through farmer-to-farmer transfer of technology.

Although we started with a few crops, mainly maize, wheat, and teff, now we have started to bring in cash crops as well as livestock. We always thought in terms of half a hectare, but now we are concerned that the if farmers allocate a half hectare for feed, a half hectare for cash crops, and a half hectare for cereals, they

may have committed their entire landholdings. So we must have an integrated approach that will take into account the whole enterprise of the farmer, which has a lot of policy implications.

What is left? As I said, all the stakeholders initially sat together to develop the program. Unfortunately this was not organized at a high level. But the rest came together and through seminars and workshops, the findings are taken down to the smallest administrative level.

On the input side, the World Bank has spearheaded a project to provide fertilizer and seed credit, and there are other donors who assist, especially in fertilizers. In seed production, a private company is involved, but seed production has not expanded as fast as we would like.

Then we go into the field to observe technology transfer. Credit providers, input providers, and extension, all go out in a group to see the problems farmers have. Other groups take assignments that are relevant to their institutions. Previously agricultural researchers were simply working on their own. When they were satisfied, they recommended a variety or a technology for transfer to the farmers. Now, when they go out to the field, they do a lot of observation of the recommended varieties and other technologies. If farmers find that some of the released varieties have problems, they request other varieties to be released.

Institutions have been reorganized. The Ministry of Agriculture itself has been organized into two major sections. One is a technology department, which works with the agricultural and research institutions to look for new technologies, and the other is the regulatory part. In fact, extension repackages the technology developed for transfer to the regions.

We identified two groups of partnership. One is the internal one, the research institutions, the seed and other technology multipliers, extension, input and credit providers, even the policy makers. The second is external partners, such as SG 2000. The government has taken over the demonstration of crop production. SG 2000 has shifted to problems like postharvest technology and other interventions that the government has not fully addressed. We work in cooperation. We are also working with the World Bank, particularly in credit provision. We are working with the FAO. FAO started with a dryland package, but later we thought they could assist us in irrigation and better management.

Various NGOs are involved. What we require from the NGOs is that they accept the principles of the government. Some of them had been giving free service or free inputs. We insist that they not provide free goods or services because we do not want farmers to become dependent on them.

We still have a number of gaps. One is that output marketing has not been yet resolved, starting from postharvest technology, marketing, and storage. The input delivery system is not well developed. Fertilizer is in a better position than seeds or other inputs. The credit system is there, but a sustainable credit system has not yet been developed. Technology for the dryland areas is not well developed.

Areas for further partnership include improving marketing structure, including information on marketing and postharvest technology, particularly processing. Although maize is one of the crops that has high yield, especially the highlands, maize is not our staple food. So some kind of processing has to be done to make it more attractive for home consumption, and there are possibilities for other product processing.

To realize successful partnership, one has to define the objectives and set goals,

identify proper partners, work out areas of partnership, develop practical mechanisms, and avoid violating partners' identities. Every partner has to have its focus. The big test is the joining of forces rather than overlapping.

Workshop Participants

Partnerships for Rural Development in Sub-Saharan Africa, held at Villar-sur-Ollon Switzerland, September 12–14, 1998.

Imourou Adam
Directeur de l'Agriculture
Ministère du Développement Rural
Cotonou, Benin

Andrew Agle
Director of Operations
Global 2000 Inc.
The Carter Center
Atlanta, Georgia, USA

Belay Ejigu
Head of Extension Department
Ministry of Agriculture
Addis Ababa, Ethiopia

Berfke Ogbamichael Kiflay
Head
Crop Production and Protection Division
Ministry of Agriculture
Asmara, Eritrea

Calisto Bias
Director of Extension
National Directorate for Rural Development
Ministerio da Agricultura e Pescas
Maputo, Mozambique

Malcolm J. Blackie
Agricultural Sciences Division
Rockefeller Foundation
Cringleford, Norwich, Great Britain

Boré Adama
Chef de la Division de la Vulgarisation et Conseil Rural
Ministère du Développement Rural et de l'Environnement
Bamako, Mali

Norman E. Borlaug
President
Sasakawa Africa Association
Mexico D.F., Mexico

Steven Breth
Editor
Arlington, Virginia, USA

Camara Baba Gallé
Directeur Général
Service National de la Promotion Rurale et de la Vulgarisation
Ministère de l'Agriculture, des Eaux et Forêts
Conakry, Guinea

Harris Chanza
Director
Agricultural Extension Services
Ministry of Agriculture and Irrigation
Lilongwe, Malawi

Anna Crole-Rees
President
Association des Ingénieurs Agronomes de Suisse Romande
Zurich, Switzerland

Michael Davies
Managing Director
Africa Division
Cargill Pty
Sloane Park, South Africa

Marie-Jo Demante
Chargée de Mission
Institut de Recherches et d'Applications des Méthodes de Développement
Paris, France

Diallo Oury
Directeur
Bureau Central de la Politique Agricole
Ministère de l'Agriculture, des Eaux et Forêts
Conakry, Guinea

N'Deye Sarr Diop
Présidente
Fédération des Organisations Non Gouvernementales du Sénégal
Thies, Senegal

Christopher Dowswell
Director for Program Coordination
Sasakawa Africa Association
Mexico D.F., Mexico

Günter Dresrüsse
Director
Planning and Development Department
GTZ
Eschborn, Germany

Paul Egger
Chef, Division Agricole
Direction du Développement et de la Coopération
Département Fédéral des Affaires Etrangères
Bern, Switzerland

Rodney K. Evans
Managing Director
Homegrown Ltd.
Nairobi, Kenya

Jim Findlay
Director
Agricultural Resource Consultants
Parklands, South Africa

William Foege
Distinguished Professor
Rollins School of Public Health
Emory University
Atlanta, Georgia USA

Michael Foster
Country Director
Sasakawa Global 2000
Kampala, Uganda

Jean-Luc François
Chargé de Mission
Bureau Production Agricole, Industrielle et Echanges
Ministère des Affaires Etrangères
Paris, France

Jost Frei
Head Business International Region Africa
Novartis Agro AG
Dielsdorf, Switzerland

Jean F. Freymond
Director
Centre for Applied Studies in International Negotiations
Geneva, Switzerland

Kokoro Fujiwara
The Nippon Foundation
Tokyo, Japan

Marcel Galiba
Country Director for Benin, Burkina Faso, Mali & Togo
Sasakawa Global 2000
Bamako, Mali

Bernardin Ganlaky Glehouenou
Directeur
Fédération Nationale des Caisses Rurales d'Epargne et de Prêt
Cotonou, Benin

Martial Genthon
Corporate Head of Agriculture
Nestlé S.A.
Vevey, Switzerland

Getachew Teklemedhin
Vice-Minister of Agriculture
Addis Ababa, Ethiopia

Wayne Haag
Country Director
Sasakawa Global 2000
Maputo, Mozambique

Leonides Halos-Kim
Research Specialist
International Institute of Tropical Agriculture
Ibadan, Nigeria

John Hardman
Executive Director
The Carter Center
Atlanta, Georgia, USA

Robert Havener
Board Member
Sasakawa Africa Association
Solvang, California, USA

Christian Heye
Area Manager
Business International
Region Africa
Novartis Agro AG
Dielsdorf, Switzerland

Frank Hicks
Program Director
TechnoServe Inc.
Accra, Ghana

Llewellyn Hille
Executive Director
Self-Help Foundation
Waverly, Iowa, U.S.A.

Makoto Inaba
Director, Follow-up Division
Grant Aid Program Management Department
Japan International Cooperation Agency
Tokyo, Japan

Akira Iriyama
President
Sasakawa Peace Foundation
Tokyo, Japan

Takashi Ito
General Manager
Department of International Affairs
Nippon Foundation
Tokyo, Japan

Michio Itoh
Assistant Program Officer
Sasakawa Africa Association
Tokyo, Japan

Y. W. Jeon
Head
Postharvest Engineering Unit
International Institute of Tropical Agriculture
Ibadan, Nigeria

Joël Joffre
R&D and Business Support Africa
Hydro Agri International France
Paris, France

Jacob Kampen
Principal Agriculturalist
Africa Technical Families
The World Bank
Washington, D.C. USA

Henk Knipscheer
Director, Implementation
Winrock International Institute for Agricultural Development
Morrilton, Arkansas, USA

Sylvester Korang-Amoakoh
Director
Agricultural Extension Services
Ministry of Food and Agriculture
Accra, Ghana

William I. Lindley
Senior Officer
Agricultural Education
FAO
Rome, Italy

Emmanuel J. Lujuo
Commissioner for Agriculture and Livestock Development
Ministry for Agriculture and Cooperatives
Dar-es-Salaam, Tanzania

Toshiro Mado
Program Officer
Food Processing Enterprise
Sasakawa Africa Association
Accra, Ghana

Mebrahtu Iyassu Mehari
Director General
Land Resources and Crop Production Department
Ministry of Agriculture
Asmara, Eritrea

Mary A. Mgonja
Plant Breeder
Selian Agricultural Research Institute
Arusha, Tanzania

Masataka Minagawa
General Manager
Sasakawa Africa Association
Tokyo, Japan

John B. Mubiru
Director of Agricultural Extension
Ministry of Agriculture, Animal Industries and Forestry
Entebbe, Uganda

Deola Naibakelao
Representative
Sasakawa Africa Association
Accra, Ghana

Oumar Niangado
Chercheur
Novartis Foundation for Sustainable Development
Basel, Switzerland

David Nielson
Economist
Africa Technical Families
The World Bank
Washington, D.C. USA

Steven Obimpeh
Former Minister of Agriculture
Accra, Ghana

Faustine A. Ojacor
Associate Director
National Agricultural Research Organisation
Entebbe, Uganda

PATRICK ORR
Partner
Raitt Orr & Associates
London, Great Britain

A. CHARLES OUEDRAOGO
Directeur des productions Végétales
Ministère de l'Agriculture et des Ressources Animales
Ouagadougou, Burkina Faso

PARKOUDA SIBRI
Directeur de la Vulgarisation Agricole
Ministère de l'Agriculture et des Ressources Animales
Ouagadougou, Burkina Faso

MARCO A. QUIÑONES
Country Director
Sasakawa Global 2000
Addis Ababa, Ethiopia

GÉRARD RASS
Development Engineer
Monsanto Company
Bruz, France

MICHELLE RILEY
Public Information Officer
The Carter Center
Atlanta, Georgia, USA

AMIT ROY
President
International Fertilizer Development Center
Muscle Shoals, Alabama, USA

YOHEI SASAKAWA
President
The Nippon Foundation
Tokyo, Japan

JOHN F. SCHEURING
Manager
Maize Hybrid Evaluation and Product Development
Novartis Seeds AG
Basel, Switzerland

G. EDWARD SCHUH
Director
Freeman Center for International Economic Policy
Minneapolis, Minnesota, USA

EDWARD S. SEIDLER
Senior Officer
Marketing and Farm Supply
FAO
Rome, Italy

VICTORIA SEKITOLEKO
Sub-Regional Representative for Southern and Eastern Africa
FAO
Harare, Zimbabwe

ANATOLE SOGBOHOSSOU
Directeur, Formation Opérationnelle et de la Vulgarisation Agricole
Ministère du Développement Rural
Cotonou, Benin

TAKELE GEBRE
Principal Local Program Coordinator
Sasakawa Global 2000
Addis Ababa, Ethiopia

TAREKE BERHE
Country Director
Sasakawa Global 2000
Conakry, Guinea

AMADOU BABA TOURÉ
Directeur National de l'Appui au Monde Rural
Ministère du Développement Rural et de l'Environnement
Bamako, Mali

MOCTAR TOURÉ
Executive Secretary
Special Program for African Agricultural Research
World Bank
Washington, D.C. USA

STRAFFORD TWUMASI-AFRIYIE
Highland Maize Breeder for Eastern Africa
International Maize & Wheat Improvement Center
Addis Ababa, Ethiopia

JOSÉ ANTONIO VALENCIA
Country Director
Sasakawa Global 2000
Kano, Nigeria

LARS ARNE WIERSHOLM
Vice-President
Business Development Africa & Near East
Hydro Agri International France
Paris, France

LENNY YIGA
Deputy Commissioner for Crop Production & Marketing
Ministry of Agriculture, Animal Industries and Forestry
Entebbe, Uganda

MOSES ZINNAH
Joint Coordinator
SAA/ Winrock Ghana SAFE Project
Accra, Ghana

Centre for Applied Studies in International Negotiations, 7, bis Avenue de la Paix, 1211 Geneva 1, Switzerland

Sasakawa Africa Association, c/o CIMMYT, Apdo. 6-641, 06600 Mexico D.F., Mexico

Global 2000 Program of The Carter Center, 1 Copenhill Road, Atlanta, GA 30307, USA

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