JULY 2002

Affinities

GROWING

ISSN 0122-8048

A BULLETIN ABOUT COOPERATION IN AGRICULTURAL RESEARCH

Investing in Farmers' Future

An open alliance to restore soil fertility in Africa

Last March, as world leaders meeting at Monterrey, Mexico, implored rich countries to double their development aid, a group of international agricultural researchers was building the case for greater investment in the restoration of tropical soils, especially in Africa. Only by raising soil fertility, the scientists argued, will the 85 percent of Africa's poor who live in rural areas be able to achieve food security and increase farm incomes. To the extent that rural communities succeed in making agriculture more dynamic and competitive, any new development aid that does come their way should do a lot more good.

In a determined effort to create the conditions for that success, three international agricultural research organizations have recently joined forces by establishing the Alliance for Integrated Soil Fertility Management in Africa. The founding partners are CIAT, the Tropical Soil Biology and Fertility (TSBF) Programme, and the International Centre for Research in Agroforestry (ICRAF).

In a prior step toward forming the alliance, the TSBF Institute of CIAT was created under an agreement signed in December 2001 at Center headquarters in Colombia. Subsequently, CIAT and ICRAF agreed on terms for a wider arrangement that will fully integrate the soils research of the three organizations. The new TSBF Institute will be hosted by ICRAF at its headquarters in Nairobi, Kenya.

Scientists from the alliance's three founding partners met during early March with technical advisers from interested donor agencies for a 3-day strategy-development workshop. The event was sponsored by the Rockefeller Foundation at its Bellagio Study and Conference Center in Italy. Afterwards, a working group produced a synthesis of the workshop presentations, entitled "Soil Fertility Degradation in sub-Saharan Africa: Leveraging Lasting Solutions to a Long-Term Problem." This *Affinities* article

Continued on page 8

INSIDE THIS ISSUE

International Center for Tropical Agriculture

Growing Affinities

ISSN 0122-8048

The International Center for Tropical Agriculture (CIAT) publishes this bulletin once a year for people who share our commitment to innovative cooperation in agricultural research for development.

CIAT is one of 16 food and environmental research organizations known as the Future Harvest centers. The centers, located around the world, conduct research in partnership with farmers, scientists, and policymakers to help alleviate poverty and increase food security while protecting the natural resource base. The Future Harvest centers are funded principally through the 58 countries, private foundations, and regional and international organizations that make up the Consultative Group on International Agricultural Research (CGIAR).

Contact:
CIAT Communications Unit
A.A. 6713
Cali, Colombia

Phone: (57-2)445-0000
(1-650)833-6625 (via USA)
Fax: (57-2)445-0073
(1-650)833-6626 (via USA)

Internet: www.ciat.cgiar.org

Text:
Nathan Russell (n.russell@cgiar.org) and Eduardo Figueroa (e.figueroa@cgiar.org)

Photography:
Alfredo Camacho (14, 15), Nathan Russell (3-7, 11-13), and Bernard Vanlauwe (1-2, 8-10)

Design:
Julio C. Martínez (j.c.martinez@cgiar.org)

FOCUS

Stewards of the Soil

Vast areas of agricultural land in the tropics are succumbing to the subtle threat of soil fertility loss. And this is undermining the efforts of rural people to improve their livelihoods through more intensive production. In Africa alone about a half billion hectares are already moderately or severely degraded.

Soil scientists have developed effective approaches for turning around the soil fertility decline. But the practices they're now promoting usually require more labor and other inputs. CIAT's experience suggests, though, that, if two key conditions are met, small farmers will invest their scarce resources in these new practices. First, they must be offered the opportunity to play an active role in research on soil management. And second, the improved practices that result must be accompanied by superior crops (or new market links associated with value-added processing) that promise short-term improvement in farmers' income. Only then can they meet their families' basic needs and still afford the luxury of acting as stewards of the soil.

Those two lessons are abundantly clear from our work on improved climbing beans and integrated soil, disease, and pest management in central and eastern Africa. And they're also underscored by recent CIAT projects in Asia and Latin America, which are described in this issue of *Growing Affinities*.

A desire to put those lessons into practice on a large scale is one of our main reasons for entering into the soils research alliance described in the lead article of this bulletin. The alliance brings together the soils research capacities and the collaborative networks of three institutions, and it weds these resources to CIAT's strengths in crop improvement and participatory approaches. Small farmers have thus gained a valuable new companion in their journey to sustainable rural livelihoods.

Joachim Voss
Director General, CIAT

Forage Connoisseurs

Sustainable intensification of livestock systems in Laos

Though somewhat shy by nature, Kama Zong shows no signs of nervousness as he addresses a group of agricultural extension workers and researchers at Ta village, Pek District, in northern Laos. And why should he? For most of his life, he has known and worked the small hillside plot that today is his amphitheater. And it's obvious from his remarks that he has a pretty good command of the topic under discussion.

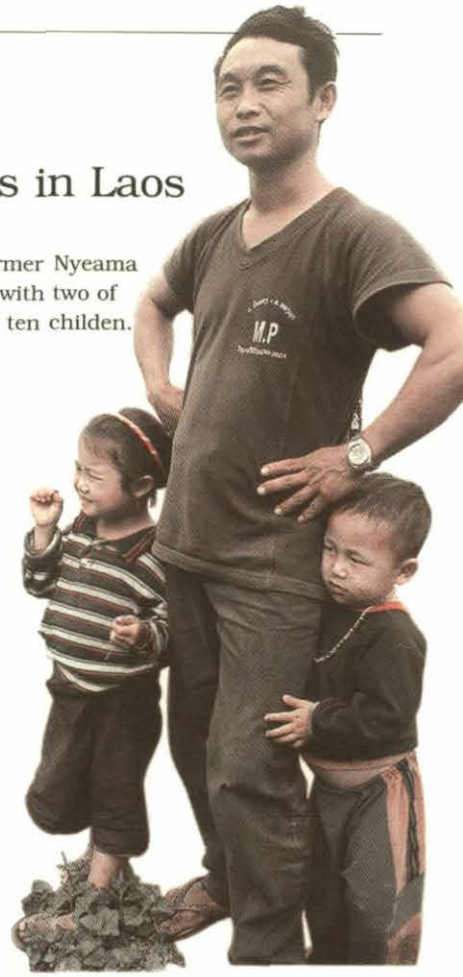
Kama describes a problem that has arisen with the productive forage grasses (such as *Panicum maximum*) that he adopted a couple of years ago. After continuously cutting the grass to feed his livestock, he has recently observed a steep drop in yields. Now, he hopes the technicians can help him find a way to restore the grasses to their former vigor.

CIAT agronomist Peter Horne demonstrates the nature of Kama's predicament with some quick calculations on a drawing board. It would take all of the manure produced by at least eight cows, he explains, to return enough nitrogen to the plot to maintain forage production at its original level. For several reasons—starting with the fact that Kama owns fewer than eight cows—the use of manure alone is clearly not a workable solution.

Soon, the discussion shifts to the forage legumes growing in the hillside plot. "I think this Stylo (*Stylosanthes guianensis* 'Stylo 184', of tropical American origin) is a kind of fertilizer," Kama remarks. "Next season I want to plant maize where the Stylo has been growing to see if the maize yields better than usual." Horne suggests that Kama try a similar experiment with *Calliandra calothyrsus* 'Besakih', a leguminous tree. Extension officers have planted a demonstration plot of the trees next to the grass.

"Look at the *Panicum* along the edge of the *Calliandra* plot," notes Hongthong Phimmasan, the government's livestock specialist for Xieng Khouang Province. "Its leaves are wider and greener where *Calliandra* leaves fell during the dry season." Someone else suggests growing hedges of *Calliandra* around the grass, so clippings from the trees can be used to maintain soil fertility.

Farmer Kama Zong (left) and his cousin Saishua Zong chat with CIAT scientist Peter Horne.



Farmer Nyeama Lo with two of his ten childen.

A journey of exploration

By the end of the field day, Kama has several options with which to experiment, and the extension officers who will accompany him in his search are better prepared to help.

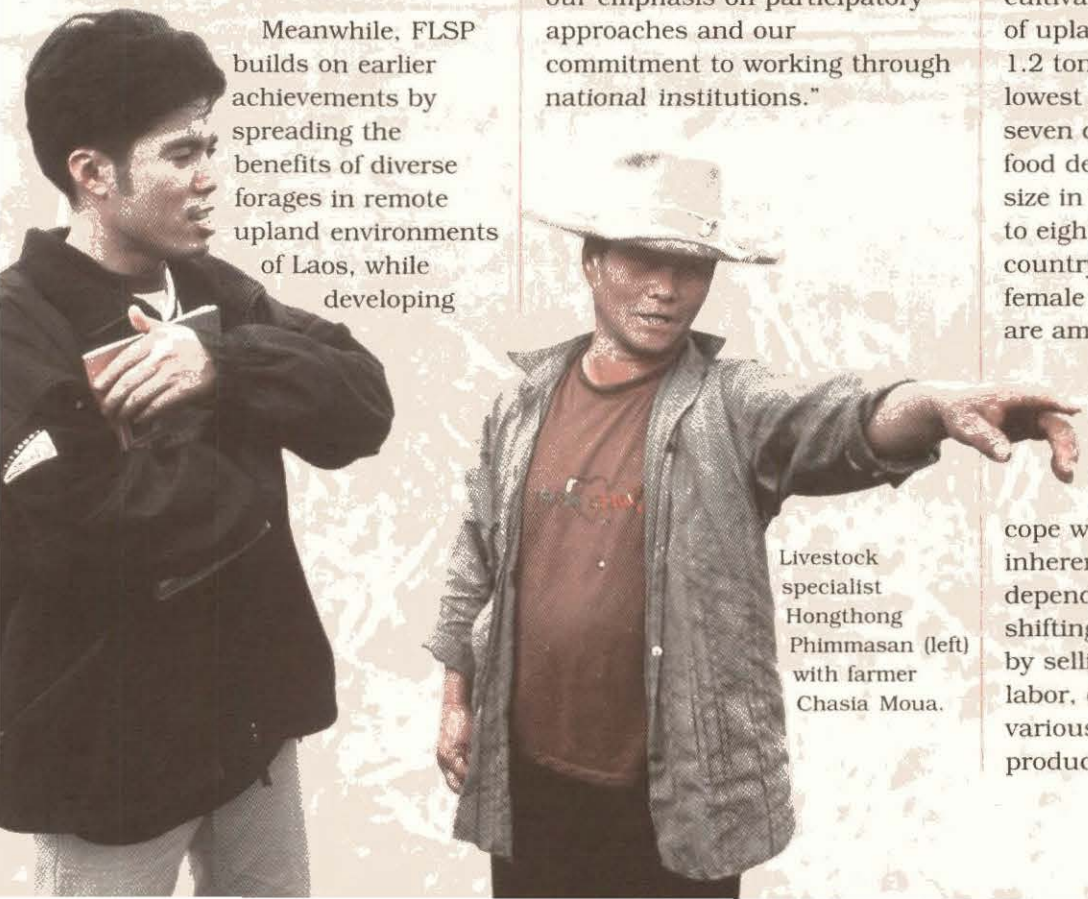
The start of their exploratory journey is one early result of the Forages and Livestock Systems Project (FLSP), which is funded by the Australian Agency for International Development, or AusAID. A 5-year initiative begun in 2000, FLSP is being managed by CIAT and implemented in northern Laos by the country's National Agriculture and Forestry Research Institute (NAFRI), in partnership with two Provincial and four District Agriculture and Forestry Offices.

The project grew out of a previous initiative, the regional

Forages for Smallholders Project (FSP), which AusAID funded from 1995 to 1999. Working with national research institutes in seven Southeast Asian countries, FSP identified a "basket of options" that show great potential for benefiting small-farm families. The project continues in a new phase supported by the Asian Development Bank (ADB).

Meanwhile, FLSP builds on earlier achievements by spreading the benefits of diverse forages in remote upland environments of Laos, while developing new options for sustainable intensification of livestock systems, with strong emphasis on animal health and links between livestock and crops.

Pointing to differences between the two projects, FLSP coordinator Peter Horne says, "before we mainly introduced new forages to individual farmers; now we're trying to create a culture of experimentation with farmer groups. What hasn't changed is our emphasis on participatory approaches and our commitment to working through national institutions."



Livestock specialist Hongthong Phimmasan (left) with farmer Chasia Moua.

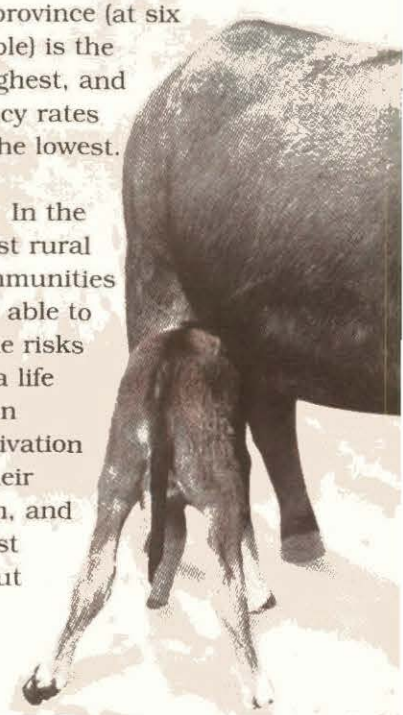
I'd rather die than lose my buffalo!

The prevailing agricultural system in northern Laos is shifting cultivation, which accounts for 40 percent of the country's total land area. According to traditional practice, farmers first clear forest plots by slashing and burning native vegetation; then cultivate upland rice, maize, poppies, and other crops for several years; and finally leave the land fallow for 12 years or more.

FLSP directly addresses two closely related problems with shifting cultivation. One is declining soil fertility, which has resulted from shortening fallow periods (to just 3 or 4 years) as population pressures have increased. And the other is entrenched poverty in the rural communities that depend on this system.

In Xieng Khouang Province, for example, where shifting cultivation predominates, yields of upland rice (at less than 1.2 tons per hectare) are the lowest nationwide, and six out of seven districts suffer chronic food deficits. Average household size in this province (at six to eight people) is the country's highest, and female literacy rates are among the lowest.

In the past rural communities were able to cope with the risks inherent in a life dependent on shifting cultivation by selling their labor, opium, and various forest products. But



as the scope for these activities has narrowed, farmers have increasingly turned to livestock for achieving more secure livelihoods.

According to a recent ADB-supported study, the solutions to poverty proposed by Lao villagers "mainly centered around land and livestock." Animals, the study report says, "play an indispensable role in villages as a social safety net." By selling a buffalo, for example, a rural family can cover the costs of health care. The villagers surveyed often said, though, that they preferred to die and leave the buffalo for their families rather than sell it to pay hospital bills!

A new style of research and extension

These people obviously appreciate the advantages of keeping livestock. Often, animals are upland farmers' best or even only means of accumulating cash income. Also, they can be sold any time at relatively stable prices and provide manure for sustaining crop yields.

"The challenge for these farmers," says Peter Horne, "is to reap greater benefits from their animals." That, in turn, requires more reliable feed supplies and better disease management." FLSP is working closely with the Lao government to help farmers meet those requirements.

The country's Ministry of Agriculture and Forestry has recently developed a new extension strategy, in which farming system extension workers operate at the district level with support from subject matter specialists at the provincial and national levels. The recently created National Agriculture and Forestry Extension Service is coordinating the implementation of the strategy throughout Laos.

FLSP supports that effort in its four target districts by providing intensive practical training on a variety of topics. In its first year, the project trained a total of 32 people at the national, provincial, and district levels through workshops dealing with participatory methods, forage agronomy, and gender/equity.

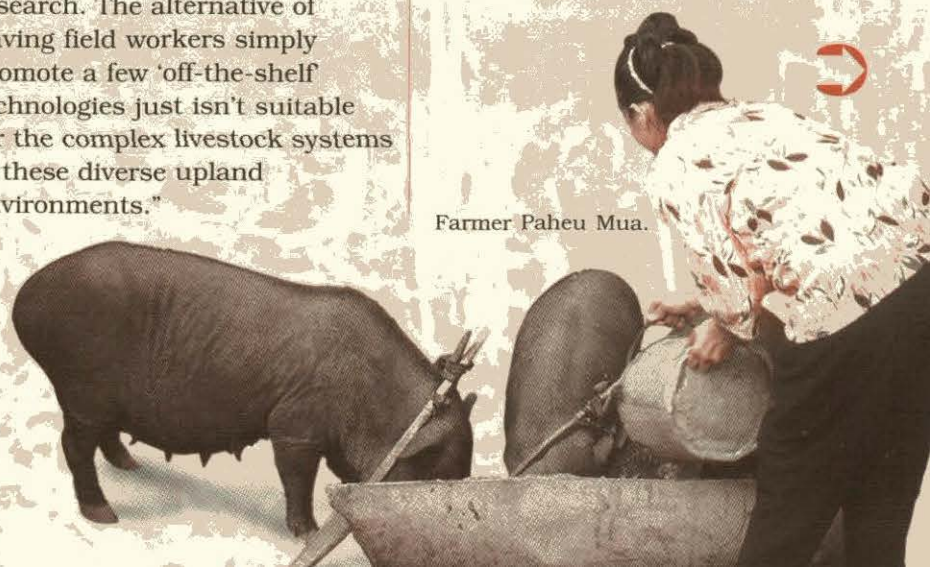
"Our aim in this training," says Horne, "is to build teams of professionals who are skilled at involving farmers in adaptive research. The alternative of having field workers simply promote a few 'off-the-shelf' technologies just isn't suitable for the complex livestock systems of these diverse upland environments."

The workshops are closely tied to "active mentoring," an approach whereby project staff lead participants through each step in the research and extension process. For example, the farmer field day described above was designed mainly to show national partners how to organize such events, how to prepare useful training materials (heavily illustrated with cartoons and pictures taken with digital cameras), and how they can use field days to promote a culture of experimentation in rural communities.

Field staff in Xieng Khouang Province say they appreciate this approach, because it gives them the knowledge, experience, and skills they need to win farmers' confidence. Also, they clearly enjoy the camaraderie that comes from spending long days in the field together and from sharing meals in the evenings.

An enticing menu of options

Through active mentoring and participatory methods, FLSP is starting to turn district extension officers and farmers into real forage connoisseurs—steeped in the culture of these diverse, multipurpose plants. Both groups are rapidly gaining knowledge about the various



Farmer Paheu Mua.

uses, advantages, and limitations of an enticing menu of forage options, and they're becoming adept at integrating these successfully into local farming systems.

At Khangpanien village, for example, in Nonghet District of Xieng Khouang Province, Chasia Moua takes a break from rice threshing to show researchers and extension workers his forage nurseries, which contain several grasses (*Paspalum atratum*, for example) as well as Stylo. He has sown some of the grasses on bunds surrounding the village's limited paddy fields in the hope that they will help stabilize the soil. He also notes that with the nurseries here, he can keep his livestock close by rather than letting them graze extensively, thus saving time and labor.

On a hillside farm above the village, Nyeama Lo leads visitors to one corner of an upland rice field, with three of his 10 children running behind and pulling at his hands and legs. He explains that, since the upland rice performs poorly in this spot, he has planted forage grasses instead to provide more feed for his cattle, one of which he lost recently to disease.

Suddenly, children and adults are startled by a loud

Agricultural technician Vieng Souh (left) with farmer Paheu Mua.

explosion in the distance. Bombs from the USA's war with Vietnam still litter the countryside in Nonghet District, keeping government explosives teams busy and farmers nervous. Clearly, animal diseases, food insecurity, and declining soil fertility are not the only risks involved in shifting cultivation here.

No wonder increasing numbers of women in this area prefer to grow Stylo for pig feed rather than wander the hills for several hours a day gathering heavy basket loads of native vegetation. "I'm happy, because I don't feel so exhausted every evening!" exclaims Paheu Mua, one of Kama Zong's neighbors. "I've cut the time I spend gathering pig feed daily from about 3 hours to just 30 minutes," she adds.

During the second half of the field day at Ta village, it's Paheu's turn to occupy center stage. First, she explains how she has sown rows of Stylo, too thickly it turns out, between rows of pigeonpea on contour ridges, an innovation that has beautifully transformed her small piece of the upland landscape. Afterwards, she follows intently a discussion of Stylo sowing rate, determined to get it right.

Eventually, FLSP will be working with 27 villages like this one in each of its four target districts, benefiting some 1,400 households. The project is also putting in place a monitoring and evaluation strategy that will provide detailed feedback from every village, giving thousands of farmers like Kama Zong and Paheu Mua a stronger voice in research and development.

Members of the livestock R&D team in Xieng Khouang Province.

Strength in Unity

Collaborative soils research for Central America

In search of a whole that is greater than the sum of its parts, international and national organizations engaged in soils research have made a sizable investment during recent years in building collaborative networks, often with impressive results.

One product of these efforts is the Integrated Soil Management (MIS) Consortium for Central America. This is one of four R&D consortia sponsored by the CGIAR's Soil, Water, and Nutrient Management (SWNM) Program, which CIAT coordinates. MIS aims to improve the livelihoods of small farmers by developing improved practices for integrated management of fragile soils. Members work toward this end through joint research projects at shared "reference" sites—two in Honduras and two in Nicaragua.

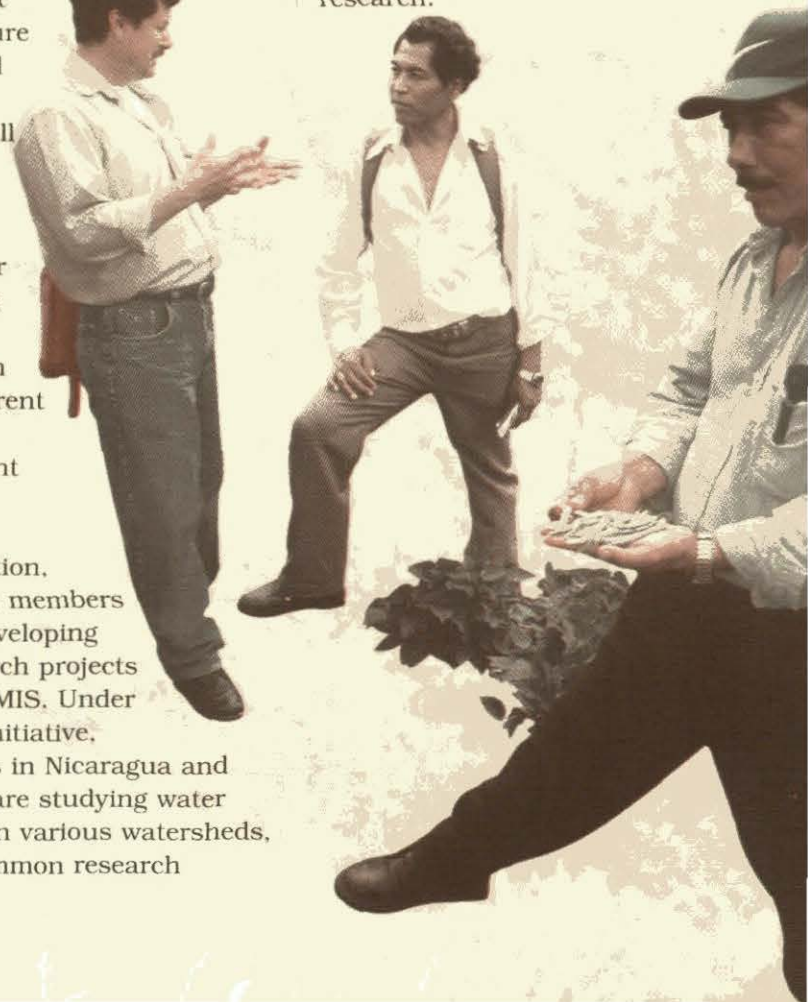
MIS has evolved from an informal group of like-minded research organizations into a sharply focused collaborative network. This is largely the result of effective guidance from a steering committee chaired by Miguel Ayarza, the soil scientist who coordinates CIAT's work in Central America.

The consortium was launched through a workshop held in 1999 at the Panamerican School of Agriculture in Honduras. The consortium's 18 founding members decided then to center their joint efforts on three main tasks: (1) organizing the available information on management of fragile soils in Honduras and Nicaragua, (2) developing production systems that use water and soil nutrients more efficiently, and (3) disseminating improved practices to farmers.

During the consortium's first year, partners began exchanging experiences among themselves and developed a Web site (www.123.hn/ciathill/mis.htm). By the second year, they were testing research methodologies developed by other SWNM consortia. Researchers with the Managing Soil Erosion Consortium (MSEC), for example, offered them training in the estimation of soil losses at the watershed level. This year, in cooperation with scientists from the US Department of Agriculture (USDA) and CIAT, MIS partners will begin evaluating various methods for quantifying soil degradation under different crop management systems.

In addition, consortium members are now developing joint research projects funded by MIS. Under one such initiative, universities in Nicaragua and Honduras are studying water resources in various watersheds, using a common research approach. Likewise, CIAT soil scientists have joined forces with the Lempira-Sur Project (PROLESUR), which has been conducted by the UN Food and Agriculture Organization (FAO) in Honduras since 1992, to study the impact of a native agroforestry system called *Quesungual* on soil conservation and crop productivity.

These developments have come at a time when national institutions in Central America are hard pressed, because of declining budgets, to maintain their capacity for helping farmers develop sustainable production systems. The MIS Consortium offers them a way to gain new strength through vibrant collaboration in soils research.



Continued from page 1

Investing in Farmers' Future

provides an overview of the Bellagio synthesis, which is available on CIAT's Web site (www.ciat.cgiar.org).

Not a simple problem

Declining soil fertility in Africa is a widespread and complex problem. Overall, African farmers apply only 10 percent the amount of soil nutrients used in the rest of the world. Unsurprisingly, scientists across the continent have reported negative nutrient balances (i.e., removal of more nutrients through harvest than are returned to the soil). In southwestern Kenya, for example, the net loss of soil nitrogen is about 100 kilograms per hectare per year.

An estimated 500 million hectares of land in Africa have been physically degraded through erosion, making it all the more difficult to restore soil fertility. Moreover, the option of simply abandoning degraded land to clear new fields has narrowed considerably over the last two decades, as availability of cultivable land in Africa has shrunk from 0.38 hectares per capita to 0.25. In large part because farmers have lacked the means to reverse soil degradation, per capita food production in Africa has dropped from an estimated 150 kilograms per person to 130 kilograms over the last 35 years.

Fixing the soil fertility problem is not a simple matter of applying extra doses of chemical fertilizer. To achieve lasting solutions, the Bellagio report stresses, requires a holistic approach involving integrated management of soil fertility, beneficial soil organisms, as well as crops, their diseases, and pests.

It is also essential that farming households and communities gain additional resources and incentives to invest in soil improvement through new income-earning opportunities and appropriate national and international policies.

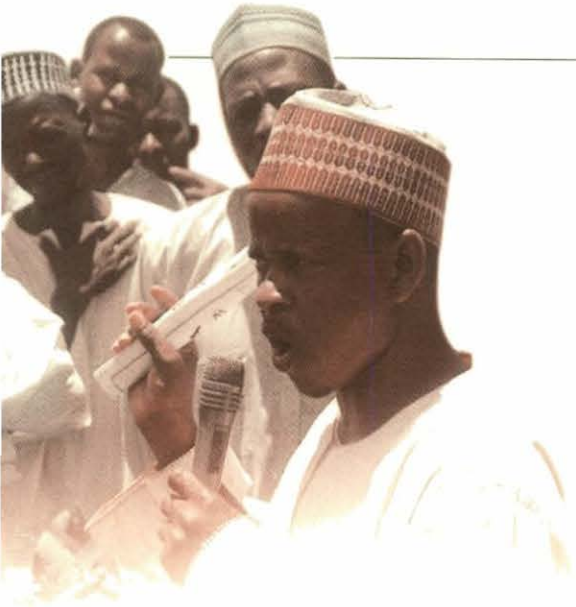
Another vital prerequisite is that farmers play an active role in the search for solutions. To generate new knowledge and practices that measure up to the complexity of the soil fertility challenge, multidisciplinary teams of scientists must work together as well as with farmers and development professionals.

Some good news

Though there is plenty of bad news about soil fertility degradation in Africa, some good news is starting to circulate as well. The holistic, people-centered approach of which some African farmers are now enjoying a taste—what scientists call "integrated soil fertility management" (ISFM)—is starting to take hold. Three key signs of progress are evident.

First, thanks in part to international agricultural research, there is now a broad consensus among scientists on the basic soil management principles (e.g., the importance of integrating multipurpose legumes into cropping systems) that are involved in both sustaining crop production and maintaining the ecosystem services performed by the soil. These services, among other benefits, reduce threats such as natural habitat loss, declining water quality, and catastrophic flooding and landslides.

Second, beyond its effect on individual scientists, ISFM has markedly influenced the way whole organizations and farming communities address the challenge of raising soil fertility.



Largely because of extensive training in ISFM across the continent, national and international R&D organizations, NGOs, and extension agencies increasingly follow this approach. And as a result, farmers are starting to adopt a wide range of ISFM technologies—improved fallows, appropriate use of organic inputs, and so forth—on a significant scale.

Third, researchers have developed new tools and methods for greatly enhancing and extending those gains. Participatory approaches, for example, which fuse formal science with local knowledge based on farmer experimentation, have been found effective for ensuring the relevance and increasing the adoption of new technologies. Also, geographic information systems, or GIS, show tremendous promise as an aid to targeting proven ISFM practices to areas where they stand a high probability of repeating previous successes.

Time for concerted action

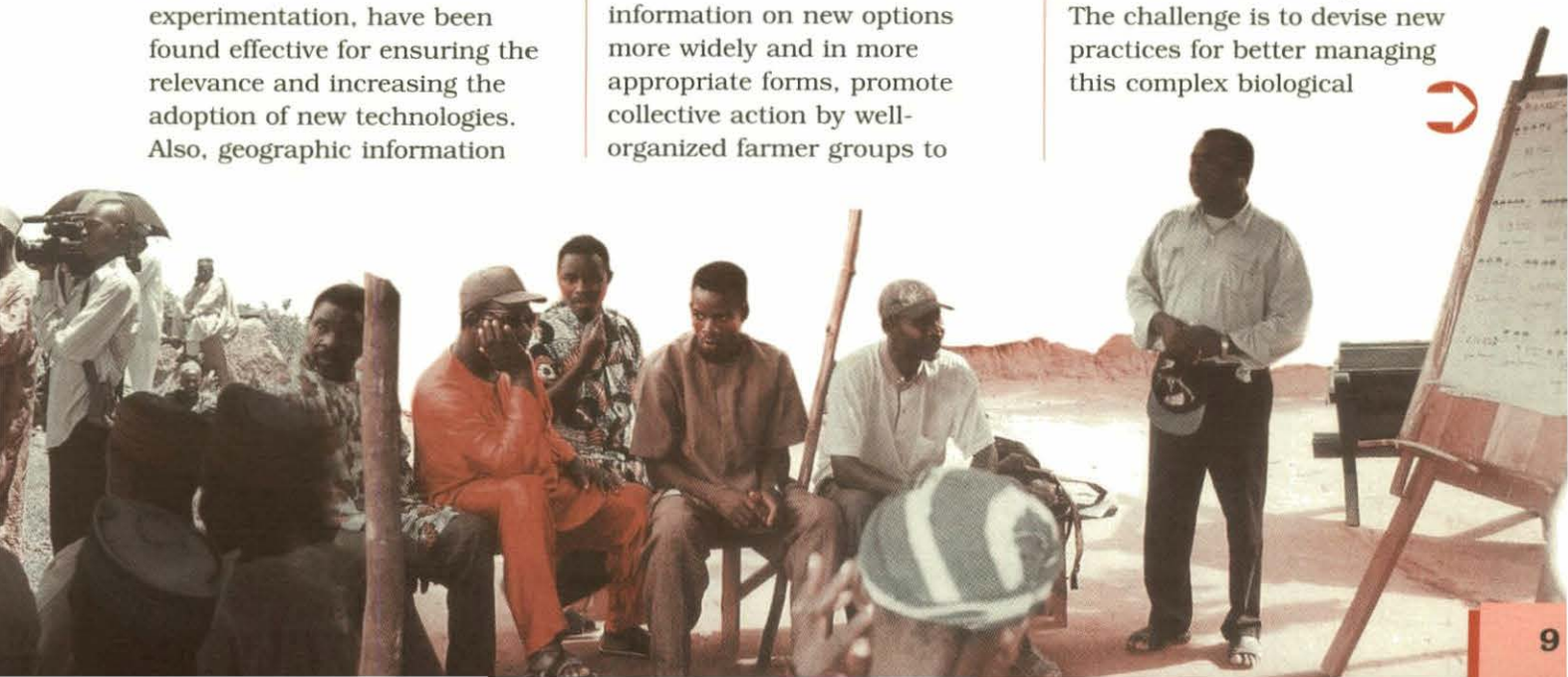
Despite some good news about soil fertility in Africa, this is no time for complacency. The Bellagio report calls for concerted action to build rapidly on recent gains, with a view to creating large social, economic, and environmental benefits for Africa's poor. The Alliance for Integrated Soil Fertility Management in Africa is a timely response to that call. Participants in the alliance's planning workshop identified the main steps that need to be taken, organized under five headings.

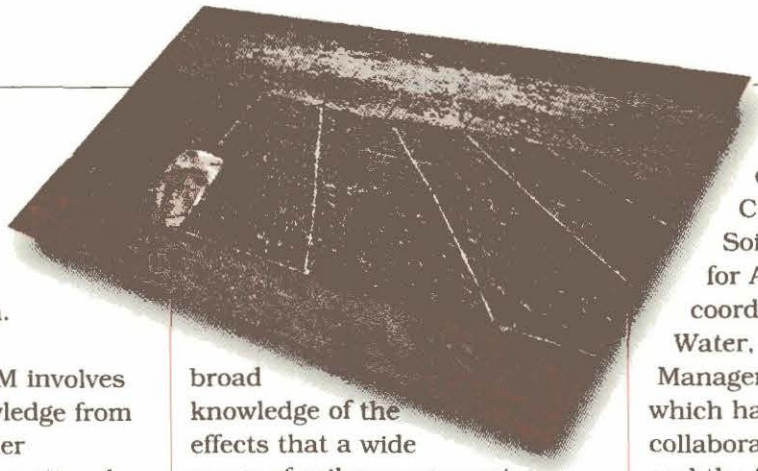
First and foremost, farmers must be empowered to apply ISFM practices and knowledge on a larger scale—from individual farm plots and households to entire landscapes and communities. To help achieve this end, R&D organizations need to further diversify the ISFM practices available, disseminate information on new options more widely and in more appropriate forms, promote collective action by well-organized farmer groups to spread ISFM approaches, and identify policy incentives that favor investment in soil fertility enhancement.

Second, soil scientists must find ways to translate new knowledge emerging from strategic research on soil carbon and nutrient cycles into practical soil management measures that boost and sustain agricultural productivity.

Third, researchers must also devise new management practices that enhance the soil's ecosystem functions, such as carbon storage, which reduces emissions of greenhouse gases. In connection with this work, scientists need to develop new approaches for measuring the impact of ISFM practices on ecosystem services as well as for determining the value of these services to rural communities and society as a whole. Such methods are essential for making informed decisions about trade-offs between agricultural production and environmental protection.

Fourth, in their work on soil ecosystem functions, scientists must pay particular attention to the vital role of soil organisms. The challenge is to devise new practices for better managing this complex biological





community and for monitoring its valuable contributions to human welfare and agroecosystem health.

Finally, since ISFM involves intensive use of knowledge from both formal and farmer experimentation, international and national organizations must renew their efforts to strengthen networks of scientists, development professionals, and farmers through training, partnerships, and information sharing.

Breadth plus depth

To advance quickly on all of those fronts is clearly beyond the capacity of any single organization. But through a marriage of breadth and depth, the triple alliance formed by CIAT, its new TSBF Institute, and ICRAF can make rapid headway in placing ISFM technologies within the reach of African farmers.

Each member of the alliance offers unique scientific strengths that will contribute to this end in a complementary fashion. Thus, the former TSBF Programme has amassed a broad knowledge of the effects that a wide range of soil management practices have on soil processes under different conditions.

CIAT, meanwhile, has focused more on identifying and applying basic principles involved in overcoming soil degradation. And it has closely integrated this work with crop improvement, disease and pest management, land use studies involving GIS, and the development of farmer participatory methods.

ICRAF has played a lead role in research on integrated soil nutrient management for Africa, based on its assets as the world agroforestry center and on its strong expertise in soil and land management.

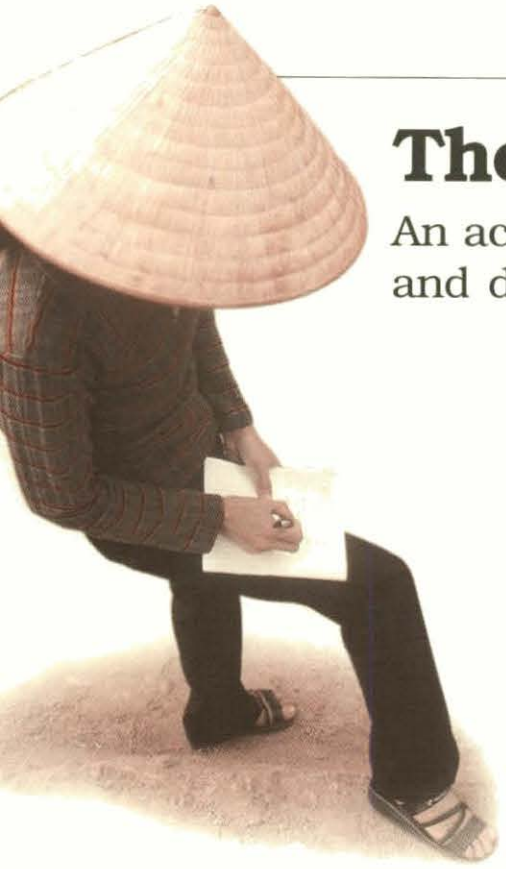
The three partners also bring to the alliance a long history of collaboration and a wealth of R&D networks and partnerships, through which they can jointly implement ISFM approaches. ICRAF, for example, represents the CGIAR in the World Bank Soil Fertility Initiative (SFI) for Africa, while CIAT coordinates the CGIAR's Soil, Water, and Nutrient Management (SWNM) Program, which has given rise to close collaboration between the Center and the former TSBF Programme.

The strength of the triple alliance, though, will depend, not just on the combined expertise of its founders and their current partners but on the alliance's ability to serve as a hub for effective collaboration with regional networks (e.g., ASARECA, the Association for Strengthening Agricultural Research in Eastern and Central Africa) and with major development programs, such as SFI and similar initiatives of the German and Japanese governments.

All of these actors must join forces now to foment farmer innovation based on knowledge and principles rather than simplistic recipes. The well-being of millions of rural people and the future of Africa's agriculture depend on it.

The Power to Choose

An active role for Asian farmers in cassava research and development



On a Sunday morning near the end of cassava harvest, the communal meeting hall at Thong Nhat village in northern Vietnam is nearly packed with well-groomed farmers. Spared today from the backbreaking toil of pulling starchy cassava roots from the ground, they're busy instead making choices that could mean real improvement in their families' livelihoods.

For the last 2 hours, the farmers have hurried from one on-farm experiment plot to another, observing trial results printed neatly on paper signs and jotting down data on specially prepared forms. Now it's time for them to examine the results together and plan their next steps.

Tran Ngoc Ngoan, a professor from Thai Nguyen University, stands at the podium opposite a large white bust of Ho Chi Minh on a stage adorned with brightly colored banners bearing communist party slogans. After a brief introduction to the meeting, Prof. Ngoan takes his seat among the farmers, while extension officers begin compiling the experiment results on a chalkboard.

The extensionists preside over a lively polling process, in which farmers comment on the various options, ask questions, and finally vote through a show of hands for the technologies they prefer.

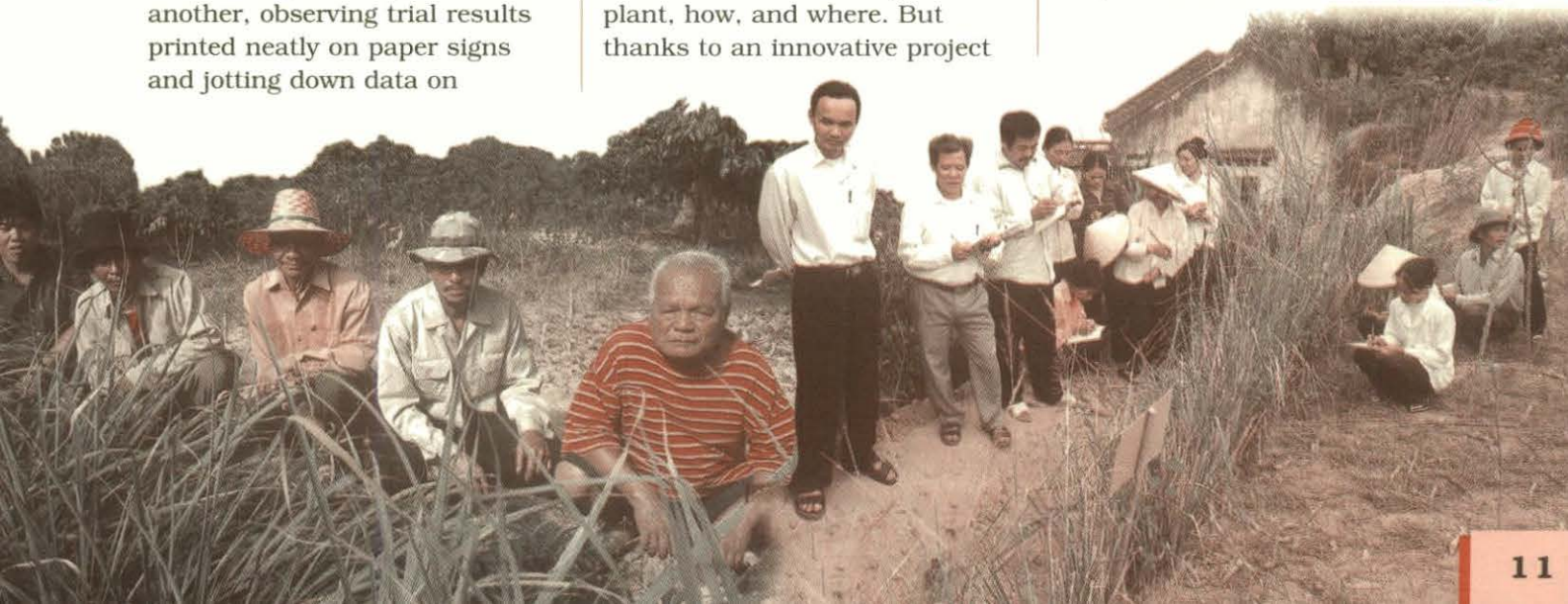
National teams

Not many years ago, these farmers would most likely have been summoned to the meeting hall to be told what they should plant, how, and where. But thanks to an innovative project funded by Japan's Nippon Foundation, they have an opportunity to test and choose the technologies that best meet their needs.

Now well into its second phase (1999-2003), the project is disseminating sustainable practices for cassava-based cropping systems as widely as possible. "The success of this work," says Reinhardt Howeler, CIAT soil scientist and project coordinator, "depends on national teams of researchers and extension officers working with farmer leaders at numerous pilot sites."

Such teams have been formed with six organizations in Vietnam and five in Thailand. The project also operates to a lesser extent in southern China and Indonesia. Researchers and extensionists have been trained in participatory methods, allowing them to support farmer research on a growing scale.

In Vietnam farmers at 21 pilot sites are conducting a



total of 155 participatory research trials. For Thailand the figure is 106 trials at 21 sites. "Building on experience with participatory research in the project's first phase" (1994-98), Howeler notes, "our national partners are now employing farmer participatory extension methods to achieve wide adoption of the practices farmers have selected."

"This is the only way farmers in our very diverse upland areas will adopt new technologies," says Ngoan, who is Vietnam's national coordinator for the project.

Eye-opening experience

Clearly, there's no lack of alternatives. Cassava research, Howeler explains, has produced improved varieties as well as simple agronomic practices that effectively counter soil erosion and declining soil fertility. But since the new practices require extra labor and capital and may take land out of crop production, it's vital that farmers be directly involved in determining which options offer attractive benefits at acceptable costs.

The participatory approach begins with farmer visits to demonstration plots at experiment stations or to other villages where farmers have already conducted participatory trials and adopted new technologies.

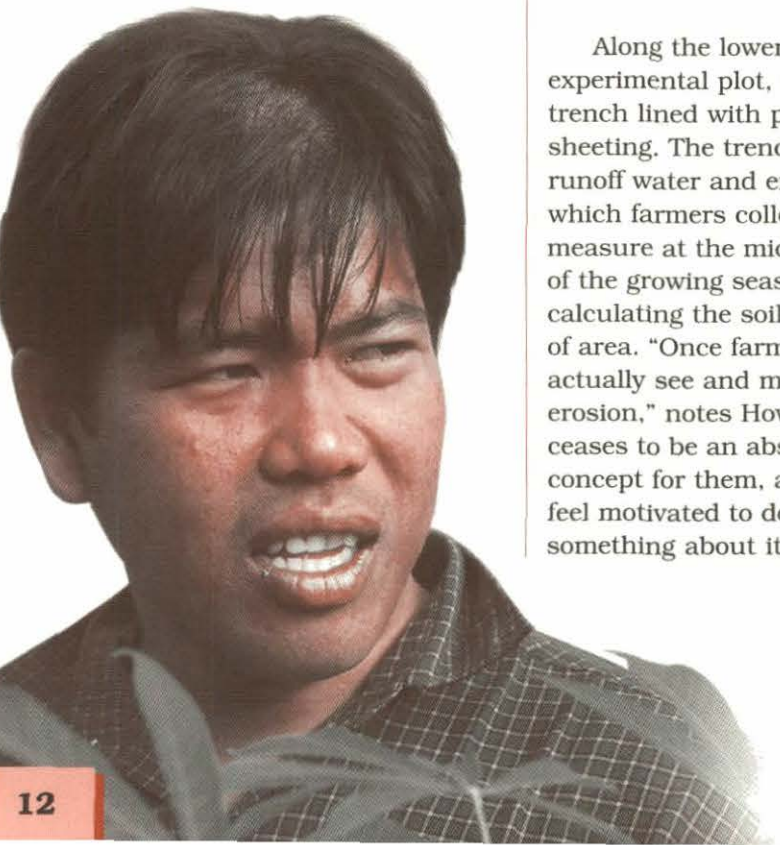
A farmer group from Nadee District of Thailand's Prachinburi Province visited one such village 2 years ago. Group members say they enjoyed being able to exchange ideas with other farmers. It was an eye-opener for them to see how much progress was being made in a village much like their own. After discussing what they'd seen, the visiting farmers decided which options to test in their own fields, and extension officers then helped them set up the trials.

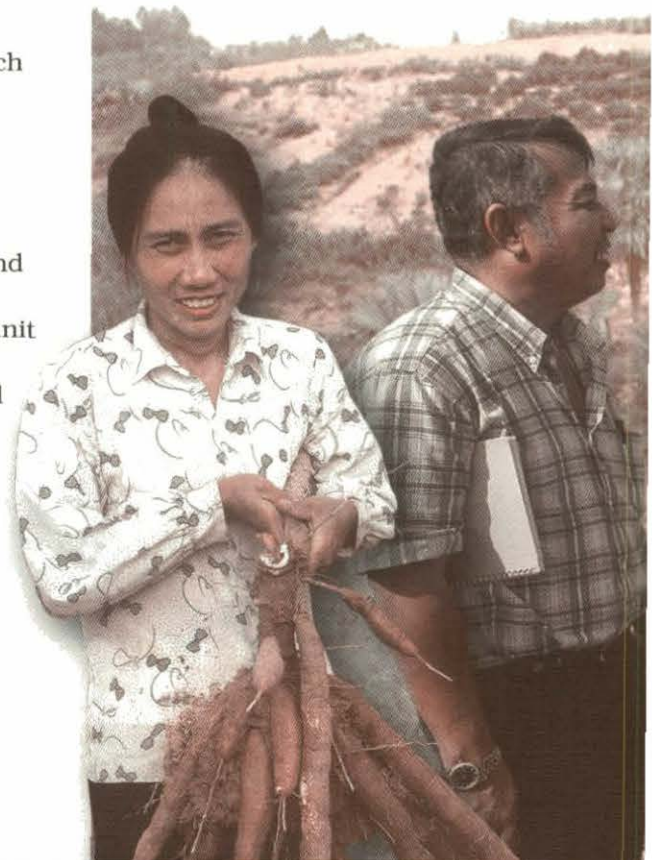
Along the lower end of each experimental plot, there is a trench lined with plastic sheeting. The trenches trap runoff water and eroded soil, which farmers collect and measure at the middle and end of the growing season, calculating the soil loss per unit of area. "Once farmers can actually see and measure soil erosion," notes Howeler, "it ceases to be an abstract concept for them, and they feel motivated to do something about it."

Building sustainable livelihoods

Much is at stake in these farmers' search for ways to intensify cassava production while protecting the soil. Grown mainly by small farmers in marginal upland areas, the tropical American root crop has been transformed in Southeast Asia from a secondary staple into an important raw material for starch production and animal feed, especially in Thailand and Vietnam. The transformation is being driven now by a new generation of high-yielding, high-starch varieties, developed through intensive collaborative between CIAT and national programs, with strong financial support from the Japanese government.

Improved cassava production offers upland farmers a rare opportunity to boost their incomes by catering to diverse





markets. A major drawback, though, is that more or less continuous cultivation of the crop on sloping soils leads to a sharp decline in soil fertility and to serious erosion problems, undermining the sustainability of cassava-based systems.

But experience in a growing number of rural communities demonstrates that this outcome is by no means inevitable. Take the case of Tien Phong village in Vietnam's northern Thai Nguyen Province. Following a visit to demonstration plots at Thai Nguyen University in the first year of the Nippon Foundation-funded project, a small group of farmers from the village began testing new cassava production practices.

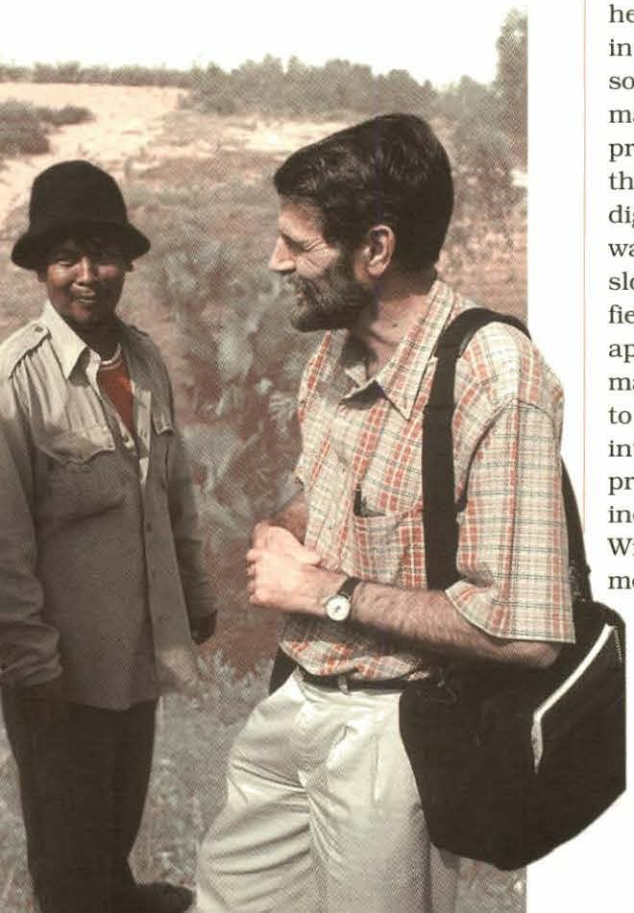
A year later they were cautiously optimistic about some of the new technologies. Over time, though, their confidence in trial results grew, explains farmer group leader Ngo Trung Kien. With new cassava varieties—now grown on 65 percent of the village's cassava area—farmers have nearly doubled their crop yields. Villagers mainly use cassava as feed for pigs—their primary source of cash income. The number of pigs in the village has increased, and the cost of feeding them has declined.

Higher incomes from pig production have visibly improved farmers' livelihoods. Kien, for example, has just sold the motorcycle he bought a few years ago and is about to buy a newer one. At this and four other pilot sites in northern Vietnam, Howeler notes, the adoption of improved technologies, including new cassava varieties, has raised gross incomes by four to five times those reported in 1995 at the outset of the project.

Kien and dozens of other farmers have established hedgerows of *Tephrosia candida* in their upland fields to check soil erosion. In addition to maintaining cassava productivity over the long term, this spares them the trouble of digging out soil that has been washed down from upland slopes into their lowland rice fields. The farmers are also applying a combination of manure and chemical fertilizers to their cassava and are intercropping it with peanuts—practices that increase their income while improving the soil. With more pigs around, Kien mentions, farmers can now apply more manure to their rice, sweet potato, and cassava, helping maintain reasonably good yields on the village's poor sandy soils.

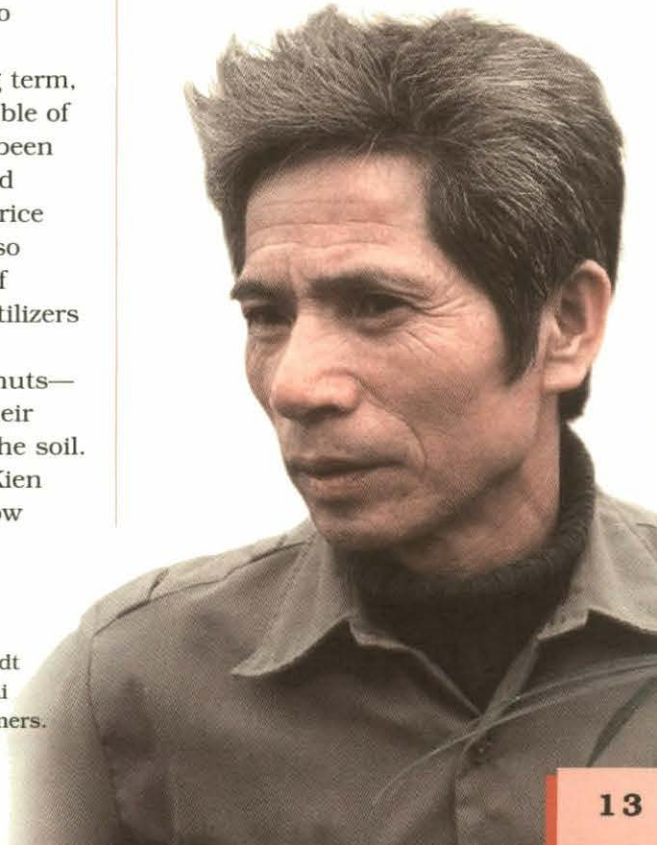
The new practices have spread among farmers at Tien Phong thanks to the efforts of the group led by Kien. From just a handful of members in 1995, it has grown to include about 80 farmers today. Kien's functions as group leader, he says, are "to organize meetings during the growing season and at harvest for evaluating the results of experiments and deciding what to do next."

Back at Thong Nhat village, the field day closes in a modest feast displaying local cuisine and the farmers' unstinting hospitality. With small cups of rice wine held high, they offer toast after toast to one another and to the researchers who helped them seize the power to choose.



CIAT soil scientist Reinhardt Howeler (right) visiting Thai research partners and farmers.

Vietnamese farmer leader Ngo Trung Kien.



Barriers That Permit Progress

Making soil conservation pay in Colombia

"A lot of people would like to have my land," says José Balcué, a weatherbeaten, 68-year-old farmer. "But I'm not going to sell it!"

His farm, "La Camelia," is perched on a steep slope leading down to the Cabuyal River in the community of Caldono in Colombia's Cauca Department. Despite its difficult topography, Don José is proud of the farm, because it shows no signs of soil erosion, its soils require no chemical fertilizers, and, by maintaining a constant output of diverse agricultural products over the years, it has enabled him to raise his six children.

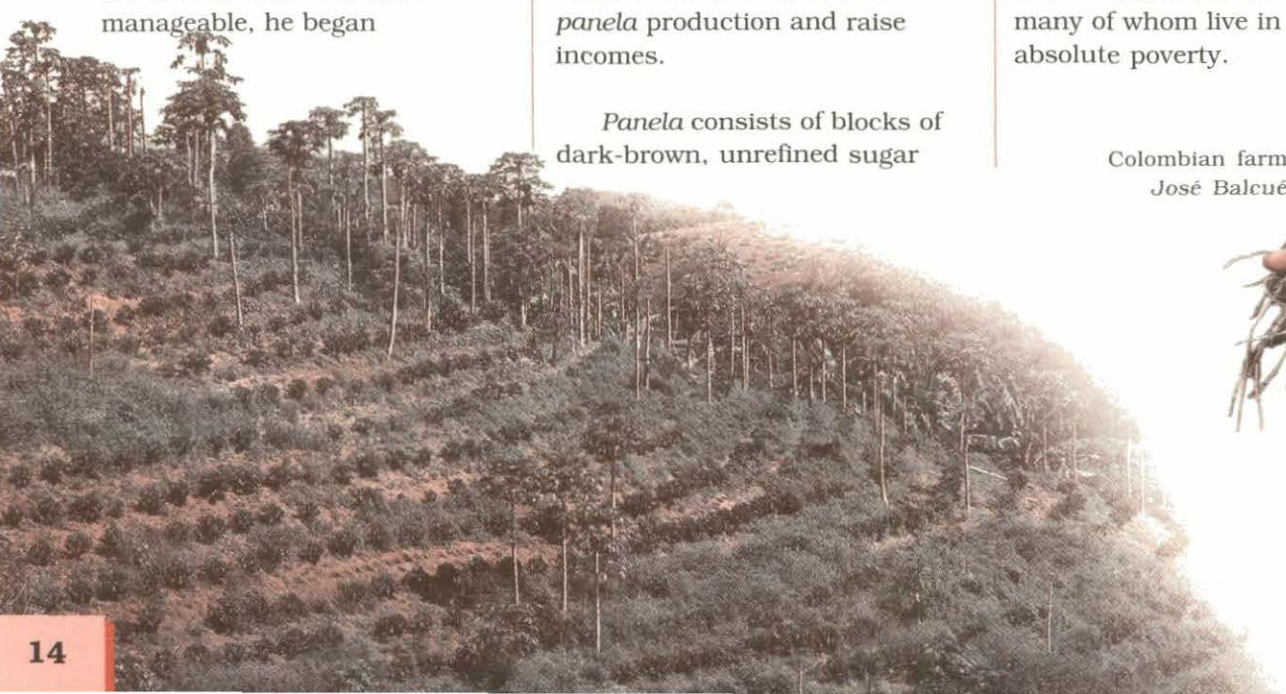
Lessons from experience

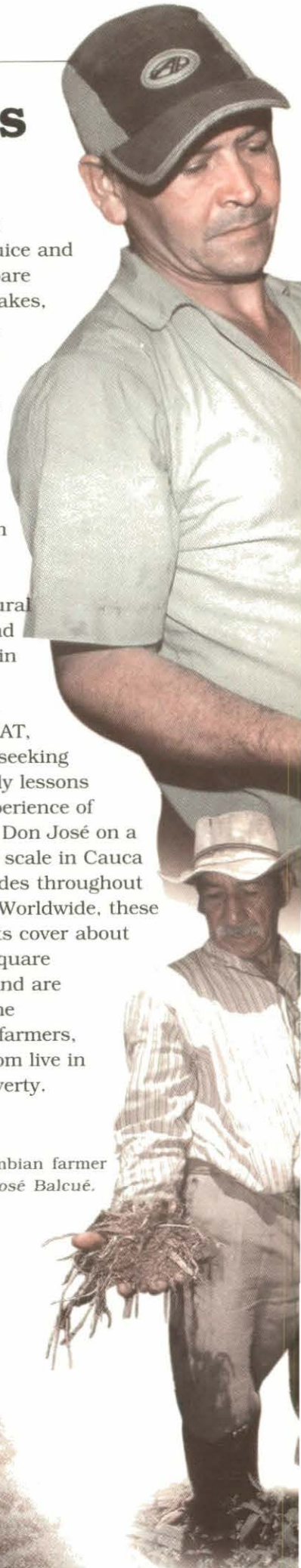
"Working this hillside was tough," he recalls, as he points out his coffee, banana, citrus, and vegetables. But then in a bid to make the land more manageable, he began establishing "live barriers," or dense hedgerows of perennial plants, sown across the slopes to minimize soil loss in heavy rains. Don José has established 25 barriers of sugarcane (*Saccharum officinarum*), each 120 meters long. In addition to protecting the soil from erosion, they improve soil fertility, as fallen sugarcane leaves and other crop residues trapped by the barriers are gradually incorporated into the soil.

In addition, the barriers provide a source of food for his family and feed for his livestock. For some time now, he has also been manufacturing *panela* (brown sugar) for sale in the local market. He uses the bagasse (or part of the sugarcane left after the juice has been extracted) as fuel, making it unnecessary for the family to fell trees for firewood. Don José soon plans to buy a motor for his small *panela* processing operation and to form a processing association with his neighbors. This will enable them to increase their volume of *panela* production and raise incomes.

Panela consists of blocks of dark-brown, unrefined sugar derived from sugarcane juice and used to prepare beverages, cakes, and cookies. Colombia is the world's third largest producer of *panela* and ranks first in consumption per capita.

Agricultural scientists and technicians in many institutions, including CIAT, are actively seeking ways to apply lessons from the experience of farmers like Don José on a much larger scale in Cauca and in hillsides throughout the tropics. Worldwide, these environments cover about 13 million square kilometers and are home to some 525 million farmers, many of whom live in absolute poverty.





Colombian farmer José Balcué.

The search for incentives

A key challenge for researchers is to find ways in which simple technologies that protect fragile soils can also generate economic benefits in the short term, so farmers will have a stronger incentive to adopt them.

In a novel effort to meet this challenge, CIAT specialists in soils, participatory research approaches, and rural agroenterprise development are combining their expertise. One example of their new integrated approach is recent work in Colombia aimed at making live barriers more profitable.

"To promote the adoption of a live barrier, we need to help farmers find alternative uses for the barrier species as well as different approaches to processing that increase farmers profits," says Juliana Andrea Rizo of CIAT's Agroenterprise Development Project.

Toward this end she has been working with farmers in Caldono to develop a simple tool for evaluating different alternatives in sugarcane processing. This effort grew out of previous work by Elías Claros of CIAT's Participatory Approaches Project, who evaluated the management of live barriers with farmers in the microwatershed of the Cabuyal River. Sugarcane was the barrier species that most farmers preferred.

Even so, while clearly appreciating the effectiveness of sugarcane barriers in halting soil erosion, farmers in Caldono have been slow to adopt the practice. The main obstacle is that returns from the sugarcane do not always outweigh the costs of hedgerow establishment and management.

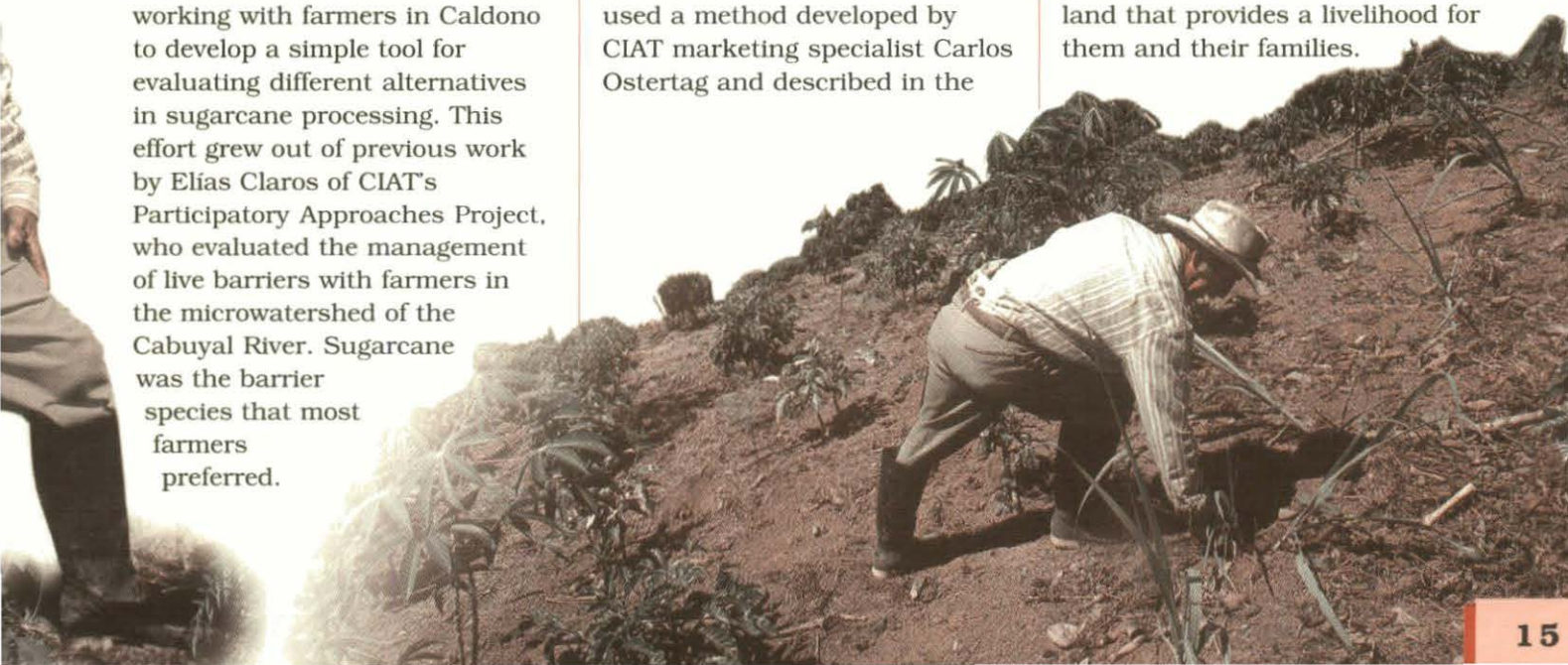
This problem, in turn, is related to many farmers' commercial arrangements with local agroindustries (known as *trapiches*) that process sugarcane into *panela*. Ordinarily, farmers must deliver the harvested cane to the *trapiche*, and since this is a quite bulky product, its transport can be costly and difficult. In exchange for their sugarcane, farmers receive only half of the *panela* produced. The other half goes to the *trapiche*, together with the bagasse, which is used as fuel for processing.

Farmer-run agroenterprises

To help farmers find a way out of this trap, Rizo prepared financial models to analyze different alternatives for sugarcane processing in terms of their advantages and disadvantages for farmers. In this work she used a method developed by CIAT marketing specialist Carlos Ostertag and described in the manual *Identifying and Assessing Market Opportunities for Small Rural Producers*.

The results suggest that the farmers' best bet is to form their own sugarcane processing enterprises. Some farmers, like Don José, already have small *trapiches*, which they operate by hand. But these agroenterprises could generate greater social benefits if they were run by farmer groups. And the processing could no doubt be made more efficient and profitable if these groups had the capacity to conduct their own problem-solving research as well as access to information and other support services.

CIAT and various partner organizations are already developing and testing approaches for forming such groups in Cauca and other parts of Latin America. The big task ahead is to form alliances among local organizations that are committed to replicating the experience of people like José Balcué and supporting the development of farmer-operated agroenterprises. He and thousands of other hillside farmers are eager to test new alternatives for keeping alive the land that provides a livelihood for them and their families.



In memoriam:
Chusa Ginés and Verónica Mera

Two key members of the Cassava Biotechnology Network (CBN), María Jesús ("Chusa") Ginés and Verónica Mera, lost their lives on 28 January 2002, when the commercial aircraft they were aboard crashed into the Cumbal volcano on the border between Colombia and Ecuador.

Chusa, an expert in plant genetic resources who held a PhD in molecular biology, had been CBN Coordinator since 2000. Verónica, who held an MSc in the management of agricultural knowledge systems, was a social scientist with the network, simultaneously working toward a PhD in sociology. Based in Quito, Ecuador, they were en route to CIAT headquarters in Cali at the time of the accident.

Center management and staff as well as colleagues in many partner organizations mourn the tragic loss of these two valued staff members. To their families, we extend our sincere condolences. An endowment fund in their memory is being planned. It will provide scholarships for young women from developing countries to complete studies in the conservation of agrobiodiversity.

New CIAT Web site

CIAT is pleased to announce the launch of its newly redesigned and expanded Web site (www.ciat.cgiar.org). Here are some of the things you can do with information resources available on the site:

- Consult databases on the extensive plant genetic resources of beans, cassava, and tropical forages conserved in the CIAT gene bank and make on-line requests for samples.
- Contact Center plant breeders to obtain improved germplasm of cassava, common bean, tropical forages, and rice.
- Browse the easy-to-use catalog of electronic and print products providing useful tools, methods, and other information relevant to crop improvement and natural resource management. The full text of many recent publications and documents can be downloaded in PDF format.
- Visit the growing collection of CIAT project subsites, which provide further access to finished products as well as a glimpse at research in progress.
- Refer to the highly detailed library subsite, which opens numerous avenues to helpful information, including on-line catalogs, electronic journals, agricultural databases, and other services such as bibliographic searches.

Nicaraguan Community Wins International Award

A project on natural resource conservation at San Dionisio in Nicaragua's Matagalpa Department was awarded during the 48th annual meeting of the Central American Cooperative Program for Crop and Livestock Improvement (PCCMCA).

Under the project farmers in a remote hillside community used a method called "Participatory Mapping, Analysis, and Monitoring of Natural Resources in a Microwatershed" to determine the status of forests, water, and soils both before and after Hurricane Mitch struck the region late in 1998. They then developed an action plan for resource conservation in the areas that had suffered the most damage.

The work was led by CIAT agronomist Jorge Alonso Beltrán, Jairo Morales of Nicaragua's National Agrarian University, and Juan Carlos Zeledón, a farmer and member of the local watershed management association, with support from Canada's International Development Research Centre (IDRC).