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Environmentally Sound Agriculture Is Focus of U.N. Agriculture Briefing

The drive for economic development often overrides concerns for environmental protection. We face a dual challenge: to increase food production and, simultaneously, protect the land for future generations.

Global strategies to help the world "feed, without destroying, itself" were featured in a special briefing on environmental issues of international agricultural research at the United Nations in New York on 1 April. The meeting was organized by the Consultative Group on International Agricultural Research (CGIAR).

"Food production must increase at a rate that will feed twice as many people in 40 years—while preserving our most precious asset, the forests and other natural resources that will sustain future generations," said Dr. Gustavo Nores, CIAT's Director General.

Nores described *resource management research*—a strategy to develop productive and environmentally sound farming systems that protect fragile tropical ecosystems of Latin America that are threatened by agressive land use. "Increasing the productivity of worn-out soils on the deforested hillsides of Central America, for example, will help keep people on the present farmland, so they won't have to clear new areas," Nores said. "That will help protect our precious rain forests."

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The International Center for Tropical Agriculture (CIAT, from the Spanish acronym) is dedicated to the alleviation of hunger and poverty in developing countries of the tropics by applying science to agriculture to increase production while sustaining the natural resource base.

CIAT is one of the 17 international centers sponsored by the Consultative Group on International Agricultural Research (CGIAR), a group of 40 nations and international agencies that fund research for development. The Centers focus on the crops and livestock that provide 75% of the food for the developing world.

Editing and Production

Thomas R. Hargrove	Editor
Alexandra Walter	Assistant Editor
Julio C. Martínez	Design and Layout
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Crop improvement favoring the ecosystem

"For 20 years CIAT has worked to improve production of cassava, field beans, tropical forages, and rice for Latin America," Nores said. CIAT conserves and makes available the world's genetic resources for these crops. Through strategic breeding and research CIAT generates improved genetic populations and knowledge that scientists in national institutions use to develop varieties and technologies for farmers.

"CIAT will continue to work on crop improvement," Nores said, "but complemented by strategic research in resource management on three threatened ecosystems: the deforested hillsides, the forest margins, and the savannas with acid and infertile soils."

"Areas with similar climates, soils, and land use patterns tend to have similar problems and research challenges," says Dr. Peter Jones, CIAT agroecologist. A team of national and international scientists used that principle to define and select the agroecosystems where research is needed most.

"The truth is that social and economic forces drive agricultural development in tropical America," explains Dr. Filemón Torres, CIAT's Deputy Director General for the Resource Management Research Division. "The region has abundant land, but overpopulation in certain areas plus poverty and inappropriate policies are rapidly destroying...forever...the natural resources that make food production possible.

Ecologic, economic, and cultural balance

"We all agree that environmental protection is vital for Latin America's future," Torres says. "But the drive for economic development often overrides that concern." The results: land hunger and social conflict.

"Thus, to slow or stop this encroachment on fragile lands requires technologies that are ecologically stable, economically viable, and culturally acceptable," Torres adds. "They could be generated by a combination of fundamental research knowledge and sound development policies."

"Environmental quality can be compatible with higher farm production," Nores explained to the U.N. group. "The profuse, well-managed vegetation of intensive farming systems covers the soil, reducing erosion and maintaining soil health.

"Farmers in the humid tropics will benefit from technologies that give good crop yields, year after year, plus firewood, fodder, and fiber," Nores explained. Urban consumers should benefit from more produce, at lower prices.

"But humanity is the ultimate beneficiary because less deforestation means a better environment.

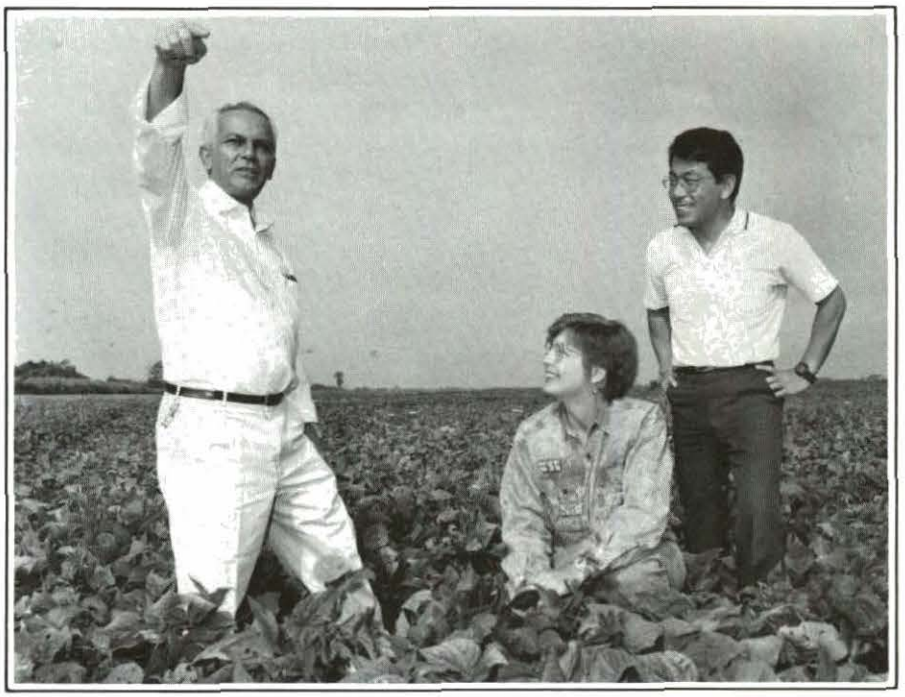
"We must meet a dual challenge: to vastly increase food production while protecting the land we must pass to our children—a heritage for generations yet unborn," Nores concluded in his U.N. address.

by **Margarita Baena**
photo by **Alexandra Walter**

Wild Mexican Bean Protects Crops Without Chemicals

The wild vine looked like a useless weed—and it was. But a U.S. plant collector exploring the rugged hills of southern Mexico by muleback two decades ago recognized it as a primitive bean. Dr. H. S. Gentry, U.S. Department of Agriculture, knew that its genes might be invaluable to future generations, so he saved a handful of the bean's tiny seeds.

Eventually, those seeds arrived at CIAT. The seeds were preserved among relatives—a collection now reaching 26,500 different bean samples in CIAT's Genetic Resources Unit (GRU).



Some 160 experimental bean lines now carry genetic resistance to the Mexican bean weevil. CIAT scientists discuss with enthusiasm the dollar savings for farmers in Latin America and Africa from not having to apply chemical protection against this pest. (From left to right: Cesar Cardona, entomologist; Julia Kornegay, plant breeder; and Masaru Iwanaga, head of the Genetic Resources Unit.)

Neither pests nor pesticides

Today, genes from that wild plant offer nonchemical control of the Mexican bean weevil, a pest that devours 25% of the beans stored in Africa, and 15% in Latin America. Dollar savings to small farmers may reach hundreds of millions annually. And those genes help feed 300 million people—mostly among the world's poorest.

"Environmental savings—by eliminating the need for hazardous pesticides—are harder to measure," says Dr. Masaru Iwanaga, GRU head.

CIAT scientists knew that breeding genetic resistance into seeds that farmers plant is the safest and cheapest way to control insects. From 1977 to 1982, they tested 10,000 domesticated bean types for Mexican weevil resistance. Not one survived attack. Dr. Cesar Cardona, CIAT entomologist, felt that the search was hopeless—and even wrote in a scientific journal that resistance could not be found in cultivated lines.

Why not evaluate the wild ancestors of modern beans? suggested Dr. Daniel Debouck, then CIAT's bean germplasm specialist. The team agreed and fed the weevil the wild Mexican bean collected 20 years earlier. The pesky bug starved to death.

Cardona slept well that night; so would bean farmers worldwide.

Novel protein

Jeanne Romero-Andreas found that the wild bean carried arcelin, a novel protein, as part of her

1986 Ph.D. research at the University of Wisconsin, USA. CIAT and Wisconsin scientists later found that arcelin blocks the insect's digestion, yet has no adverse effects on humans.

The arcelin gene—which made that wild bean resistant—was bred into commercial varieties by Dr. Julia Kornegay and associates in the CIAT bean breeding program. CIAT is now training national program scientists to test and select farm varieties that carry that resistance gene.

"The arcelin gene from the wild Mexican bean has been bred into 160 experimental lines that have been tested in Africa and Latin America," Cardona says. The resistance has been stable across countries.

"Had Dr. Gentry, now 88, not saved those wild seeds, the world might have lost that resistance forever," Iwanaga says. "The rate of genetic erosion—the disappearance or even extinction of plant species—is alarming in Latin America. Wild plants must be collected and securely conserved if we are to develop environmentally safe agriculture."

by **Alexandra Walter**
photo by **Mauricio Antorveza**

Seeds of New Thoughts Become Seeds of Hope for Latin American Farmers

Seeds mean life itself to farmers—seeds of maize, rice, beans. Good seeds may mean a bountiful harvest. Their lack can mean hunger, even starvation.

Scientists have developed improved varieties of most crops that feed the developing world. "But small farmers can seldom get high-quality seeds of either improved or native crops," says Dr. Adriel E. Garay, head of CIAT's Seed Unit.

"There are few or no commercial seed enterprises delivering dependable seeds in developing countries," Garay says. "The situation is serious for people whose breakfast, lunch, and dinner depend on a single crop, like beans in Central America."

"Small seed markets for crops like beans are seldom profitable," says René Velásquez, a Guatemalan farmer who produces and markets bean seeds. His testimony may reflect the thinking of many large seed enterprises across Latin America.

Current situation

Most small farmers must plant whatever varieties are available. They maintain and select seeds with traditional practices passed down from their ancestors, or purchase them in the village grain market just before planting.

Planting such seeds is risky for farmers. The identity and quality of seeds can seldom be assured. Unscrupulous dealers often market inferior seeds as whatever the farmer wants.

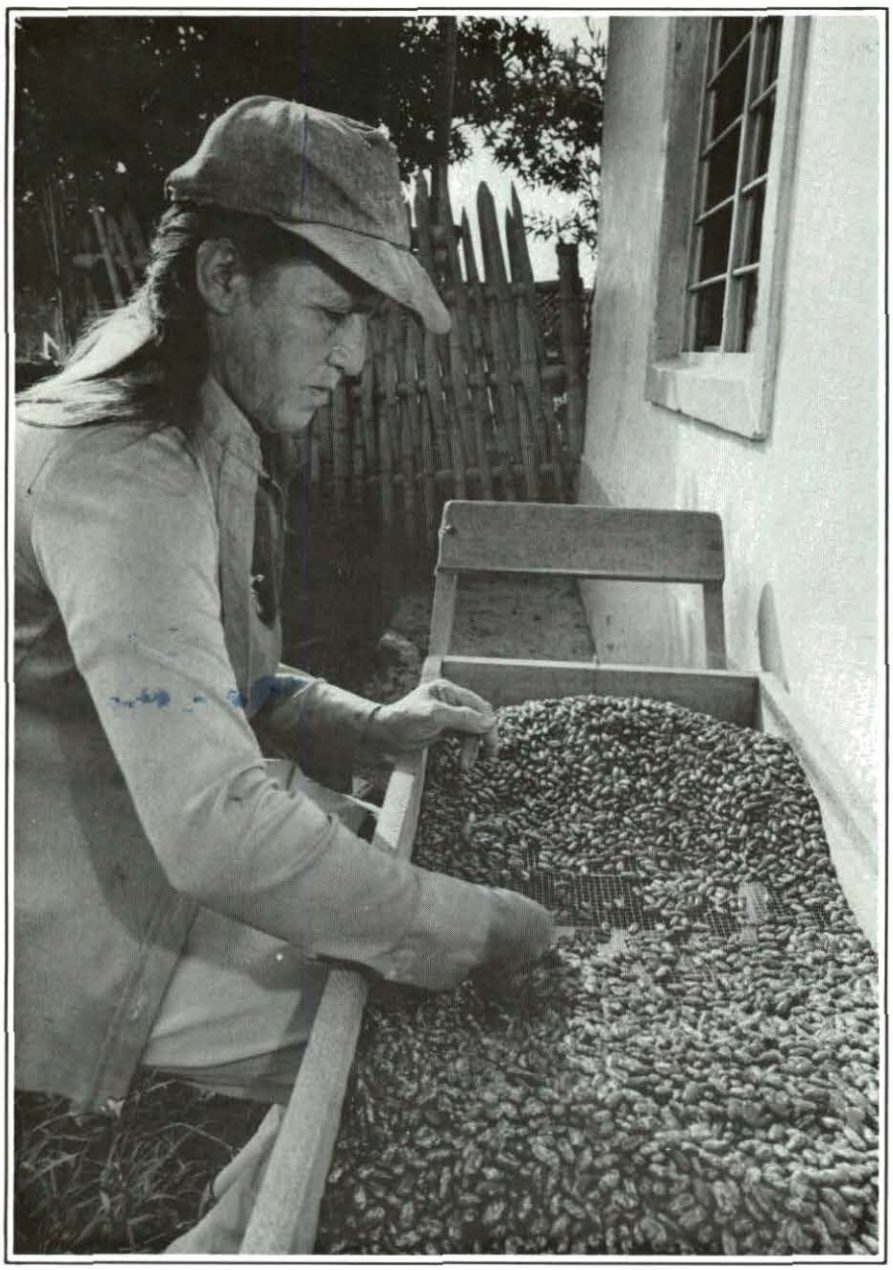
"You buy the seed at your own risk," says Froilán García from Puente Palo, Colombia. He planted 87.5 kg of purchased bean seeds—a bush type, the farmer thought. Only after the crop came up did he learn that it was a climbing bean—worthless for his conditions. García didn't harvest a single bean.

CIAT scientists are searching for ways to solve the problem at the small market level through a cooperative effort among farmers, non-government organizations, national agricultural research systems, and national seed development organizations.

Small seed enterprises

Farmer groups organize to supply seeds for their own crops and for surrounding villages. The farmers test, select, and market acceptable varieties.

"The systems are biodiversity-friendly; they make the best seeds of the best varieties, native or imported, for local conditions available to farmers," Garay says. The labor-intensive systems generate rural employment.



Here, a farmer in Pescador, Colombia, selects bean seeds to supply to surrounding villages and preserve, produce, and distribute seeds of native and improved varieties.

CIAT scientists have trained 58 specialists to promote local seed industries through farmer groups such as *Profrijol* in Central America, *Profriza* in the Andes, and at CIAT with support of the Swiss Development Cooperation. "It is a continuing process," Garay explains. "The trainees' feedback on crop performance and seed production technologies helps CIAT scientists tailor the program, making it more responsive to farmers' needs."

Local farmers plant 36,000 kg of dependable new seeds per year from a 42-person cooperative in Santa Gertrudis, Guatemala. A 23-farmer cooperative in San Gil, Colombia, produced 8000 kg in 1984, but now supplies more than 30,000 kg annually.

"Small seed enterprises can be profitable," says Dr. Jacqueline Ashby, leader of the Pescador Participatory Research Project, funded by the Kellogg Foundation.

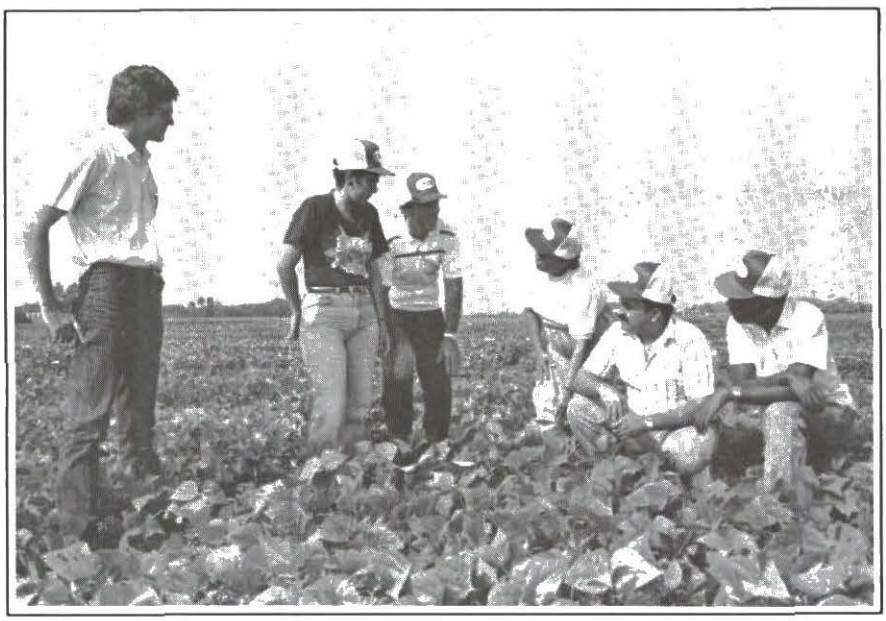
Farmers of the Pescador Seed Enterprise near CIAT headquarters produced 3000 kg in 1990. Three seasons later, the farmers supply 25,000 kg of seed to the local community.

"The message is clear. Small markets do not attract large seed enterprises, but can be profitable for small communities," Garay says. "That's why 20 other small enterprises are being set up from Guatemala to Bolivia.

"The seeds of new thoughts are beginning to germinate," Garay says.

by **Margarita Baena**
photo by **Fernando Pino**

First 'Train the Trainers' Class Graduates from CIAT



Practice in the field allowed participants to apply what they learned in the classroom.

More than 4000 agricultural scientists and extension workers have been trained at CIAT since 1970. Those men and women have returned to their home countries to pass new technology for beans, cassava, forages, and rice on to hundreds of thousands of small farmers.

"But the class that graduated in March, 1992, will have an even greater multiplier effect," says Dr. Vicente Zapata, head of the Training the Trainers Project. "It was trained in how to train other trainers to use the new bean technology."

The new train the trainers courses are part of a strategy through which CIAT is turning over primary responsibility for training of agricultural technicians to national agricultural research systems, or NARS, Zapata explains.

Planning, managing, and evaluating

The trainer group included 24 professionals from Mexico, Central America, and the Caribbean. They learned how to plan, conduct, and evaluate a training course. During the workshop, the trainers learned to develop, adapt, and update teaching materials for local trainers and extension agents.

"The learning materials are tested to see if they really fulfill the proposed objectives, that is, updating the audience," says Zapata. More important, the materials are released to hundreds of extension agents who, in turn, will take vital current information to thousands of farmers.

The needs for continuous updating of scientific information in Latin America are considerable, Zapata says. A special strength of the project, funded by the Inter-American Development Bank (IDB), is that the trainers themselves designed it. Through the bean project about 1000 extension agents will be trained and updated in 5 years.

This is the first case of scientific, technical, and resource *devolution*," Zapata explains. "It shows that the region is now responsible for training its own technicians."

New courses

Two other train the trainers courses are planned. One will train the trainers in new rice technology for the Andean zone. CIAT will update and teach new cassava technology to a third group of trainers from the Southern Cone: Argentina, Paraguay, and Brazil. Each group will train 1000 more extension agents.

by **Claudia Muñoz L.**
photo by **Mauricio Antorveza**

Cassava Conquers New Markets

Cassava has multiple uses: from meat pies to ice cream cones.

The last time you ate an ice cream cone you probably didn't think about cassava, but cassava may have been there. You also may have eaten the starchy root crop with your last meat pie, sweet cookie, or piece of bread.

Cassava is known as the 'neglected crop' because it has seldom been the focus of agricultural research. CIAT has worked not only on improving cassava production, but, since 1980, on developing new uses and markets for cassava products, says Dr. Christopher Wheatley, CIAT cassava quality and utilization specialist.

The idea is: more varied products create more demand, and thus more income for small-scale cassava farmers, who are among the world's poorest. Most cassava is grown on farms smaller than 1 hectare.

"The CIAT Cassava Program develops small-scale processes to generate income for small-scale cassava farmers, farmer cooperatives, and small businesses," Wheatley says. "New cassava products can link farmers to growth markets, such as processed foods."

The four priorities for cassava process and product development are: cassava chips for animal feed; fresh, preserved cassava; cassava flour; and cassava starch.

Cassava chips for animal feed

To make cassava into a better animal feed, CIAT has improved the design of the traditional chipping machine, and developed a better natural drying process, Wheatley explains. CIAT has catalyzed the production and marketing of dried cassava through more than 350 farmer cooperatives and small businesses across Latin America for 10 years. Most are in Colombia, Brazil, and Ecuador. Income and employment generation for small farmers and landless laborers are now rising significantly in those project areas.

Fresh, preserved cassava

Marketing of fresh cassava is complicated because the root is highly perishable, with a shelf life of only 2 to 3 days. CIAT research on deterioration of fresh cassava roots is done

collaboratively with the U.K.'s Natural Resources Institute (NRI).

"A simple storage system based on curing cassava roots in polyethylene bags, with an additional, safe chemical treatment, prolongs storage life to 2 weeks or more," Wheatley says.

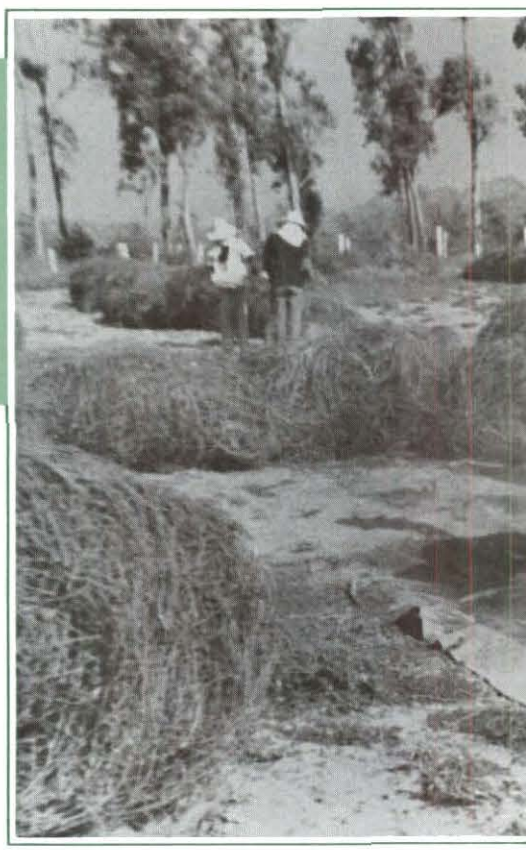
This technology is now used commercially in Colombia. Some wholesalers also supply cassava to shopkeepers in 12-kg polyethylene bags, Wheatley explains. This increases storage life by 2 to 3 days, even with no chemical treatment.

Cassava flour

Cassava flour can replace wheat as an inexpensive flour in food products such as processed meats, sweet cookies, pasta and soup noodles, cakes, spice bases, bread, meat pies, soup mixes, soft sweets, ice cream cones, and sauces, Wheatley says.

CIAT scientists have developed a simple, low-cost cassava flour process that is now being pilot-tested with a small-farmer cooperative in Colombia. Funding is from Canada's International

South American Forage Legume Spreads to China



A wild forage legume from the Colombian Andes has found a new home—halfway around the world, in the tropics of central China.

"The forage legume *Stylosanthes guianensis* had little economic value in its native home, the high, rugged mountains of South America," says Dr. Raúl Vera, leader of CIAT's Tropical Pastures Program. "Too many enemies—insects and fungus diseases—had evolved with the plant over centuries." But German agronomist and plant collector Dr. Rainer Schultze-Kraft learned that the leaves of *Stylosanthes* were loaded with protein, so in 1973 he collected and stored a few grams of its seeds in CIAT's gene bank.

"In 1982, scientists from the South China Academy of Tropical Crops (SCATC) visited CIAT and took seeds of 21 species of Latin American forage grasses and legumes for testing back in China," Schultze-Kraft says. After 3 years of testing in Hainan Province, SCATC researchers Chaozu He and Houming Jiang found that CIAT 184, a selection of *Stylosanthes*, performed superbly. Thus the Latino forage was released under the Chinese name 184-Zhuhuacao.

"Most forage legumes grown in China originated in Australia. They are decimated by forage diseases common to Asia," says Guodao Liu, a scientist at

Development Research Centre (IDRC).

Cassava starch

"Cassava's future is promising as a source of starch for the food, chemical, and pharmaceutical industries," Wheatley says. "But cassava now provides only 4% of the industrial starch used in Colombia."

Besides natural or 'sweet' cassava starch, a traditionally fermented 'sour' starch is also made. It is widely used in **pandebono** and **biscoito**, warm snack breads that are popular in Colombia and Brazil, Wheatley points out. But traditional cassava extraction plants are inefficient, wasting 40% of the root starch.

New technologies to improve the sweet and sour starch extraction processes for the food and other industries have been developed in collaboration with the Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD) of France.

by **Bill Hardy**
photo by **Mauricio Antorveza**

A seed production field of 184-Zhuhuacao in Hainan, China. Chinese farmers harvest as much as 650 kilograms of seed per hectare of the South American forage legume.

SCATC's Tropical Pastures Center.

Multiple benefits

"Chinese farmers like 184-Zhuhuacao because of its high forage production—more than 12 tons per hectare. It also produces bountiful seeds, tolerates local diseases, and is a cheap source of protein for poultry and pigs."

"184-Zhuhuacao has the potential to spread over 8000 square kilometers in the Chinese provinces of Hainan, Yunnan, Guanxi, and Fujian," Liu commented. To meet the demand, Hainan scientists produced 40 tons of seed in 1990, which planted 13,000 hectares, both as a sole crop and intercropped with fruit trees and cassava.

"The rich diversity of tropical flora drew me to the Colombian Andes in 1961," Schultze-Kraft recalls. "But I never imagined that a legume that I collected would be widely accepted by farmers—in China—decades later. Productive use of this Latin American forage in China shows how plants sometimes have uses other than those for which they were originally collected."

by **Alberto Ramírez**
photo by **Dr. Rainer Schultze-Kraft**

New IDB Book Examines Lessons From Latin American Development

Key economic and social policies and programs are being implemented at the grassroots level, often in dramatic fashion, in communities across Latin America. The initiative and innovation of the people and institutions involved are described in Frank Meissner's *Seeds of Change*, recently published by the Inter-American Development Bank (IDB).

Seeds of Change is a book about important themes in small places. In 28 stories about agricultural projects throughout the region, the human face of development is interwoven with important issues such as free trade, women in development, protection of the environment, and marketing.

In El Salvador, women vendors have taken advantage of a new market to form a savings and loan association; in a remote valley in Peru, farmers have switched from cotton to asparagus, which they export to the USA; and in Costa Rica, a small company has developed a way to use the waste from coffee beans into animal feed.

Seeds of Change examines lessons to be learned from the trial and error of development through descriptions of such projects.

The book also describes economic returns from IDB investments in three International Agricultural Research Centers (IARCs) based in Latin America: the International Maize and Wheat Improvement Center (CIMMYT), Mexico; the International Potato Center (CIP), Peru; and CIAT. All three Centers work under an umbrella group, the Consultative Group on International Agricultural Research (CGIAR), a voluntary association of 40 donors. IDB has supported the Centers, through the CGIAR, since 1974.

"Gains stemming from the research system have made foodstuffs more abundant and profitable throughout Latin America and the developing world —the biggest impact the Bank has received for its development dollar, bar none," Meissner wrote.

By the mid-1980s, about half of the professionals in agricultural research in Latin America had received some training at CIMMYT, CIP, or CIAT, Meissner wrote. "From 1985 to 1989, another 4200 professionals participated in IARC training courses."

The late Frank Meissner was an agricultural economist, lecturer and teacher, and creator of the Agricultural Marketing Section of the IDB, where he worked from 1969-1988.

In Latin America and the Caribbean, complimentary copies of *Seeds of Change* are available from the External Relations Office, IDB, 1300 New York Ave. NW, Washington, D.C, 20577, USA. From elsewhere, the book may be purchased for $15.95 from Johns Hopkins University Press, 701 West 40th St., Suite 275, Baltimore, MD 21211, USA (telephone 1-800-537-5487).

Review copies are available from the Bank's External Relations Office.

Rajagopalan Visits CIAT

Dr. Visvanathan Rajagopalan, chairman of the Consultative Group on International Agricultural Research (CGIAR) (third from left, in hat), visited CIAT 12-15 April. In a farmer's cassava field near Pescador are (left to right) Dr. Rupert Best, CIAT Cassava Program Leader; Dr. Jacqueline Ashby, coordinator of CIAT's Farmer Participation Project; Rajagopalan; Benito Cantero, a CIAT-farmer cooperator; Dr. Filemón Torres, CIAT Deputy Director General for Resource Management Research; Michel Petit, World Bank Director of Agricultural and Rural Development; and Dr. Gustavo Nores, CIAT Director General.

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Beans

Snap beans in the developing world (1992)
Technical editors; Henry, G. and Janssen, W.; 366 pages, 15 x 22 cm, perfect bound, paperback;
ISBN 958-9183-28X. Price: Colombia, Col.$ 8000; other developing countries, US$ 13; developed countries, US$ 18.

[a] **Common beans: Research for crop improvement** (1991)
Technical editors:Schoonhoven, A. van and Voysest, O.; copublication with CAB-International; 984 pages, 15 x 22 cm, hard cover;
ISBN 958-9183-24-7.Price: Colombia, Col.$ 28000; Latin America, the Caribbean, and Africa, US$ 42.

[b] **CIAT African Workshop Series No. 9.** Quatrieme Seminaire Regional sur l'Amelioration du Haricot dans la Region des Grands Lacs, Bakavu, Zaire, 21-25 November 1988.

[b] **CIAT African Workshop Series No. 10.** National research planning for bean production in Uganda: Makerere University, Kampala, Uganda: January 28-February 1991.

Bibliografías nacionales. Frijol en América Central y el Caribe (1990) 244 pages, 15 x 22 cm, perfect bound, paperback; ISSN 0121-1706. Price: Colombia, Col.$ 3000; other developing countries, US$ 5; developed countries, US$ 6.

Cassava

Mejoramiento genético de la yuca en América Latina (1991)
Technical editor: Hershey, C. H.; 430 pages, 15 x 22 cm, perfect bound, paperback; ISBN 958-9183-16-6. Price: Colombia, Col.$ 8500; other developing countries, US$ 17; developed countries, US$ 23.

Cassava utilization in animal feed: Supplement 1989 (1990). (Also available in Spanish)
Compilators: Best, R. and Menéndez, L; 134 pages, 15 x 22 cm, perfect bound, paperback; ISBN 958-9183-21-2. Price: Colombia, Col.$ 3000; other developing countries, US$ 5; developed countries, US$ 6.

National bibliographies. Cassava in Asia: East and Southeast Asia (1990) 482 pages, 15 x 22 cm, perfect bound, paperback; ISSN 0121-1706. Price: Colombia, Col.$ 5000; other developing countries, US$ 8; developed countries, US$ 10.

National bibliographies. Cassava in Asia: South Asia (1990) 304 pages, 15 x 22 cm, perfect bound, paperback; ISSN 0121-1706. Price: Colombia, Col.$ 3000; other developing countries, US$ 5; developed countries, US$ 6.

Rice

A simplified crossing method for rice breeding: A manual (1991)
Author: Sarkarung, S.; 34 pages, 11 x 18 cm, perfect bound, paperback; ISBN 958-9183-33-6. Price: Colombia, Col.$ 2000; other developing countries, US$ 4; developed countries, US$ 5.

Tropical Pastures

Establecimiento y renovación de pasturas: Conceptos, experiencias y enfoque de la investigación (1991)
Technical editors: Lascano, C. E. and Spain, J. M.; 426 pages, 15 x 22 cm, perfect bound, paperback;
ISBN 958-9183-26-3. Price: Colombia, Col.$ 6000; other developing countries, US$ 10; developed countries, US$ 12.

[a] **A world list of fungal diseases of tropical pasture species** (1990)
Author: Lenné, J. M.; copublication with CAB-International; 164 pages, 18 x 24 cm, perfect bound, paperback; ISBN 0-85198-674-9. Price: Colombia, Col.$ 17000; Latin America and the Caribbean, US$ 26.

***Centrosema*: Biology, agronomy, and utilization** (1990)
Technical editors: Schultze-Kraft, R. and Clements, R. J.; 668 pages, 15 x 22 cm, perfect bound, paperback;
ISBN 958-9183-12-3. Price: Colombia, Col.$ 11500; other developing countries, US$ 24; developed countries, US$ 30.

Other Topics

Evaluating technology with farmers: A handbook (1992).
(Also available in Spanish and French)
Author: Ashby, J. A.; 96 pages, 21 x 27 cm, perfect bound, paperback; ISBN 958-9183-29-8. Price: Colombia, Col.$ 3100; other developing countries, US$ 6; developed countries, US$ 8.

Farmer evaluations of technology: Methodology for open-ended evaluation. Instructional Unit No. 1 (1991). (Also available in Spanish)
Authors: Quiros, C. A.; Gracia, T.; and Ashby, J. A.; 92 pages, 21 x 27 cm, perfect bound, paperback;
ISBN 958-9183-31-X. Price: Colombia, Col.$ 3100; other developing countries, US$ 6; developed countries, US$ 8.

Gender analysis in agricultural research (1991). (Also available in Spanish)
Editors: van Herpen, D. and Ashby, J. A.; 104 pages, 21 x 27 cm, perfect bound, paperback; ISBN 958-9183-36-0. Price: Colombia, Col.$ 3100; other developing countries, US$ 6; developed countries, US$ 8.

Cultivo de tejidos en la agricultura: Fundamentos y aplicaciones (1991)
Technical editors: Roca, W. M. and Mroginski, L. A.; 976 pages, 15 x 22 cm, perfect bound, paperback;
ISBN 958-9183-15-8. Price: Colombia, Col.$ 15000; other developing countries, US$ 24; developed countries, US$ 30.

[a] Customers in countries other than those listed must send orders to: CAB-International, Wallingford, Oxon OX10 8DE, United Kingdom.

[b] Not avaliable from CIAT in Colombia. Send orders to: Regional Coordinator, SADCC/CIAT Regional Programme on Beans in Southern Africa, P.O. Box 2704, Arusha, Tanzania; Regional Coordinator, CIAT Regional Programme on Beans in Eastern Africa, P.O. Box 67, Debre Zeit, Ethiopia; Coordinateur Regional, CIAT, Programme Regional pour l'Amelioration du Haricot dans la Region des Grands Lacs, B.P. 259, Butare, Rwanda.