CIAT Goes Public

CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

The International Center for Tropical Agriculture (CIAT, its 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 18 international agricultural research centers sponsored by the Consultative Group on International Agricultural Research (CGIAR).

The core budget of CIAT is financed by 19 donor countries, international and regional development organizations, and private foundations. In 1993, CIAT donors include the governments of Australia, Belgium, Canada, China, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom, and United States. CIAT donor organizations include the European Economic Community (EEC), the Ford Foundation, the Inter-American Development Bank (IDB), and the World Bank.

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Hard new financial realities mean that CIAT must focus more communication resources on increasing public awareness. We must show our investors, and the informed public, what we are accomplishing, and what we *can* do to catalyze agricultural production and social equity, while conserving our natural resources.

This is a change of direction for CIAT; in the past, we purposely kept a low profile. But today, those that invest in sustainable agricultural development through CIAT want us to inform the public of the role that we play in the future of this planet. They started the International Agricultural Research Centers, and consider the system an effective mechanism to improve the lives of hundreds of millions of the world's poorest people. But our donors know they will have a hard time increasing our funding in the future. There is much competition for scarce overseas development assistance from the former Eastern European block, the Middle East, and other important programs. Thus, the donors want us to create an environment that is conducive to attracting new sources of funds.

CIAT increased its emphasis on public awareness significantly in 1992-93. We now send about 30 press releases a year to 800 outlets, half in English, half in Spanish. We've recently been in the *Washington Post* and *Los Angeles Times*, the *Frankfurter Allgemeine*, *Asahi* in Tokyo, the *New Scientist* and the *London Financial Times*, *The Sidney Morning Herald* in Australia.

CIAT is also the focus of two recent international TV programs. CIAT press releases triggered both productions.

Kurtis Productions produced *Super Seeds*, a 28-minute documentary on CIAT research on nonchemical pest control of beans and cassava for the U.S. television series "The New Explorers." More than 300 Public Broadcasting Stations in North America have aired the program. The Swiss company Becker Audiovisuals produced another show on CIAT's bean program for world broadcast, in six languages, on the educational series "Fruits of the Earth."

We also produced our own 27-minute video, *A Fragile Paradise: The Environmental Challenge* of *Tropical America*. The English edition has been broadcast on at least 40 North American TV stations. The Spanish edition has aired on about 20 stations. We are now making a second video, focusing on CIAT programs of sustainable agriculture in the South American savannas, and how they can help relieve pressures on the rain forests.

We initiated *CIAT On-Line*, a series of two-page bulletins, each with five or six summaries of CIAT research highlights. *On-Line* is targeted to our investors, current and potential. We stress the support of specific donors, so their information gatekeepers can easily rewarm and send items to their own supporters.

CIAT Goes Public is a compilation of selected clippings that represent CIAT coverage in the world media.

Tom Hargrove

Thomas R. Hargrove
Editor and Head
CIAT Communications Unit

The Washington Post 9 August 1993

SCIENCE
NOTEBOOK

Agriculture: Whipping Up a Low-Tech Pesticide

Put 12 fat caterpillars in a kitchen blender with some water and run the machine for a minute. The "green milkshake" that results is the most effective pesticide yet devised for controlling one of the most serious pests of cassava, a root crop that feeds 500 million of the world's poorest people. This recipe makes enough to treat 2½ acres—plenty for the average small farmer.

The pest is the cassava hornworm and the secret ingredient in the green goop is a virus that infects and kills only that worm.

It is a low-tech solution that grew out of high-tech studies among the International Center for Tropical Agriculture (CIAT) in Cali, Colombia, the Boyce Thompson Institute for plant research at Cornell University and the Empresa de Pesquisa Agropecuaria de Santa Catarina, a Brazilian research program.

All a farmer has to do when an infestation starts is collect hornworms infected with the virus (they are easy to spot because they swell up like balloons), whip up a "milkshake" and spray it on the plants. The virus easily survives the blender and remains dormant on the leaves, waiting to be swallowed by a healthy hornworm.

Two to five days after eating viruses, the hornworms die. A typical spraying, according to a CIAT report, kills 60 percent to 100 percent of the worms. Notably, according to CIAT entomologist Antonio Belloti, the technique does no harm to friendly insects such as wasps that parasitize other cassava pests.

—Boyce Rensberger

Also ran:
St. Louis Post Dispatch September 6, 1993
International Herald Tribune (Paris) August 12, 1993

The Washington Post 1 February 1993

SCIENCE
NOTEBOOK

Agronomy: Planting Rice to Save the Rain Forest

Agricultural researchers in Colombia have developed a rice variety that they say could help discourage South American farmers from clearing more Amazon rain forest to create pasture for cattle.

The rice is the first variety that grows well in the poor, unirrigated, acid soils of the grassy savannas that surround the rain forest, land that is now used mainly as pasture.

Because the pasture is relatively poor, however, it cannot feed as many cattle as land with lusher growths of grass. But since demand for beef is growing, there is economic pressure to cut down more forest for pasture. →

The idea behind the new rice variety is that it can be planted along with grasses and legumes for foraging. Four months later, the rice is harvested and the field opened to grazing. After subtracting the cost of fertilizer and other inputs for the rice, the harvest still makes a profit.

At the same time, the residual fertilizer makes the pasture so much richer that it can support six times more cattle per acre.

The rice and the new farming system were developed at the International Center for Tropical Agriculture in Cali and described by the center's director general, Gustavo Nores, at the IFPRI symposium cited above.

Nores said the rice variety is being grown on about 15,000 acres of Colombia's eastern savannas and that the once-sandy soils are becoming richer in organic material and microbial life.

Nores said the scheme could be extended to 500 million acres of overgrazed savanna, an area that is being enlarged by more than 4 million acres a year through forest clearing.

Because the increased profitability of the rice-pasture system might encourage more forest cutting, Nores recommended that governments enact and enforce land-use laws to discourage the practice. If that happened, he said, the forests could be saved even as food production is increased.

—B.R.

Los Angeles Times 30 January 1993

Global Food Shortage Looms, Experts Say

By DONNA K. H. WALTERS
TIMES STAFF WRITER

Unless more attention—and money—are focused on agricultural research and conservation, the tragic famine in Somalia will seem "infinitesimal" compared with the massive food shortage the world will face by the end of the decade, leading agricultural researchers warned Friday at a symposium in Washington on food, poverty and the environment.

Even as a United Nations-led network of research centers begins work with relief agencies on the difficult process of restoring Somalia's devastated agricultural system, other scientists in the network are focusing on farming techniques and crops designed to safeguard and enhance the world's vulnerable food supplies.

At the symposium, which drew agriculture experts from around the world, announcements of progress in farming techniques and crop breeding were the hopeful spots amid dire predictions that by the year 2000, the annual shortfall in food needed to feed the world's hungry could climb to 90 million tons—eight times the shortage that exists in sub-Saharan Africa today.

"In eight years, sub-Saharan Africa will have a shortfall of 50 million tons, and there's no way they can afford to import that much food," said Per Pinstrup-Andersen, director general of the International Food Policy Research Institute, which sponsored the symposium.

Dramatic improvements in crop yields will be needed in the next 20 years to stave off disastrous starvation, Pinstrup-Andersen said. A 40% increase in production per acre is possible, he said, but not if the worldwide network of agricultural research centers continues to be starved for funds.

> 'In eight years, sub-Saharan Africa will have a shortfall of 50 million tons.'
>
> PER PINSTRUP-ANDERSEN
> *Agricultural researcher*

Annual international assistance to developing countries for agricultural programs fell to $10 billion from $12 billion during the 1980s, and individual governments' support for their own research and conservation programs has fallen even more sharply.

Key advances in production of rice, the staple food for 1.5 billion people in developing countries, were announced by Gustavo Nores, director general of the International Center for Tropical Agriculture in Cali, Colombia.

Nores said the center has developed a "rice-pasture" farming technique for use on savannas that could ease encroachment into Amazon rain forests. The system uses a new rice that can be grown on grassland used for cattle grazing.

In addition, a team of scientists from the Colombian center and Purdue University has made what could be a significant breakthrough in conquering rice blast, a disease that has long frustrated researchers, Nores said.

Such advances often rely on stores of seeds and plant materials in "seed banks" throughout the world. Many of those stores are increasingly endangered, the symposium was told.

The situation is grave at the Vavilov Institute in St. Petersburg, Russia, the grandfather of all seed banks and once the most important collection of plant materials in the world. Seed collections throughout Eastern Europe are also in dire straits, said Geoffrey Hawtin, director general of the International Board of Plant Genetic Resources.

"These governments are so strapped for cash, they're talking about staff cuts of 20% to 70%," Hawtin said.

Des Moines Register January 31, 1993
Los Angeles Times (not Orange County ed.) January 30, 1993
Lansing State Journal January 30, 1993
Harrisburg Patriot February 1, 1993
Hartford Courant January 30, 1993

In brief

Roots for the rain forest

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The rice and the new farming system were developed at the International Center for Tropical Agriculture in Cali. The center's director general, Gustavo Nores, described the new system at a symposium in Washington of the International Food Policy Research Institute.

Nores said the rice variety is being grown on about 15,000 acres

Financial Times, England 15 May 1993

Green shoots appear on Colombia's arid savannahs

John Madeley reports on a rice pasture experiment that is yielding dramatic results

THE FARMER looked bemused as he looked out on rice growing on flat savannah land in eastern Colombia. "It's too good to be true," he said.

Crops are a rare sight in the infertile and acid soils of South America's huge savannah lands, which cover almost half the continent's agricultural area and are particularly extensive in Brazil, Colombia and Venezuela. Although traditionally used for cattle ranching, the native savannah make poor pasture.

But ten years of research at the International Centre for Tropical Agriculture, in Cali, western Colombia has led to the development of a rice variety that grows in savannah soils. This could open the way for a substantial increase in both crop and livestock production on savannah lands, one of the last areas in the world not exploited by farmers.

The centre's researchers now believe that the savannahs can sustain rice-pasture farming and that crops can be grown for the first time on up to 240m hectares (600m ha) of savannah land – larger than the area of sub-Saharan Africa under food crops.

"The savannahs represents most of the area in the world that can be expanded for agriculture," says scientist Mr Richard Thomas.

With rice-pasture agriculture, farmers plant their rice and pasture at the same time. After preparing and fertilising the land, they plant the rice in rows and scatter the pasture seeds, a mixture of improved grasses and legumes. Farmers harvest the rice after three to four months and then graze cattle on pasture.

"The legumes pull nitrogen from the air, thus acting as a free nitrogen fertiliser," explains Mr Thomas. He estimates that they effectively provide between 40 and 80 kg of nitrogen per hectare a year.

For the first farmers in Colombia who tried the new system in 1992, results were dramatic. In all, some 4,000 hectares of savannah were planted with the improved grasses, legumes and rice. The unirrigated rice – adequate rainfall makes irrigation unnecessary – yielded an average of 3.1 tonnes a hectare.

In turn the quality of the pasture has been improved both by the new grasses and legumes and by the fertiliser that remains after producing rice; this means that farmers are able to increase the numbers of cattle on their land. Where they might have previously stocked one cow to every 10 ha, they can now start to think in terms of two animals a hectare – a 20-fold increase.

The cattle also gain weight faster on rice-pasture land. Whereas farmers previously waited two years before taking their cattle to market, the centre's scientists are hopeful that they will now be able to sell within 15 or 16 months. Although there are large farms on the savannah lands, there are also many smallholders with between 100 and 200 ha who make only a meagre living on the poor soils. By changing to rice-pasture they can grow a crop, which they have not done before, keep substantially more cattle and make their farms profitable.

There are also environmental benefits. Many savannah pastures are over-grazed and the system could help to recover these lands and help to ensure they are farmed on a sustainable basis. Mr Thomas believes that it could also be used in some Amazonian forest lands that have been badly damaged by indiscriminate logging.

The centre's scientists stress that savannah soils are poor and that rice should not be planted continuously – "for no more than three or four years", says agronomist José Ignatio Sanz. Farmers should then leave the land purely for pasture for several years before growing rice again.

Nor should rice be planted on its own on savannah land. If the new rice variety is grown in monocropping fashion on the savannahs, it may produce well in the first year, but yields will be down to almost nothing by the third.

"We want farmers to understand that the system is fragile," says plant breeder Mr Elcio Guimaraes.

New Scientist, England 31 July 1993

31 July 1993 No1884 Weekly £1·50
ISSN 0262-4079
NewScientist

Taming wild peanuts brings life to poor soil

WILD peanuts have suddenly become a highly sought after commodity. Agronomists around the world have begun to squirrel them away in an effort to save some South American species from extinction.

The American peanut industry started the campaign to save the peanut because it wanted to save pest or disease-resistant wild species that could prove useful to commercial peanut breeders. But researchers are also finding that taming wild peanuts and introducing them as a pasture crop may help to enrich and stabilise fragile tropical soils.

The cultivated peanut is *Arachis hypogaea*, which must be replanted each year. But wild peanuts, which are indigenous to Brazil, Argentina, Uruguay, Paraguay and Bolivia, are hardy perennials. There are some 80 known species of wild peanut, more than 60 of them native to Brazil.

T. Morrison/South American Pictures

Peanut power: wild species are tougher than the cultivated nut

Perennial peanuts produce a dense mat of vegetation which is rich in proteins and minerals. The International Center for Tropical Agriculture (CIAT) in Colombia has found that bullocks which graze on a pasture of the perennial peanut *Arachis pintoi*, mixed with native savannah grasses, gain 20 times as much weight as bullocks that graze on grass alone. "Perennial peanuts have very high quality as forage, as high as white clover or alfalfa in the temperate regions," says Brigitte Maass, a specialist in tropical forage at the CIAT.

The perennial peanut is well adapted to the poor acid soils of the tropics, and prevents erosion because it has such a tenacious hold on even heavily grazed pastures.

Peanuts are already widely used in Latin America as a "cover crop", grown among commercial crops including coffee in Colombia and bananas in Costa Rica. The peanuts fix nitrogen in the soil, and help to prevent weeds from gaining a foothold because they cover the soil so well.

Rapid development and the conversion of pasture into crops of soya beans is threatening some species of wild peanut, particularly in Brazil and Paraguay.

Susan Katz Miller

New Scientist, England 19 June 1993

Raising rice in the savannas

Few farmers once bothered with the savannas of South America for anything other than cattle raising. Now they have begun to grow rice on the continent's grassy plains

John Madeley

CROPS are a rare sight on the vast savannas of eastern Colombia. Farmers who try to cultivate the grassy plains, even the river banks, often give up in despair. Infertile, acidic, sandy soils seem to make the land fit only for pasture. And even then, the cattle must be well spaced to avoid damaging this fragile soil—no more than one cow every 10 hectares is the norm.

But now the farmers have good reason to try again. Last year,

a variety of rice developed especially for the conditions grew for the first time alongside pasture grasses and forage plants on 4000 hectares of this unpromising land. It also improved the quality of the pasture, and the density of cattle rose twentyfold. If this success is repeated across South America, the breakthrough would exploit one of the last areas in the world that can be expanded for agriculture and would provide more food for a continent suffering considerable malnutrition.

South America has some 243 million hectares of savanna, which, though barely half the area of land currently used for agriculture, is more than four times the size of France and larger than the total area under cultivation in sub-Saharan Africa. Besides Colombia's eastern plains, Llanos Orientales, the continent's savanna lands cover the Brazilian Cerrados, the Venezuelan plains and some of Argentina, Bolivia, French Guiana and Paraguay. Typically, the acid soils are well drained but contain too little phosphorous, calcium, magnesium and potassium, and too much aluminium.

Overcoming these drawbacks was the task of the International Centre for Tropical Agriculture (CIAT) in Cali, a provincial city about 300 kilometres south west of Bogotá. CIAT, founded in 1967, is one of 18 aid-funded research centres that make up the worldwide Consultative Group on International Agricultural

South American Pictures

Research. Under the Tropical Pastures Programme, which CIAT has run since its first day, researchers at the Colombian centre worked at three levels to find a way of using the savannas for sustainable pasture and crops. They looked for new varieties of pasture grasses to improve the quality of the grazing for animals, for legumes to increase the fertility of the soil, and for crop plants to cultivate for food.

Out of Africa

At its Carimagua research station in the heart of eastern Colombia's savanna lands, CIAT evaluated and selected pasture grasses of the genus *Brachiaria*. Originally from Africa, these are known to adapt well to low fertility and acid soils although they are susceptible to damage by the larvae of froghoppers—known as spittlebugs because of the frothy fluid the larvae secrete around themselves for protection. Among the grasses selected were *B. decembens*, which offers good nutritional value, and *B. dictyoneura*, which is partly resistant to froghoppers.

But previous attempts to upgrade savanna pastures by sowing improved grasses have led to a decline in the soil's fertility. So CIAT decided to combine the grasses with legumes, whose roots harbour bacteria that absorb nitrogen from the air and convert it into soluble nitrates, an important nutrient for plants.

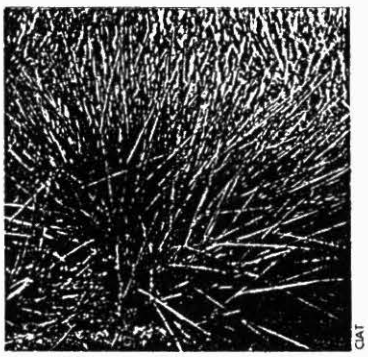
Researchers at the centre screened more than a thousand species of tropical legumes to find ones suited to the savannas, but which would not be so vigorous that they killed the grass. One of the most promising, *Arachis pintoi*, is known as tropical white clover, although its flowers are yellow and it is not a clover. Indigenous to Brazil, *A. pintoi* is a perennial legume that produces a dense mat of horizontal stems, known as stolons, which run along the surface of the soil and produce numerous roots and shoots so that the plant spreads quickly. "*A. pintoi* seems to contribute enormously to the quality of the grass and to animal production," says Indupulapati Rao, a plant nutrition physiologist at CIAT.

Richard Thomas, also from the centre, specialises in the nitrogen cycle and estimates that legumes such as *A. pintoi* provide between 40 and 80 kilograms of nitrates per hectare a year. Legumes give savanna farmers two advantages: they reduce the need for nitrate fertiliser and improve the quality of grazing land by adding organic matter to the poor soil as their foliage dies and rots.

Thomas says that in tests at Carimagua over a nine-year period, from 1978 to 1987, cattle on grass-legume pastures increased their weight by 50 per cent more than those on grass-only pasture. Measurements of milk production, carried out in wet and dry seasons and with cows at different stages of lactation, showed that cows on grass-legume pastures produced 20 per cent more than those on grass-only pastures.

But investing in improved pasture may still be uneconomic for some farmers if the only benefit is a more productive herd of cattle. To make the investment worthwhile, these farmers need to be able to harvest a crop as well. With this in mind, the Inter-American Development Bank provided CIAT with funds to develop a crop-pasture system for the savannas. After testing a number of crops, rice emerged "as a clear winner", says Elcio Guimarães, a plant breeder at the centre.

One of the problems of finding a rice for savannas is that, although the crop grows in a wide range of soils, acid soils are usually not conducive to its growth. (Farmers have succeeded in growing rice on Brazilian savannas but only after heavy use of chemicals, such as lime, to reduce acidity.) CIAT, as part of the Rice Programme that it has also been running since 1967, began by selecting varieties that had been developed for upland areas in the 1980s by the International Institute of Tropical Agriculture in Nigeria and the Paris-based Tropical Agronomical Research Institute (IRAT). These varieties will grow without the flooding that is necessary for irrigated varieties grown in



CIAT

Good for grazing: the pasture grass *Brachiaria dictyoneura*, which originated in Africa

paddy fields, and are common in Latin America and Africa.

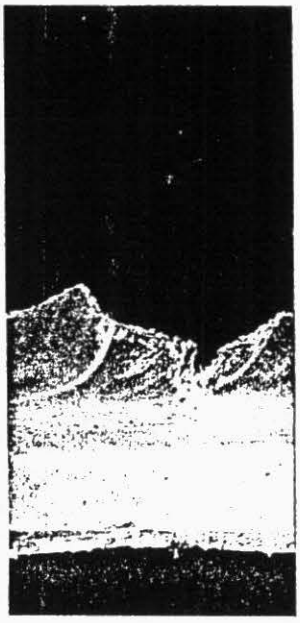
Upland rices have some tolerance to soil acidity and disease, but they are susceptible to the brown planthopper pest and are inferior in quality to the irrigated varieties. IRAT has developed upland varieties for Madagascar that produce a better quality of rice and have some resistance to the planthopper, but they are sensitive to the acidity of the soil and susceptible to the fungus, rice blast, which is one of the most serious rice diseases.

So CIAT crossbred the most promising varieties and, in the late 1980s, developed rice types that are partly resistant to the planthopper. Eventually the research led to the development of *Oryzica sabana 6*, which was released to farmers in late 1991 by a government agency, the Colombian Agricultural and Livestock Institute. In eastern Colombia last year, farmers turned over about 4000 hectares of their savanna—between 300 to 600 metres above sea level—to rice-pastures. Researchers say the first-year results are highly encouraging.

Under the system, farmers plant their rice and grass-legume pasture at the same time. In May, after preparing and fertilising the land, they plant the rice in rows and scatter the mixture of improved grasses and legume seeds. Last year, farmers harvested the rice after three to four months and then grazed cattle on the pasture. Adequate rainfall, equivalent to about 1500 millimetres a year, made irrigation unnecessary, and the rice yielded about 3 tonnes per hectare—three times the normal yield for an upland rice. CIAT estimates that farmers need to obtain 2 tonnes of rice a hectare in the first year to recover the initial costs of establishing a rice-pasture system.

Froghoppers: the larvae attack *Brachiaria*

Frieder Sauer/Bruce Coleman



Cut and carry: *Brachiaria* grasses are vulnerable to leafcutter ants that cut and remove vegetation

David C Houston/Bruce Coleman

Some farmers are seeing the rice-pasture system chiefly as a means to raise livestock production. "We have planted 450 hectares of rice and *Brachiaria dictyoneura*," said an assistant on a cattle-raising farm in eastern Colombia, "but intend to remain cattle raisers." The farm had adopted the new system because it wanted "higher quality pastures to grow more and better cattle on less land".

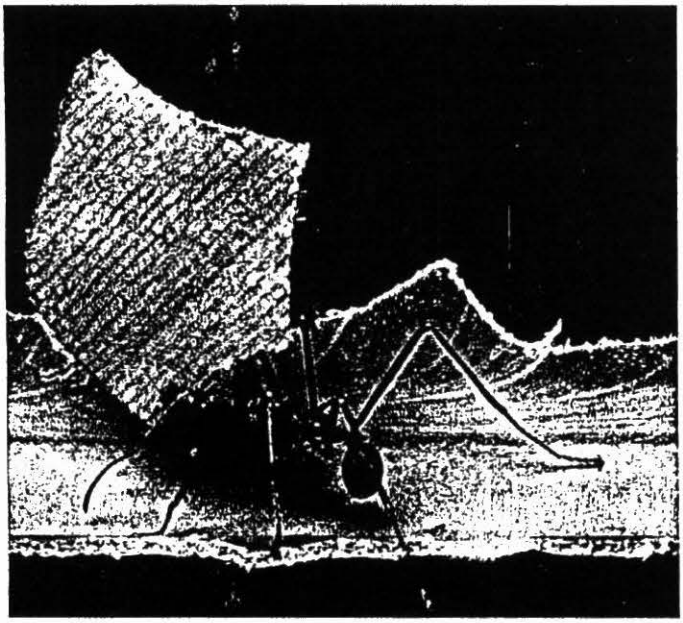
Farmers found that the pasture grew faster because of the small quantities of fertiliser they used for the rice. Normally it takes about a year to establish improved pasture but the period reduces to four or five months when rice is planted. The pasture is also richer, allowing the density of cattle to be increased. Farmers who could once stock their land with only one cow every 10 hectares are now thinking in terms of two animals per hectare. They also found that cattle put on weight even faster when grazed on land where rice has just grown, because of the richer grass. Under the grass-legume regime, farmers waited two years before taking their cattle to market; now they may be able to sell the animals within 16 months.

Quality crop

The only drawback for the farmers who grew rice in 1992 was its quality. *O. sabana 6* is considered equivalent to upland rice in quality, which sells for about 30 per cent less than irrigated rice. The Rice Programme has recently developed a new variety for the savannas, *CT 10037*, which the centre will release to farmers this year. The new variety yields 10 per cent more rice than *O. sabana 6*, and gives a grain quality that should fetch around the same price as irrigated rice.

CIAT is keen to emphasise that rice will not succeed in poor savanna soils if it is grown alone. Tests by the centre with monocropping, where no grass-legume pastures were sown, show that rice yields are good in the first year on savannas, drop considerably in the second year, and are down to almost nothing in the third. Even when a grass-legume pasture is sown, rice should not be grown continuously: "No more than three or four years," says José Ignacio Sanz, coordinator of CIAT's rice-pasture project. He stresses, however, the variability of the time limit: "It all depends on management—land preparation, fertilisation, weed infestation, pest incidence and so on." Farmers might think in terms of having up to half their land under rice-pasture at any one time and half under pasture only.

Sanz believes that the rice-pasture system is not only profitable but also protects the environment. Using savanna in this way helps to maintain soil fertility, as nutrient recycling is generally efficient. "Continuous monocropping is avoided," he says, "and we don't need a lot of land preparation that leads to



erosion, or heavy pesticide and fertiliser use." This also helps to reduce the amount of chemicals leaching into groundwater. If agricultural productivity from savannas can be increased by this rice-pasture system, there would also be less pressure to clear forests for growing crops or rearing cattle.

Nonetheless, there is a danger that farmers with large holdings of savanna, or people with money to buy land, will believe there is a killing to be made out of growing rice on the savannas and will try to cultivate it in monocropping fashion. This could ruin the already fragile savannas. "Farmers in the area are excited by the realisation that they can grow rice on the savannas, but we want them to understand that the system is fragile," says Guimarães.

Froghoppers and leafcutter ants pose another problem. Many *Brachiaria* grasses are susceptible to attacks by froghoppers, and also to leafcutter ants that cut and carry away pieces of vegetation to use as fertiliser for the fungus on which they feed. One species, *B. brizantha*, is "highly resistant to froghoppers, but more demanding in soil fertility," says Stephen Lapointe, an entomologist at CIAT. Within a few years of sowing this grass, the soil becomes very impoverished. The centre now has a major breeding programme under way with a number of species including one from Brazil, *B. ruziziensis*, which also has a reputation for good nutritional quality.

The search for a grass that is resistant to leafcutter ants is less advanced, but the problem can be alleviated by tilling the land thoroughly, which destroys their nests.

Breeding for tolerance and, ultimately, resistance to pests and disease is seen by CIAT scientists as vital in view of the price of insecticides and their environmental side effects. The Colombian government has eliminated subsidies for agrochemicals over the past two years, and this has encouraged the search for natural methods of pest and disease control.

Weeds have also emerged as a problem in tests. The complex and irregular distribution of the various species on the savannas means that chemical control with weedkillers is not possible. The rice-pasture team is now concentrating on methods of preparing the soil that will check the growth of weeds.

Crop searching

The Tropical Pastures Programme is continuing its research on identifying and developing legumes that, when grown as part of a rice-pasture system, could help to increase the sustainable fertility of the savanna soil. Lapointe says *Stylosanthes capitata* is particularly suitable, having an "excellent adaptation to very low fertility acid soils, particularly light-textured soils" such as the sandy soils of the savanna. Research is also continuing on other crops that could grow in South American savannas, including maize, sorghum and soya bean. "Savannas are very underutilised," says Sanz.

While CIAT's rice-pasture system could not be applied directly to savannas on other continents or agroecosystems because of the differences in soil composition, the principles of crop-pasture integration and the research behind it could be useful. Africa has tropical savannas similar to those in South America, many of them in the dry Sahelian zone, which lies to the south of the Sahara.

CIAT

Clear winners: rice, pasture grass and legumes can grow well together

In South America itself, the rice-pasture system could help to alleviate poverty among farmers with small holdings in the savannas. Many farms are between 100 and 200 hectares, which means they can keep a maximum of only 20 cattle and grow no crops. With a rice-pasture system, farmers can keep more cattle, grow and sustain a crop, and make a profit.

But the limited pace of land reform in South America means that the continent's vast estate farms still thrive. At least some of the rice, extra meat and milk produced under rice-pasture, especially on large farms, is likely to be exported and make little contribution to alleviating hunger and poverty. For the many landless and urban poor of the continent, who cannot afford the fruits of science, it is by no means certain that the system will bring any benefits. □

John Madeley *is a freelance writer.*

Looking upwards to grow more beans

People in the Great Lakes Region of central Africa—Burundi, Rwanda and western Ziare—are very fond of their beans; on average they eat 50 kilos of beans a year each. They eat bean leaves, green beans and fresh bean seeds as intermediary foods between dry bean harvests.

The bush beans of the area, often grown under bananas, give some of the highest yields in the world. But with populations growing, and little or no new land to grow beans, output needs to increase. And to do that, farmers are looking upwards.

The regional office of the International Centre for Tropical Agriculture has helped to develop climbing beans, that grow climbing upwards on stakes. "Farmers who grow climbing beans can almost double their yields compared with traditional varieties. Whereas bush beans might yield around 700 kilos per hectare, the new climbing beans can yield as much as 1,400 kilos a hectare in the same area", says CIAT plant breeder, Julia Kornegay. And climbing beans are often more tolerant of disease.

The most favoured climbing bean is known as Umubano. Originally introduced by CIAT from Mexico this has adapted well to local conditions, and farmers are keen to plant more.

Give us the stakes and watch us climb. Beans in Africa's Great Lakes Region

Looking upwards to grow more beans

....and we'll soon be up this tall

Problems

But there are problems. "The major problem with the climbing bean is that they need staking material", says Kornegay; "climbing beans in Latin America are normally grown with maize, and climb up the maize stalk. This keep them off the ground. But in the Great Lakes Region, very little maize is grown. So we had to introduce a technology to stake the climbing beans. This means that staking material is needed, trees for example, but we wanted to avoid putting pressure on the forests.

"With the help of farmers who were involved in the research on climbing beans, we have designed other technologies that can be used for staking the climbing bean.

Several ways have been explored, such as careful management of trees in the area, selective pruning, better use of stakes etc, and growing other crops, sesbania is one, that provide natural staking material. Rwanda has trees such as eucalyptus and acacia that need to be selectively pruned".

The stakes do not necessarily have to be very strong; bamboo material is more than adequate, and the growing banana plants are sometimes suitable. In all, farmers are familar with about 15 plant species that can provide them with stakes.

Under good soil fertility conditions, the beans can climb well over 2 metres, Kornegay points out, "but the farmer may not have a stake that high. What they do then is to wind the climbing bean plant back down the stake, so it grows downwards".

Within 2 to 3 years, more than 2000 farmers in the Great Lakes Region have started to grow the climbing bean; the normally good rainfall in the area allows them to grow 2 crops a year.

Frankfurter Allgemeine Zeitung, Germany 11 November 1992

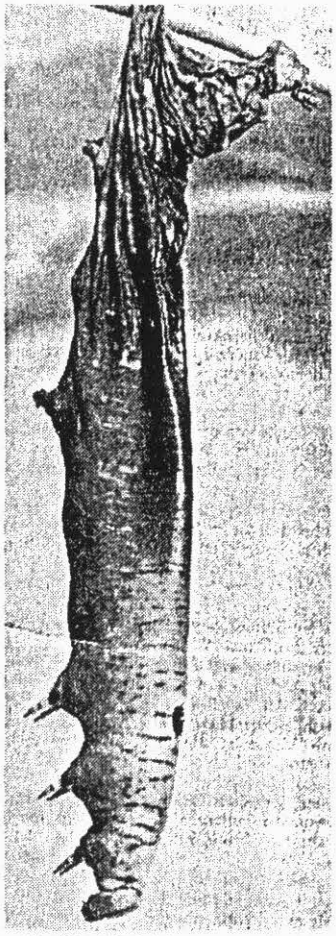
Frankfurter Allgemeine
ZEITUNG FÜR DEUTSCHLAND

Natur und Wissenschaft
Herzmittel schützen auch Gefäße

Stickoxyd mit vielfältigen Wirkungen: Prophylaxe des Infarkts?

Nature and Science:
Checkmate to the cassava hornworm

Schach dem Cassava-Hornwurm



Diese Raupe, ein sogenannter Hornwurm, kann an der befallenen Pflanze keinen Schaden mehr anrichten. Das Insekt wurde das Opfer von Granulose-Viren, die zur biologischen Schädlingsbekämpfung genutzt werden. Forscher des Internationalen Zentrums für tropische Landwirtschaft (Ciat) in Cali/Kolumbien haben über viele Jahre hinweg Erfahrungen mit diesen Viren gesammelt. Der Hornwurm ist ein gefürchteter Schädling. Er befällt die für die Ernährung der Bevölkerung wichtigen Cassava-Pflanzen und kann zu erheblichen Einbußen bei der Ernte führen. Grundlage für das biologische Präparat sind infizierte Hornwurm-Raupen. Diese werden zerkleinert und zu einer Sprühlösung verarbeitet. Die Wirkung setzt allerdings nicht so prompt ein wie bei chemischen Insektiziden. Es kann mehrere Tage dauern, bis die gefräßigen Raupen dem Angriff der Viren erliegen. Die biologische Schädlingsbekämpfung erfordert daher regelmäßige Beobachtungen in den Cassava-Plantagen. Es kommt darauf an, einen drohenden Befall möglichst frühzeitig zu erkennen – in einer Phase, in der die Raupen noch klein sind. Nur dadurch ist gewährleistet, daß die Raupen, die insgesamt fünf Entwicklungsstadien durchlaufen, rechtzeitig bekämpft werden.
Foto Ciat

Als Alfred Nobel im vergangenen Jahrhundert die kontrollierte Sprengung mit Nitroglyzerin erfand und später denselben Stoff als Medikament zur Linderung seiner schmerzhaften Herzanfälle erhielt, empfand er dies als eine besondere Ironie des Schicksals. Doch er ahnte nicht, daß es noch hundert Jahre dauern sollte, bis man die molekulare Wirkungsweise des nitrathaltigen Herzmittels zu verstehen begann. Erst in der jüngsten Zeit hat man erkannt, daß viele der altbewährten Herzmittel, die gefäßerweiternd wirken und das Herz entlasten, über die Freisetzung von Stickoxyd (NO) wirken.

Die empirisch gefundenen Medikamente ahmen einen Vorgang nach, der sich auch unter normalen Verhältnissen an den Blutgefäßen abspielt. Das Endothel, jene einlagige Zellschicht, die die Gefäße innen auskleidet, wird durch ganz verschiedene Botenstoffe angeregt, Stickoxyd freizusetzen. Das Stickoxyd veranlaßt dann die glatten Muskelzellen, welche die Gefäße umhüllen, sich zu entspannen. Auf diese Weise wirkt es gefäßerweiternd. Solange man seine chemische Natur noch nicht kannte, hatte man den im Endothel gebildeten blutdrucksenkenden Stoff daher auch als endothel-abhängigen relaxierenden Faktor (EDRF) bezeichnet.

Da die Wirkung der gefäßerweiternden Nitratverbindungen bei einer Dauerbehandlung nachläßt, hat man neue Herzmittel entwickelt, die diesen Nachteil nicht haben. Ein solcher Stickoxydspender der zweiten Generation ist das Molsidomin. Es handelt sich um eine recht komplizierte chemische Verbindung, in der das Stickoxyd in eine Ringstruktur eingebunden ist. Im Körper wird das Präparat so verändert, daß sich das Stickoxyd spontan abspaltet. Weil das Zwischenprodukt im Gegensatz zu den organischen Nitraten nicht auf die Wirkung eines Enzyms angewiesen ist, bleibt die Toleranzentwicklung aus. Selbst in jenen Fällen, in denen die Nitrate keine gefäßerweiternde Wirkung mehr zeigen, kann das Molsidomin den Patienten noch helfen.

Forscher der Firma Hoechst haben vor kurzem eine weitere chemische Verbindung entdeckt, die spontan Stickoxyd freisetzt. Es handelt sich wie beim Molsidomin um eine komplexe Stickstoff-Sauerstoff-Verbindung, ein Sydnonimin. Das als CAS 936 (Pirsidomin) bezeichnete Molekül besitzt eine langanhaltende blutdrucksenkende Wirkung. Hunde mit hohem Blutdruck, die das Präparat erhielten, entwickelten keine Toleranz. Auch die schon lange zur Blutdrucksenkung verwendeten ACE-Hemmer wirken letztlich über das Stickoxyd. Die ACE-Hemmer, die in die Regulation des Blutdrucks eingreifen, führen zur Anreicherung des Botenstoffs Bradykinin. Das Bradykinin regt seinerseits die Synthese von Stickoxyd im Endothel der Gefäße an. Diese Medikamente fördern also die körpereigene Bildung von Stickoxyd.

Das Stickoxyd wirkt jedoch nicht nur gefäßerweiternd; es schützt die Endothelzellen auch vor krankhaften arteriosklerotischen Veränderungen, die durch mancherlei innere und äußere Faktoren begünstigt werden, etwa bestimmte genetische Veranlagungen oder hohe Cholesterinkonzentrationen. Das Stickoxyd unterdrückt die Vermehrung der glatten Gefäßmuskelzellen, die nach Verletzungen des Endothels in den Hohlraum der Gefäße hineinwuchern und die Bildung von Blutgerinnseln fördern. Außerdem hemmt es die Vemehrung und *das Verklumpen der für die Blutgerinnung* verantwortlichen Blutplättchen.

Zu fatalen Gefäßverschlüssen kommt es vor allem bei Patienten mit Bluthochdruck, arteriosklerotischen Ablagerungen und Zuckerkrankheit. Untersuchungen an Kaninchen zeigen, daß man gestreßtes Endothel durch eine medikamentös verstärkte Bildung von Stickoxyd vor krankhaften Ablagerungen bewahren und vorhandene Schäden wenigstens teilweise zum Verschwinden bringen kann. Die Forscher hoffen zudem, mit den gefäßschützenden Stoffen die Schädigung des Herzmuskels nach einem frischen Infarkt in Grenzen halten und die Sterblichkeit dadurch senken zu können. bh

Frankfurter Allgemeine Zeitung, Germany 21 October 1992

Frankfurter Allgemeine
ZEITUNG FÜR DEUTSCHLAND

Natur und Wissenschaft

Maniok von steilen Hängen

Nature and Science: Cassava on steep hillsides
Experimental new form of planting in Colombia/reduces soil erosion

Neue Anbauformen in Kolumbien erprobt / Weniger Bodenerosion

Maniok zählt zu den wichtigsten Nahrungspflanzen in den tropischen Ländern der Erde. Schätzungsweise 800 Millionen Menschen ernähren sich davon. Die auch Cassava genannte Staude bildet große, stärkehaltige Wurzelknollen, aus denen sich etwa Mehl gewinnen läßt. Zwar enthalten die Knollen eine giftige Blausäure-Verbindung, doch wird diese durch Erhitzen unschädlich. Maniok liebt warm-feuchtes Klima und viel Licht, stellt aber an den Boden keine großen Ansprüche.

Viele Bauern in den tropischen Ländern sind dazu übergegangen, Maniok an gerodeten Berghängen anzupflanzen. Dort können sie noch einigermaßen erschwingliches Land erwerben. Es handelt sich oft um leichte, wenig entwickelte Böden, sogenannte Inceptisole. Da Maniok den Boden nicht das ganze Jahr über bedeckt, gibt es aber an den Steillagen große Verluste durch Erosion. Messungen an Hängen mit einer Neigung von 10 bis 15 Prozent zeigten, daß innerhalb eines Jahres zwischen 8 und 13 Tonnen Bodenmaterial abgetragen wurden. Das ist zwar weniger als ein Zehntel der Erosion auf unbebauten Flächen, aber immer noch viel zuviel.

Forscher des Internationalen Zentrums für tropische Landwirtschaft (Ciat) in Cali/Kolumbien suchen seit einigen Jahren nach Möglichkeiten, durch veränderte Anbauformen die Bodenerosion zu verringern. Maßgeblich unterstützt werden sie dabei von deutscher Seite. Wissenschaftlicher „Vater" des Projekts ist Dietrich Leihner vom Institut für Pflanzenproduktion in den Tropen und Subtropen an der Universität Hohenheim. Leihner, der selbst lange am Ciat gearbeitet hat, begann vor sechs Jahren mit Untersuchungen über die geeignetste Form des Maniok-Anbaus. Das Bundesministerium für Wirtschaftliche Zusammenarbeit finanziert das Vorhaben.

Zur Verminderung der Erosion ist es wichtig, daß der Boden schonend bearbeitet wird. Das allein reicht aber nicht. Gelegentlich versucht man, durch Dämme dem Abtrag entgegenzuwirken. Gerade auf großen Flächen ist das aber schwer zu verwirklichen. Eine andere Möglichkeit besteht darin, neben dem Maniok noch weitere Gewächse anzupflanzen. Freilich kommt es dadurch zu einer Konkurrenz um Platz, Nährstoffe, Wasser und Licht. Wie die Versuche von Leihner und seinen Mitarbeitern zeigten, können Barrieren aus Gräsern recht wirkungsvoll sein. Bewährt hat sich das Vetiver-Gras. Es führte während der vier Jahre dauernden Versuche nur zu geringen Mindererträgen an Maniok. Freilich wächst es nicht so gut an wie eine andere Art, das Guatemala-Gras. Die Erosion ließ sich drastisch senken. Gegenwärtig untersucht man sieben Grasarten auf ihre Eignung als Barrieren.

Ebenfalls erfolgversprechend sind Versuche, den Boden zwischen den Maniokpflanzen durch Untersaaten zu schützen, die ihrerseits als Viehfutter genutzt werden können. In Frage kommen vor allem Hülsenfrüchtler wie Centrosema acutifolium und Galactia striata, die zur gleichen Pflanzenfamilie gehören wie der in gemäßigten Breiten bekannte Klee oder die Luzerne. Einreihig gesät, bedeckten diese Gewächse im ersten Untersuchungsjahr den Boden recht gut. Der Schatten der Maniokpflanzen machte ihnen wenig aus, und sie stellten auch keine allzu große Konkurrenz für die Nahrungspflanzen dar. Allerdings bleibt ein großer Teil des Bodens unbedeckt, solange die Maniokstauden klein sind. Auf den mit Hülsenfrüchtlern bepflanzten Flächen gab es große Unterschiede in der Erosion. Mitunter wurden jährlich nur 2,5 Tonnen Boden je Hektar abgetragen, ein andermal registrierte man sogar 30 Tonnen. Die schlechten Ergebnisse dürften auf das anfangs zögerliche Wachstum der Hülsenfrüchtler zurückgehen. Auch Trittschäden, die beim Nachsäen entstanden waren, spielten wohl eine Rolle.

Wie hoch die Erosion ist, hängt auch vom Maniok selbst ab. Es gibt Varietäten, die den Boden unterschiedlich stark bedecken. Die Sorte „Algodona" etwa erwies sich in dieser Hinsicht als dreimal so wirksam wie die Sorte MCol 113. Am Ciat will man nun Sorten züchten, die bestmöglichen Bodenschutz und hohen Ernteertrag vereinen. Diese Forschungen sollen helfen, die Lebensgrundlage der Kleinbauern zu erhalten. Nur wenn dies gelingt, kann auch der Drogenanbau in der Region zurückgedrängt werden. R.W.

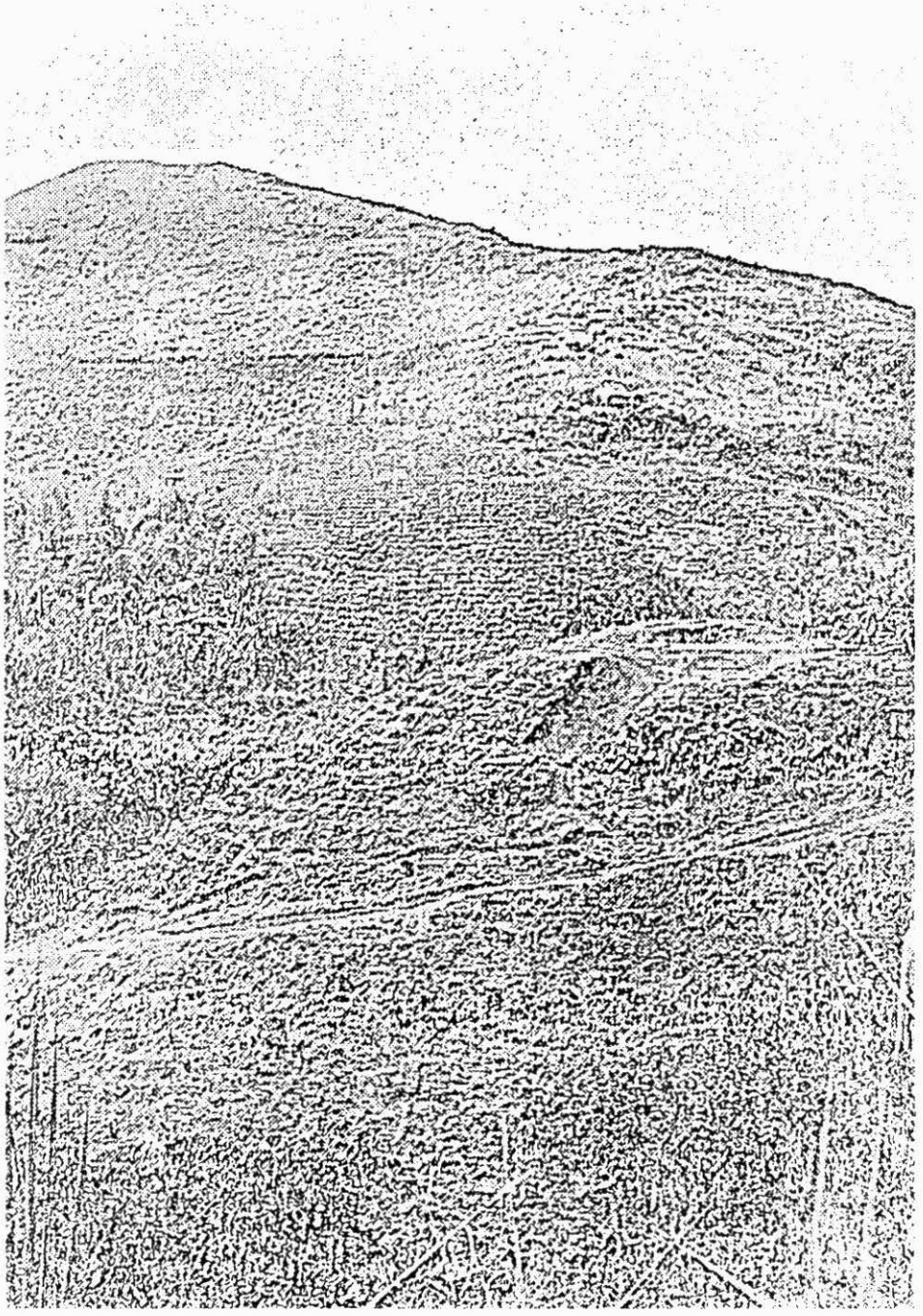
Frankfurter Allgemeine Zeitung Mittwoch, 21. Oktober 1992, Nr. 245 / Seite N3

Frankfurter Allgemeine
ZEITUNG FÜR DEUTSCHLAND

Natur und Wissenschaft

Maniok von steilen Hängen

Nature and Science: Cassava on steep hillsides



Maniok wächst auf den degradierten Hängen der Kordillere nur langsam. Er steht daher im Ruf, die Erosion zu fördern. Könnte man den Bodenabtrag aufhalten und die Fruchtbarkeit erneuern, würde auch Maniok kräftiger wachsen, den Boden schneller bedecken und seinerseits die Erosion weiter vermindern. Leguminosen zwischen den Maniok-Pflanzen oder Grasbarrieren aus Elefantengras vermindern den Bodenabtrag deutlich, machen aber dem Maniok Konkurrenz. Man sucht deshalb nach besser geeigneten Erosionbremsen. Foto D. Leihner

Frankfurter Allgemeine Zeitung, Germany 18 September 1993

Frankfurter Allgemeine
ZEITUNG FÜR DEUTSCHLAND

Agrarforscher im Kampf gegen den Hunger

Agricultural research fights hunger
From wonder wheat to friendly wasps

Vom Wunderweizen bis zur freundlichen Wespe /

Von Carola Kaps, Washington

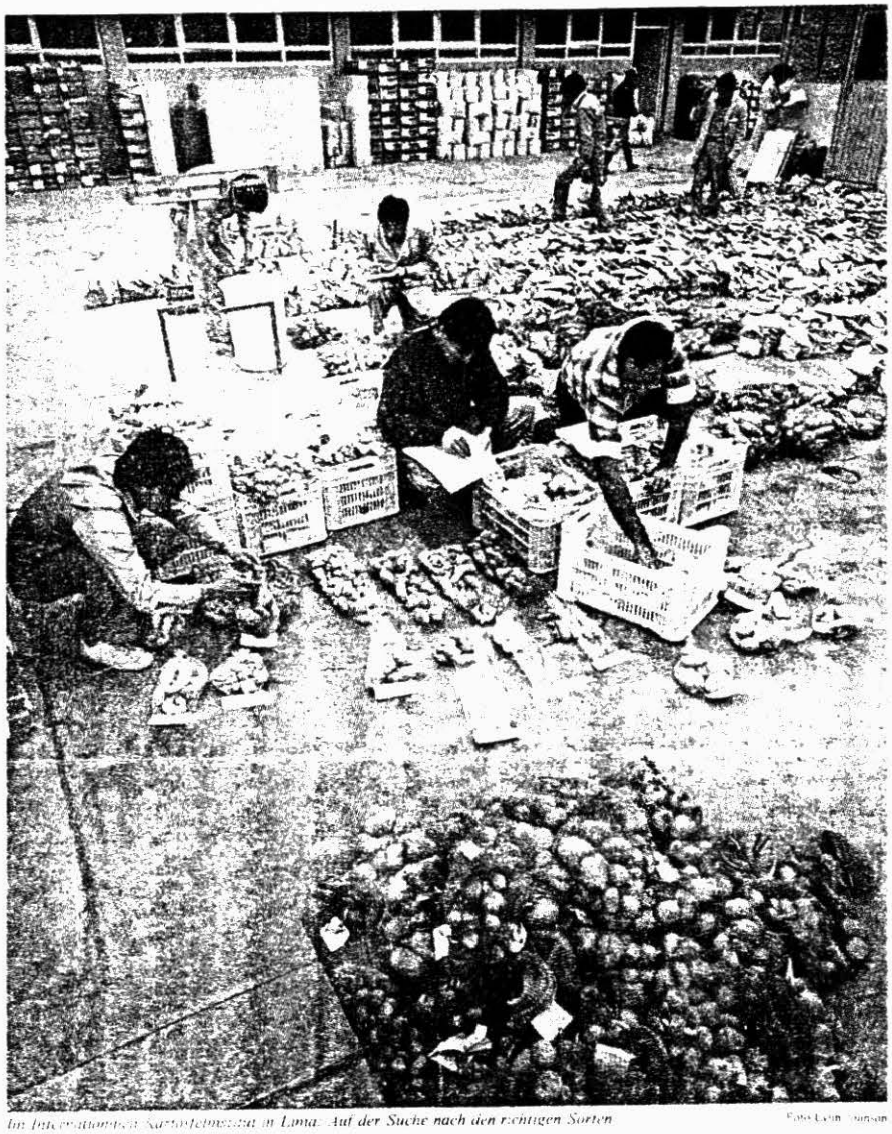
Behutsam klaubt David Jewel ein kleines Würmchen nach dem anderen aus den aufgeschnittenen Maisstauden. Fast zärtlich wiegt er sie in seiner breiten Hand, ehe er sie sorgfältig in einen kleinen Behälter legt, in dem schon Hunderte von Maisbauern gefürchtete Schädlinge wimmeln, die Maisstammbohrer. Mit einem scharfen Dolch, der im gleißenden Licht der mexikanischen Sonne blitzt, schneidet der bärtige, vierschrötige Mann mit dem sonnenverbrannten Gesicht geduldig Maisstaude um Maisstaude auf, um das Vernichtungswerk der kleinen Maden eingehend zu betrachten. Stauden, in denen die gefräßigen Würmer nur wenige kurze Straßen gezogen haben, werden als wertvolles Zuchtmaterial ausgesondert, der Rest kommt auf den Komposthaufen.

David Jewel ist Agrarforscher im Internationalen Weizen- und Mais-Institut (Abkürzung: CIMMYT) in Mexiko und auf der ständigen Suche nach immer kräftigeren, ertragreicheren und klimatisch besser angepaßten sowie widerstandsfähigen Maissorten. Zum Forschungsalltag des Neuseeländers gehört die Arbeit auf den Feldern der Versuchsstation Thaltigapan; sie liegt in der heißesten und trockensten Region Mexikos, im Staat Morelos. Jewel ist nur einer von zahlreichen Agronomen, die wöchentlich mindestens einmal ihren Computer in den bequemen, kühlen Büros und Laborräumen des Hauptquartiers vor den Toren von Mexiko-Stadt mit den staubigen, heißen Feldern in Thaltigapan oder einer der anderen vier Versuchsstationen vertauschen. In den siebziger Jahren, als noch der weltberühmte Forscher und Friedensnobelpreisträger Norman Borlaug zur

Gustovão A. Nores vom Institut für Internationale Tropenforschung in Cali/Kolumbien.

Forschungsmannschaft des Instituts gehörte, verbrachten die Agronomen den größten Teil ihrer Arbeitszeit auf den Feldern, um am lebenden Objekt ihrer Arbeit nachzugehen. Borlaug, der mit der Züchtung des mexikanischen Wunderweizens als einer der Väter der „Grünen Revolution" in die Agrargeschichte eingegangen ist, trieb seine Mitstreiter unbarmherzig aufs Feld; nur dort und nicht am Schreibtisch konnten seiner Ansicht nach die wichtigen Erkenntnisse gefunden werden, die es erlaubten, einer explosiv wachsenden Weltbevölkerung ausreichende Nahrung zu sichern.

Dank der neuesten Erkenntnisse von Gentechnik und Molekularbiologie kann die schweißtreibende Arbeit auf dem Feld heute zwar etwas verringert werden; einen Ersatz für die mühselige, langwierige Zuchtarbeit bieten die neuen wissenschaftlichen Methoden aber noch lange nicht. Auch heute noch dauert es mindestens zwölf bis fünfzehn Jahre, bis die Forscher sicher sein können, daß eine neue Sorte alle gewünschten Eigenschaften hat, sagt Jewel, der bei CIMMYT auch als führender Molekularbiologe gilt. In Thaltigapan wird daher nicht nur nach einer Maisstaude geforscht, die dem Maisbohrer Widerpart bietet. Daneben laufen auch Bemühungen, dürrebeständige Maissorten zu entwickeln. Ziel der unzähligen Kreuzungen ist es, eine Staude zu finden, bei der die männliche



Im Internationalen Kartoffelzentrum in Lima: Auf der Suche nach den richtigen Sorten Foto Lehtikuva

und die weibliche Blüte fast zeitgleich aufbricht; nur so kann eine Befruchtung unter dem dürrebedingten Streß sichergestellt werden. Auf einem dritten Versuchsfeld arbeitet ein Maisforscher aus Island an einer neuen Maissorte für das Hochland von Zimbabwe. Erwünscht wird eine möglichst kurze Staude mit spärlichem Blätterwuchs, die dem Wind des Hochlands widersteht und auch bei enger Bepflanzung die Sonnenbestrahlung der reifenden Kolben zuläßt. Außerdem soll der Maiskolben möglichst tief an der Staude sitzen, um Windbruch und damit Ernteverluste zu verhindern.

Das Wunder der haarigen Kartoffel

Was in Thaltigapan geschieht, ist nur ein kleiner Ausschnitt aus der täglichen Arbeit der sechzehn internationalen Agrarforschungsinstitute, deren Auftrag es ist, den „Ärmsten der Armen" in den Entwicklungsländern mit verbesserten landwirtschaftlichen Produkten und Produktionstechniken ein ausreichendes Auskommen und eine ausreichende Ernährungsbasis zu sichern. Auf dem lateinamerikanischen Kontinent gibt es außer CIMMYT noch das Institut für Internationale Tropenforschung (CIAT) in Cali, Kolumbien, sowie das Internationale Kartoffelinstitut (CIP) in Lima, Peru. Auch von diesen beiden Schwesterinstituten lassen sich eindrucksvolle Forschungserfolge aufzählen. Das „Wunder der haarigen Kartoffel", an deren zarten Härchen die Schädlinge festkleben und jämmerlich verhungern, setzte im letzten Jahr die Welt in Staunen. Noch wichtiger für den Geldbeutel und die Gesundheit der armen Bauern in den Entwicklungsländern sind freilich die Züchtungen von widerstandsfähigen, resistenten Kartoffelarten, die nur ein Mindestmaß an Pflanzenschutzmitteln erfordern. Ein großer Fortschritt ist auch die Entwicklung des Kartoffelsamens; statt der aufwendigen und kostspieligen Lagerung von Tonnen von Steckkartoffeln können die Bauern heute das Saatgut in einem Marmeladenglas aufbewahren. Eine Handvoll Samen reicht für ein zwei Hektar großes Feld aus, für das man früher zwei Tonnen Saatkartoffeln brauchte. Einen überzeugenden Beweis für die effiziente und kostengünstige Arbeit der Forschungszentren steuert auch Anthony Bellotti bei, der im Tropeninstitut in Cali die entomologische Abteilung leitet. In den siebziger Jahren, erzählt er, habe sich in den Maniokfeldern Afrikas die Schmierlaus wie der Wind ausgebreitet und die Nahrungsmittelbasis von mehr als 200 Millionen Afrikanern bedroht. Die CIAT-Forscher konterten mit der Einführung einer kleinen Wespe als biologische Wunderwaffe. Das „freundliche Insekt" war erfolgreich und im Gegensatz zu Pflanzenschutzmitteln ungefährlich für Mensch und Umwelt. Besser noch, es war billig. In der von der Universität Berkeley erstellten Kosten-Nutzen-Analyse rechnen die Ökonomen mit einer Erfolgsrate von 1 zu 149; ein Forschungsdollar hat demnach einen volkswirtschaftlichen Nutzen von 149 Dollar oder mehr als 3 Milliarden Dollar während der letzten 25 Jahre ermöglicht. „Unsere Anstrengungen steigern nicht nur die Produktivität", sagt CIAT-Direktor Gustovão Nores mit berechtigtem Stolz; fast noch segensreicher seien die Auswirkungen für die Umwelt. Für Bauern, die hohe landwirtschaftliche Erträge bei angemessenen Produktionsmethoden erwirtschafteten, bestehe kein Anreiz, in die Städte abzuwandern; vor ihnen sei auch der Wald sicher.

Finanziert werden diese Forschungsanstrengungen weitgehend von der sogenannten „Consultative Group for International Agricultural Research" (CGIAR). Diese Gruppe formierte sich 1971 unter der Führung der Weltbank mit dem Ziel, die Erfolge der „Grünen Revolution" möglichst allen Entwicklungsländern zugänglich zu machen und ihre landwirtschaftlichen Probleme mit Hilfe moderner wissenschaftlicher Methoden zu lösen. Vierzig bilaterale, multilaterale und private Geber haben seither jährlich zwischen 250 und 300 Millionen Dollar für die Forschungszentren aufgebracht. Doch das Geld fließt inzwischen spärlicher. Deutschland steuert gerade 13,2 Millionen DM bei und sucht, wie alle anderen Geber auch, nach Einsparungsmöglichkeiten.

Die Wurzeln für das Netz der internationalen Agrarforschungszentren hatten die beiden weitsichtigen amerikanischen Stiftungen, Rockefeller und Ford, schon kurz nach dem Zweiten Weltkrieg mit der Gründung des Internationalen Reisinstituts (IRRI) auf den Philippinen und des Internationalen Weizen- und Mais-Instituts in Mexiko gelegt. Die Gründungsväter gaben den beiden Zentren den Auftrag, mit Hilfe verbesserten Saatgutes die Produktion dieser wichtigen Grundnahrungsmittel in der Dritten Welt zu erhöhen. Die bemerkenswerten Erfolge dieser ersten Forschungseinrichtungen veranlaßten die beiden Stiftungen zu zwei weiteren Gründungen: In Nigeria schufen sie das Internationale Institute of Tropical Agriculture (IITA), das sich mit der Landwirtschaft in den feuchten Tropen befassen sollte. Gleichzeitig wurde ihm die Forschungsverantwortung für die Maniok-, Reis- und Maisproduktion in Afrika übertragen. In Cali, Kolumbien, hoben sie das Internal Center for Tropical Agriculture (CIAT) aus der Taufe. Neben der Forschungsverantwortung für die sauren Savannenböden in den Tropen sollte sich CIAT auch um die Bohnen-, Maniok- und Reiserzeugung in Lateinamerika kümmern. Später kamen unter Führung der CGIAR andere Zentren in Indien (Tropenforschung), in Westafrika (Reis), in Syrien (Wüstenforschung), Peru (Kartoffel), Äthiopien (Tierhaltung), Kenia (tropische Krankheiten), Rom (genetische Vielfalt), Den Haag (Zusammenarbeit mit nationalen Programmen), Sri Lanka (Bewässerungswirtschaft), Washington (Nahrungsmittelpolitik) und Kenia (Forstwirtschaft) hinzu.

Mit diesen Zentren konnten die von CGIAR finanzierten Forscher alle für die Entwicklungsländer wichtigen Nahrungsmittel, aber auch alle geographischen und klimatischen Zonen abdecken. In ihrer ersten Arbeitsphase ging es den Forschern nur darum, die Nahrungsmittelproduktion

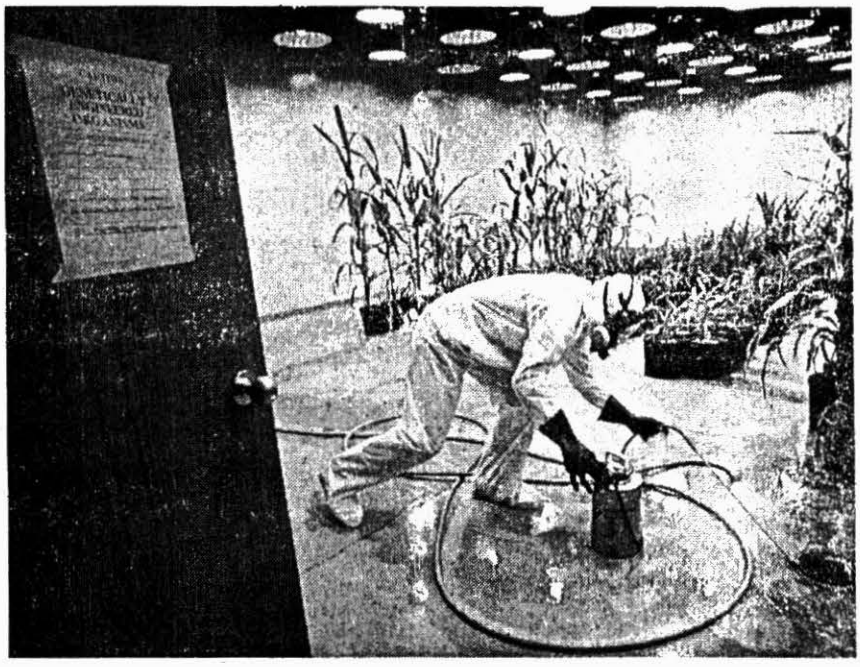


Foto Lynn Johnson

In einem biotechnischen Labor in Minnesota, wo das erste transgene Getreide von dem Mikrobiologen Ron Lundquist erschaffen wurde

so rasch und so nachdrücklich wie möglich zu steigern. Der Erfolg ließ nicht lange auf sich warten. Die von den Fachleuten in den fünfziger Jahren vorhergesagten Hungersnöte konnten mit der Einführung ertragreicher, widerstandsfähiger Sorten nicht nur verhindert werden. Innerhalb von vierzig Jahren waren die Länder der Dritten Welt sogar in der Lage, ihre Nahrungsmittelproduktion zu vervierfachen.

Auch für den lateinamerikanischen Kontinent legen die drei dort beheimateten Zentren Zahlen vor, die sich sehen lassen können. In der Forschungsbilanz für das Jahr 1992 stehen beispielsweise Forschungsausgaben für Bohnen, Mais, Reis und Weizen von 22,3 Millionen Dollar landwirtschaftlichen Erträgen von einer Milliarde Dollar gegenüber. Bauern, die sich die landwirtschaftlichen Forschungsergebnisse der drei Zentren zunutze gemacht haben, haben demnach ihren Einsatz um das 46fache erhöht. Stolz sind die Forscher auch darauf, daß ihre Arbeit es Lateinamerikas Bauern ermöglichte, im Wettrennen zwischen Bevölkerungswachstum und Nahrungsmittelproduktion die Nase vorn zu behalten. Mais, meint CIMMYT-Direktor Donald Winkelmann, werde in den nächsten Jahren aufgrund der Doppelverwendung als Grundnahrungsmittel und Viehfutter die größten Wachstumsraten realisieren. Der aus Nebraska stammende Ökonom rechnet mit einer Produktionssteigerung von jährlich vier Prozent. CIMMYT hat den Ehrgeiz, diese Entwicklung mit immer besserem Saatgut nach Kräften zu unterstützen.

Drei Milliarden hungrige Mäuler mehr

Schon heute haben Samen aus der Genbank des Instituts bei rund 70 Prozent der Weltproduktion von Mais Pate gestanden. Mit seinen Zuchterfolgen trage CIMMYT zu „mehr Wachstum und steigenden Einkommen in den Entwicklungsländern" bei und werde so seinem Gründungsauftrag vollständig gerecht, sagt Winkelmann. Auch die Umwelt komme nicht zu kurz, da „wir den Bauern größere Ertragsmöglichkeiten auf den Böden eröffnen, die es verkraften können".

Ungeachtet dieser beachtlichen Erfolge, haben die internationalen Agrarforscher große Sorgen. Die Ebbe in den Kassen der Industrieländer hat in der internationalen Landwirtschaftsforschung tiefe Spuren hinterlassen. Zwischen 1980 und 1990 hat sich der Anteil, der von der internationalen Entwicklungshilfe für Landwirtschaftsprogramme ausgegeben wird, von 22 auf 14 Prozent vermindert. Auch die internationalen Entwicklungsorganisationen haben ihre Ausgaben für die Landwirtschaft in diesem Zeitraum um 2 Milliarden auf 10 Milliarden Dollar verringert.

Für die Forschungsinstitute bedeutet dies, daß das sorglose Forschen in der Country-Club-Atmosphäre der Zentren der Vergangenheit angehört. Innerhalb von nur fünf Jahren hat beispielsweise CIMMYT real mehr als ein Drittel seines Forschungsetats eingebüßt. Bei CIAT flossen statt zugesagten 30 Millionen Dollar 1992 nur 26 Millionen Doll. in die Kasse. In diesem Jahr sind es noch weniger. Die Kartoffelforscher fühlen sich noch am wenigsten eingeengt; wohl deshalb, weil die Kartoffel von vielen als die Wunderwaffe im Kampf gegen den Hunger, als Vehikel der nächsten „Grünen Revolution" angesehen wird. Bei keinem der wichtigen Grundnahrungsmittel klaffe die Lücke zwischen den derzeitigen Erträgen und dem erreichbaren Potential so weit wie bei der Kartoffel, erklärt CIP-Direktor Hubert Zandstra. Dennoch ist auch in Lima Sparen angesagt. Harte Entscheidungen werden notwendig, wo gekürzt, welche Forschungstätigkeiten forciert und welche abgebaut werden sollen. In den drei lateinamerikanischen Zentren herrscht spürbare Unruhe. Zahlreiche Forscher haben sich bereits nach einem neuen Arbeitsgebiet umgeschaut. Viele zittern um ihren Arbeitsplatz, und andere fürchten, daß unter den einschneidenden Kürzungen die zukünftige Forschungsarbeit leiden wird. Sie zweifeln, ob die für die hohe Qualität notwendige „kritische Masse" beibehalten werden kann. Immer häufiger müssen die Zentren ihre an sich langfristige Forschungsagenda auch nach den Wünschen und kurzfristigen Launen der Geber ausrichten. Mal liegen den Gebern die Frauen in der Entwicklung besonders am Herzen, mal die Regenwälder, dann wieder der biologische Pflanzenschutz. Neuerdings haben die Umwelt und die Umweltverträglichkeit der Landwirtschaft Hochkonjunktur.

So verständlich und angebracht die Aufforderung zum Sparen auch ist, so ungünstig ist der Zeitpunkt. Denn seit zwei Jahren sinken in der ganzen Welt die Hektarerträge für Reis und Weizen. Im Erntejahr 1989/90 war auch das Wachstum der Flächennutzung zum erstenmal gleich Null. Dagegen ist das Wachstum der Weltbevölkerung ungebrochen. Bis zum Jahre 2010 müssen drei Milliarden hungrige Mäuler mehr gestopft werden. Zu dem Zeitpunkt also, zu dem von dem technischen Fortschritt „an der Wurzel" das Überleben vieler Menschen abhängt, drohen die spärlicher fließenden Forschungsgelder den dringend notwendigen Fortschritt zu verhindern. Die industriellen Geber, so scheint es, wiegen sich in der falschen Sicherheit ihrer eigenen Überschußproduktion und vergessen, daß der Nahrungsmittelkorb für alle bald leer sein wird, sofern die Investitionen in die Zukunft unterbleiben.

Die Umweltverträglichkeit der Landwirtschaft

Freilich hat die Geldknappheit auch ihre guten Seiten. Einmal treibt sie die bislang verwöhnten Forscher aus ihrer Betulichkeit und zwingt sie dazu, die Geber mit neuen innovativen Ideen und Programmen zu überzeugen und aus ihrer Reserve zu lokken. Zum anderen haben die Zentren notgedrungen gelernt, daß im Zeitalter der Kommunikation und des Wettbewerbs um immer knapper werdende Mittel Öffentlichkeitsarbeit eine wichtige Rolle spielt. Auch sie müssen ihre vornehme Zurückhaltung aufgeben. Es gilt, das Produkt Forschung möglichst attraktiv zu verpacken und fachmännisch zu vermarkten. Die Selbstverständlichkeit, mit der in der Vergangenheit die Gelder flossen und der Wert der Forschungsarbeit anerkannt worden ist, ist ein für allemal vorbei. Eine kritische Öffentlichkeit stellt heute Fragen, wie und zu welchem Zweck Steuergelder verwendet werden. Immer wieder werden heute Zweifel an dem Nutzen der internationalen Landwirtschaftsforschung und ihrem Beitrag für die ärmsten Bevölkerungsschichten laut und müssen befriedigend beantwortet werden.

Schwer tun sich die Zentren zur Zeit vor allem mit der Frage nach der Umweltverträglichkeit der Landwirtschaft und dem Beitrag ihrer Forschungsarbeit zur nachhaltigen Bewirtschaftung. Durch die Umweltkonferenz in Rio hat sich die Aufmerksamkeit der Weltöffentlichkeit voll auf dieses Problem gerichtet. Freilich haben die Forschungszentren schon viel früher erkannt, daß die Landwirtschaft sich nicht mehr allein nur auf die Erhöhung der Nahrungsmittelproduktion beschränken kann, sondern der Pflege und Erhaltung der Ressourcenbasis für das Wohl der zukünftigen Generationen eine ebenso wichtige Rolle zukommt. Diese Doppelfunktion, unter dem Zauberwort „Nachhaltigkeit" bekannt, ist bereits 1987 zum übergeordneten Ziel der Forschungsarbeit der sechzehn Zentren erhoben worden. Über die Umsetzung dieses Doppelzieles, vor allem aber über die entsprechende Gewichtung der Forschungsarbeit und die Verteilung der knappen Forschungsmittel streiten sich nach wie vor die Geister. Vor allem die Züchter fürchten, daß über der Beschäftigung mit sozioökonomischen Grundlagen, mit Öko-Regionen, Bodennutzungssystemen und Ressourcen-Management ihre Arbeit zu kurz kommt. „Unsere vordringliche Aufgabe ist die Erhaltung der genetischen Vielfalt, die Erhöhung der Produktivität und die kontinuierliche Verbesserung unseres Saatgutes", sagt beispielsweise der peruanische Agronom und Kartoffelzüchter Carlos Ochoa. Im Samen und dessen angezüchteten Qualitäten liege die Antwort für die Überwindung des Hungers und der Armut. Freilich wissen aber auch die Züchter, daß sie ohne bessere Bodennutzungssysteme, ohne effizienteres Management und ohne ein ökonomisch vernünftiges Umfeld nicht auskommen können. Umgekehrt sehen die Systemmanager und Befürworter der unabdingten Priorität der Umwelt in den Forschungsprogrammen ebenso die Bedeutung der Züchtung. Hubert Zandstra, der wohl leidenschaftlichste Umwelt-Befürworter im Kreis der CGIAR-Forscher, trifft die Zwangsgemeinschaft der beiden Zielsetzungen wohl am besten: „Wenn es uns nicht gelingt, die Nahrungsmittelproduktion zu steigern, sieht die Zukunft, in der wir doppelt soviel Menschen wie heute ernähren müssen, düster aus. Gleichzeitig dürfen wir aber unsere natürlichen Ressourcen nicht vernachlässigen, sondern müssen in ihre Erhaltung ausreichend investieren. Vergessen wir dies, so wird unser Nahrungsmittelkorb eines Tages leer sein." Die umweltverträgliche Landwirtschaft ist für ihn keine Option, sondern der Schlüssel zum Überleben.

PRESSE - ARCHIV

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Erforsch und erfunden

Pop-Snack aus Peru

Popping-beans oder *ñuñas* nennen sich weiche Bohnen mit einem Geschmack zwischen Erdnüssen und Popcorn, die, unterstützt vom Kolumbianischen International Center for Tropical Agriculture (CIAT), auf ihre letzte Rettung durch Feinschmekker der modernen Welt warten. Die *ñuñas* könnten laut CIAT einen wichtigen Beitrag zur Ernährung leisten. Weil in den Hochlagen der Anden das Wasser bereits bei niedrigeren Temperaturen kocht, benötigen gewöhnliche Bohnen, das Hauptnahrungsmittel von 300 Millionen Armen in Lateinamerika, dort lange Kochzeiten und damit knappes Brennholz. Anders die seit Urzeiten von den Indios angebauten *ñuñas:* Wenige Minuten reichen, um sie auf einer Pfanne wie Popcorn zu garen. Weil für Züchtungen zuwenig Geld da ist, können die an extreme Höhen angepaßten „Popbohnen" bisher nicht über geographisch begrenzte Anden-Areale hinaus angebaut werden. Julia Kornegay, Bohnenzüchterin am CIAT, erhofft sich allerdings vom Weltmarkt eine Chance für die „Popbohnen" und ihre peruanischen Farmer: Sie empfiehlt die Bohnen als Eiweiß-Snack, zubereitet in den Mikrowellenherden der Küchen des reichen Nordens.

Diario 16, Spain 6 September 1992

Protect crops without insecticides

Diario 16

Ignacio Fernández Bayo
Ciencia y Salud

Información y Prensa, S. A.
Albasanz, 14 Tel. 396 50 00
28037 Madrid

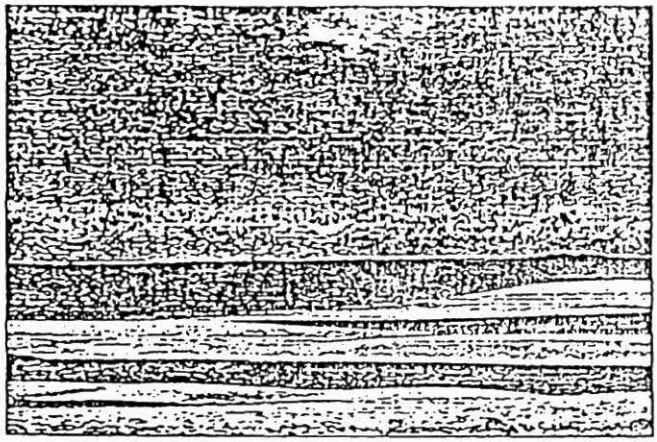
NOVEDADES

Cultivos protegidos sin necesidad de plaguicidas

El Centro Internacional de Agricultura Tropical (CIAT), situado en Cali (Colombia) ha logrado un medio para controlar el gorgojo del frijol, una plaga que destruye el 25 por 100 de la producción africana de esta planta (fundamental en la alimentación de buena parte del mundo en desarrollo) y el 15 por 100 de la de América Latina. El sistema carece, además, de los inconvenientes derivados del empleo del plaguicidas químicos ya que se trata de la incorporación de genes resistentes a la plaga en el genoma de las plantas cultivadas. Ello ha sido posible gracias al descubrimiento de que una variedad silvestre primitiva del frijol disponía de los genes de resistencia a la plaga. Las semillas de esta variedad se conservaban en el CIAT desde su descubrimiento hace dos décadas y eran una variedad más entre las 26.500 que conserva este centro de investigación. De momento el gen protector ha sido incorporado a 160 líneas experimentales, ensayadas con éxito en Africa y América Latina.

Voce Republicana, Italy 13-14 October 1992

Il riconoscimento che ogni paese ha diritti sovrani sulle proprie risorse naturali e quindi anche l'autorità di controllare l'accesso alle proprie risorse genetiche. Una visione della biodiversita come espressione di vita di complessita e di interdipendenza che non deve essere sfruttata ma conservata anche per porre un limite al degrado ambientale



After Rio, many doubts about environment and development

Laws needed to protect the planet

Dopo Rio troppi i dubbi su ambiente e sviluppo

L'enorme bisogno di interventi in difesa del pianeta

LA CONFERENZA di Rio: molti ne considerano l'esito deludente rispetto alle aspettative e all'enorme bisogno di azione in difesa del pianeta. Altri, più benevolmente, sono convinti che non ci si poteva attendere *realisticamente di più da un mega*convegno a cui indistintamente tutti hanno voluto partecipare, dando voce ad istanze ed interessi i più contrastanti. Tutti, a parole almeno, in difesa del pianeta stesso.

Più pragmaticamente, tornato il silenzio dopo i clamori, si valutano ora le acquisizioni concrete della conferenza. Preminente tra esse, il fatto che per la prima volta è stata offerta, all'intera opinione pubblica mondiale, una visione completa, seppur drammatica, dello stato di salute del pianeta Terra. E' poco probabile che l'elevato grado di attenzione prestato a quei problemi durante la conferenza possa allentarsi nel futuro, e che quindi governi e responsabili di vario genere possano tornare tranquillamente a concedersi silenzi colpevoli e comodi rinvii *sine die*.

A Rio è stato raggiunto un accordo su quattro documenti:

1. *Dichiarazione di Rio*: enunciazione di 28 principi generali di etica ambientale.

2. Clima.

3. Agenda 21: piano operativo globale a cui ci si dovrà attenere nello sforzo di procedere ad un risanamento ambientale e nell'impostazione di uno sviluppo sostenibile. All'agricoltura è riconosciuto un ruolo cardine nell'assicurare alimenti a quell'80% della popolazione mondiale che vive nei paesi in via di sviluppo, e nel conservare integre, allo stesso tempo, le risorse naturali che sono alla base della produzione agricola. Per società ancora largamente rurali, sviluppo agricolo è infine sinonimo di sviluppo economico generale.

4. Convenzione sulla biodiversità.

Al fine di valutare tali risultati, organizzato da Integres, si è svolto il 9 ottobre a Roma, presso la sala conferenze dell'Enea, *un incontro di scienziati*, managers di Istituzioni internazionali e rappresentanti di Organizzazioni non governative (Ong). Fra i partecipanti: A. Bozzini (Enea); E. Porceddu (Università della Tuscia); C. Baker (Campagna nord/sud); G. Hawtin (International Board for Plant Genetic Resources), e *L. M. Monti* (Università di Napoli).

La convenzione sulla biodiversità: pregi e limiti

Attenzione particolare, durante l'incontro, è stata rivolta alla Convenzione sulla biodiversità, firmata da 153 paesi. Quali sono i suoi contenuti essenziali, e quali gli sviluppi futuri a partire da essa?

Come *posto in evidenza da* E. Porceddu, cruciale è, nella convenzione, il riconoscimento della duplice necessità di conservare la diversità biologica, e di assicurarne a tutti la disponibilità, in quanto risorsa fondamentale per lo sviluppo. La convenzione impegna i firmatari alla elaborazione di strategie nazionali, piani e programmi per attuare la stessa nell'ambito di ciascun paese, incoraggiando, nel contempo, il libero scambio di materiali e conoscenze.

La biodiversità verrà conservata *in situ* proteggendo ecosistemi ed habitat naturali. *La conservazione ex situ*, con il trasporto dei materiali biologici al di fuori del loro ambiente naturale, è riguardata come azione complementare alle misure di conservazione *in situ*. Le strutture per la conservazione *ex situ* dovrebbero essere realizzate e gestite preferibilmente nei paesi d'origine del materiale, in quanto ciò favorisce la disponibilità dello stesso a fini di studio, valutazione ed utilizzazione.

La convenzione, che copre l'intera area della diversità biologica, presenta, sempre secondo Porceddu, punti non ben definiti, specialmente per quel che concerne i diritti e l'accesso alle risorse genetiche. Non v'è paese che sia completamente autosufficiente in materia di risorse genetiche: tutti debbono fare affidamento, chi più chi meno, su materiali biologici che si originano al di fuori del territorio nazionale. Lo scambio di risorse genetiche interessa quindi tutti i paesi, ed è stato, fin dagli albori dell'agricoltura, la premessa a tutti i progressi nel miglioramento sia delle piante che degli animali.

La convenzione riconosce che ogni paese ha diritti sovrani sulle proprie risorse naturali, e quindi anche l'autorità a controllare l'accesso alle proprie risorse genetiche. Essa specifica però che ogni paese firmatario farà il possibile per creare condizioni che facilitino l'accesso a tali risorse genetiche». Ciò che è meno chiaro, rileva Porceddu, è lo status dei materiali attualmente conservati nelle collezioni e raccolte prima dell'entrata in vigore della convenzione. Si tratta di 3,5 milioni di accessioni presenti nelle banche di geni in tutto il mondo, molte delle quali fuori del loro paese d'origine. Questo patrimonio di incalcolabile valore comprende le collezioni dei centri del Gruppo consultivo per la ricerca agricola internazionale (Cgiar). Il Cgiar è il più grande singolo detentore di germoplasma del mondo, ma, in quanto istituzione, non è ammesso alla firma della convenzione. Tali risorse genetiche, raccolte prevalentemente con fondi pubblici, sono conservate in deposito fiduciario a favore delle generazioni presenti e future, e a disposizione, senza restrizioni di qualsiasi paese. Non è chiaro se, a seguito della convenzione, ciò sarà ancora possibile. Inoltre, come verranno considerate le varietà nel cui pedigree compaiono più genitori originari di paesi diversi, o semplicemente di origine sconosciuta? Chi avrà diritti sovrani su di esse? Per risolvere *questo ed altri problemi*, annuncia Porceddu, si riunirà, un anno dopo l'entrata in vigore della convenzione, una conferenza di tutte le parti interessate.

Una visione più critica della convenzione sulla biodiversità è stata proposta da C. Baker, in rappresentanza di molte organizzazioni non governative (Ong) che hanno partecipato alla conferenza di Rio. Secondo queste ultime, che hanno formulato a Rio un loro documento chiamato *Citizen's Commitment on Biodiversity*, tutta la gestione sulla biodiversità è stata dominata da una visione eccessivamente sviluppista ed economicista. Esse propongono invece una visione della biodiversità come «espressione di vita, di complessità e di interdipendenza», che va non già sfruttata, ma conservata, anche per porre un limite al degrado ambientale.

Secondo Baker, non deve esservi conservazione della biodiversità se non nella salvaguardia del diritto dei popoli indigeni e rurali a usufruire in modo sostenibile delle proprie risorse naturali. Tradizioni e cultura di questi popoli indicano, d'altronde, che i loro comportamenti sono già in armonia con la natura, e quindi di sostenibili. Altro punto centrale delle Ong è che la biodiversità non deve essere considerata come merce di scambio, o fatta oggetto di ricerche genetiche magari lontano dai paesi d'origine. Secondo il *Citizen's Commitment* sopra citato, «ove deve essere permessa alcuna azione di brevetto su alcuna forma di vita o prodotto derivato. Ciò non pregiudica comunque i diritti di popoli indigeni, agricoltori tradizionali e pescatori a conservare il controllo esclusivo e l'accesso ad essa (forma di vita) e ad utilizzare conoscenze, innovazioni, tradizioni culturali e pratiche di gestione relative alla biodiversità».

Le Ong propugnano inoltre un modello di ricerca agricola più partecipativa, con laboratori non tanto legati ad interessi industriali e commerciali, quanto strumento di miglioramento delle prassi tradizionali, di lotta alla fame e di protezione ambientale.

Protagonisti della conservazione delle risorse genetiche

E veniamo alle istituzioni che, in quanto attive nella conservazione della biodiversità, potranno essere strumento dell'attuazione delle linee - guida della convenzione. Come sottolineato da G. Hawtin, l'Ibpgr (International Board for Plant Genetic Resources) è parte di una rete di istituzioni internazionali facenti capo al già ricordato Cgiar. Si tratta di una infrastruttura di ricerca agricola internazionale, i cui centri sono in massima parte dislocati nei paesi in via di sviluppo, e che può contare sull'attività di 1800 scienziati e su un budget annuale di circa 250 milioni di dollari. Tali fondi sono elargiti da circa 40 donatori, tra cui l'Italia. Gli sforzi del sistema hanno teso finora principalmente alla costituzione di nuove varietà di piante, specialmente quelle utilizzate nell'alimentazione di base dei paesi più poveri, come riso, mais, frumento, orzo, sorgo, miglio, cassava, patata, patata dolce, fagiolo, cece, lenticchia, arachide, banana e platano, oltre che foraggi per le regioni tropicali e specie arboree a molteplice attitudine.

Le caratteristiche più pregevoli delle nuove varietà (produttività più elevata, ma anche tolleranza o resistenza a malattie, insetti e stress ambientali), hanno origine inequivocabile nella variabilità genetica esibita da varietà tradizionali e locali e da antenati selvatici delle specie attualmente coltivate. Una volta di più va ribadito quindi, secondo Hawtin, che la variabilità genetica delle specie utili o potenzialmente utili è una componente indispensabile per arrivare ad ottenere forme coltivate più in grado di soddisfare le esigenze di alimentazione e progresso del genere umano. Da ciò la definizione alternativa di risorse genetiche vegetali.

Nel quadro dell'azione di conservazione delle risorse genetiche vegetali condotta dal Cgiar, di particolare rilievo è il ruolo dell'International Board for Plant Genetic Resources (Ibpgr), il cui mandato specifico è quello di «promuovere e coordinare una rete di centri per le risorse genetiche che abbiano il compito di raccogliere, conservare, documentare, valutare ed utilizzare il germoplasma delle specie vegetali».

L'Ibpgr, fondato nel 1974 come risposta a preoccupazioni crescenti circa il fenomeno dell'erosione genetica, è stato recentemente riconosciuto dall'Italia e da altri paesi come *organismo di interesse e status internazionali*. L'Italia ha successivamente negoziato e concluso con esso un accordo di sede, in seguito al quale l'Istituto prenderà stabile sede a Roma, col nuovo nome di Ipgri (International Plant Genetic Resources Institute). Nell'ambito del coordinamento esplicato dall'Ibpgr, anche altri centri del Cgiar sono attivi nella conservazione delle specie oggetto di mandato. Massicce collezioni di germoplasma. Insignificativa rappresentanza della biodiversità di ciascuna delle specie elencate più in alto, sono tuttavia custodite, curate, valutate e rese disponibili a chiunque presso le banche di geni dei centri del Cgiar. Si tratta, nel complesso, di più di 600.000 accessioni, cioè il 25% del patrimonio globale di risorse genetiche di queste specie. I centri distribuiscono gratis circa 100.000 campioni di sementi l'anno, e ciò, sottolinea Hawtin, nonostante l'attuale tendenza mondiale a limitare in misura crescente l'accesso alle risorse genetiche, come conseguenza dell'applicazione dei sistemi di protezione della proprietà intellettuale degli organismi viventi. A tal proposito, tuttavia, i centri stanno ora considerando l'adozione di misure atte ad evitare che i materiali da essi distribuiti vengano successivamente fatti oggetto di protezione di proprietà intellettuali da parte di terzi. Ciò andrebbe a detrimento dei paesi di origine dei materiali stessi, e dei paesi in via di sviluppo in generale.

Come sottolineato da L. M. Monti, l'Italia non è, né lo è stata in passato, inerte nei confronti del problema della conservazione, in ambito nazionale. Il Cnr, coll'Istituto per il Germoplasma di Bari, svolge azione diretta di esplorazione, raccolta e valutazione e salvaguardia di quelle specie di particolare interesse per l'agricoltura italiana e mediterranea, oltre a ricerche su aspetti biologici della conservazione stessa. In ambito internazionale, esistono in primo luogo accordi di collaborazione *dello stesso Istituto* per il Germoplasma. Ma va soprattutto sottolineato secondo Monti, l'apporto finanziario e di cooperazione nella ricerca dato dall'Italia al Cgiar nel suo assieme e ad alcuni suoi centri in particolare.

Così, si è contribuito al miglioramento delle infrastrutture per la conservazione all'Iita (International Institute for Tropical Agriculture) di Ibadan, in Nigeria, e al Ciat (Centro Internacional de Agricultura Tropical) di Cali, in Colombia, ed è stato finanziato la costruzione ex novo di un impianto per una banca di geni all'Icarda (International Center for the Agricultural Research in Dry Areas) ad Aleppo, in Siria. Con la più parte di questi centri, inoltre, ricercatori italiani collaborano a progetti di ricerca o di valutazione delle risorse genetiche vegetali. Si ricordano i programmi per la valutazione del germoplasma di fagiolo, patata, frumento duro, cece, fagiolino dall'occhio, e quelli di ricerca sui metodi di conservazione di germoplasma di cassava e yam, condotti in collaborazione con Ciat, Cip (Centro Internacional de la Papa), Icarda ed Iita.

Per concludere con Baker, non v'è che sperare che gli sforzi compiuti che da più parti vengono esercitati per salvaguardare la biodiversità non siano pretesto di nuovi conflitti di idee ed interessi, ma occasione per ristabilire migliori rapporti tra l'uomo e la natura.

Dr. Kazuo Kawano: dedicating his life to cassava breeding

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郵便振替口座 東京0-1730

キャッサバ 育種ひと筋

南米、アジアで熱帯作物の育種研究と指導に二十年以上携わっている河野和男さん(五二)＝写真＝が、勤務地のタイから休暇で故郷の大阪に帰り、九日夜、友人らの集まりでキャッサバの育種を中心に話した。北大農学部、大学院を出た後、「サラリーマンにはなりたくなかったので」、米国ノースカロライナ大に留学。同大学で准教授になり、その間にペルーで三年にわたり稲作研究と指導をし十年、さらにCIATのアジア支部担当としてバンコクで十年。熱帯地方で最も重要な主食の一つ、サツマイモに似たキャッサバの育種・普及ひと筋に打ち込んできた。

タイとともにベトナム、インドネシアが重要な仕事場だが、「いい育種材を育て、それを多くの国に広めること、各国の研究機関を育てるのが目標です」。

Nihon Nogyo Shinbun, Japan 20 April 1993

CIAT director general seeks Japanese cooperation

この人

日本の協力を求めるため来日した国際熱帯農業研究センター所長

グスタボ・ノレスさん

アルゼンチン生まれ。同国経済大学経由、90年からコロンビアのカリ市にあるカトリック大学部教授などを経て、国際熱帯農業センター所長。50歳。

「日本は環境問題に関心が高い。日本の環境政策を解決するための方策を、センターは直接担当できる」

国際熱帯農業研究センターの予算は、一時に比べて三割も減る現状である。百人の研究者のうち、日本人は三人。「人の面でも、財政面でも、もっと、日本の協力をお願いしたい」と、国内を回った。

センターの仕事は、キャッサバや熱帯牧草の品種開発、栽培・防除を研究、開発途上国の飢えと貧困を解決すること。

「途上国の農業も、ただ作ればいいという時代とは全く違う。自然を保護し、これ以上破壊しないようにしないといけない」と、九二年以降、持続的農業へ大きく方向転換した。

世界の人口は増える一方。「南ア、南米地域が同時に干ばつにでもなれば、食料危機は一度に現実化する」と、途上国での食料増産の必要性を訴える。

サバンナ地域の土壌は強酸性で、アルミニウムも多いため作物ができない。センターでは、これに向く稲作を確立しつつある。

「この技術ができれば、アマゾン地域でも稲作が可能になり、結果的に、ジャングルを伐採する焼き畑農業を防ぐこともできる」と強調する。

途上国の持続的農業開発のためにも、「日本の食料自給が必要では」と質問すると、「途上国は、トヨタ、ソニーなど、日本のものをたくさん買っている」との答えが返ってきた。

Rice - pasture cropping system revives savannas

海外ニュース

よみがえるサバンナ

稲と牧草の混合栽培法

南米の景色を代表するサバンナ（大草原）が、牧草と稲の混合栽培で、荒緑からエメラルドグリーンに変わろうとしている。強酸性土であるサバンナでは、これまで作物を作ることが難しかったが、南米コロンビアにある熱帯農業国際センター（CIAT）の十年にわたる研究の成果だ。

「ライスーパスチュアシステム」と呼ばれるこの栽培法は地ごしらえ、施肥をした後、陸稲と牧草を同時に植える。稲は列状に植え、牧草はイネ科とマメ科を混ぜてばらまく。農家は四か月後に稲を収穫し家畜を放牧する。

コロンビアの東部平原で一九八九年に実験が始まった。九一年には同国農業研究所が酸性土用に改良した最初の品種「オリシカ・サバナ6」を発表した。この品種は稲と牧草の群生を可能にした。

「牧草単独では、サバンナ土壌の改良は難しい。なぜなら高額の投資が要求されるからだ。それに比べるとこの方法は、農家は二年で肉畜経営に利益をもたらす」とCIATは説明する。しかも牧草は、稲の残りの肥料で育ち、稲はマメ科牧草が固定した窒素を利用できる。

CIAT、ICA（コロンビア農業研究所）、それに同稲作生産者協会三者の共同作業で、農場での実験をしたところ、サバンナの環境保護にも役立った。

実際の成果としては、自然のサバンナより六倍以上の家畜を支え、九倍以上の利益をもたらす。家畜は、自然サバンナでは一年でヘクタール当たり平均九十五㌔しか増体しなかったのに、このシステムでは百二十五㌔増え、百七十四㌔のマメ科の草が得られた。

この技術開発により、二億ヘクに及ぶサバンナの再生に道が開けたと評価されている。コロンビアでは今年、この方法の普及に力を注ぐという。

（熱帯農業国際センタープレスリリースから）

ライスーパスチュア・システムは低コストのサバンナ改良法、と語るCIATのサンツ氏

The CIAT gene bank: collection of 52,000 accessions of seeds

海外ニュース

5万2千種を収集

CIATの遺伝子銀行

12/12 日農

CIAT（熱帯農業国際センター）のドアを開けた人は、アリババが「開けゴマ」といって莫大な宝を前にしたのと同様の驚きを感じるだろう。宝物ではなく、さまざまな形や色の小さな種子である。これらは一万年に渡る農民の苦労と作物の無限に近い変異を反映する。

CIATのジーンバンク（遺伝子銀行）にはキャッサバ、豆類、熱帯牧草などの種子や生体植物が五万二千点以上集まっている。同バンク内の種子には、病害虫の抵抗性を持つ遺伝子や酸性土壌や塩分の多い土地など環境ストレスに強いものもある。

いくつかの種子はここにしかないものもあり、農家の畑から消えたものもある。作物が消えることは遺伝子も消えることで、これらは現在あるいは次の世代にとって貴重なものであるかも知れないからだ。

CIATの研究者らは、一九七〇年代後半から収集を始めて以来、野生植物の起源地を調査している。また、CIATが分類し増やしてきた野生植物などは、各国の要求に応じ世界中に配られている。

約三万点の豆類や牧草種子は短期保存として五～十年の間、五～八度で管理され、長期保存は二十五年以上保存するため、アルミホイルなどで真空密閉される。これらは研究者が生育性や発芽能力をチェック、発芽率が落ちたら新しく植え替えたり、移植したりする。

キャッサバなどは、試験管で配布している。種子より生長が早いからで、試験管内には二十三か国から三千品種が保管されている。

過去十七年間で十万点の豆やキャッサバ、熱帯牧草を配布し、八十か国以上の国の育種研究に貢献した。このうち三十八か国で百八十三の新品種を生んでいる。CIATは種子の信頼性を保有するが、一方ではだれでもこれを利用できる機能も持つ。

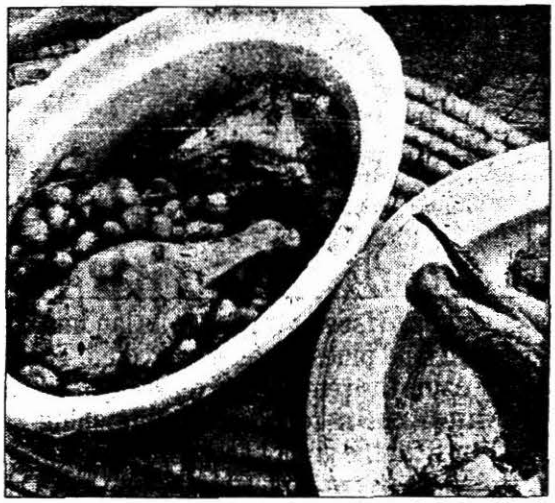
「種子は未来であり、遺伝子の多様性は消えたら二度と作り出すことはできない。種子を保存することはわれわれの未来を保存することなのだ」とCIATの遺伝資源部ではいう。

（CIATニュースから）

Sydney Morning Herald, Australia 11 August- September

CHECK OUT THIS PULSE

Rimfire was a long shot in the 1948 Melbourne Cup, but as an all-new, all-Aussie bean it's an odds-on favourite to replace the imported beans on our supermarket shelves, writes **ALAN SAUNDERS.**



Beans means cassoulet, the traditional French dish of duck, sausage and beans. This version is from *Potager: Fresh Cooking From the French Kitchen Garden* by Georgeanne Brennan (Ebury Press, $45). Right, Rimfire, the Melbourne Cup winner from which our newest bean took its name.

THE news that Australia has a new bean is unlikely to set any pulses racing (as it were) in these dark, recessionary times. Beans have never had a good press.

As long ago as the 6th century BC, the philosopher and mathematician Pythagoras was warning his followers (for reasons that remain obscure) not to have anything to do with them.

More recently, the bean has become a symbol of the futile and the worthless: there's no worse job than that of a bean-counter; Jack the Giant Killer got told off good and proper by his mum because he sold the family cow for – of all infuriatingly useless things – a handful of beans; and, as Rick told Ilsa, it's doesn't take much to see that the problems of three little people don't amount to a hill of beans in this crazy world. But, Pythagoras aside (and we'll come to him later), each of these apparent dismissals is in fact a tribute to the virtues of the bean. It's because the bean is so useful that it's around so much, and it's because it's around so much that it looks so commonplace and boring. High in bulk and fibre, rich in vegetable protein, beans have always proved excellent food for people who don't have a lot of disposable income, because they fill you up at a relatively low cost.

"Since ancient times," writes Claudia Roden in her beautiful *A New Book of Middle-Eastern Food* (Penguin, $27.95), "dishes based on chickpeas, beans, lentils and cereal have been looked down on as the food of the poor". But she adds that these dishes are in fact loved by rich and poor alike: *ful medames*, the Egyptian national dish, consists basically of broad beans, cooked for a long time until they're very tender.

The new Australian bean is a red kidney bean, which means that it's a member of that large genus of common beans, *Phaseolus vulgaris*, bequeathed to us by the Americas. In its numerous varieties – borlotti, cannellini, haricot, navy, field, pinto, black – the common bean is a staple of many American diets, from Peru to the southern United States (where it's an inescapable ingredient of soul food and Cajun cuisine).

Unfortunately, it hasn't – until recently – done as well as might have been hoped for in Australia. There has been little research into finding varieties suitable for Australian conditions, and beans grown here have often fallen victim to rust, a fungal pathogen that can spread quickly and ruin a whole crop.

With any luck, A21 will change all that. A21, a cross between a Nicaraguan red bean and a Salvadorian black bean, is just one among the 35,000 varieties of bean held in the collection of the International Centre for Tropical Agriculture in Colombia. In 1981, more than 1,000 of these varieties were shipped to the Queensland Department of Primary Industry. There, it was the job of a bean breeder, Robert Redden, to find out which would be most suitable for local conditions.

A21 was the winner, and it was rewarded for its success by being crowned with an Australian name. It's now called "Rimfire", in accordance with the strange custom whereby bean releases in Australia are always named after

caused any major problems and it's offset, perhaps, by the really good way the Rimfire behaves itself in the can.

"Canning tests are expensive, time-consuming and laborious," says Robert Redden, "and we always try to keep the numbers down before we ask commercial canners to co-operate in these tests."

To pass the test, a bean must be able to withstand the canning process without going mushy, while at the same time not being so firm that it is unable to absorb moisture.

Here, Rimfire came top of an exam class of about 100; both Edgells and Masterfoods have found its canning qualities to be at least as good as those of imported American beans. This is particu-

winners of the Melbourne Cup. (Rimfire, an outsider, triumphed against the odds in 1948.)

According to Robert Redden, Rimfire has a number of qualities desirable in a bean: it's resistant to current strains of rust, which means that growers will be able to reduce their reliance on fungicides; it's quite high yielding; it takes canning well; and it can be harvested without difficulty.

When it comes to harvesting, Rimfire is not, in fact, the best-behaved of bean plants. It has a tendency to send out shoots which either trail along the ground out of reach of mechanical harvesters or drag other plants into the way of the cutter. So far, though, this inconvenient creepiness hasn't

larly good news, because at the moment Australian canners are forced to rely totally on beans imported from the States.

So it looks as though Rimfire may provide us with an opportunity to increase our negligible production of red beans.

Pythagoras would not have approved, though it's not altogether clear why he thought that beans were to be avoided. Perhaps he got the idea from the ancient Chaldeans, who believed that they could be reincarnated as beans.

On the other hand, beans were used in Greece as voting tokens in elections, so any ancient Greek who told you to abstain from beans was possibly telling you to steer clear of politics. Then again, he may have had a very simple reason for his objections.

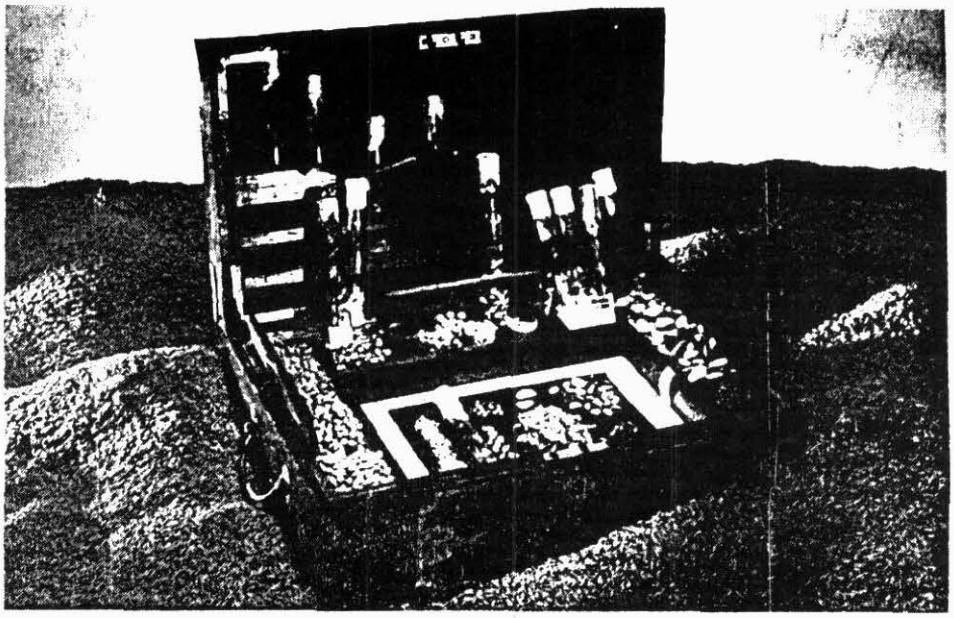
"Beans are one of the highest sources of valuable types of fibre," write Terry Bolin and Rosemary Stanton in their recent book, *Wind Breaks*. "When this fibre is fermented by the bacteria in the colon, it will increase gas." They recommend soaking the beans for a long time as a way of reducing the explosive effects of eating them. This has been the Egyptian practice for centuries. Perhaps nobody thought to tell Pythagoras.

Alan Saunders presents The Food Program *on Radio National.*

ENVIRONMENT AND CONSERVATION

ARAB WORLD AGRIBUSINESS
Vol. 9 No. 1

Witness to our past, guardian of our future.



A genetic treasure for humanity. Past and future are preserved in the seeds of 52,000 varieties of cassava, beans and tropical pastures in CIAT's gene bank. The seeds offer a healthy food supply for the coming generations.

Open sesame! Ali Baba said-then was awed by the size and value of the treasure he saw. One feels the same astonishment when opening the door of the gene bank at the **International Center for Tropical Agriculture (CIAT)** near Cali, Columbia.

The treasure? Shiny little seeds of different forms and colors that reflect 10,000 years of farmers' toil and aeons of plant history."CIAT's gene bank is an austere, but precious, legacy for humanity-a collection of seeds and living plants of more than 52,000 varieties of cassava, beans, and tropical pastures," says Dr Masaru Iwanaga, head of CIAT's Genetic Resources Unit (GRU).

"It protects what nature shaped for its own survival"."Seeds in the bank carry genes that allow the plants to resist, for example, disease and insect attacks without pesticides," Iwanaga explains. Or to adapt to ecological stresses such as drought or salty soils."Some of the seeds in the bank are the world's only remaining samples. The varieties themselves have disappeared from farmers' fields," Iwanaga adds. "When a plant vanishes, so do its genes, which may be invaluable to present and future generations."

"CIAT's scientist and cooperators have explored the centers of genetic origin of each species to rescue seeds of wild species since the collection was started in the late 1970s, says Rigoberto Hidalgo, GRU research associate. CIAT characterizes and multiplies wild, domesticated, and modern germplasm and distributes seeds on request to national agricultural research systems worldwide.

An 'active' collection of 50,000 bean and pasture seed samples is preserved for 5 to 10 years at temperatures ranging from 5 to 8 degrees C. Seeds can remain viable for more than 25 years in a similar 'long-term' collection, packed in vacuum-sealed bags of multiple layers of aluminum foil, paper and plastic.

Scientists systematically monitor the seeds' viability, or capacity to germinate."If the germination rate drops, we replant and replace with fresh seeds," says Javier Belalcazar, GRU research associate."For cassava, we distribute cuttings rather than seeds, because the plant is normally multiplied vegetatively, explains Graciela Mafla, GRU research assistant."Thus, we keep 5,000 varieties of cassava from 23 countries as a living *in vitro* collection in test tubes."

CIAT constantly supplies cuttings of the most popular cassava varieties from a 'working' collection that continuously grows in the field. During the past 17 years, the GRU has distributed 100,000 samples of beans, cassava, and tropical pastures to breeding programs in more than 80 countries. National programs in 38 countries have released 183 farm varieties bred from CIAT-supplied germplasm.

"CIAT holds the seeds in trust, but they actually belong to humanity," explains Dr. Douglas R. Laing, former CIAT deputy general."As a trustee, CIAT has a continuing obligation to guarantee free access to the seeds, and the genes that they carry." "Seeds are the future," Iwanaga says."It is wonderful to plant them, then see the new plants grow and produce seeds before they die. It is like they are raising children. "Genetic diversity cannot be re-created after it has disappeared," Iwanaga adds. "By preserving seeds, we are preserving our future.

OPEC FUND NEWSLETTER

RESEARCH

CIAT develops weevil-resistant beans

The International Center for Tropical Agriculture (CIAT) in Cali, Colombia has recently developed new bean varieties that are genetically resistant to the Mexican bean weevil, a stubborn pest that devours up to 25% of the beans harvested in Africa and Latin America. The new varieties will help farmers save hundreds of millions of US dollars annually, not only by reducing storage losses, but also by eliminating the need for expensive, potentially detrimental pesticides. Most importantly, the new beans will provide some 300 million of the world's poorest people with cheap, nutritious food.

The new resistant beans, which owe their existence to the chance preservation of a wild Mexican bean, make a good case for the importance of protecting genetic diversity, a principle recognized in June 1992 when the UN Conference on Environment and Development (UNCED) signed the "Biodiversity Treaty". The search for a weevil-resistant bean had been long and discouraging. Over 10,000 domesticated bean types had been examined for resistance to the weevil, but to no avail: not a single bean had survived.

Finally, CIAT's germplasm specialists turned their attention to the modern bean's wild ancestors. A handful of tiny seeds from the vines of a scraggly, weed-like primitive bean provided the answer. Collected twenty years earlier by an American biologist in the rugged hills of southern Mexico, the seeds had been preserved among the 26,500 different bean samples in CIAT's gene bank.

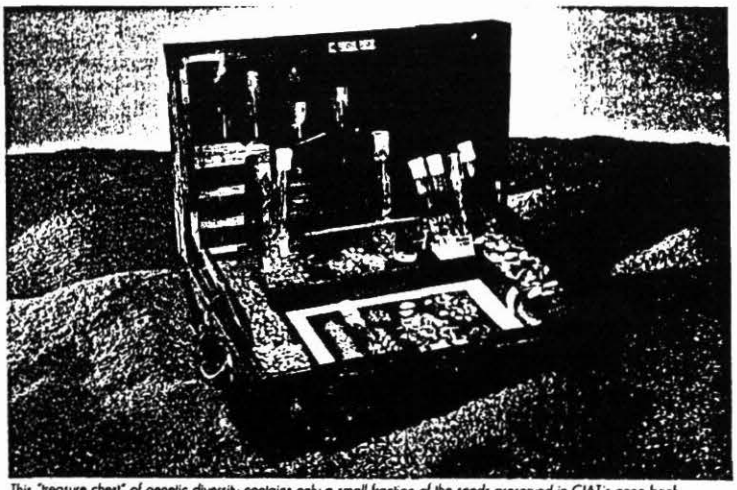
When the wild beans were fed to the Mexican bean weevil, it starved to death. Research showed that the wild bean contains *arcelin*, a unique protein which disrupts the weevil's digestion but has no adverse effect on humans.

CIAT reseachers then began breeding the wild bean's resistance into commercial bean varieties. The arcelin gene has now been bred into 160 experimental lines that have been successfully tested throughout Africa and Latin America. At last, small farmers will be able to grow beans that can withstand weevil attacks — without resorting to pesticides.

Without that handful of wild Mexican beans, the search for resistant beans might have ended in failure. According to Dr. Masaru Iwanaga, head of CIAT's Genetic Resources Unit (GRU), "the rate of genetic erosion, the disappearance or even extinction of plant species, is alarming." Worldwide, hundreds of plant species are becoming extinct every year. Unless wild plants are collected and preserved, the essential genetic pool needed for developing new varieties will be lost for all time.

Dr. Iwanaga describes CIAT's gene bank as an "austere, but precious, legacy for humanity." The collection of seeds and living plants from more than 52,000 varieties of cassava, beans, and tropical pastures seeks to preserve and protect the characteristics "nature shaped for its own survival", genes that enable plants to resist diseases or insect attacks without pesticides, or to adapt to drought or poor soils.

A farmer in Colombia selects bean seeds to supply to surrounding villages



This "treasure chest" of genetic diversity contains only a small fraction of the seeds preserved in CIAT's gene bank. Photo: CIAT.

Some of the seeds in the bank are the world's only remaining samples of varieties that have already disappeared in nature or from farmers' fields. When a plant becomes extinct, its genes, which may prove invaluable to present and future generations, are lost forever. "Genetic diversity cannot be recreated after it has disappeared. By preserving seeds, we are preserving our future", Dr. Iwanaga emphasizes.

CIAT is dedicated to the alleviation of hunger and poverty in the developing countries in the tropics by applying science to agriculture to increase production while sustaining the natural resource base. As of the end of 1992, the OPEC Fund had contributed two grants in the total amount of US$900,000 in support of CIAT's research work. The Center characterizes and multiplies wild, domesticated, and modern germplasm, and distributes seed on request to national agricultural research systems worldwide. During the past 17 years, CIAT has distributed almost 100,000 samples of beans, cassava, and tropical pastures to breeding programs in more than 80 countries. Over 180 farm varieties have been bred from CIAT-supplied germplasm. □

update

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Friendly insects battle across continents to save a neglected crop

Buoyed by past successes, the Colombia-based International Center for Tropical Agriculture (CIAT) and its Nigerian affiliate, the International Institute of Tropical Agriculture (IITA), have joined forces in a new pest management campaign. Their aim is to kill remaining cassava pests in Ghana, Benin, Nigeria, Cameroon and northeastern Brazil.

CIAT will work in Brazil. IITA will spearhead the effort in West Africa. UNDP is providing funds to help the two institutes fend off the cassava pests using non-chemical methods. One potential tool in this campaign may be found in the form of a tropical fungus. The fungus is already used to attack the green mite in dry areas of tropical America.

In the past, CIAT and IITA banded together to control the mealybug which was destroying cassava plants in sub-Saharan Africa. IITA scientists knew that biological control of the mealy bug would be a safe and inexpensive way to control insect pests. Because of CIAT's knowledge of cassava pests in Latin America, IITA requested assistance.

In Latin America, wasps had proven to be a natural enemy of the mealybug. Entomologists collected and shipped wasps to Africa. There, IITA found a way to package and drop these "friendly insects" into affected areas by airplane. These wasps finally brought the mealybug under biological control in Africa. The campaign has been revived, however, to eradicate new cassava pests.

SPORE
CTA

Biotechnology to improve cassava

PHOTO MEDIA PROJECTS

Low cyanide cassava reduces risks to health

The production of cyanide by the cassava plant, possibly as a defence mechanism against pests, was one of the subjects under discussion at the first international scientific meeting of the Cassava Biotechnology Network (CBN) held in Colombia in August. The meeting examined ways of using biotechnology to enhance the use of cassava and produce new strains.

Cassava is an extremely important crop for providing a cheap source of starch under harsh climatic conditions, but it does have several drawbacks. The cyanogenic compounds which occur naturally in cassava can affect health if the processing of cassava is inadequate or rushed. Cassava is also pest-susceptible and liable to rapid deterioration after harvest. In recent years cassava production has increased substantially in Africa, with the surplus going into processing. Participants at the meeting recommended biotechnology research in the areas of processing, especially fermentation, so as to develop additional ways of using cassava.

Participants also discussed the successful use of biotechnology in the areas of biochemical markers to help identify duplication among the 5,000 varieties in CIAT's cassava gene bank; genetic mapping to increase efficiency of genetic improvement; lowering the cost of germplasm conservation and successful embryogenesis replication in recalcitrant cassava cultivars.

✍ *CIAT*
AA 6713, Cali,
COLOMBIA

THE IDB
Inter-American Development Bank • July 1993

Agriculture's brave new world

The recurrent impasses in international trade negotiations over the past few years have highlighted what may well be the chief threat to peace and prosperity in the post-Cold War era: restrictions on free trade.

As has historically been the case, agriculture plays a key role in these negotiations. The origins of the trade conflict date back to the 1960s, when the developed countries established agricultural subsidies and the European Community created a common agricultural policy. Even earlier, in 1952, a proposal to create a World Trade Organization was abandoned for want of sufficient ratifying votes.

The Latin American countries, as major agricultural exporters, have suffered from international trade restrictions. At the same time, however, they have until recently lacked the political will to carry out the economic integration that would have strengthened their bargaining position. The countries have fought their battles individually, and for the most part, have lost.

Now, Latin America is stepping up efforts toward integration, first at the subregional level, with the eventual goal of a hemispheric market. Through integration, the region can engage in multilateral negotiations from a position of strength, protecting its interests while working towards the long-term free trade goals of the Uruguay Round of the General Agreement on Tariffs and Trade.

Problem of subsidies. On the free trade front, agricultural subsidies remain a major stumbling block. The magnitude of the problem is clear from the size of the transfers to the agricultural producers in the developed countries—that is, the subsidies paid by the national treasuries and the higher costs paid by consumers as a result of protectionism, equal to some $300 billion a year. This compares with the $301.4 billion represented by all world trade in agricultural products in 1989.

The lowering of trade barriers as part of Latin America's economic reform will make its agricultural producers subject to aggressive foreign competition, in many cases, subsidized. As IDB President Enrique V. Iglesias has said, the region's farmers are capable of competing with foreign farmers, but not with the treasuries of the developed countries. To level the playing field, countries must adopt policies for implementing external tariffs based on subsidies for producers and consumers in their trading partners.

Falling trade barriers have created an urgent need for Latin America's farmers to become more competitive.

As integration lowers trade barriers and Latin America's producers face greater competition, they will face a triple challenge: reducing the costs of production, improving the quality of products, and simultaneously protecting the environment. The ability of a country's farmers to sell their products domestically and abroad depends on their relative costs of production. Their economic survival demands that they adopt technologies that increase yields and significantly reduce costs per unit of the product.

Pressure on small farmers. Falling trade barriers will put particular pressure on small-scale farmers producing for the domestic market. The drop in prices for agricultural products will intensify the vicious circle of poverty and environmental degradation in which so many small-scale farmers are trapped, increasing unemployment and migration to the cities, with the accompanying high economic and social costs.

In the name of economic and social efficiency and environmental preservation, priority must be placed on the creation of opportunities to enable small-scale farmers to enter expanding internal and foreign markets, in particular through new forms of community organization that facilitate the adoption of technologies, enable greater efficiency in processing, and provide direct market access.

Agricultural technology is an essential instrument for increasing a country's trade competitiveness while preserving the environment. Underestimating the role of technology can be suicidal, not only for the agricultural sector, but also for a society's future economic and social development.

— Gustavo A. Nores
Director General, International Center for Tropical Agriculture

El BID (Banco Interamericano de Desarrollo), USA November 1992

EL BID
Banco Interamericano de Desarrollo • Noviembre de 1992

Seeds of progress

REGIONAL

Semillas de progreso

Hace dos décadas, viajando en mula por las colinas del sur de México, H.S. Gentry, del Departamento de Agricultura de los Estados Unidos, se detuvo a inspeccionar una enredadera silvestre que a un lego en la materia le hubiera parecido un arbusto inútil. Pero Gentry la reconoció como un haba silvestre cuya conformación genética podría ser útil para generaciones futuras.

Científicos del CIAT combaten plagas con genes.

Las semillas que Gentry recolectó ese día terminaron en el Centro Internacional de Agricultura Tropical (CIAT) con sede en Cali, Colombia, que recibe apoyo del BID. Allí un grupo de científicos ocupados en el estudio de variantes genéticas de control de plagas decidieron usar las semillas en su trabajo.

Durante años, los científicos habían estado buscando un haba que tuviera resistencia genética al gorgojo del haba, plaga que devora una cuarta parte de los frijoles almacenados en Africa y un 15 por ciento en América Latina.

De 1977 a 1982 los científicos habían dejado que el gorgojo atacara 10.000 tipos de habas de cultivo y hallaron que ninguna podía sobrevivir a la plaga. Fue entonces que comenzaron a alimentar al destructivo gorgojo con frijoles producidos con las semillas de Gentry. El resultado fue que el insecto moría por inanición. Resultó que el haba contenía una singular proteína llamada arcelín, que bloquea la digestión del gorgojo.

Se han injertado genes de esa haba silvestre en 160 variedades experimentales y el CIAT está enseñando a científicos de toda América Latina a examinar y seleccionar variedades de cultivo que contienen el gene resistente.

"Si el doctor Gentry (que ahora tiene 88 años) no hubiera recolectado esas semillas silvestres, el mundo podría haber perdido esa resistencia para siempre", afirmó Masaru Iwanaga, titular de la Unidad de Recursos Genéticos del CIAT. Con el alarmante índice de desaparición y hasta extinción de especies vegetales en América Latina es importante que otros sigan el ejemplo de Gentry, agregó.

"Las plantas silvestres deben ser recolectadas y conservadas cuidadosamente, si vamos a desarrollar una agricultura que sea ambientalmente segura", explicó.

— Thomas Hargrove

El BID (Banco Interamericano de Desarrollo), USA July 1992

EL BID
Banco Interamericano de Desarrollo • Julio de 1992

Training the trainers


MAURICIO ANTORVEZA—CIAT

Graduados del curso del CIAT.

REGIONAL

Entrenando entrenadores

El Centro Internacional para la Agricultura Tropical (CIAT), en Cali, Colombia, ha estado entrenando científicos agrícolas y agentes de divulgación agrícola de América Latina y el Caribe desde 1970. En total, unos 4.000 graduados del CIAT han vuelto a sus países para diseminar técnicas para cultivar frijoles, mandioca, forrajes y arroz.

La camada 1992 del CIAT tendrá un efecto multiplicador aún mayor, dice Vicente Zapata, jefe de un nuevo proyecto financiado por el BID, llamado Entrenando Entrenadores. Estos graduados fueron capacitados en entrenar a otros entrenadores en el uso de nuevas tecnologías.

El programa enseña a los entrenadores cómo planear, realizar y evaluar sus propios cursos, y cómo desarrollar, adaptar y poner al día materiales didácticos para otros entrenadores locales.

El primer grupo en completar el curso, que se concentró en tecnologías del frijol, comprendió a 24 agentes de extensión de México, América Central y el Caribe. Unos 1.000 agentes serán entrenados en los próximos cinco años.

—*Claudia Muñoz*

Excelsior, Mexico 26 October 1992

10-B EXCELSIOR

Does international agricultural research pay its dues?

¿Aporta su Cuota la Investigación Agrícola Internacional?

CALI, Colombia.— En 1990, tres centros internacionales de investigación agrícola de América Latina invirtieron 22.3 millones de dólares en investigación en frijol, maíz, arroz y trigo. Ese mismo año, el aumento de la producción agrícola resultante del uso de variedades mejoradas de estos cultivos básicos reportó a la región utilidades de más de mil millones de dólares —alrededor de 46 veces la suma invertida en investigación en los cuatro productos, y 11 veces la suma del presupuesto de los tres centros para 1990.

"En términos ambientales, este valor puede ser aún mayor", afirma el doctor Gustavo Nores, director general del Centro Internacional de Agricultura Tropical (CIAT). "Los sistemas agrícolas altamente productivos y sostenibles ayudan a detener la migración de los agricultores hacia las ciudades y reducen el ritmo de la deforestación".

Un equipo de seis economistas estudió las utilidades de la investigación agrícola realizada en América Latina y el Caribe por

el CIAT en Colombia, el Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMyT) en México, y el Centro Internacional de la Papa (CIP) en Perú. Los tres centros son auspiciados por el Grupo Consultivo para la Investigación Agrícola Internacional (GCIAI). El estudio fue financiado por el Banco Interamericano de Desarrollo (BID).

Durante el periodo 1966-1989, la producción de trigo en la región prácticamente se duplicó. La producción de arroz se incrementó en 93%, la de maíz en 58%, la de papa en 57% y la de frijol en 12%. El crecimiento de la producción de carne y leche durante 1974-1989 fue de 23% y 34%. Los aumentos en la producción se atribuyen principalmente al incremento en la producción de alimentos por área sembrada.

"Estos aumentos sirvieron para que la producción de alimentos de América Latina se mantuviera por encima del crecimiento de la población", reportaron los economistas.

En 1987-1989, los nueve productos del CIAT, CIMMyT y CIP generaron ganancias de 26.6 mil millones sobre la inversión en tierra, mano de obra y capital. Los economistas estimaron que un agricultor promedio latinoamericano se gana 640 dólares por año, lo que permite pensar que por lo menos 41.5 millones de personas viven de estos cultivos. Estos productos aportan directamente 59% de las calorías y 75% de la proteína que consumen los pueblos de esta región.

"Los científicos de los programas nacionales de investigación y de los centros colaboraron en la investigación que llevó al aumento en la producción y, posteriormente, a la reducción del precio de estos alimentos en las ciudades", dice el doctor Willhem Janssen, coordinador del estudio y vinculado al CIAT hasta hace poco. "En consecuencia, atribuimos 50% de las ganancias a la investigación realizada por los centros, y 50% restante a la investigación nacional. Con esta distribución, las tasas de retorno para la investigación realizada por los Centros en el mejoramiento de los principales cultivos de América Latina (maíz, arroz y trigo) oscilaron entre 50% y 70%".

SE CIERRAN LAS FRONTERAS AGRICOLAS

"Las ganancias provenientes del sistema de investigación han hecho más abundantes y rentables los alimentos en América Latina y el mundo en desarrollo —el principal impacto que ha logrado el Banco Interamericano por cada dólar invertido en desarrollo", escribió Frank Meissner (fallecido) en el libro Semillas de cambio, publicado por el BID en 1991. Desde 1974, el BID ha sido el principal donante del GCIAI, un grupo de 40 naciones y agencias internacionales que financian la investigación para aumentar la producción agrícola en el trópico, protegiendo a la vez el acervo de recursos naturales.

"La población seguirá aumentando durante los próximos 20 años por lo menos... y las fronteras agrícolas se están cerrando cada vez más rápidamente", afirma Janssen. "Los agricultores de América Latina deben continuar adoptando tecnologías mejoradas que les permitan mantener su nivel actual de autosuficiencia; de lo contrario, la importación de alimentos absorberá una inmensa porción de las divisas de la región".

Según el estudio, la rentabilidad es sólo un indicador de la efectividad de los centros. El fortalecimiento de los programas nacionales de investigación ha permitido que los centros reduzcan algunas de sus actividades tradicionales y se concentren en áreas de investigación que requieren un esfuerzo internacional. Actualmente, el CIAT, el CIMMyT y el CIP dirigen su atención no sólo al mejoramiento de cultivos, sino también a la biotecnología y al manejo de los recursos naturales —una estrategia para desarrollar sistemas agrícolas productivos y ambientalmente sanos que protejan los ecosistemas frágiles del trópico latinoamericano, amenazados por el uso agresivo de la tierra.

Los agricultores que adoptan tecnologías que redundan en una mayor productividad no se ven presionados a desplazar sus cultivos hacia tierras marginales ni a adoptar prácticas de cultivo migratorio que afectan el bosque, señala el doctor Miguel López Pereira, economista del CIMMyT.

Los sistemas de cultivo mejorados también permiten a los agricultores utilizar sus recursos naturales más eficientemente. "Tomemos el caso del arroz", dice el doctor Luis Sanint, economista del CIAT. "El uso de plaguicidas ha disminuido dramáticamente porque los agricultores han adoptado el manejo integrado de plagas, o MIP —una batalla ecológica que reduce tanto el uso de productos químicos como los costos de producción. En 1980, los agricultores colombianos fumigaban nueve veces por ciclo de cultivo; en 1990, esta cifra se redujo a menos de 3. Hace diez años, 60% de los agricultores venezolanos asperjaban sus cultivos dos o más veces con insecticidas y fungicidas. Hoy, 90% fumiga sólo una vez, si acaso".

"Investigaciones recientes han demostrado que prácticas económicas de MIP, particularmente el uso de trampas con feromonas, son realmente efectivas para controlar el gorgojo de la batata, la principal plaga de este alimento consumido más que todos por las clases pobres del Caribe", afirma el doctor Thomas S. Walker, economista del CIP. "El robo de estas trampas en los ensayos de investigación en fincas indica la gran demanda por este tipo de tecnología".

"No podemos olvidar que 70% de la población de América Latina vive en las ciudades", añade el doctor Guy Henry, economista del CIAT. "La investigación poscosecha y de mercadeo ha aumentado la disponibilidad de alimentos para los consumidores urbanos y ha abierto nuevos mercados para los agricultores. Por ejemplo, casi 200 plantas de secado de yuca en pequeña escala producen actualmente miles de toneladas de trozos de yuca seca en Brasil, Colombia, Ecuador y Panamá. La fabricación local de este sustituto energético de bajo costo en concentrados para animales genera empleo y mejora el poder adquisitivo de la población rural. Esto, a su vez, aumenta el mercado de bienes producidos en las ciudades".

"La investigación es una actividad de alto riesgo de la cual se espera un alto grado de retribución", explica Sanint. "Treinta y cinco estudios sobre la rentabilidad de la inversión en investigación en América Latina, realizados durante los últimos 20 años, arrojan indicadores de rentabilidad social superiores a 30%. Esto demuestra que la investigación sí es una inversión rentable de fondos públicos".

Altillanura verde

Colombia inició, prácticamente, la conquista de 12,6 millones de hectáreas infértiles de los Llanos Orientales, en el área conocida como altillanura.

Fueron 10 años de investigación del CIAT, el ICA y la participación de la Federación Nacional de Arroceros (Fedearroz).

Se trata ni más ni menos de la liberación de la primera variedad mejorada de arroz, la 'Oryzica Sabana 6', para los suelos ácidos de la sabana llanera, que combinada con leguminosas y gramíneas, fortalecerá la pradera, lo cual es el objetivo de la investigación para esa parte del Llano.

Varios ganaderos y agricultores ya han comenzado a trabajar en el sistema arroz-praderas. El CIAT explica que ambos cultivos se siembran al tiempo.

"El arroz se siembra en hileras y el pasto -una mezcla de gramíneas y leguminosas- a voleo. Cuatro meses después se cosecha el arroz y la pastura se somete a pastoreo".

convierten el nitrógeno atmosférico en compuestos nitrogenados muy útiles para la la planta", señala Karridge.

De acuerdo con el CIAT, cuando las leguminosas forrajeras se incorporan al suelo los tejidos de la planta se descomponen, el nitrógeno es transferido al suelo y otras plantas podrán tomarlos luego.

El CIAT agrega que "además las pasturas en que se asocian gramíneas (plantas que tienen tallos huecos divididos por nudos y flores en espigas o en panojas, como en los cereales) y leguminosas también sirven para recuperar la tierra degradada en los márgenes del bosque tropical del Perú".

"Protegen además las laderas colombianas que han sido erosionadas por prácticas agrícolas inadecuadas".

Actuando también como cobertura del suelo, esas leguminosas ayudan a evitar que el fertilizante salga, por lixiviación (disuelto), en el agua subterránea.

"Las leguminosas, por tanto, actúan como un fertilizante nitrogenado gratuito".

Colombia es vanguardia

En Colombia ya se han dado los primeros pasos para conquistar los suelos infértiles de los Llanos Orientales (ver recuadros).

La región conocida con Altillanura ya tiene un poco más de cuatro mil hectáreas, de las 12 millones que la conforman, con cultivos de arroz combinados con leguminosas forrajeras.

Los científicos que trabajaron el sistema explican su funcionamiento: la cosecha de arroz -el Oryzica Sabana 6- para el establecimiento de la pastura deja un margen de ganancia.

Las pasturas se benefician del efecto residual del fertilizante aplicado al arroz.

El arroz, a su vez, se beneficia de la fertilidad de las pasturas bien manejadas, especialmente cuanto estas contienen leguminosas forrajeras fijadoras de nitrógeno.

En un informe del CIAT sobre las experiencias en la Altillanura colombiana, uno de sus agrónomos, José Ignacio Sanz, explica que "el establecimiento de sistemas de solo pasturas mejoradas resulta poco práctico porque demanda una gran inversión de capital en preparación de la tierra, fertilización y semilla".

El Tiempo, Colombia 27 March 1993

EL TIEMPO

New pasture resistant to spittlebug discovered

Tierras y Ganados

Intentan adaptarlo en los Llanos Orientales

Descubren nuevo pasto resistente al 'salivazo'

Investigadores del Centro Internacional de Agricultura Tropical (CIAT), recibieron un premio mundial por el manejo del 'mión' o 'salivazo', plaga que acaba con los pastos tropicales y ocasiona grandes pérdidas a la ganadería

Por IVAN NOGUERA
Corresponsal de EL TIEMPO
Cali

Cientos de hormigas arrieras ingresan a uno de los laboratorios del Centro Internacional de Agricultura Tropical (CIAT), de Palmira (Valle). Los insectos continúan por entre tubos transparentes, para tomar pequeños trozos de hojas de naranjo colocadas sobre un recipiente. Ellas siguen su camino hasta una recámara donde ha sido alojada la hormiga reina.

En otra zona, con los mayores cuidados, es reproducido un pequeño bicho conocido como 'salivazo', que ocasiona graves daños a los pastos.

Este es el ambiente en que se mueven los entomólogos Stephen Lapointe, Guillermo Arango, Miguel Serrano, Guillermo Sotelo y Freddy Córdoba, quienes obtuvieron el premio internacional a la mejor publicación científica.

En el Centro Internacional de Agricultura Tropical (CIAT) de Palmira, ellos lograron por primera vez en el mundo, el desarrollo y manejo del 'salivazo' o 'mión'.

Esta plaga causa grandes pérdidas a la ganadería al acabar con el pasto o forrajes tropicales, especialmente en los Llanos Orientales.

Adicionalmente, el grupo investigativo logró detectar en África una especie de pasto braquiaria, resistente al 'salivazo'. Las investigaciones indican que el maligno bicho no sobrevive después de alimentarse con raíces y tallos de la nueva braquiaria.

En el CIAT se busca ahora determinar las causas que originan la resistencia del pasto a la plaga, para hacer los cruces con las sabanas llaneras.

Todo este proceso fue publicado por la revista de la Sociedad Entomológica de América, después de seis años de investigación.

La selección del trabajo ganador se efectuó entre todas las publicaciones científicas hechas por los investigadores del Centro Internacional de Agricultura Tropical (CIAT), en revistas de todo el mundo.

Lapointe señala que la investigación hace parte del programa de forrajes o pastos tropicales desarrollado por el CIAT, con el fin de aumentar la producción de carne y leche en América Latina, especialmente en suelos pobres y ácidos como los Llanos Orientales.

Sobre el manejo de la plaga, Arango explicó que se trató de un trabajo donde se combinan la ciencia y la paciencia, y que para ello fue necesario recomenzar en muchas ocasiones, con largas horas de observación de las características del bicho.

Explicó que los adultos son depositados en cámaras de oviposición, unas cajas de madera con piso removible para introducir una capa de barro que se mantiene húmedo. A través de aberturas laterales se alimenta al animalito con hojas de pasto braquiaria.

Cada semana se retiran los insectos muertos y el barro con los huevos depositados por las hembras. Los huevos se separan por flotación en una solución salina.

Entomólogos de Brasil, Estados Unidos, México y Venezuela, que también estudian el insecto, y cuyos países son afectados por especies similares al 'salivazo', han llegado hasta las instalaciones del CIAT para conocer la técnica y desarrollarla en sus países.

Sotelo anota que aun cuando se descubrió una variedad resistente a la plaga, se busca conocer sus características. Entre otras hipótesis, se dice por ejemplo que esa braquiaria puede carecer de ciertos nutrientes que perturban el desarrollo del animalito o que tiene algún elemento que al tomarlo causa efectos de envenenamiento.

Aun cuando la especie africana es resistente, no se considera productiva para el ganado y este no gana peso suficiente. Por ello, se busca su cruce con especies desarrolladas en los Llanos Orientales.

Pese a las dificultades en esta etapa, se espera lograr antes de cinco años esta fase de reproducción y cruzamiento.

Lapointe precisa que para el Valle del Cauca son pocos los beneficios de los logros científicos alcanzados por el grupo de investigadores, dado los excelentes suelos de la región. Sin embargo para la inmensa zona ganadera del oriente colombiano, caracterizada por suelos pobres, el impacto económico sería incalculable.

Fotos Ingrid Trejos/EL TIEMPO.

EL SALIVAZO se ubica en la raíz del pasto provocando secamiento. Los mayores daños se presentan en época de invierno.

El País, Colombia 13 June 1993

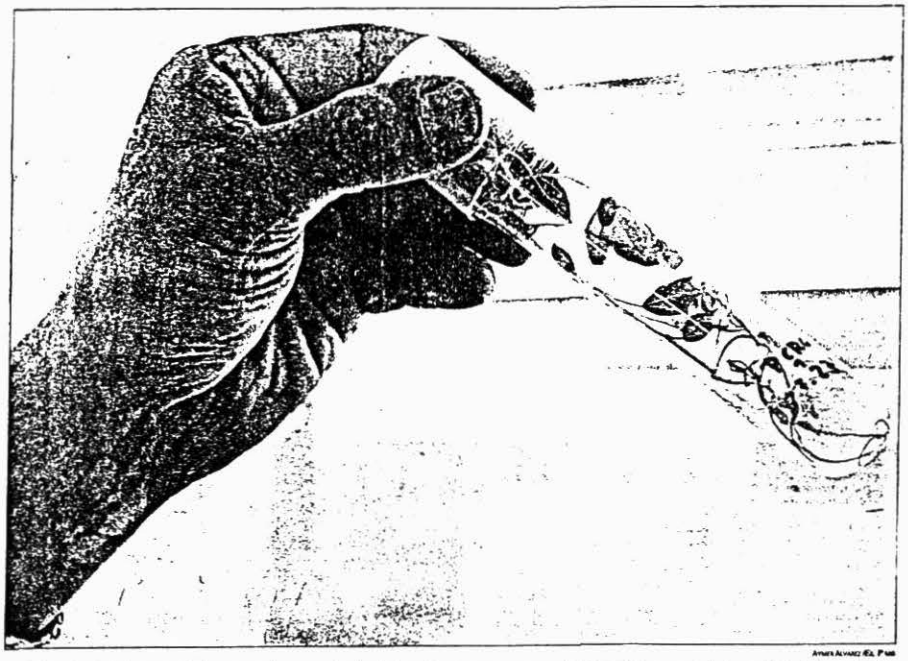
Colombia en la revolución de la biotecnología agrícola

Era de mutantes vegetales

EL PAIS

Colombia in the agricultural biotechnology revolution

Age of plant mutants



En el Ciat, plántulas in vitro son utilizadas tanto para la preservación de colecciones de germoplasma como para la introducción de genes foráneos y regeneración de plantas que expresan nuevos genes. La biotecnología, nueva ciencia de magnitudes similares a la nuclear, pudo producir este novedoso fenómeno. La idea es producir mejores variedades.

AYMER ALVAREZ/EL PAIS

En la unidad de biotecnología del Ciat, Centro de Investigaciones de Agricultura Tropical, permenecen las plantas in vitro, al interior de un cuarto climatizado.

POR PATRICIA LASSO
REPORTERA DE EL PAIS

Que cultivos como la yuca tengan en su estructura información genética de una baceria o un hongo, que el fríjol posea una parte de la célula de una gallina, o que el arroz asimile un gen de cebada, con fines de mejoramiento, era hasta hace algo más de un decenio, ciencia ficción.

Sólo una revolución científica de magnitudes similar a la nuclear, pudo generar este fenómeno, cuya base es la manipulación de los genes que determinan las características propias de cada ser vivo.

Se trata del nacimiento de una nueva ciencia, tan apasionante para quienes la practican, como la conquista del espacio estraterrestre: la genética.

Con la manipulación genética, por primera vez el hombre empieza a antender el fenómeno de la vida en términos químicos y descubre que puede intruducir en los organismos respuestas o características que no le son paropias sino transferidas.

Esta disciplina existe desde que el hombre empezó a utilizar métodos para el aprovechamiento del sistema biológico, como la polinización artificial para generar nuevas variedades de vegetales, la inseminación artificial para obtener animales híbridos y la selección de cepas de microorganismos para conseguir por fermentación ciertos alimentos y bebidas.

Pero la biotecnología moderna se diferencia de las prácticas anteriores, en que parte del cambio de las estructuras genéticas.

Jorge Meyer, bioquímico del Ciat explica estos nuevos procesos: "Al Ciat le interesa conseguir plantas resistentes a plagas o con cualidades indiscutibles. Producir una mejor variedad por medio de la polinización, puede llevar entre diez y 20 años de cruces sucesivos. Es un proceso prolongado que comprende: el cruce de un padre y una madre, para obtener una semilla, volver a sembrar, cosechar y escoger las que

La genética molecular promete ser la solución al problema del mejoramiento en los cultivos comerciales. Colombia participa en proyectos innovadores. El Ciat en Palmira desarrolla los primeros trabajos de plantas transgénicas en yuca, arroz, fríjol y forrajeras.

son buenas, volver a cruzar y conseguir en cada ocasión una generación para fijar la mejor línea. Realmente lo que se quiere es agregarle a un cultivo, que ya es muy bueno, una o varias cualidades específicas.

Por ejemplo, hay una planta que produce un fríjol excelente, pero es suceptible a una peste o a un hongo que lo ataca y lo deshace, en estos casos lo que se hace es aplicar un pesticida, que a la larga es un prioblema por sus consecuencias sobre la salud.

La idea es encontrar una planta que sea resistente a estas enfermedades de una manera natural, y transferir utilizando la biotecnología, ese gen de resistencia que puede venir de otra especie de fríjol o incluso de otro organismo, saltándonos todo el programa de mejoramiento de cruces.

Ahora transgredimos fronteras que antes no se podían, cuando sólo se lograba el cruce de un fríjol con un fríjol".

La transferencia de información genética es posible a partir del descubrimiento de la estructura del ADN, ácido disoxirribonucléico, sustancia química que se encuentra en el núcleo de toda célula, unidad fundamental de la vida y componente de todo organismo.

La molécula de ADN, que se halla en los genes de los cromosomas, y determina las características de todo ser vivo, son a su vez los responsables, en gran parte del crecimiento, división y la progenie de una célula original. La biotecnología moderna manipula este ADN y en la medida en que lo altera modifica las propieades de un organismo.

MANEJO DEL ADN

con alto poder nutritivo y resistentes a las plagas se pueden crear a través de cruces genéticos. La biotecnología permite mejorar especies, transpasando aun los linderos de la propia naturaleza vegetal.

"Con esta técnica se caracteriza la información que tiene una planta en sus ácidos nucléicos o ADN, y se hacen mapas cromosomáticos para conocer en qué posición se encuentran. Finalmente identificamos el gen que queremos transferir o alterar", anotó Meyer.

Las plantas con genes transferidos se llaman transgénicas, en Estados Unidos existen 600, mientras en Colombia el Ciat desarrolla la tecnología en yuca, arroz, fríjol y forrajeras, que se encuentran en experimentación.

La llegada de un nuevo mundo

La introducción de un gen en una célula es proceso complicado y entre los métodos que se utilizan está el del liberación de energía y el de biolística. Un organismo está hecho de miles y millones de células y como es imposible introducir un nuevo material genético en todas ellas, se juega con sus unidades mínimas y se

logra la reproducción de una célula o de un tejido a planta.

Para el primer caso se liberan con ciertas encimas, el protoplasto o membrana de la célula y se introduce ADN a través de cargas eléctricas, con cierta probabilidad de que entre al núcleo y se integre al genóma de la planta o cromosomas, con la nueva información.

"Estos protoplastos regeneran la pared celular y empeza a dividirse y a formar tejidos complejos. Finalmente, le introducimos hormonas y regeneramos otra vez planticas, con un nuevo gen", explicó Meyer.

Sin embargo, hay otros protoplastos que no se dividen o se desonoce la tecnología para ello, como sucede con dos de los cultivos que estudia el Ciat en Colombia, la yuca y el fríjol, ante lo cual se hace necesario utilizar la biolística, bombardeando pequeños tejidos celulares con ADN.

Para tal efecto, se utilizan micro partículas metálicas de oro o de tugsteno del tamaño de una bacteria, más pequeña que una célula, y se les adhiere ADN, luego se aceleran a través de una explosión de gas o pólvora contra el tejido, para que las células reciban el gen necesario.

Después de penetrar algunas células se destruyen, otras se reparan. Las que quedan vivas asimilan la nueva información y con la ayuda de un experto en tejidos, se empiezan a formar las nuevas plantas.

En la biotecnología participan especialistas en fisiología, biología molecular, bioquímicos, entomólogos y agrónomos, que son los que se encargan en el invernadero de constatar que la planta esté dando los resultados esperados.

Uno de los proyectos transgénicos que tiene el Ciat, consiste en transferir de un fríjol silvestre, que se encontró entre 24 mil especies, su gen de resistencia al gorgojo, a un fríjol comercial suceptible a la plaga, sin que este último pierda sus buenas cualidades agronómicas.

Asímismo, los expertos del Ciat están estudiando la forma de instroducir genes de resistencia al deterioro de la yuca.

Proyectos transgénicos

Uno de los proyectos de plantas transgénicas que tiene el Ciat, consiste en transferir a un fríjol comercial, un gen de resistencia al gorgojo, que se encontró en un fríjol silvestre, entre 24.000 especies, con lo cual el cultivo conserva sus buenas cualidades agronómicas y se defiende de la plaga.

Asimismo, los expertos del Ciat, estudian la forma de introducir genes de resistencia al deterioro de la yuca, identificando bioquímicamente por qué una yuca en alta humedad se conserva por más tiempo.

Por otra parte, el Centro ha logrado introducir en una forrajera de alto potencial nutritivo, un gen de hongo y dos de bacterias, sin que ninguno de los tres sea vegetal, con el fin de aplicar sobre suelo cultivado, un herbicida, sin afectar la forrajera.

Igualmente, se busca introducir un gen de gallina a una planta de fríjol, después de comprobar que en la clara de huevo hay dos proteínas que pueden servir para que el cultivo sea resistente al gorgojo. Esta idea es resultado de un experimento con fríjol molido y mezcla de clara de huevo donde se observó el efecto del producto sobre el insecto.

Se intenta introducir los genes de la gallina que codifican para dos enzimas inhibitorias, en el fríjol. En el momento el Ciat está en la fase bioquímica, probando encimas individuales en semillas artificiales y caraterizando su efecto sobre el insecto.

El Ciat: una buena causa

Los colombianos, y más específicamente los vallecaucanos, no nos damos cuenta que en nuestro vecindario tenemos una institución que es patrimonio no sólo del país, sino de toda la humanidad.

No es una exageración. En las instalaciones del Centro Internacional de Agricultura Tropical, localizado en las afueras de Palmira, trabajan discretamente profesionales venidos de todas partes del planeta, con el propósito de ayudar a alimentar a los pobres del mundo. El contacto que tenemos con ellos es escaso. Los vemos manejando sus autos de placas diplomáticas, pero en la mayoría de los casos no sabemos muy bien qué es lo que hacen. El Ciat, en efecto, ha tenido por política rehuir la publicidad innecesaria.

Tal vez por eso muchos no saben que, junto con otra docena de institutos regados en los cinco continentes, el centro está a la vanguardia del desarrollo de técnicas agrícolas para disminuir el riesgo mundial del hambre. De su labor han resultado descubrimientos tecnológicos que ayudan a millones de campesinos en Africa, América Latina y Asia.

Una visita a sus instalaciones a veces deja la impresión de estar en otro país. Ahí trabajan más de cien profesionales PhD y cientos de otros empleados, con un presupuesto anual de más de 30 millones de dólares, proporcionados por fundaciones extranjeras. Laboratorios muy sofisticados, extensos terrenos para cultivos experimentales y una apariencia general de "campus" extranjero sirven para romper la vieja creencia de que en el Tercer Mundo no se puede hacer ciencia de calidad mundial.

La gama de actividades que llevan a cabo es también impresionante. Algunos ejemplos: los laboratorios de biotecnología usan técnicas de la era atómica para buscar variedades vegetales resistentes a las plagas. Una bodega inmensa sirve para guardar la colección más completa de semilla de fríjol en el mundo. Es un tesoro genético invaluable, pues de aquí saldrán nuevas variedades que aumentarán la producción mundial de alimentos.

En otro costado del centro, un científico británico recoge ideas usadas originalmente por los indios del Vaupés para desarrollar nuevos usos de la yuca. Y otro académico peruano ensaya aparatos artesanales para que los pequeños campesinos puedan producir sus propias semillas.

El trabajo de los colombianos y los extranjeros en el Ciat es una demostración palpable de lo que puede aportar nuestro país a la comunidad mundial. Y tenemos razones más que suficientes para sentirnos orgullosos de ello.