Breeding a Better Bean: The Horizontal Resistance Approach

by Douglas Powell

Mexican farmers: sowing seed

Researchers in Mexico and Canada have dramatically boosted the yield of a major Mexican food crop using an unconventional breeding technique that harnesses the power of multiple resistance genes to protect against a range of plant pathogens.

Using horizontal resistance breeding, scientists from the Colegio de Postgraduados in Montecillos, east of Mexico City, — in partnership with the University of Guelph in Canada — have more than tripled the yield of locally grown black beans — without the help of pesticides.

Different Kinds of Resistance

In 1963, J.E. Vanderplank, a South African plant pathologist, coined the terms "horizontal" and "vertical" resistance to describe the different kinds of genetic resistance found in crop plants. Vertical resistance, which involves a single gene, is a temporary form of genetic resistance that breaks down as new pathogens appear on the scene. Horizontal resistance, which involves many genes, is a more durable form of resistance to disease or insects.

To protect crop plants from parasites, most breeders use classic Mendelian breeding techniques to transfer a single gene from a wild plant into a cultivar (cultivated variety), a process that enhances its vertical resistance. This involves crossing a wild plant with a cultivar to generate a hybrid variety, then backcrossing the hybrid offspring with the cultivar parent for several generations until the hybrid is identical to the cultivar but carries the wild parent's resistance gene.

Failed Objectives

> "[Unfortunately], when plants are being bred for vertical resistance, or they are being bred [to improve] yield and crop quality under the protection of insecticides and fungicides, the level of horizontal resistance tends to decline," says Raoul Robinson, a Canadian crop scientist and member of the IDRC-supported plant breeding team. "We have actually been increasing the susceptibility of many of our crops to their parasites. Most of the [vertical] resistance breeding programs of the twentieth century have totally failed to achieve their original objectives."

Since 1991, Dr Robinson has worked with Dr Roberto García Espinosa, the Mexican project manager, to attempt horizontal resistance breeding in black beans — a process in which the best individuals from each generation are selected and bred with each other. After only two breeding cycles, each cycle lasting about a year in duration, the team achieved yields of 1,500 kilograms per hectare **without using pesticides**. For comparison, the average bean yield in the Mixteca region of Mexico is 400 kilograms per hectare **using pesticides**. This is good news for the approximately 200,000 small-scale farmers in the area, who cultivate over 300,000 hectares, of which 40,000 are beans. Moreover, the breeding techniques developed in Mexico can be used almost anywhere and on most kinds of crops.

"Return to Resistance"

Dr Robinson is the author of *Return to Resistance*, which features a how-to guide for amateur plant breeders interested in selecting for horizontal resistance. In addition, he helped to establish the world's first horizontal breeding club at Universidad Autonoma de Chapingo in March 1995. To date, its 76 members have collected more than 3,000 bean varieties from all over Mexico and are considering launching additional clubs for breeding potatoes, wheat, onions, and peanuts.

Douglas Powell is the Science and Society professor at the universities of Guelph and Waterloo.

Resource Persons:

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Additional resources:

Breeding for Resistance: Stages

Plant Breeding Clubs

Review of Raoul Robinson's *Return to Resistance*

Cooperative Research Centre for Tropical Pest Management Internet site

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Horizontal Resistance and the Potato Blight Fungus

In 1946, the Rockefeller Foundation sent John S. Niederhauser to Mexico, birthplace of the potato blight. For over 100 years, the blight fungus had decimated potato yields around the world — beginning with the Irish potato famine in the nineteenth century. Dr Niederhauser — dubbed Mr Potato by friends and colleagues — decided to breed new potato varieties that could withstand the most severe epidemics of blight. He succeeded by pioneering a new breeding technique that enhances the horizontal resistance of the plant. For his efforts, Dr Niederhauser was awarded in 1990 the World Food Prize, the agricultural equivalent of the Nobel Prize.

Douglas Powell is the Science and Society professor at the universities of Guelph and Waterloo.

Additional Resources:

Phytophthora infestans: the potato blight

Potato Blight Re-emerges on 150th Anniversary of Irish Famine

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High Maize Yields Offer Hope for Burundi Farmers

by Andrew Ker and Dunstan Malithano

Dunstan Malithano (left) and research assistant

Burundi, a nation trying to end a devastating civil war, appears to have overcome a different type of threat. Using locally available maize populations, an IDRC-supported research team has developed several high-yielding varieties resistant to the African maize streak virus. This virus is one of the worst of several plant diseases to attack maize, an important staple food here and throughout eastern and southern Africa.

Infested maize leaves

The disease, carried from plant to plant by a leafhopper insect (*Cicadulina spp.*), can decimate an entire maize crop in a severe attack. The disease is characterized by greenish streaks on the maize leaves. Historically, it has been more prevalent at lower altitudes, but in recent years the virus has increasingly affected crops grown at higher altitudes. This may be due to changes in the habits of the leafhopper vector, perhaps because increasing numbers of small-scale farmers are being forced to cultivate maize further up

the hills and throughout the year.

Beginnings

In 1978, ISABU, the Burundi national agricultural research institute, approached IDRC for help in establishing a maize-improvement program. The program's aim was to breed high-yielding maize varieties resistant to streak and other diseases, and adapted to the needs of farmers in the different ecological zones of Burundi. The research team began by collecting and testing a wide range of varieties, both local and foreign, including high-altitude lines obtained from the International Centre for Maize and Wheat Improvement (CIMMYT) in Mexico. However, this material was poorly adapted to local conditions and quickly succumbed to the maize streak virus.

Late-maturing

The highest yielding introductions at the Kisozi maize research station in Burundi (located 2150 metres above sea level) were hybrids bred at a similar altitude at the Kitale station in Kenya. However, these hybrids were generally late-maturing varieties, taking eight or nine months to harvest. Farmers in Burundi preferred varieties that matured in four or five months, which gave them time either to plant another crop after the maize or plant two maize crops a year.

On the Imbo Plain -- located on the floor of the Rift Valley north of Burundi's capital, Bujumbura -- maize varieties adapted to the 800-metre altitude environment were needed. Intensive screening of maize obtained from the International Institute of Tropical Agriculture (IITA) in Nigeria resulted in the identification of one variety adapted to the Imbo Plain and preferred by farmers. IITA had also developed several streak-resistant breeding lines, although none of them were suitable for Burundi conditions.

Improving Local Maize

In 1985, Dr Dunstan Malithano, a Malawian researcher who had previously worked for IDRC in Mozambique, joined the team. He reorganized the breeding program to place greater emphasis on improving local maize populations, rather than making selections from exotic varieties and developing hybrids. Previous work had shown that maize obtained from other countries often fared poorly in Burundi and that farmers did not accept them. By contrast, new varieties based on local populations would be readily accepted by farmers and consumers. This approach also meant that farmers would not have to buy hybrid seeds every year.

It turned out that farmers did not have to wait long before receiving improved seed. Within two years of beginning the new approach, superior maize varieties were distributed, while the researchers continued developing better and higher yielding varieties. By 1989, the team had developed three high-yielding varieties resistant to streak disease: "Mugamba I" and "Isega I" for the high and medium altitude areas, and "Imbo I" for the lakeshore and Imbo plains. Imbo I was also found suitable for beer brewing, replacing barley in the Burundi Brewery.

Distribution Bottleneck

The brewery played a key role in getting the seed into the hands of farmers. Burundi lacked a seed-production facility, creating a bottleneck when it came distributing the new varieties. To meet demand, Dr Malithano negotiated with the brewery to multiply his improved maize varieties. After one growing season, the brewery had produced enough seed to distribute to a limited number of farmers, who in turn generated 43 tonnes of seed. The new variety was then sold to farmers throughout the Rift Valley, on the condition that part of their crop be sold back to the brewery for further distribution or brewing purposes.

By 1994, it was estimated that 80% of all Burundi maize growers had adopted the streak-resistant varieties

and were growing them successfully. In addition, there was increasing interest in the new maize varieties from other neighbouring countries such as Kenya, because of the rapid spread of streak disease there. An important legacy of the maize improvement program is that Burundi researchers have been trained to take over the breeding program completely.

Andrew Ker was the senior IDRC program officer responsible for crops and cropping systems projects in eastern and southern Africa, from 1987 to 1992. Dunstan Malithano served as scientific advisor for IDRC on the Burundi maize improvement program.

Resource Persons:

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Additional resources:

CIA World Fact Book: Burundi

International Centre for Maize and Wheat Improvement (CIMMYT) Internet Site

International Institute of Tropical Agriculture (IITA) Internet Site

Maize Seed Industries in Developing Countries: Seeds of Contention or Collaboration?

FAO/WFP Crop and Food Supply Assessment Mission to Burundi

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Integrated Pest Management for Colombian Small Farmers

by David Mowbray

Integrated Pest Management (IPM) test plot in Colombia

Gerardo Sota farms on some of the most difficult terrain on earth -- the precipitous slopes of the Andes mountains in Colombia. No farm machine can negotiate the steep hillsides and narrow furrows. Every carefully terraced row must be plowed by hand. Every bean pod, ear of corn, or potato that grows is picked or dug by hand. He, his sons, and now his grandsons work year-round to keep their hectare-and-a-half farm productive.

Despite the demanding conditions for farming, Sota loves his land. To him, every square metre is precious and, if treated well, will give something back. "Agriculture is my profession," Sota explains. "My father taught me how to farm the land. Farming is what I most like doing."

Staple Food

Sota grows potatoes, carrots, corn, and -- most importantly -- beans. Beans are a vital food crop in the Andean region of South America. In Colombia, Ecuador, and Peru, beans provide both calories and protein in the diets of the rural poor. Many Andean families eat beans three times a day. By the turn of the century, demand is expected to exceed supply by 30%. Beans have been grown in rotation with corn on the mountain slopes for thousands of years. The stalks left from the harvested corn form climbing poles for the beans. The nodules on the bean roots take nitrogen from the air to fertilize the soil for the next corn crop.

Gerardo Sota had always farmed without using chemical pesticides. More than 20 years ago, his father had warned him of their dangers. For years, he saw no need for them. But 15 years ago, the situation changed. "I started to use them ever since I lost a bean crop," he recalls. "The crop was attacked by a pest. The

beans had already developed pods and suddenly that pest attacked. The pods turned black."

Vicious Cycle

Sota lost his crop and any chance of making ends meet that year. He determined never to let it happen again, deciding that the risk of sickness from the insect spray was worth it. Now Sota and the other bean farmers of the Andean region are caught in a vicious cycle of ever increasing pesticide use.

The indiscriminate use of the sprays killed not only the pests but beneficial insects too. As a result, what had been insignificant pests, such as the leafminer, were left with no natural enemies and began devastating bean crops. So farmers had to spray more. Today, in some bean-growing areas of the Andes farmers spray every week.

> "We farmers have a fault," explains Sota. "If we see that a tablespoonful works to kill the insects, then we say, 'Well let's add another tablespoonful so it will be even more effective!'"

Cause for Alarm

Practices such as these were alarming Dr Cesar Cardona, an entomologist at CIAT, the International Centre for Tropical Agriculture based in Cali, Colombia. "We detected a very serious situation of insecticide abuse among small bean farmers in the Andes of Colombia, Ecuador, and Peru. We found that the levels are extremely high, that the crop is becoming uneconomic because of the excessive use of chemicals," Cardona says.

In the past, Cardona himself had advocated the use of pesticides to improve crop yields. "I was trained to use pesticides 20 or 25 years ago. I did it for a while but I have been convinced that we can produce safer products at lower cost without using so many chemicals."

Participatory Research

Cardona determined that a program of integrated pest management, a strategy that had worked with many other crops to reduce the need for spraying, could work on the tiny mountainside plots if enough farmers could be convinced to use it. The key to his idea was to involve farmers in the research itself.

With funding from IDRC and the cooperation of the national agricultural research systems of Colombia, Ecuador, and Peru, Dr Cardona initiated a program of farmer participatory research to find out which insect management strategies would work.

Implementing IPM

The whole goal of integrated pest management (IPM) is to reduce pesticide use to the minimum necessary by introducing practices such as destroying crop residues that harbour the eggs of next season's pests. The crops are regularly inspected and then sprayed using only the chemical that is appropriate for the particular pest. The various components of the IPM approach had worked well in other situations but this was the first time anyone had tried to use them with small farmers in such difficult terrain and with a crop like beans.

Cardona's research team selected farmers willing to set aside some of their fields for the tests. Each farmer had two similar plots -- one which he or she maintained in the usual way, spraying whenever it was considered necessary. In the adjacent plot, the scientific teams used the more environmentally sound, integrated approach.

If IPM techniques worked, the scientists thought the farmers participating in the tests would see the results

right away. For the most part that was true. But the researchers also learned from the farmers. Not all the ideas tested at the research stations were acceptable to the farmers. For example, the scientists thought that sticky yellow traps coated with fuel oil would reduce the insect population. To trained scientific eyes they did kill millions of bugs. But the scientists had not considered the extra work involved in maintaining the traps on the steep mountain slopes. The extra trips down the mountain to town to get new oil, and the cleaning of the traps demanded too much labour to be worthwhile. Moreover, although the traps were full of dead bugs, the farmers still saw thousands of live insects on their bean plants.

Simple Monitoring Techniques

Another part of the IPM strategy is to monitor the bean plants for signs of insect infestation. But many of the farmers have little formal education. The careful record keeping and arithmetic that served well at the research stations could not succeed with the farmers. So the researchers who were working with farmers on the test plots in Ecuador came up with a straightforward monitoring and counting technique that every farmer could understand and use. It required just a glass jam jar and a pocketful of beans. For every damaged bean pod the farmer spots, a bean goes into the jar. If the jar fills slowly, there is no need to spray.

Cesar Cardona says the results on the test farms throughout the region are impressive. Crop quality has been maintained, pesticide use dramatically reduced and the profitability of the bean crop increased because the farmers spend less on pesticides.

> "If most of them start implementing IPM, insect population levels will gradually decrease in the area," Cardona says. "Now they do see the better economic returns and lower cost. There is no need to use so many chemicals. They can produce the same with at least 60 or 70% less insecticides without losing a penny -- or even make more money."

Everybody Wins

In the towns and on the farms of the Andes, it is an approach by which everybody wins. Consumers get a healthier product, farmers expose themselves and their families to far fewer potentially damaging chemicals, and the land carries a lower toxic burden into the future. Eventually, it appears possible to restore the equilibrium that existed thousands of years ago when the indigenous people of the region first understood the close relationship between beans and corn and never used a drop of insect spray.

The next phase of the project will develop methods of getting the technology from the test farms to everybody's farm. Gerardo Sota does not think this technology transfer will be especially difficult. "It favours farmers and it's less risky for us not to use toxic chemicals. Consumers are in less danger of being harmed by these products. I would recommend it because it gives such good results."

David Mowbray is an Ottawa-based film-maker and writer, reporting from Colombia.

Resource Person:

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The CIAT-Canada Connection

Canada has had strong links with CIAT, the International Centre for Tropical Agriculture based in Cali, Colombia for a quarter of a century. CIAT is one of 16 international research centres in the developing world devoted to improving food security for the world's most impoverished people. It was founded in 1967 and since 1971 both the Canadian International Development Agency and IDRC have been major donors to the operations and the research programs of the renowned Centre.

Robbin Ruggles, a Canadian recently on CIAT's professional staff, points out that Canada was instrumental right from the beginning in getting CIAT's renowned cassava improvement program off the ground. Cassava, a root crop that originated in South America, now serves as a food staple for half a billion people, primarily in South America and Africa.

Canadians Benefit

Canadians farmers have also benefitted directly from work done at CIAT. In addition to its research work to improve beans, cassava and other crops, CIAT holds one of the world's major germplasm collections in its gene bank. A navy bean variety called ExRico 23 was developed by the national research program of Colombia. CIAT introduced it to North American farmers. It is resistant to white mould disease and its use has saved Canadian farmers millions of dollars. Other CIAT bean lines with resistance to potato leaf hoppers will soon find their way onto Canadian farms.

As for the future Ruggles feels there are areas for cooperation between Canada and CIAT that remain to be tapped. He would like to see CIAT linked with more agriculture and environment departments at Canadian universities. "CIAT can act as a bridge for Canadian universities to partner with national organizations in developing countries."

Links to explore ...

Related IDRC articles and publications

> In the Tangerine Grove: Pesticide Use in Thailand, by Daniel Girard. *A multidisciplinary research team examines the high incidence of pesticide poisoning and damage to humans and the environment in Thailand.*
>
> Return to Resistance: Breeding Crops to Reduce Pesticide Dependence *Raoul Robinson describes how to use a long-neglected plant breeding technique to create hardy new plant varieties that are naturally resistant to pests and disease.*
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Additional resources:

> Cooperative Research Centre for Tropical Pest Management Internet site
>
> IPM Net Internet site *Information for international agricultural interests from the Consortium for International Crop Protection.*
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> Selected references on pesticides and pest management

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WOMEN AGAINST CROP PESTS

INTEGRATED PEST MANAGEMENT IN THE PHILIPPINES

MARGARITA T. LOGARTA

Rural women in the Philippines are slowly beginning to realize that they actually do 'hold up half the sky'. Studies indicate that women are vital participants in rice farming. Although they provide less than one-fifth of the actual labour needed for rice production, they have a major role in decision making on the farm. For example, besides running the farm household, bearing children, and augmenting the family income, they also make important decisions about the purchase of agrochemicals.

A recent project funded by IDRC shows that these women can act as effective agents for the adoption of integrated pest management (IPM) -- an environmentally and economically sound way to control agricultural pests (see box).

Under the project, Filipina researchers introduced IPM to five communities in Calamba, Laguna, 50 kilometres south of Manila. "At first, the men denied any participation of their wives in the farming process," observes Dr Candida B. Adalla, an entomologist working on the project. "But in further discussion, some revealed that the women were responsible for choosing and buying pesticides during their trips to market."

Dr Adalla and her predominantly female staff from the nearby University of the Philippines at Los Banos found such information significant. "More than ever, it convinced us of the need to educate women as well as the men," she says.

Two groups of cooperators participated in the experiment: 51 rice farmers working 80 hectares, and 26 vegetable growers cultivating seven hectares. The fields were divided into experimental plots for testing IPM and 'control' plots (for comparison) where current farming techniques, including liberal use of pesticides, were followed.

The farmers actively managed both IPM and control plots, but they were required to consult the project staff before applying pesticides in the IPM control area.

For IPM to succeed, certain conditions must exist. One Filipino agriculturist described these as "all the right type, all the right amount, all in the right sequence, all when the stage of the plant, the weather, and the pest are right to achieve significant control for the least cost". Like most technologies, IPM must be fine-tuned and adapted to specific locations.

In considering their results after the first year, the researchers agree the project is succeeding and should continue. "IPM practices began to greatly influence the farmers' way of thinking," says Dr Adalla. "If they didn't spray in the IPM plot, they wouldn't spray the non-IPM plot as well."

More than three-quarters of the rice farmers obtained higher yields in the IPM portion. If not for a series of bruising typhoons which struck the Philippines last October, IPM yields could have been even higher, say the researchers.

More IPM experiments are currently being conducted on the vegetable plots since last year's results proved inconclusive.

A much misunderstood technology, IPM was initially seen by people as risky. Cooperators were difficult to attract. "We were cynical about the project," Mereng Manzanero, a woman rice farmer, admitted. "We had been the victims of too many government projects in the past. Researchers came and went without even telling us of the results of the experiments."

Alejandro Muya, a school teacher who also manages a farm, said, "We thought that any insect had to be eliminated. We didn't know that 'friendly insects' help destroy pests."

Project coordinators won over the farmers by promising to reimburse them for whatever differences in returns between the two plots. Aware of the people's fears, Dr Adalla and her colleagues quickly established their presence in the communities. "We worked with them in the fields, lecturing and demonstrating IPM," she recalls. Their efforts paid off. "The people praised us for being *ma-charisma* (convincing)," she chuckles.

The staff employed various methods to bring the IPM message to the farmers and their families. They held regular meetings to share ideas and problems. Since few women attended the sessions because they were busy with household chores, the staff visited them at home to solicit their opinions.

The researchers also learned that the women were eager for new ways to earn extra income. Seminars in mushroom culture, accounting, and beekeeping were arranged. And now there are plans to organize a cooperative store stocked with basic goods such as soap, canned food, and coffee.

A team of communicators, headed by Dr Teresa M. Stuart, developed a four-week

HITTING THE ENEMY FROM ALL SIDES

Integrated Pest Management (IPM) is fast becoming a popular alternative to the widespread -- and often indiscriminate -- use of chemical pesticides in agriculture.

IPM controls pests using a combination of techniques -- biological control (using the natural enemies of a pest as weapons against it), special cropping patterns, and the planting of pest-resistant varieties. Chemical pesticides also have a role in IPM, but they are used minimally.

The hit-them-from-all-sides approach of IPM has proven effective in lowering the risks to human health and the environment that pesticides pose. It has also led to higher yields and profits for farmers.

"A beautiful ecological balance between prey and predators in rice ecosystems has evolved over centuries," said Dr Merle Shepard at a recent briefing in Washington for representatives of international agricultural research centres. Dr Shepard is former head of the entomology department of the International Rice Research Institute in Los Banos, Philippines. "Pesticide misuse upset that balance in many areas. But researchers hope to restore it through integrated pest management."

In Asia, four countries have adopted IPM as official policy on crop protection: the Philippines, Indonesia, India, and Malaysia. "Wide scale IPM adoption should reduce pesticide use on rice by 50 percent," according to Dr Shepard. That could save the Philippines about US$5 to 10 million per year, and Indonesia as much as $50 to $100 million.

IPM advocates frequent monitoring of fields to reduce spraying of chemicals.

Education of field workers is the key to spreading integrated pest management techniques. Photos by Arthur de la Rosa.

radio course on IPM. The program aired before the project was implemented in May 1988. More than a thousand farmers enrolled. "Most often their wives would sit beside them while they listened to the program," says Dr Stuart. The regular radio program *Balitang Pambukid* (*Farm News*) over station DZLB continues to provide supportive information and motivation for IPM cooperators and other clientele.

IPM activities were documented through pictures and video tape and exhibited at every opportunity. "It made the people feel good to see themselves on screen," says Dr Stuart. Under her supervision, students of development communication designed an informative comic book, leaflets, and posters on IPM.

The staff hit upon the idea of creating IPM 'scouts' when many farmers complained that monitoring pest populations and recording it with paper and pencil took up too much of their time. (Some farmers pleaded poor eyesight!) Thus, seven young boys, aged 12 to 15, were trained to do the job for four pesos (about 22 Canadian cents) an hour.

Puppets for IPM

Dr Stuart's team also produced a puppet show on IPM entitled "The Verdict", the story of a farmer who files a court case against insect pests. A one-day puppetry workshop was subsequently conducted for the scouts to groom them for future presentations.

When it comes to making agriculture a healthier and more profitable profession, it seems clear that women and youth can be successful agents of change, permanent change. Mereng Manzanero, a mother of two, is one whose life has been so touched. "IPM has truly been a big help to us," she says. "Even if Dr Adalla and her group were to leave this place tomorrow, we would still continue to use IPM."

■

Margie Logarta is an investigative reporter with the Manila Chronicle in The Philippines.

INFORMATION AS ANTIDOTE

FRANCES DELANEY

The curly-haired boy in his striped pajamas slept peacefully. What misfortune could have brought him to this hospital bed in Cairo? The shocking response was that this eight-year-old Egyptian had attempted suicide by poisoning. But he would survive, as would the two-year-old who arrived in her mother's arms a few moments later, the victim of an accidental ingestion of pills.

These children were among the lucky ones. They had been brought to the Cairo Poison Control Centre where a team of qualified clinical toxicologists works with limited resources to save lives. In this busy city of 12 million people, the centre has a herculean task to perform, but it has only 14 beds at its disposal. In 1988, it treated more than 3600 people for poisoning.

Six thousand kilometres to the southeast, in the Indian Ocean island nation of Sri Lanka, physicians grapple with the same problem. More than 25 000 poisoning cases two-thirds of them from pesticides and many of them attempted suicides are admitted to the country's state hospitals every year. Now the second leading cause of death in hospitals after heart disease, poisoning takes the lives of nearly 4000 Sri Lankans annually.

On the other side of the globe, staff of the *Centro de Información y Asesoramiento Toxicológico* (CIAT) in Montevideo, Uruguay, worry about the growing problem of poisoning. The number of cases now numbers more than 6000 annually an alarming rate for a country of only three million people.

The rise in the incidence of poisoning in the developing world coincides with the increasing availability of pharmaceutical, industrial, and agricultural chemicals of both foreign and domestic origin. For countries whose economies are dominated by agriculture, poisonings are mainly the result of overuse and misuse of pesticides and fertilizers. In many instances, the daily users of such agrochemicals are illiterate or containers are labelled in a language other than their own.

Physicians treating poisoning victims need ready access to detailed information about the substance ingested. It can mean the difference between life and death for their patients. An estimated 60 000 man-made chemicals and one to two million products that are mixtures of these chemicals are in common use in the industrialized countries. It is impossible for a physician to remember all the toxicological details of even a tenth of these products. Yet in many developing countries, where information on chemicals and appropriate treatment is not so readily available, it would appear that perfect recall is expected of physicians.

Fortunately, more and more countries are recognizing the importance of ready access to information such as the names, composition, manufacturers, and management of the toxic substances in their own markets.

In Sri Lanka, the National Poisons Information Centre was set up by the government in 1986 at the General Hospital in Colombo with financial assistance from IDRC. It has already compiled several thousand "index sheets" on various poisoning agents. Recently the centre acquired a microcomputer which will streamline the compilation and provision of relevant data.

IDRC support will also enable the Cairo Poison Control Centre and CIAT to strengthen their poison information service to health professionals and communities. In turn, this will increase public awareness of the threat of poisoning.

But what about other countries that may want to establish their own poison information centres but are short of resources? To address this, IDRC is supporting the establishment of a poison information package for developing countries. The project is coordinated by the International Programme on Chemical Safety of the World Health Organization, in cooperation with the Canadian Centre for Occupational Health and Safety and the *Centre de Toxicologie du Québec.*

The package, to be produced in English, French, and Spanish, will consist of monographs on the major generic substances commonly involved in poisonings, guidelines for collecting and storing information about the local situation, and a standardized format for recording case data. Both computerized and hard copy versions will be produced.

The war against poisoning in the developing world is an arduous one. Arming doctors and communities with the right information at the right moment helps save lives. In the long run it will also make for better informed communities generally thereby preventing poisonings from happening in the first place. Then, little children will sleep peacefully at home in their own beds rather than in hospital.

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