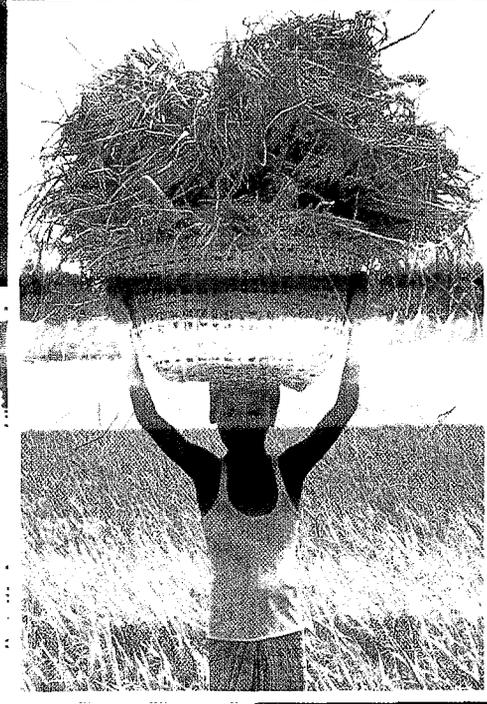


PN-ABZ-529

*Empowering People to  
Improve Their Lives*



International Fertilizer Development Center  
Annual Report 1995

## IFDC's Mission

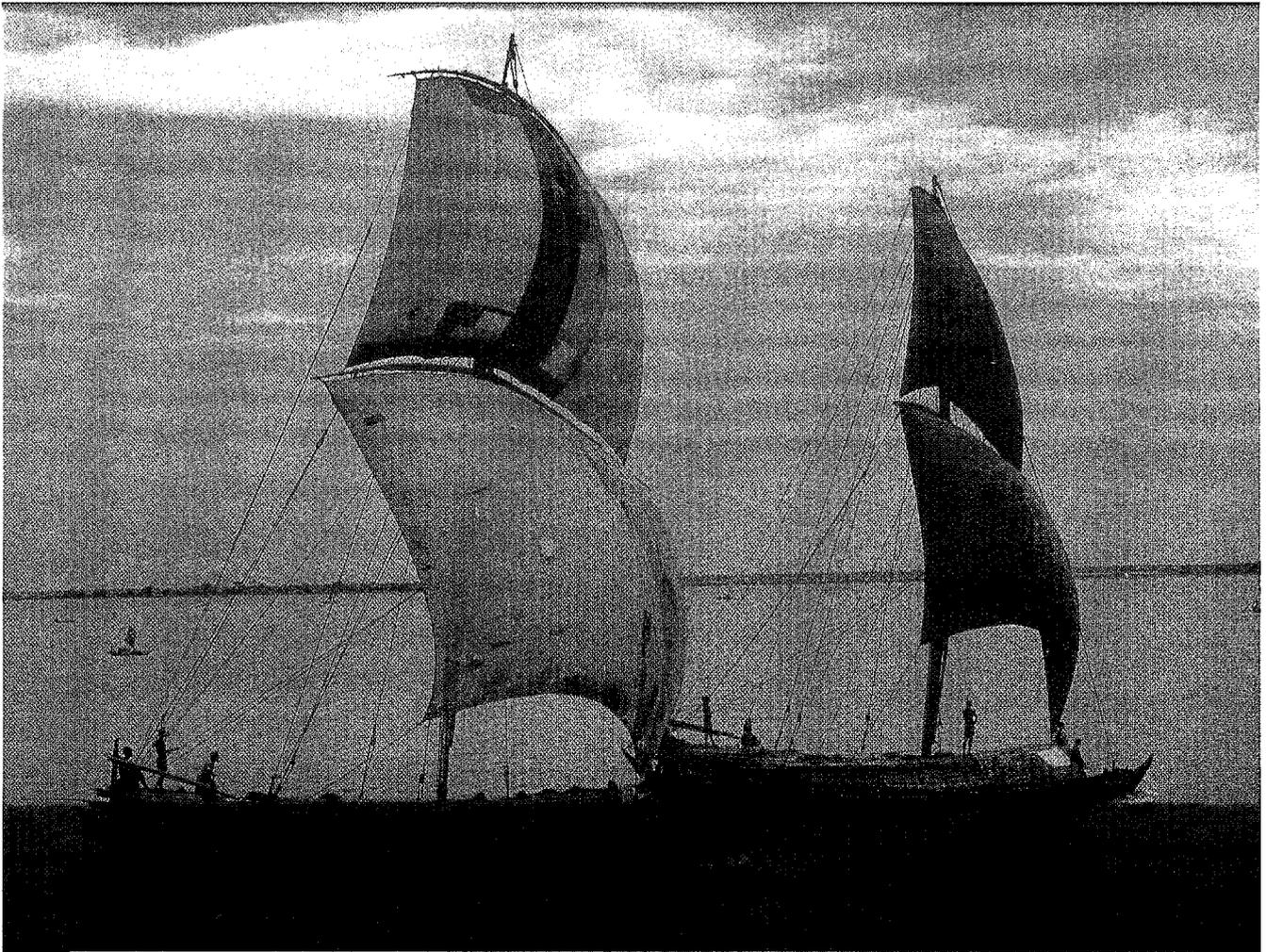
To increase and sustain food and agricultural productivity in developing countries through the development and transfer of effective and environmentally sound plant nutrient technology and agribusiness expertise.

### **Strategic Goals**

- To conduct strategic and applied research that seeks to enhance plant nutrient efficiency.
- To transfer and implement improved plant nutrient technology.
- To assist in the development and implementation of economic policies that promote open, competitive markets.
- To help strengthen national institutions through the transfer of technology and the development of the human resources of developing countries.
- To ensure the complementarity of international and national research efforts through close collaboration with national agricultural research systems and other international agricultural research centers (IARCs).
- To conserve the natural resource base and the environment.
- To promote food security and poverty alleviation through improved management of plant nutrients and natural resources.

### **Clients/Beneficiaries of Our Work**

- Farmers in the developing countries and the newly independent states of Eastern and Central Europe
- Developing-country researchers and extension officers
- Policymakers
- Agribusinesses



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## Evidence of IFDC's Impact

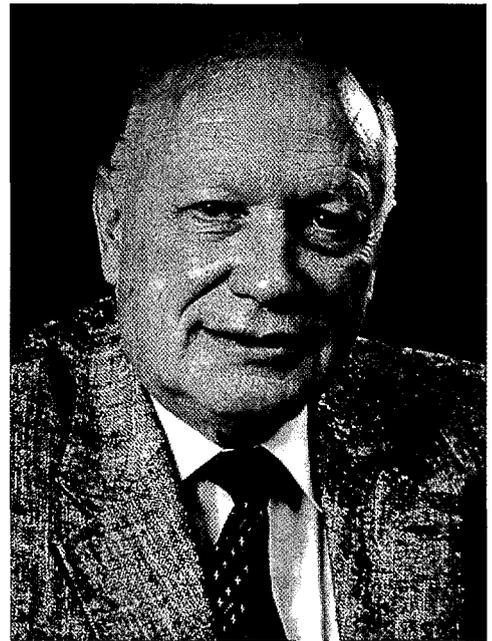
- Designed and implemented a major policy reform, capacity building project in Bangladesh, focusing on improving the fertilizer distribution system by establishing a market-economy fertilizer subsector, thereby improving food security and facilitating development of a sustainable agricultural production system; Created a network of 170,000 private entrepreneurs, which added more than US \$200 million to the Bangladesh economy; Eliminated fertilizer subsidies and other support costs, thereby saving US \$100 million since 1988; Assisted Bangladesh in achieving self-sufficiency in rice production.
- Assisted the Government of Albania in establishing a free market economy in that country's agricultural sector; Created a fully privatized market for agricultural inputs, developed a supporting institutional capability, and nurtured the development of the Albanian Fertilizer and Agricultural Inputs Dealers' Association, composed of more than 150 fertilizer dealers; Created an agricultural inputs dealers' network of 400 agribusinesses; Assisted Albania in developing an efficient national agricultural statistical system.
- Conducted farmer-participatory research in Niger, West Africa, in which thirty farmers realized millet yield increases of 250% by applying 30 kg of P<sub>2</sub>O<sub>5</sub> per hectare as Niger phosphate rock, or its partially acidulated form, or as a commercially available single superphosphate.
- Conducted on-farm research that showed applying the ash from rice hulls to rice fields improved seedling health, produced 30% higher yields, reduced the incidence of stem borer and leaf blast by 60%, and significantly reduced the need for plant protection chemicals.
- Assisted a petrochemical company in Venezuela in increasing its factory's overall production capacity from 60% to more than 85% of rated capacity; Helped the company save US \$10,000 per day through improved production efficiencies.
- Helped a Malaysian fertilizer company reduce plant construction costs by 30% by assisting them in managing the entire project and using local resources for all major equipment fabrication; Conceptualized and developed a process to produce NPK fertilizers.
- Helped Colombia realize an estimated saving in foreign exchange of US \$1 million per year by using 25,000 tons of its indigenous phosphate rock on Colombian farmers' fields each year; Other examples of countries that IFDC has assisted in utilizing their phosphate rock resources include Brazil, India, Philippines, Tanzania, Venezuela, and Zambia.

# Message From the Chairman

## "A Year of Challenges and Achievements"

*In spite of a climate of reduced funding throughout multilateral development agencies, nongovernmental and private voluntary organizations, and governments, IFDC realized several outstanding achievements in research, agribusiness, and technology transfer during 1995. In the years ahead, funding for agricultural development may well become even more limited. Because policymakers and the general public are more concerned with other pressing problems, they no longer realize the importance of addressing the problems of poverty, unemployment, malnutrition or even starvation, and environmental degradation.*

*It is extremely encouraging to IFDC's Board of Directors to be associated with a group of donors whose actions have proven that they share our concerns and appreciate IFDC's efforts toward sustainable agricultural development. On behalf of the Board, I thank IFDC's many supporters for their contributions in assisting the Center in the continuation of its important work. This assistance will undoubtedly prove even more valuable as we face the challenges of the future.*



W. David Hopper,  
Chairman of the Board

# Message From the President

## *“Development That Empowers People to Improve Their Lives”*

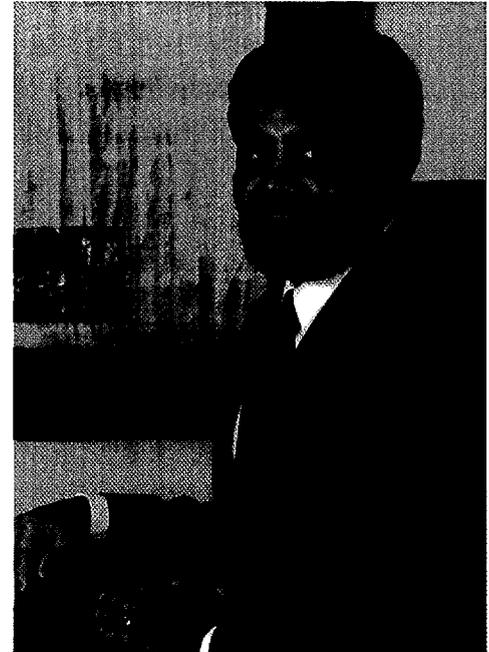
*Most demographers agree that almost 800 million of the world's population today are chronically malnourished. In the developing nations poverty presents increasing challenges, and it occurs in more advanced countries as well. As the global population increases, the demand for food expands, with a growing diversity in diets. As a result of population pressures, the world's finite resources are taxed to the limits by those same people whose existence depends on them.*

*The international staff of IFDC – now located in Albania, Bangladesh, Burkina Faso, Colombia, Niger, Peru, the Philippines, Togo, Uruguay, and Venezuela – have devoted the past two decades to helping people increase the amount of food on their tables, find meaningful employment, and preserve the environmental resource base for future generations.*

*Throughout its brief history IFDC has fostered long-term solutions to hunger, poverty, and environmental degradation. Sustainable development in IFDC's experience involves enhancing the capability of people to help themselves through innovative training, engaging in strategic and applied research, and transferring and implementing the technology resulting from this research where it will achieve the greatest benefit. The development and implementation of effective policies comprise another essential building block of sustainable development.*

*Our seven program strategies – agribusiness; engineering and technology; nutrient dynamics and environmental impact; policy, economics, and information systems; human resource development; watershed management; and policy reform and market research and development – concentrate on making an impact in the areas of agricultural productivity, employment generation, poverty alleviation, and natural resource management.*

*Developing effective means of increasing agricultural productivity has always been and continues to be at the forefront of IFDC's endeavor. In the future we will continue to apply*



Amit H. Roy,  
President and Chief Executive Officer

*the research results and information to expand the productivity of the land that is already being cultivated so as to prevent the expansion of agriculture to marginal lands. To allow people the means of escaping the endless spiral of poverty, IFDC will continue its commitment to employment generation through its agribusiness activities in the newly developed free market economies. IFDC's multidisciplinary staff has the knowledge base and the expertise to allow the Center to accomplish these goals. Our activities in the future will focus on a vision of a world without hunger, famine, and malnutrition – a vision of free, open, and competitive markets for agricultural technology and production – a vision of a responsible environmental ethic in development.*

*In this annual report, we have humanized the compelling issues of poverty, population pressures, hunger, and malnutrition through real-life situations. The solutions to many of the challenges faced by the people presented here can be found in IFDC's advances in research, technology transfer, and agribusiness development. The activities and success stories that are presented in this report represent only a small segment of IFDC's achievements during 1995.*

# Empowering People to Improve Their Lives Through

According to the World Bank, by the year 2025 the planet will be inhabited by 8.5 billion people, of whom 90% will live in the developing countries of Asia, Africa, and Latin America. The world faces the multiple challenges of producing enough food to feed this population in a sustainable manner without damaging the environment; ensuring that the food is accessible to all so that every person receives an adequate diet; and ensuring that agricultural production is effectively linked with economic and social development.

More than 800 million people living today in the developing world do not have access to enough food to live healthy and productive lives; they often go hungry not knowing when they will have their next meal. These people are referred to as the “food insecure,” that is, those people who lack the ability to buy or grow the food required to lead healthy and productive lives.

Until well into the next century, approximately 100 million people will be added to the world population each year. Over half of this population will live in urban areas; they and the rural population will have to depend on a declining area of cropland per person. Almost 70% of the developing world’s poor live in South Asia and sub-Saharan Africa, and the numbers are growing at an alarming rate. According to the World Bank, poverty, malnutrition, and hunger will increase rapidly in the coming years unless action is taken to dramatically increase agricultural production through technological change that also increases agricultural employment.

In 1990, more than 1 billion people were living on less than US \$1 a day in the developing countries. Poverty is the driving force in the food production – population – environmental degradation nexus. Because they need to survive, developing-country farmers consider only the short term and, thus, exploit the land and its resources, often with disastrous effects on the environment. Overgrazing, deforestation, and overexploitation for fuelwood primarily result from poverty and the lack of intensive agriculture. According to the United Nations Environment Programme, almost 2 billion hectares of land globally have been degraded in the past half century.

Solving the poverty problem and, thus, the food insecurity problem, in developing countries requires rapid growth in food production, income, and employment. According to the United Nations, agricultural production – the engine of development and the key to alleviating poverty – must be tripled within the next 50 years, and people must have the income to buy it. The erosion of the environmental resource base must be halted and then reversed. Another component of the solution is trade liberalization and the opportunities for engaging developing countries in a market economy. This implies economic development based on market principles that would result in increases in both agricultural production and purchasing power. Thus, the primary challenges confronting the international community include ensuring food security for the world’s increasing population and renewal of the long-term production capacity of the planet’s natural resources.

The next few pages of this annual report will show some of the ways that IFDC is addressing the issues of poverty, food production, and economic development. To humanize these abstract concepts, this information is presented first through brief descriptions of the lives of developing-country people and next through the activities and accomplishments of specific projects that IFDC is conducting in their countries, which should ultimately help to improve their lives.



# Increased Food Production and Employment Generation

Training participants learn of the latest advances in fertilizer and irrigation technology during an international study tour across the U.S.A. During 1995 IFDC conducted 22 training programs, which were attended by 348 participants. These programs complemented IFDC's efforts in the establishment of sustainable agricultural systems, economic development, and poverty alleviation.

*"The Poverty-Food  
Production-Environmental  
Degradation Nexus"*



# Empowering People to Improve Their Lives Through

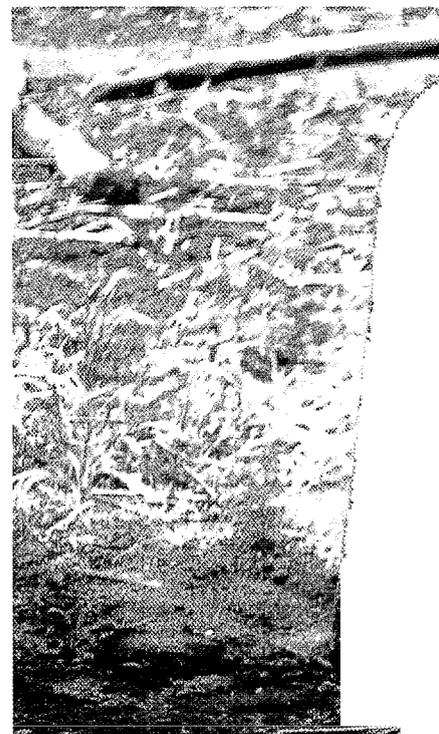
**T**he morning sun filters through the lush tropical foliage of eucalyptus trees overlooking Gobery, a farming village in Niger, West Africa. On his small farm, Amadou Yide ekes out a living for his family of nine by raising millet, sorghum, groundnuts, and a few animals. Until recently, Yide – like many other farmers of sub-Saharan Africa – rarely used chemical fertilizer. As a result, his yields were very low. However, as a participant in research being conducted by IFDC in his country, a new day is dawning for Yide and other Nigerien farmers.

Yide's wife and three daughters harvest millet, stacking the spikes in a cylindrical pile for drying. Threshing is done to meet the day's needs. The women beat the spikes of millet with sticks to dislodge the shotlike grain, a dry-climate staple. A toss in the air separates the chaff, which the wind blows away. After being pounded into flour and mixed with water, millet is eaten as a pasty gruel or patted into cakes and cooked. Hivelike mud granaries store future rations; protruding stones form a stairway leading to the opening at the top.

Thatched with straw and lined with mats, dome-shaped huts provide shelter to the families of Gobery. Strings of white granaries surround the family compounds like strands of pearls.

The farmers of Gobery must grapple with periods of drought and wait for a respite in the form of spring rains. In desperate hunger, many farm families eat the seed normally reserved for the following year's planting.

With help from IFDC scientists working in Niger, farmers like Yide are learning ways to increase their millet yields so that they will have larger stocks in their granaries.



A Nigerien woman threshes millet, a staple in the West African diet. IFDC's researchers, working with farmers in West Africa, are finding ways to drastically increase millet yields.

# Increased Food Production and Employment Generation

*“Regenerating Sub-Saharan Africa’s Soils”*



**A**ccording to the United Nations, one African in three is food insecure as a result of poverty. Poverty, environmental degradation, and low agricultural productivity are interlinked. Sustained high population growth rates have led to increased degradation of the resource base for agriculture. Lacking technologies to improve yields of basic staples, African farmers have continued to mine the soils of their meager nutrients. In the meantime, reduction in agricultural productivity has led to an increased food gap. Food production in Africa must grow at an annual rate of 3.3% to eliminate an estimated food deficit of 250 million metric tons by 2020.

To improve the food situation, African agricultural growth must depend primarily on improved yields rather than on expansion of area under cultivation. Thus, the restoration and maintenance of Africa's soil fertility should be at the forefront of any development agenda. Sustainable agricultural development in Africa depends on a strong partnership among national policymakers, research and extension workers, farmers, and private sector activists. Policy reform measures that promote free and open, competitive markets for both fertil-

izer products and farm outputs must be established. The world can invest wisely now by working with African farmers to improve the fertility of their soils or pay the more expensive price later in terms of instability, death, and destruction.

### Farmers as Research Partners

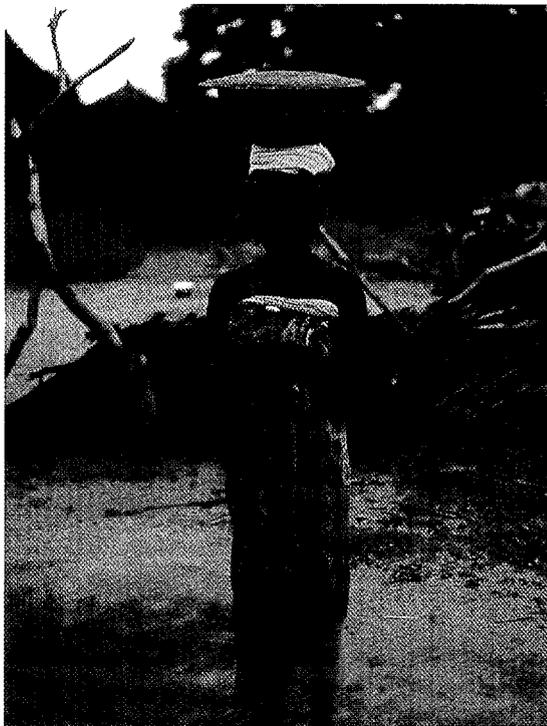
On-farm research being conducted by IFDC is providing some of the solutions to the dilemma facing African farmers. For example, thirty West African farmers have been partners in an IFDC research project that is producing results that could impact the lives of all farmers of sub-Saharan Africa and their families.

In the small village of Gobery, Niger, located 120 km southeast of Niamey, Niger's capital city, millet farmers face the risks of uncertain rainfall, disease, and pest damage and cropping in areas where the soils are seriously infertile. In an IFDC project, which was designed to help farmers increase millet yields, farmers tested the effect of applying 13 kilograms of phosphate per hectare as phosphate rock from Niger, or its partially acidulated form (PAPR), or as a commercially available single superphosphate.

"Technicians assisted the farmers in laying out the various treatments," says Dr. André Bationo, IFDC Senior Soil Scientist, who has been stationed at the Sahelian Centre of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Niamey, Niger, since 1982. "The farmers performed all operations from fertilizer application to harvesting of the millet crop. A resident technician visited the farmers on a daily basis during the season and took notes on such items as the timing of weeding operations by each farmer. The technicians also answered questions posed by the farmers. Village meetings, attended by participating and nonparticipating farmers and research personnel from IFDC, ICRISAT, and Niger's National Institute for Agronomic Research (INRAN), were held routinely throughout the season."

### Fruitful Findings

As a result of this partnership, farmers in Gobery increased their yields of millet by an average of 250% in the plots to which the phosphate fertilizers had been applied. What was perhaps more striking was that fertilizer consumption increased in Gobery from less than 2 mt of single superphosphate



With stacks of millet spikes as a backdrop, this Nigerien girl assists her family with farm chores.

(SSP) in 1982 to more than 115 mt of SSP, urea, and compound NPK fertilizers in 1988. This figure has continued to grow and over 150 mt of fertilizer was used during the 1995 cropping season. In 1995, 98% of the farms in Gobery were fertilized.

As early as 1982, IFDC was conducting collaborative research with the ICRISAT Centre and Niger's National Institute for Agronomic Research (INRAN) to assess the nutrient needs of the primary food crops and soils of the Sahel and to develop technologies to improve the fertility of the soils. Earlier the research was devoted to on-station trials at the ICRISAT station and at INRAN research sites. The results suggested that certain fertilizer-use and soil management technologies could be adopted by farmers to improve the fertility of the soils, improve crop production, and increase their incomes. In 1986, the research was moved to farmers' fields.

### **Innovative Technologies**

"Use of phosphate fertilizers is only one of several technologies that we have tested with farmer participation in Gobery since 1986," says Bationo. "The other technologies include correct planting density for sole-crop millet, legume-millet rotations, and the use of millet residue as mulch. We are particularly excited about the rate of adoption of the millet-legume rotation technology. In 1995, 86 households of a total of 136 in the village planted a portion of their fields to pure cowpea for rotation with pearl millet the following season. Use of millet straw as mulch and as a source of plant nutrients has become a common practice in the village."

Even though very little of the increased millet production was sold during the first few years of this program, farmers improved their food security and used a greater proportion of their off-season income to purchase fertilizers. More significantly, in terms of soil fertility maintenance, farmers who applied fertilizers increased crop residue production, which was used as fuel, fodder, and building materials. The left-over material served to protect the soil from wind erosion and to improve the organic matter content and overall fertility of the soil.

### **New Strategies to a Better Life**

Traditionally, farmers have grown millet intercropped with cowpeas as their subsistence crops and have kept livestock to provide cash. Population pressure on the land is breaking down that



**Animals are increasingly playing an important role in food production in West Africa. This farm family returns home after a day's work in the fields.**

system, and rangeland to feed the livestock is decreasing and is being degraded. This deteriorating situation demands change, and IFDC researchers are introducing new strategies to address this situation.

Researchers have learned that farmers tend to only spend money for fertilizer on crops that can be sold for cash. Therefore, IFDC researchers are suggesting that farmers should grow cowpeas as a cash crop. They will be grown separately from millet, planted earlier than at present, and fertilized with locally available phosphate rock. Grown in this manner, research indicates that they will produce 5-10 times the present yield, and the millet, which will follow the cowpeas in a rotation, will double in yield. The cowpeas will be grown essentially for hay, which will be rolled into bundles at harvesting and stored for sale during the dry season. In addition to providing the farmer with high-quality cowpea hay during the dry season, the sale of surplus hay provides much-needed income. Thus, the introduction of sole-crop cowpea as a cash crop will allow farmers to purchase inputs such as fertilizers.

IFDC has tested the success of Gobery in Mali and Nigeria, and farmer participation in the validation of fertilizer-use technologies has become a fixture of the West African Fertilizer Management and Evaluation Network (WAFMEN), which is composed of 19 member countries and is coordinated by IFDC. The focus on using indigenous phosphate rock combined with crop residue and rotations as a cardinal axis of the soil fertility management strategy, as a source of plant nutrients, and as soil amendments gave national leaders new hope for regional food security.

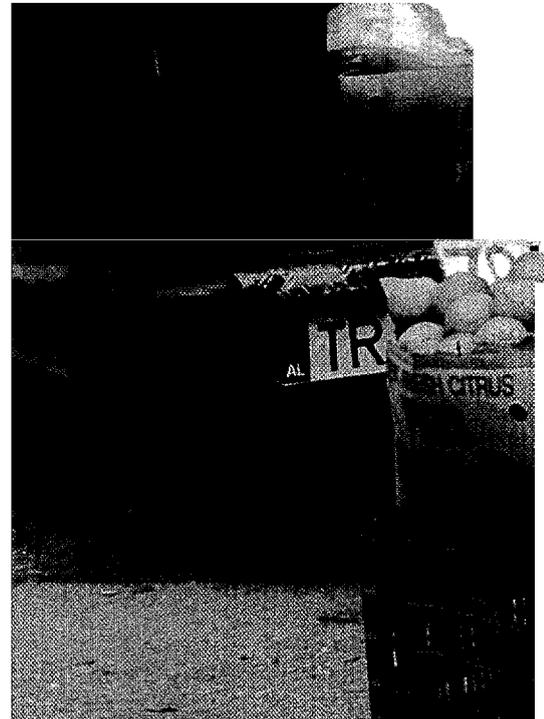
# Empowering People to Improve Their Lives Through

**S**aimir Pilaha began selling tomatoes and cucumbers on the street in Tirana, Albania, 4 years ago. Today, he supports his family on his expanded business, making about \$500 a month – not shabby in a country where the average wage is \$80 a month.

Like many Albanians, Pilaha quickly learned the ways and means of capitalism when his country ended totalitarian rule in 1991. Life in his country has improved in the past few years, but the people who realize it more are those like Pilaha who are willing to work in private business.

Pilaha and other new entrepreneurs have a brighter future ahead of them, thanks to IFDC's efforts in their country since the revolution in 1991. New doors of opportunity have been opened to give Pilaha and other Albanians a chance to improve their lives.

Entrepreneurs selling fruit and vegetables are common in Albania and demonstrate market development for agricultural products.



# Increased Food Production and Employment Generation

*“Increasing Food Production  
and Employment in Albania”*



**D**uring 1995 IFDC continued to make exemplary contributions to the development, prosperity, and sustainability of Albanian agriculture in particular and to the broader economy in general. The IFDC project effected numerous beneficial changes in the agricultural sector, and these changes form the basis for future work that will benefit further the people of Albania.

### **Privatization and Market Development**

The partnership between IFDC, the Albanian people, and the U.S. Agency for International Development (USAID) has been successful in achieving in a remarkably short time the privatization of the Albanian agricultural sector. The marketing of fertilizers and crop protection chemicals is now totally under the auspices and control of private dealers. Until now, private dealers have imported about 82,000 tonnes of nitrogen fertilizer and 4,250 tonnes of phosphate fertilizer; all costs for these transactions were borne by the private dealers with assistance of commercial credit from Albanian banks. These achievements resulted from the development of a market structure composed of importers, distributors, wholesalers, and retailers. The introduction of marketing policies by the two domestic fertilizer factories, including a variable pricing system, seasonal and volume discounts, and mercantile credit, contributed significantly to the development of the fertilizer market. Market development was enhanced further by leadership training and other technical assistance provided to the Albanian Fertilizer and Agricultural Inputs Dealers' Association (AFADA). IFDC also assisted AFADA further by facilitating dealers' contacts with international suppliers of agricultural inputs and aiding dealer diversification into other rural business activities.

"To provide further assistance in market development, IFDC is establishing a national seed testing laboratory to ensure the availability of quality seed and restoring an analytical laboratory to test fertilizer and soil to benefit Albanian farmers," says Dr. Ray B. Diamond, Chief of Party in Albania. "Another measure of achievement is that AFADA, a national trade association created by the project, has sponsored training programs, seminars, and conferences. The institutionalization of AFADA is evident in that monthly meetings are regularly conducted in six regions of the country, and an active lobbying agenda is pursued."

### **Policy Reform**

Reform of government policies and procedures was also an important part of the initiative of USAID and IFDC. The most notable achievements in this area, involving collaboration with the Albanian Government, were (1) liberalizing fertilizer prices, (2) decreasing the customs tax on fertilizer imports from 30% to 5% and (3) removing the 15% turnover (sales) tax on fertilizer. IFDC and AFADA worked together with many government agencies to implement these changes in policy. These achievements show that the Government of Albania is committed to a relatively liberal policy environment to allow a competitive market to develop and prosper.

### **Market Information System**

To develop a sound information base to guide agricultural management and policy decisions, the USAID/IFDC program trained Albanians to collect, store, and analyze data on product prices and provide timely and useful reports to the Ministry of Agriculture and Food and the multilateral and bilateral donors. The development and implementation of baseline and longitudinal agronomic and socioeconomic surveys, area sampling frames, digitized maps, and surveys of retail prices of farm products taught useful skills to the Albanian staff and provided trustworthy information to those committed to reform. Computer simulation and crop modeling, in the absence of a national agricultural research capability, were also used by the project to forecast production and make fertilizer use recommendations. This is an important point in Albania; for about 50 years, agricultural data and statistics were based often on political considerations, but now the government policymakers and private sector managers have information that can be trusted and serve as a basis for informed decisions. The information represents basic and fundamental change in Albania that was welcomed enthusiastically by the Ministry of Agriculture and Food and other government authorities and private sector managers.

### **Technical, Economic, and Environmental Assessments of Fertilizer Production**

The most important issues facing the Fier Nitrogen Fertilizer Factory (FNFF), the only one of its kind in Albania, are the lack of a reliable supply of natural gas, insufficient funds for spare parts, frequent production interruptions due to

inadequate maintenance, and the control of process effluents. The most important conclusion of the IFDC assessment is that, with a minimal investment, the FNFF can be profitable and environmentally safe provided the natural gas supply issue can be resolved. During the last half of 1995, IFDC prepared and distributed business planning information for FNFF and the natural gas industry, to attract private investment. Two of the three responses to the tenders of the state petroleum company for proposals for development of Delvina gas reservoir came from IFDC contacts. IFDC has completed an investment analysis and assessment of privatization potential for use of naphtha as feedstock for producing ammonia. Capital investment for converting the factory to use naphtha, upgrading safety and environmental standards and procuring spare parts could be economically viable if the GOA would agree to lease the facilities at a nominal fee for 5-10 years.

#### Assistance in Credit Financing

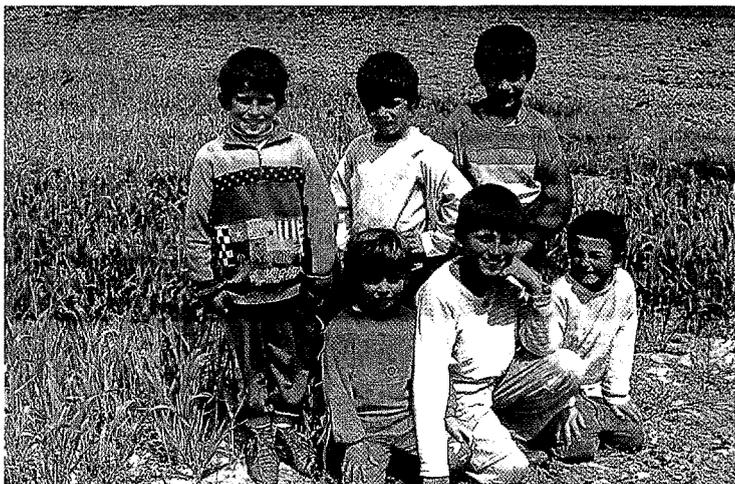
"IFDC has played a crucial role in the development of credit financing for the agricultural sector and was instrumental in developing credit procedures and convincing bankers to make loans for agricultural inputs," Diamond says. "This is a sig-

nificant achievement in a country that had no private economic activity for a half century under the communist reign."

#### Training

Training is an integral part of the work of the USAID/IFDC project in Albania. Programs in banking and finance, credit, business planning, procurement, fertilizer dealer development, factory management, data collection and analysis, geographic information systems, area sampling and survey research, and crop modeling have been conducted. In addition, several international study tours have been organized and conducted by IFDC.

The success of the USAID/IFDC initiative in Albania is strongly attributed to a strategy to achieve full market privatization at the outset rather than to accumulate interim solutions. From the outset, commercial credit was of fundamental importance to economic development in Albania, and active collaboration with bankers remains critical. With the collaboration of Albanian staff members, the help of the Albanian media, and the support of the Government of Albania and USAID, IFDC offered its entire organizational capacity, experience, and resources to restructure Albanian agriculture.



The future of Albania will rest in the hands of its youth. Young people like these will need to carry forward the development programs currently being conducted in their country by IFDC and other organizations.

Private land holdings in Albania are small, and family farms are very important. IFDC's agribusiness development efforts in Albania are helping to increase the availability of agricultural inputs to small farmers in that country.



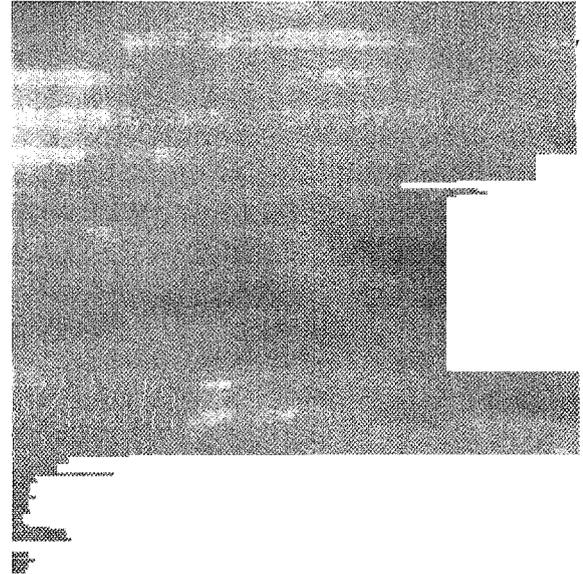
# Empowering People to Improve Their Lives Through

**I**n the Bangladesh village of Boliarpur, near Dhaka, a cluster of houses, raised on low mounds of earth for protection against monsoon flooding, is surrounded by fields planted to vegetables and rice.

Almost every man in Boliarpur is a farmer, including Abdul Khalaq. He lives with his large family in a simple hut of thatch and mud. As Abdul tends his crops, his wife is preparing loaves of unleavened bread. After supplying his family's needs, Abdul sells some of the produce from his little farm at one of the small towns located on the intersections of waterways (Per capita income in Bangladesh is only \$200.) Abdul and his family can afford no modern luxuries; their main entertainment is enjoying the company of family and friends.

During monsoon rains, when as much as 100 inches of rain may fall, the rivers bathe the fields, leaving a layer of silt. For weeks much of Bangladesh becomes a lake, and fields of rice, vegetables, and jute spring to life. Sometimes nature turns savage, baring teeth of flood and famine.

Undeterred by staggering uncertainties, Bengalis exude an incredible optimism. Bangladeshi farmers have reason to be hopeful now, thanks to agricultural development programs currently underway in their country.



Transport costs comprise a major share of the cost of distributing fertilizer in Bangladesh. In an effort to minimize the costs, traders utilize the hundreds of watery highways that crisscross the low-lying heartland of the country.

# Increased Food Production and Employment Generation

*“Providing Bangladeshi  
Farmers With Keys to the Food  
Production Puzzle”*



To increase their crop yields, Bangladeshi farmers like Abdul Khalaq need regular access to agricultural inputs such as improved seeds, fertilizer, and agricultural machinery. Provided a new IFDC project reaches its intended goals, Khalaq and many other Bangladeshi farmers like him should soon have improved access to high-yielding varieties, farm machinery, and other modern agricultural inputs, in addition to the already available fertilizers.

The establishment of a private agribusiness sector is essential to reduce poverty through increased productive employment in agriculture and to help Bangladesh's farmers produce more food for the growing population. The World Bank estimates that Bangladesh's population (now 119 million) increased during the past decade at an average annual rate of 2.1% while a negative 0.1% average annual growth rate was realized in food production per capita. Progress in agricultural production is vital for the future well-being of the nation given that its population is likely to swell to about 200 million within 30 years.

### Major Successes

The Agro-Based Industry and Technology Development Project (ATDP), which began in mid-1995, is building on the lessons learned and accomplishments of IFDC's previous Fertilizer Distribution Improvement Project, which privatized fertilizer procurement and marketing/distribution in Bangladesh. In that project, IFDC facilitated the evolution of an extensive network of private fertilizer entrepreneurs (170,000), which resulted in improved availability of fertilizer throughout the country. Eighty percent of Bangladeshi farmers can now purchase fertilizer at retail shops within 5 km of their farms.

By assisting Bangladesh in making the transition to a free market system, IFDC helped the country save an estimated US \$119 million (since 1988) by eliminating fertilizer subsidies and other support costs. A prime result of the project was Bangladesh's achievement of self-sufficiency in rice production in the early 1990s.

A farmer from Kali Kacha village, Ratan Mia, confirms that the prices he pays for fertilizer now are competitive with those paid before government subsidies were removed. His neighbor, Safayet Ali, adds that he is able to purchase fertilizer in any form he chooses in the nearby village.

### New Project Initiated

The new agribusiness project is being implemented collaboratively by the Government of Bangladesh, the U.S. Agency for International Development (USAID), and a consortium composed of IFDC – as prime contractor, Winrock International, and Ronco Consulting Corporation. The project's goal is to increase productive employment in agriculture and related enterprises. Its purpose is to create competitive markets for agriculture and agribusiness inputs, outputs, and technologies.

"IFDC can make an impact in Bangladesh by increasing the investment in agribusiness to create markets for agricultural products for both local agribusinesses and export markets," says Dr. Ronald P. Black, Chief of Party, IFDC/Dhaka.

The ATDP is promoting reforms in trade policy, industrial and agricultural policy, fiscal and commercial policy, foreign investment policy, and legal and regulatory practices in Bangladesh. These reforms will facilitate the free flow of capital and technology from domestic and international sources and help to create employment opportunities, diversification and intensification of crop production, and poverty alleviation. The project is encouraging private sector, market-driven technology development and transfer, and providing agri-entrepreneurs with information and access to credit to foster private agribusinesses in Bangladesh.

"The seed industry in Bangladesh has great potential," Black says. "In this light we recently arranged for visits by representatives of the American Seed Trade Association to explore the possibility of establishing joint ventures with Bangladesh entities. During the visit the team met with, among others, the Deputy Managing Director of the Grameen Bank."

### Pilot Zones

One phase of the project calls for the identification of pilot zones for technology transfer to increase employment opportunities in agribusiness and thereby increase income. The project has opened the first pilot zone in the thana of Kapasia, District of Gazipur.

"This thana, chosen because it shows great potential for agribusiness development involving fruits and vegetables, is not subject to excessive flooding and has fairly rich soils," says Dr. Thomas P.

Thompson, IFDC Headquarters Liaison with the ATDP. "Agribusiness activities in each component of the project represented in that thana – seed, live-stock, poultry, agricultural machinery, fertilizers, and the processing of agricultural commodities – can be given a boost."

To be successful, agribusinesses need credit to build inventories and provide dealer training programs to strengthen technical and business skills. To this end, an agribusiness credit fund of US \$25 million is available through participating Bangladesh commercial banks to allow agribusiness en-

trepreneurs to create new businesses or expand an existing one in one of these components. The project will work with promising entrepreneurs to develop viable business plans and loan applications to obtain loans for business development or expansion.

IFDC believes that agriculture in Bangladesh has a bright future. The new agribusiness project is replicating the successes achieved under the previous IFDC project. The new project will ultimately achieve increased productive employment in agriculture and related enterprises, which is the key to achieving the goal of poverty reduction.

# Empowering People to Improve Their Lives Through

**A**t the edge of his farm, Melecio Herrera walks beneath the dense canopy of breadfruit, banana and taller trees. Herrera and his family of five, who cultivate a 6-hectare farm, have seen their standard of living improve sharply since they started using locally produced fertilizer on their crops. In the past Herrera grew crops on his farm only occasionally; instead he worked in a nearby city doing odd jobs. Now with the technical assistance provided by a local fertilizer dealer and extension workers, he is planting a variety of crops including coffee, sugarcane, fruits, and vegetables. After seeing the potential results of chemical fertilizer during demonstrations by a local fertilizer dealer, Herrera started using the Venezuelan-produced fertilizer on his crops. He is pleased with the increased yields, and his family is reaping the rewards as well.



The ammonia and urea plant superintendents at PEQUIVEN's Morón complex, José Albano (left) and William Blanco (right) inspect the nitrogen facilities with IFDC's Project Manager Jorge Polo (center).

# Increased Food Production and Employment Generation

*“Aiding Venezuela in Enhancing Its  
Industrial/Employment Base”*



**I**n spite of its vast natural resources, at least 80% of Venezuela's people live in poverty, with accompanying malnutrition plaguing one half of the nation's youth, according to the U.S. Department of State. The search for jobs and a better life has lured 80% of the nation's population to urban areas, where they have settled in slums. As a result, farm production has dropped drastically and food prices have risen sharply. Venezuela has been forced to import as much as \$700 million annually in food products. To solve the nation's dilemma, development experts have suggested solutions including an increased emphasis on projects that generate long-term employment security. In this regard, for the past 3 years, IFDC has been working with a major Venezuelan employer to strengthen that company's position in a free-market environment.

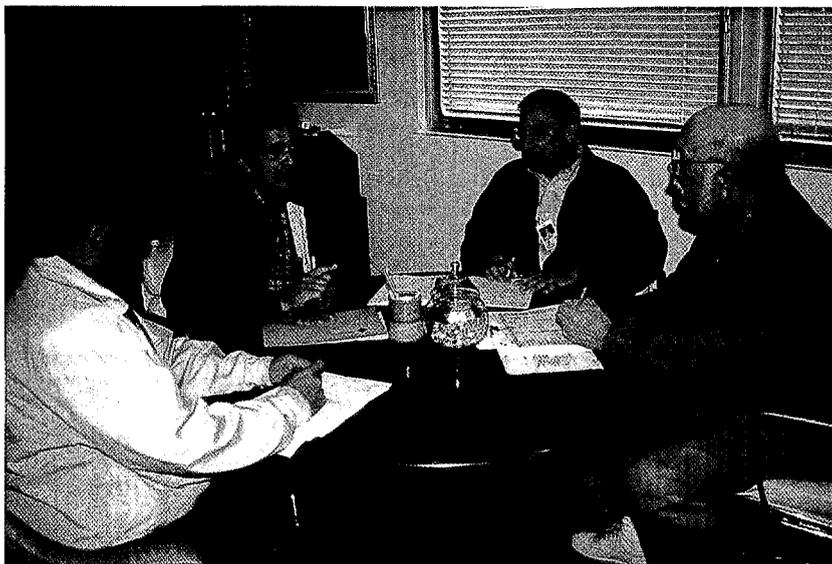
### **Technical Assistance to PEQUIVEN**

Since September 1993 IFDC has been assisting Petroquímica de Venezuela S.A. (PEQUIVEN) in the design and implementation of its transition from a previously subsidized enterprise to one that is market driven. The overall goal of this project has been to help the company retain its leading position in the marketplace and become competitive in a free market environment. The main effort in this process has been to enhance PEQUIVEN's strengths, which include a fully integrated fertilizer processing infrastructure; a capable and expe-

rienced staff; access to low-cost raw materials; a prime geographic location for domestic and regional markets; a sound financial position; a recognized name in the industry, both domestically and internationally; and an existing network of agents, dealers, and distributors.

"This restructuring project is producing tangible results," says James J. Schultz, Director of IFDC's Outreach Division. "For example, in the past 3 years PEQUIVEN's overall fertilizer production capacity has increased from 60% to more than 85% of rated capacity. The production rates of the ammonia/urea and phosphoric acid units are nearing 100% capacity. Improved production efficiencies in the phosphoric acid and NPK granulation plants have produced a saving of about US \$10,000 per day. IFDC introduced a preventive maintenance program that has decreased unscheduled downtime by about 50%. The control of credit to dealers, dealers' inventory, and past due collections has improved PEQUIVEN's cash flow. The marketing train-the-trainer program implemented by IFDC has quickly expanded PEQUIVEN's capability to develop an entirely new customer-oriented sales force."

Since mid-1994 IFDC has had counterpart managers stationed in Venezuela to assist PEQUIVEN with the implementation of recommendations made in an IFDC study performed in 1993/94. IFDC's assistance has had a two-pronged focus: to



**Officials of Petroquímica de Venezuela S.A. (PEQUIVEN) discuss plans for a field-level profit center. Pictured here are (from left): César A. Aguilar P., Domestic Marketing Manager, Fertilizer Business Unit (FBU-PEQUIVEN); Alfredo Riera L., Business Manager (FBU-PEQUIVEN); Roberto Mantellini, Assistant Business Manager (FBU-PEQUIVEN); and John M. Maschoff, IFDC Counterpart Manager, Business/Marketing.**

assist PEQUIVEN in becoming market and customer oriented and to improve PEQUIVEN's fertilizer production operations.

"IFDC's assistance has been fruitful for PEQUIVEN," says Jorge R. Polo, Coordinator of IFDC's Engineering and Technology Program. "For example, during 1995 production of NPK fertilizers amounted to more than 294,000 tonnes or 107% of the planned production. Process losses in the production of nitrogen and phosphate fertilizers have been considerably decreased through improved process control and equipment modification, thereby producing a considerable saving. The consumption of raw materials, particularly sulfuric acid and phosphate rock per unit of production, has been markedly decreased. A change in the type of bags used has improved the condition of the fertilizer at the warehouses, decreased losses due to bag breakage and leakage, and increased customer preference for PEQUIVEN materials."

PEQUIVEN is credited with having achieved these successes as a result of an improved operation due to better trained operators, better plant control, improved maintenance through dedicated plant maintenance crews, and the implementation

of scheduled weekly shutdowns for preventive and corrective maintenance.

A new cost accounting system is being implemented at the complex with the assignment of cost accountants at each of the production units. The overall cost consciousness of the staff has improved considerably. To further instill a cost consciousness within the staff, it was recommended that the company select a cadre of personnel to participate in a "train-the-trainer" program in the United States by attending a specialized cost analysis and control training program and then participating in an internship for a few weeks at similar fertilizer production facilities in the United States. These trained staff would then serve as the faculty for training the remainder of the organization.

The PEQUIVEN project is a classic example of the integrated application of IFDC's broad spectrum of practical market-oriented technical, financial, marketing, and management skills to meet a client's complex needs. IFDC looks forward to translating the successes realized in Venezuela to similar situations in other Latin American countries and, perhaps, to other regions.

# Empowering People to Improve Their Lives Through

**J**ose Hernandez, a Colombian farmer, started using Colombia's Huila phosphate rock on his small farm a few years ago. Previously, he grew very few crops on his farm; to supplement his income he worked on other farms doing fencing, construction, and agriculture-related jobs. After IFDC scientists established one of their experiments on his farm, Hernandez started using the Colombian phosphate rock fertilizer. Initially he had only a few coffee trees but now is planting beans, maize, cassava, and some legumes. He was pleasantly surprised to receive increased yields produced by the indigenous phosphate rock, and his family is benefiting from the added farm income.



One of the primary components of the IFDC/CIAT research collaboration focuses on the dynamics of mineral nitrogen under cereal monoculture and rotations involving grain legumes such as cowpeas.

# Increased Food Production and Employment Generation

*“Helping Develop Sustainable  
Crop Production Systems in  
Latin America”*



**S**ince its inception IFDC has pioneered work on the characterization and effective use of indigenous agrominerals such as phosphate rock. These technologies have been developed first at Headquarters, subsequently tested on farmers' fields in developing countries through collaboration with other international agricultural research centers, and eventually passed to institutions at the national level by using regional networks and national programs. In Latin America IFDC has long been involved in research to find energy-efficient, cost-effective alternatives to the more expensive imported phosphate fertilizers by using natural and altered phosphate fertilizers derived from indigenous resources in countries like Colombia. In 1977 IFDC began its collaboration with the Centro Internacional de Agricultura Tropical (CIAT) to evaluate the agronomic effectiveness of direct application of phosphate rock and the socioeconomic constraints to its adoption. As a result of IFDC's research and promotion of Colombia's indigenous resources, 25,000 tonnes of Huila phosphate rock (approximately one-seventh of that country's annual consumption of phosphate fertilizers) is now being sold and used on Colombian farmers' fields each year. The private sector is now actively involved in the processing and production of phosphate fertilizer based on Huila phosphate rock. By using this indigenous fertilizer, Colombia is realizing an estimated saving in foreign exchange of US \$1,000,000 per year.

In 1992 Dr. Dennis K. Friesen, IFDC Senior Soil Fertility Scientist, was posted at CIAT and now works within the tropical lowlands program with responsibility for nutrient requirements, use efficiency, and cycling in prototype cropping systems including the agropastoral systems being developed by CIAT. The present IFDC/CIAT collaborative arrangement differs from earlier ones in that it occurs within the framework of CIAT's resource management research programs in which IFDC's expertise in nutrient dynamics and supply complements CIAT expertise in crop and pastoral production systems, crop physiology, agronomy, and animal science.

The IFDC/CIAT collaboration during the past 3 years has developed around four major research areas: (1) a long-term field experiment on prototype production systems of the tropical lowlands program; (2) studies on the dynamics of phosphorus

in highly weathered savanna soils (Oxisols) and factors affecting the fate and cycling of phosphorus in different production systems; (3) lime and nutrient cation balance in these weakly buffered soils and the rate of re-acidification of limed acid soils under crop rotations; and (4) the dynamics of mineral nitrogen under cereal monocultures and rotations involving grain legumes and green manures.

### **Long-Term Cropping Systems Experiment**

This experiment and associated satellite experiments are the focus of CIAT's tropical lowlands program, which deals with nutrient cycling, dynamics of soil organic matter, soil physical health, and sustainability indicators in prototype production systems for the acid soil savannas. Established in 1993, the experiment compares a range of agricultural production systems at two levels of inputs based primarily on lime and tolerance of production system components to soil acidity factors. Low lime-input systems, in which lime is applied at fertilizer rates to supply calcium and magnesium to crops, are based on the new acid-soil tolerant rice varieties developed by CIAT in the late 1980s and complementary acid-soil tolerant grain legume and forage germplasm. Systems include, at one extreme, continuous rice monoculture and, at the other extreme, a rice agropastoral system in which rice is undersown with improved grass/legume pasture. Intermediate systems consist of within-season rotations of rice with cowpea or green manure. High lime-input systems based on maize consist of a similar range of treatments: continuous maize monoculture, maize-soybean and maize-green manure rotations and an agropastoral system initiated with maize and higher quality, less acid-soil tolerant forages.

"Initial production results from the experiment were encouraging although degradation has been experienced in subsequent years," says Friesen. "Rice grain yields in 1993 from freshly opened native savanna grassland fertilized with 500 kg/ha of dolomitic lime, 80 kg N/ha, 60 kg P/ha, 100 kg K/ha, Mg and S were a respectable 2.9 tonnes/ha and were not affected by undersown pasture. The high level of nutrients applied to the associated rice crop promoted rapid establishment of the pasture to which animals were introduced within 7 months after sowing, less than half the time required in conventional pasture establishment on the Llanos. Cowpea grain legume residues and green manure

sown in 1993 increased yields of rice sown in those plots in 1994 by almost 1 tonne/ha over rice monoculture."

In 1995 the experiment was sown to its third year of rice-based systems and its second of maize-based systems. In the low-input rice systems, weed infestations severely reduced grain yields, even in the rotations with cowpeas and green manure. Weed infestations are clearly related to the improved soil fertility in these systems and the poor effectiveness of the herbicides used.

"Maize-based systems established in 1994 were initially disappointing with yields of less than 3 tonnes/ha," Friesen says. "These were probably due to a poor and uneven population and competition from weeds, which proliferated as a result of an earlier land preparation and unmanaged fallow period in 1993. Weeds were less of a problem in the maize systems during 1995 since good control was achieved with the preemergent herbicide applications. A more uniform stand, in which the targeted plant density of about 53,000/ha was achieved, gave very respectable maize grain yields of about 4.5 tonnes/ha. There was no influence of the previous season's soybean or green manure crops on maize yields in 1995."

### **Fertilizer Nitrogen Dynamics and Balance in Cropping Systems**

After incorporation of cowpea residues and green manures at the close of the 1993 season, mineral nitrogen was monitored in the soil profile through the subsequent dry season and into the 1994 rainy season. Nitrate concentrations were found to build up in the soil during the dry season and to begin to move down through the soil when the rains began. Although this nitrogen source had a significant influence on rice yields in 1994, much of it had moved beyond the rooting zone by the time the crop was established. These results highlight the risks associated with organic systems in which control of nitrogen inputs are less easily managed, and they emphasize the need to develop techniques for reducing such losses.

Mineral-nitrogen concentrations in the soil profile were monitored on a weekly basis under rice and maize monocultures during the 1995 season. These measurements revealed the rapid movement

of a band of inorganic nitrogen (principally in nitrate form) to a depth of 40-60 cm some 8 weeks after application of the first of three splits of urea to these crops. The potential for high leaching losses appear to be confirmed by fertilizer nitrogen balances estimated in microplots established in these treatments and in rice monocrop and rice agropastoral systems on a similar soil in 1994; very high nitrogen losses were recorded in all systems. Average fertilizer nitrogen recovery in above-ground biomass was only about 10%; an additional 7% was recovered from the soil profile to the 80-cm depth. These high losses require further confirmation; however, high rainfall (about 2,500 mm/year) and saturated soil conditions in medium to heavier textured soils suggest that significant losses may occur not only via leaching but also through denitrification.

### **Fate, Residual Value, and Crop Development Effects of Applied Phosphate**

Satellite experiments to the main cropping systems experiment were established at two sites on Oxisols in the Llanos in 1993 with the primary objectives of determining phosphate fertilizer requirements for component crops in the cropping systems trial and developing a residual value function for soluble phosphate fertilizers applied to annual crops. Triple superphosphate applied in 1993 continued to show strong residual effects in 1994 and 1995. The 1993-applied phosphate was 80% as effective as the same amount applied in three equal installments in 1993, 1994, and 1995. This type of analysis and characterization of the fate of phosphate applications in these soils will be used to develop a residual value function for phosphate fertilizers on highly weathered soils. The experiments are also being used to determine the effect of phosphate nutrition on crop development. Both activities provide support to the development of phosphate dynamics capacity in computer simulation models for cropping systems. During 1995 detailed observations were made of maize phenological development and root growth and distribution at four levels of soil phosphate fertility, ranging from 0 to 200 kg/ha of applied phosphate. As expected, phenological development of maize (rate of appearance of leaves, tasseling, silking, maturity) was slowed at less than optimal levels of phosphate applied.

## **Phosphorus Dynamics in Crop and Pastoral Systems**

A comparative study of inorganic and organic phosphate pool sizes in native savanna, improved pure grass, and grass-legume pastures revealed significantly larger labile phosphate pool sizes in grass-legume pasture fertilized at the same rate as pure grass pasture. Since an associated study found much higher macrofaunal activity under mixed pasture, an investigation of the effect of earth-

worms on soil phosphate pool sizes in two contrasting savanna pastoral systems was conducted. This research revealed that earthworms significantly increased the phosphate contents of labile inorganic, organic, and microbial pools in both systems. The research showed that earthworms can greatly influence phosphate cycling and availability in infertile Oxisols, and that production systems should be managed to maintain macrofaunal populations and activity.

## 1995 in Review

The primary achievements of the International Fertilizer Development Center (IFDC) during 1995 are as follows:

- Assisted Albanian Government in developing marketing strategies and creating incentives for improving fertilizer supply and demand. New agricultural marketing systems are evolving with services provided by 400 more private dealers in the Albanian Fertilizer and Agricultural Inputs Dealers' Association (AFADA). Nearly 40,000 tonnes of fertilizer have been imported from international markets. The prospects are good for increasing national fertilizer production and use over the next few years.
- Initiated a multiyear, multimillion dollar agribusiness development project in Bangladesh focusing on five key commodity subsectors, including seeds, fertilizers, poultry and livestock, agriprocessing, and agrimachinery and equipment.
- Provided assistance to a large petrochemical company in Venezuela, which is making the transition to the free market system. The assistance resulted in an increase in the factory's overall production capacity from 60% to more than 85% of rated capacity. A saving of US \$10,000 per day resulted from improved production efficiencies.
- Contributed to USAID's Support for Agricultural Restructuring in Albania (SARA) project, which promotes food security through a broad-based, market-oriented economic growth program. As part of its role in the SARA project, IFDC is developing three agribusiness training modules and has assisted in organizing internships in agribusiness management training and communications.
- Collaborated with the International Fertilizer Industry Association (IFA) and the European Fertilizer Manufacturers' Association (EFMA) to conduct in Moscow a workshop on developing the Russian fertilizer market. The workshop participants confirmed their commitment to implement a development program to establish a private-sector fertilizer marketing system, prioritized future tasks, and demonstrated the unity of purpose required to obtain international funding. Collectively, IFA, EFMA, and IFDC have access to the analytical, commercial, and technical skills necessary to solve the problems encountered in the Russian fertilizer market and to assist in the regeneration of the domestic market.
- Developed a plan to privatize the Nigerian fertilizer sector, allowing for gradual removal of subsidies, followed by market-determined prices.
- Cooperated with the International Centre for Research in Agroforestry (ICRAF) and the Norwegian Centre for International Agricultural Development (NORAGRIC) to conduct country specific studies to assess the agronomic suitability and economic feasibility of using phosphate rock as a capital investment. Country studies concerning Burkina Faso, Madagascar, and Zimbabwe have been conducted by the three cooperators. The resulting report recommends phosphate rock investments on a pilot basis to sustain soil fertility and crop productivity in the three selected countries.

- Collaborated with the Joint Division of Nuclear Techniques in Food and Agriculture of the Food and Agriculture Organization of the United Nations (FAO) and the International Atomic Energy Agency (IAEA) on research to develop cost-effective alternative phosphate fertilizers. The research results reconfirmed that phosphorus availability from indigenous phosphate rocks can be significantly increased by supplementing some water-soluble phosphorus with the low- and medium-reactive phosphate rocks, which may not be suitable for direct application.
- Cooperated with the Goddard Institute for Space Studies at the National Aeronautics and Space Administration (NASA) and the United Kingdom Meteorological Office to conduct a study of the impacts of climate change on winter crop production in Uruguay and Argentina using crop simulation models. The research results showed that wheat and barley yields with climate change were lower, more variable, and less responsive to nitrogen fertilizer than under current conditions. Strategies to adapt to climate changes included earlier planting dates and optimum nitrogen fertilization.
- Prepared fertilizer for NASA Space Shuttle missions. Prior to contacting IFDC, NASA scientists had achieved only limited success in developing a method of transforming powdered synthetic apatite into a stable nondegrading substrate that would provide a phosphate source for hydroponic experiments aboard the Space Shuttle and for future use in Space Stations. IFDC scientists developed a simple, effective method wherein the synthetic apatite is compacted using a tableting machine under relatively high pressure.
- Assisted fertilizer companies in developing countries by conducting agronomic evaluations of indigenous phosphate rocks. The studies determined the agronomic effectiveness of phosphate rocks and their modified materials produced by partial acidulation or compaction with water-soluble phosphate fertilizers. The phosphate rocks studied were Gafsa rock (Tunisia), Djebel Onk (Algeria), Jhamarkotra rock (India), and Jiangxiang rock (China).
- Began establishing a soil fertility management unit (SFMU) in Burkina Faso to ensure that an adequate strategy is developed to improve the production base of the soil. An SFMU will accomplish the following: (1) implement and monitor a sustainable agricultural production program; (2) collect, manage, analyze, and disseminate market information; (3) develop and introduce adequate input legislation and monitor product quality; and (4) provide policy and expert advice and research guidance.
- Began participating as a member of the Steering Committee of the Desert Margins Initiative. This initiative focuses on arresting land degradation by promoting improved and innovative technologies that integrate effective nutrient management strategies with improved soil and water conservation techniques that are ecologically sound, economically viable, and socially acceptable to farmers in the dryland areas of sub-Saharan Africa.
- Collaborated with USAID's Famine Early Warning System (FEWS) Project and the Earth Resource Observation System (EROS) Data Center in attempting to improve the methodology for forecasting millet production by using the CERES-Millet model. The project assesses famine vulnerability in sub-Saharan Africa and provides decisionmakers with sufficient warning of impending food shortages to allow timely provision of food aid. A prototype model-Geographic Information System (GIS) was constructed for Burkina Faso. The system integrates information on soils, weather, and crops with provincial data on

millet area, production, and average yields; it uses satellite estimates of rainfall to simulate yields during the growing season.

- Launched Phase III of the Africa Market Development Project. Phases I and II created the African Fertilizer Trade and Marketing Information Network, which established sub-Saharan Africa's first fertilizer information database. The database contains national fertilizer supply and demand statistics, national fertilizer prices, fertilizer trade information, and the addresses of major players in the sub-Saharan African fertilizer market. The African Fertilizer Market Bulletin in English and French was distributed to 228 individuals in 52 countries. Phase III will seek to restore the productive base of degraded soils in areas with agronomic potential for crop production and develop sustainable agricultural production systems that will generate increased farm production and income. In addition, the new phase will support national governments in West Africa as they change from manager-controller of fertilizer production, procurement, and marketing to facilitator of competitive, private fertilizer marketing.
- Collaborated with the Soil Management Support Services of the U.S. Department of Agriculture and the Land Resources Institute of Albania to conduct a survey of Albania's soil resources. The end product of the survey is a soils map to assist policymakers, farmers, and other decisionmakers in the design and implementation of sustainable soil management and conservation practices. Accurate soils maps are needed to implement conservation measures successfully and to manage more effectively valley bottom soils so that agricultural pressures on marginal sloping land are reduced.
- Cooperated with other members of the International Consortium for Agricultural Systems Applications (ICASA) to develop the Decision Support System for Agrotechnology Transfer (DSSAT)-Version 3.0. This computer software enables a user to run simulation experiments to investigate options for effective crop management that are more profitable, environmentally benign, or less risky. The DSSAT is a valuable tool in teaching and training, business, research, and policymaking. Crop models for maize, wheat, rice, barley, sorghum, millet, soybean, peanut, Phaseolus bean, cassava, and potato are included in this software.
- Designed and implemented group study tours for fertilizer and industry officials from Albania, Argentina, Burkina Faso, China, Poland, and Venezuela. In addition to classroom activities, these programs involved field visits to primary fertilizer-producing and agribusiness areas in the U.S.A., wholesale and retail dealers, and primary financial markets.
- Conducted an international workshop on phosphate rock in Sri Lanka. The workshop attracted some 50 delegates from 18 countries. Nineteen speakers representing 12 organizations made presentations during the workshop. The workshop focused on the development of indigenous agromineral resources in Asia to provide nutrients to ultimately increase food production for the additional 1 billion people estimated to be added to the region's population within the next 15 years.
- Cooperated with ICASA and the University of Florida to conduct a crop modeling training program that attracted 35 participants from 24 countries. The faculty included experts from IFDC, ICASA, the Universities of Florida and Georgia, and the Wageningen Agricultural University of the Netherlands. Included among the participants were staff members from the International Rice Research Institute, the International Maize and Wheat Improvement Center, and the International Center for Tropical Agriculture. During the

program the participants learned how to apply comprehensive simulation models of crop growth and nutrient dynamics to help solve real world problems.

- Conducted a new training program on fertilizer marketing challenges. Twenty-six marketing managers from 13 countries learned about the challenges involved in the transformation of fertilizer sectors to a free market system. The participants analyzed the emergence of free marketing in their countries and discussed the opportunities that the transition has brought. A case study of a country that is making the transition to a free market system gave the participants hands-on experience. Field trips provided the participants the opportunity to discuss innovative marketing approaches of major corporations, small farming operations, agri-input dealers, trade associations, and development agencies.
- Organized and conducted an international study tour on modern techniques in fertilizer distribution and handling for 29 distribution managers from 11 countries. The participants observed transportation, warehousing, packaging, and loading and unloading operations in England, Ireland, Netherlands, Belgium, and Germany.
- Conducted a crop modeling training course in Uruguay, which emphasized climate change and included farm-level data.
- Organized and conducted a training program covering the new challenges confronting fertilizer marketing today. This program, cosponsored by Thailand's Department of Agricultural Extension, was attended by 42 participants from 13 countries. These marketing managers increased their knowledge of the new policy environment, the changing fertilizer sectors, and fertilizer marketing systems.
- During 1995 IFDC released six major publications and published 14 articles in scientific journals. These publications included: *Global Fertilizer Perspectives, 1980-2000: The Challenges in Structural Transformation*; *Applying Crop Models and Decision Support Systems*; *Worldwide List of Urea Manufacturers and Traders*; *IFDC Annual Report, 1994*; *Ghana Fertilizer Privatization Scheme*; and *Use of Phosphate Rock for Sustainable Agriculture in West Africa*.

### **For More Information**

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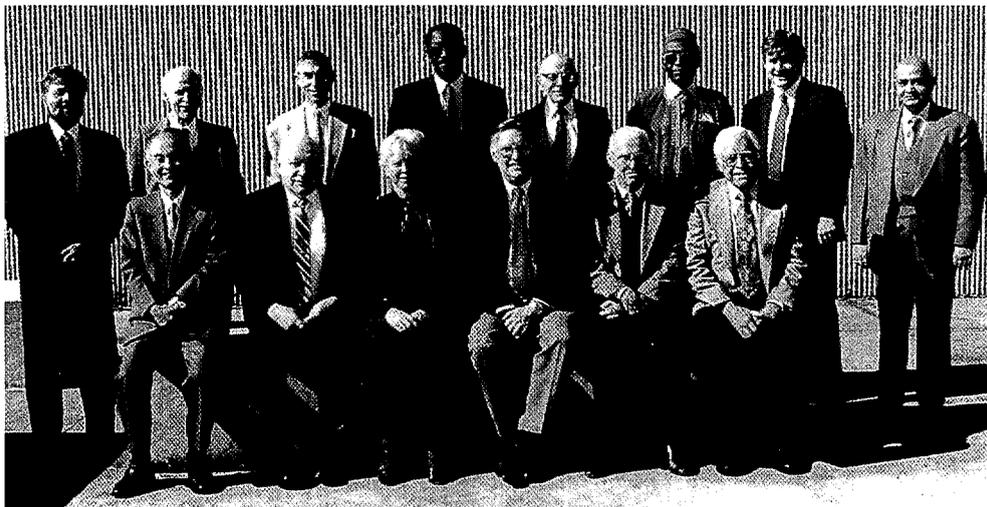
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# Financial Highlights

The following is a summary of financial information for the year ended December 31, 1995. The full financial statements and the independent auditors' reports are available from IFDC upon request.

<b>Balance Sheet</b>	<b>Statement of Revenue and Expenses</b>
<b>For the year ended December 31, 1995</b>	<b>For the year ended December 31, 1995</b>
<u>US \$'000</u>	<u>US \$'000</u>
<p><b>Assets:</b></p> <p>Cash and cash equivalents 1,966</p> <p>Short-term investments 100</p> <p>Contributions receivable 633</p> <p>Contracts receivable, net of allowance for doubtful accounts of \$170,285 704</p> <p>Other receivables 105</p> <p>Supplies inventory 124</p> <p>Prepaid expenses 62</p> <p style="padding-left: 20px;">Total current assets 3,694</p> <p>Buildings and equipment, net 2,893</p> <p style="padding-left: 20px;">Total assets 6,587</p> <p><b>Liabilities and Net Assets:</b></p> <p>Accounts payable 390</p> <p>Accrued annual and sick leave 590</p> <p>Deferred revenue 683</p> <p style="padding-left: 20px;">Total current liabilities 1,663</p> <p><b>Net Assets:</b></p> <p>Unrestricted 4,924</p> <p>Total net assets 4,924</p> <p style="padding-left: 20px;">Total liabilities and net assets 6,587</p>	<p><b>Revenues and Support:</b></p> <p>Australian Centre for International Agricultural Research (ACIAR) 42</p> <p>China National Chemical Construction Corporation 73</p> <p>Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH 102</p> <p>Egyptian Fertilizer Development Center 52</p> <p>Land O'Lakes 50</p> <p>Nalco Chemical Company 42</p> <p>Netherlands Ministry for Development Cooperation (DGIS) 1,135</p> <p>Petroquímica de Venezuela S.A. 1,026</p> <p>Rockefeller Foundation 71</p> <p>The Fertilizer Institute 112</p> <p>The World Bank 657</p> <p>U.S. Agency for International Development 4,767</p> <p>United Nations Development Programme 50</p> <p>Winrock International 474</p> <p>Training Programs 209</p> <p>Others 471</p> <p style="padding-left: 40px;">Total revenues and support 9,333</p> <p><b>Expenses:</b></p> <p>Field programs 2,219</p> <p>Research 1,784</p> <p>Outreach 3,626</p> <p>Supporting activities 1,819</p> <p style="padding-left: 20px;">Total expenses 9,449</p> <p style="padding-left: 40px;"><b>Decrease in unrestricted net assets (116)</b></p>

# IFDC Board of Directors (as of December 31, 1995)



The IFDC Board of Directors pictured here during their annual meeting at IFDC Headquarters, November 8-10, 1995. Front row (seated, from left: Dr. Kunio Takase (Japan); Dr. W. David Hopper, Chairman (Canada); Dr. Ann P. Hamblin (Australia); Mr. Joseph C. Wheeler, Vice Chairman (U.S.A.); Dr. Norman Borlaug (U.S.A.); Dr. Robert E. Wagner (U.S.A.). Back row (standing), from left: Dr. Amit H. Roy, IFDC President and CEO; Dr. Hiram Grove V. (Chile); Mr. Luc M. Maene (Belgium); Mr. Baba Dioum (Senegal); Dr. John Malcolm (USAID); Dr. Bukar Shaib (Nigeria); Dr. Barry Lennon (USAID); and Mr. Pratap Narayan (India). Not pictured are: Mr. Gary D. Myers (U.S.A.) and Dr. Christian Pieri (France).

## Chairman

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D&R Associates International  
Washington, D.C.  
U.S.A.

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Former Minister of Agriculture  
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Dr. Amit H. Roy  
President and Chief Executive  
Officer  
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Mr. Vincent McAlister  
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IFDC Legal Counsel  
IFDC

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## Office of the President

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Karen S. Billingham, Senior Analyst – Laboratory<sup>1</sup>  
Walter T. Bowen, Scientist – Systems Modeling (Soil Fertility)  
James E. Brink, GIS Specialist  
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Bernard H. Byrnes, Scientist – Soil Fertility

1. Left during 1995.

2. Extended leave.

3. Retired during 1995.

a. Seconded to IFDC by Directoraat Generaal Voor Internationale Samenwerking (Netherlands).

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Gildardo Carmona, Coordinator – Greenhouse Services  
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John T. Colagross, Technician – Electronics<sup>1</sup>  
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Deborah T. Hellums, Scientist – Systems Modeling (Soil Fertility)  
Julio Henao, Senior Scientist – Biometrics  
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# Center Profile

IFDC is a public, international, nonprofit organization, which was founded in 1974. The Center focuses on increasing and sustaining food and agricultural productivity in developing countries through the development and transfer of effective and environmentally sound plant nutrition technology and agribusiness expertise. The Center has conducted technology transfer initiatives in more than 100 countries. It has enhanced the development of human resources in more than 140 countries through some 500 training programs.

IFDC's work concentrates on these broad areas: agribusiness; engineering and technology; nutrient dynamics and environmental impact; policy, economics, and information systems; human resource development; watershed management; and policy reform and market research and development. IFDC's organizational structure for the 1990s includes four operating divisions: (1) Outreach – which concentrates on technology transfer related to efficient operations of the fertilizer and agriculture sectors; (2) Research and Development – which conducts strategic and applied research in nutrient management and soil fertility; (3) IFDC-Africa, located in Lome, Togo – which addresses the constraints to improving agricultural productivity of countries in West Africa; and (4) IFDC-Asia, located in Dhaka, Bangladesh – which concentrates on activities in Asia relating to market restructuring for agricultural inputs/ outputs.

At present IFDC has offices and/or outposted staff located in Albania, Bangladesh, Burkina Faso, Colombia, Niger, Peru, Philippines, Togo, Uruguay, and Venezuela. The Center has linkages with numerous national, international, and nongovernmental organizations around the globe. Our partners and clients are diverse and include bilateral and multilateral development agencies, host-government institutions, and private enterprises.

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