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Report

an update on the work & progress at the International Fertilizer Development Center

Headquarters—

Network Develops Model on Tropical Root Crops

A network of international scientists from four different institutions are developing a computer simulation model, called the aroid model, on two tropical root crops—tanier, more popular in the Caribbean Basin and taro, more popular in the Pacific Basin. These root crops are considered research poor by the U.S. National Academy of Sciences.

Three of the scientists recently visited IFDC to further develop the model and to confer with the project coordinator, Dr. Upendra Singh, IFDC Systems Modeler/Soil Scientist. The scientists are: Dr. Ricardo Goenaga, Research Plant Physiologist, Tropical Agriculture Research Station, Agricultural Research Service, U.S. Department of Agriculture, Mayaguez, Puerto Rico; and Dr. Robert Caldwell, Assistant Professor, Department of Agronomy and Soil Science and Hemant Kumar Prasad, a graduate student in the Department of Agronomy and Soil Science, University of Hawaii.

Goenaga is contributing information on tanier since that crop is popular in his region while Caldwell and Prasad are providing information on taro. According to the scientists the model is helping them understand the production/management systems for the root crops.

While at IFDC the scientists processed results of their field experimentation on tanier and taro. Collection of the IBSNAT minimum data sets during the experiments allowed them to link crop, soil, weather, and management data. This resulted in a comprehensive understanding of how the system (model) operated as a whole.

"The model is presently at the developmental stage; after we have assembled the data, it will be validated at different locations," Prasad says.

This model allows the scientists to get a total production picture for the crops. "It provides us the means to conduct a comprehensive study on the crops, including management practices, environmental factors, soil conditions, and technological factors," Goenaga says.

As for future plans Prasad thinks the group needs to conduct more experiments in different areas of the region so that the model can be validated (tested). He recognizes that the models eliminate duplication of experimentation.

In fact, one benefit of the models is that they reduce the number of experimental programs that are needed. "We can use the models to predict yields for us, and they can be applied to different environments," Prasad says.

Goenaga considers the real value of the models to be their contribution to the transfer of agrotechnology from one place to another.

Creation of the aroid model will provide scientists and extensionists from different disciplines a valuable tool to delineate constraints of increased productivity. This process will allow them to link interacting crop, weather, soil, water, and management variables into one system. Caldwell has five graduate students at the University of Hawaii working on various facets of the system.

The fact that the modeling project has brought several different disciplines together should add to its effectiveness. "IFDC has played a key role in putting this project together and achieving its goals," Goenaga says.

This project represents one facet of the IFDC crop modeling component. In fact, this particular project is an outgrowth of an earlier computer simulation training program, which the scientists attended at IFDC in 1989.

The training program served as the catalyst for involving the group in crop modeling. "The training program gave me the momentum to get started," says Prasad.

(Photo, courtesy USDA-ARS, Tropical Agriculture Research Station, Puerto Rico)

Tanier is one of the tropical root crops that the new aroid crop model focuses on.

IFDC Report

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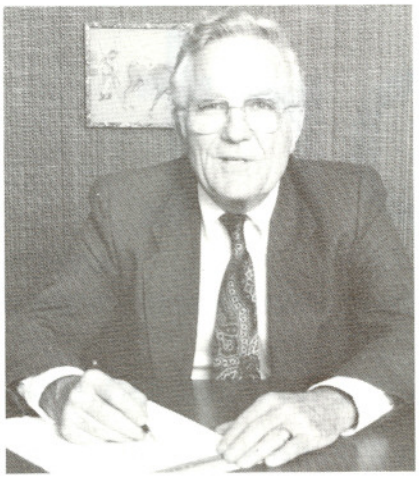
President's Report



(Photo by Charles E. Butler)

Dr. Paul J. Stangel
IFDC President and Chief Executive Officer

IFDC is moving in a new direction. In so doing, the Center is employing an approach that involves integrated nutrient management, agri-input activity, and a sustainable system of land management. In the words of Dr. Nyle Brady, Senior Consultant to the United Nations Development Programme, the Center is pursuing a "marriage of its traditional programs with new programs relating to the environment and sustainable agriculture."

The Center is moving to fit fertilizer into an integrated nutrient management system where fertilizer is viewed as a supplement to nutrient sources derived from the soil, animal manure, urban wastes, crop residues, and other sources. In its nitrogen research being conducted jointly with the International Rice Research Institute (IRRI) in the Philippines, IFDC is practicing integrated nitrogen management by effectively managing native soil nitrogen, biologically fixed nitrogen from legumes, nitrogen from crop residues and green manures, and fertilizer nitrogen. By so doing, it is lowering the requirements of supplemental nitrogen fertilizer and with proper overall management may reduce the potential for environmental pollution.

In West Africa the Fertilizer Investment for Soil Fertility Restoration Project (SFRP), an applied agronomic and socioeconomic research and development project, is evaluating various fertilizer options (including fertilizer, organic residues, and animal manures) and assessing their benefits for the restoration of soil productivity, sustainability of soil fertility, evolution of farming systems and economies of village communities. The project, being funded by the U.S. Agency for International Development, the World Bank, France (CIRAD), IMPHOS/APF, and the Rockefeller Foundation, is also assessing the implications of fertilizer use in various farming systems for resource conservation and environmental degradation.

The second aspect of the new direction deals with looking at fertilizer as an agri-input activity of which fertilizer is the backbone in a delivery system that provides a range of inputs needed by the farmer—seeds, irrigation, pesticides, fertilizers, and the technical information needed to make inputs cost effective. As the institutional framework of these systems grow in a given country, farmers will be better able to use agricultural inputs in a cost-effective environmentally sound system of crop production.

The third aspect concentrates on fitting fertilizer and the nutrient supply into a sustainable system of land management where fertilizer and plant nutrients are used with soil and water in the overall land mass, including people and other elements so that the land resource base is preserved over time and will sustain a level of agricultural productivity demanded by society but which is environmentally sound. In this regard, the SFRP is working with village communities in Ghana, Niger, and Togo to assess the long-term impact of fertilizer—not just on crop yields—but on the entire local economy and social life of the people. In addition, the types of farming systems employed will include those ranging from agroforestry to conventional agriculture, concentrating always on sound nutrient management practices.

IFDC is sensitive to the changing needs of farmers as they shift toward a more diversified and ever more intensive agriculture. Driven by changing diets created by rising personal incomes (particularly in the Pacific Rim countries), national planners are taking steps to diversify the crop production base from a focus on rice, wheat, and maize to oil crops, fruits, vegetables, and a range of new industrial crops geared for export.

In order to achieve these objectives, IFDC will not only have to broaden its base of research and development and technical assistance but also interact with a host of institutions, private and public, international and national that have a comparative advantage in one or more of these areas and that can interact with IFDC in helping developing-country farmers achieve a better economic standard of living.

At present, IFDC is actively contacting other international and national institutions to forge these linkages.

Paul J. Stangel

Zimbabwe—

African Centre for Fertilizer Development Taking Shape

The African Centre for Fertilizer Development is becoming a reality. This Centre is an important part of the long-term strategy for implementation of the Lagos Plan of Action for Economic and Social Development, which was adopted by the 1980 Economic Summit of the Organization of African Unity (OAU).

OAU has selected IFDC to serve as the executing agency and provide technical management during the planning, development, implementation, and operation of ACFD for a period of 5 years. At its October 1990 meeting, the IFDC Board of Directors nominated Dr. Samuel C. Muchena, the former Deputy Secretary, Professional and Technical Services, Ministry of Lands, Agriculture, and Rural Resettlement, Zimbabwe, to serve as ACFD's first Managing Director.

In an interview at IFDC Headquarters recently, Muchena spoke of his plans for the new Centre, located in Harare, Zimbabwe. "The ultimate objective of ACFD is to stimulate the production and use of fertilizers in order to increase crop yields and farmers' incomes in rural Africa so as to reduce widespread hunger and malnutrition and make an impact on rural poverty," Muchena says.

The specific objectives of ACFD are to achieve technology transfer for improved fertilizer production; demonstrate the role that fertilizers must play for improved agriculture; provide technical support to the fertilizer sector through an information data base; develop collaborative projects in the region; and conduct, foster, and support training.

"Among the priorities of ACFD is the improvement of fertilizer supply, marketing, and use, which will increase agricultural production," he says. "To this end, ACFD will develop, maintain, and evaluate information on all types of organic and inorganic indigenous resources that can be used to enhance soil fertility."

"We will assess the role of integrated nutrient management—fertilizers, indigenous agrominerals in association with organic materials, and yield-enhancing practices—to develop environmentally sound sustainable agricultural production systems and improve the farmer's profit margin," he says. "As we conduct our various research programs, we will monitor the progress to ensure that at the end we will have a sustainable system without causing environmental problems."

While fertilizer is recognized as an important input for increased agricultural production, its costs are high and foreign exchange for imports and farmer-buying capacity are limited. Africa has the lowest level of fertilizer use per hectare of arable land.

The limited capacity to formulate policies that would improve efficiency of nutrient production, marketing, and use is probably the most important factor limiting fertilizer use. The shortage of accurate information at the right time also contributes to poor planning in the fertilizer sector. Collection and dissemination of information on fertilizer production, trade, and use are considered major priorities for ACFD.

According to Muchena, the functional structure of ACFD consists of two technical divisions—one for research and development and one for technology transfer. The programs of ACFD are Land Resource Management, Policy Analysis, Resource Development and Utilization, Marketing Services, Human Resource Development, Information Services, and Engineering Advisory Services.

"The research and development program of ACFD will be carried out through collaborative networks in various regions," Muchena says. "Wherever possible, the networks will be developed in collaboration with other regional and international organizations."

Land for construction of the Centre's facilities has been provided by the host government. Plans for construction of the ACFD building are at an advanced stage.

After the third ACFD Board Meeting to be held in Harare during April 22-26, 1991, work should start in earnest. Muchena looks forward to the challenges ahead. "I find it a challenge to be involved in making ACFD become a reality," he says. "I am optimistic about the prospects, but at the same time, I realize the problems we face. I believe we have the potential to fulfill our objectives; the secret lies in being able to recruit good scientists and getting our programs underway quickly."

(Photo by Charles E. Butler)

Dr. Samuel C. Muchena, ACFD Managing Director, and Dr. Paul J. Stangel, IFDC President and Chief Executive Officer, discuss the plans for the new centre in Zimbabwe.

Colombia—

IFDC Provides Technical Assistance to Colombian Fertilizer Companies

An IFDC team of engineers led by Senior Project Analyst, Jorge R. Polo, recently provided technical assistance to a Colombian fertilizer company—Abonos Colombianos, S.A. (ABOCOL) and to its subsidiary, Amoniaco del Caribe, S.A. (AMOCAR), both located in Cartagena.

At ABOCOL, the team reviewed the detail engineering package prepared by the Foster Wheeler Andina Company (Bogota, Colombia) for revamping ABOCOL's NPK plant. The package was based on the basic process engineering prepared by IFDC engineers in 1989. The plans for modification of the plant call for revamping of the two granulation trains and installation of new reaction and scrubbing systems. A future addition will include a separate ammonium nitrate generation unit.

During the team's recent trip to Colombia, they visited ABOCOL's present plants to inspect actual operating conditions of several systems. They made extensive use of a scale model of the modified plant, which ABOCOL has constructed locally. "In their review, the team has recommended changes to the installations that will improve operating costs and safety of the modified plant and will result in considerable savings of downtime and costs during startup," says Polo.

The modification activities are well under way at ABOCOL, as some equipment has already been ordered and civil construction of the new reaction section has already begun.

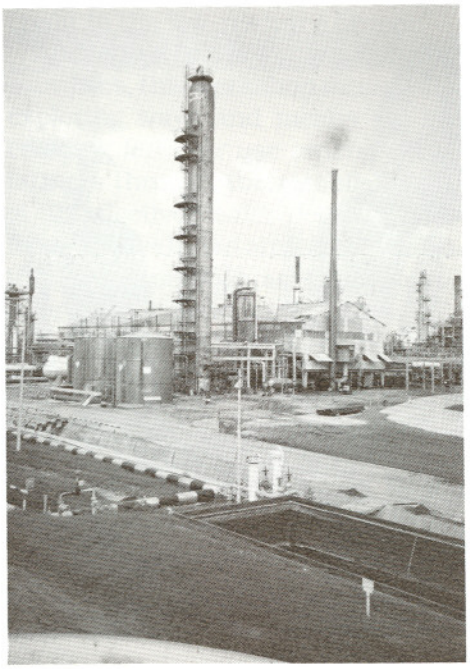
At AMOCAR, Polo had previously assisted with two aspects of modifications to their plant. AMOCAR is increasing their production capacity of ammonia from 105,000 to 120,000 tpy and of nitric acid from 40,000 to 75,000 tpy. During 1989 IFDC's engineers reviewed the basic process engineering design prepared by James Chemical Engineering, Inc. (U.S.A.), for the expansion of the nitric acid plant and later assisted in locating and inspecting a used absorber column that could be used as an extended absorber to reduce the nitrous oxide emissions of the plant.

When AMOCAR was originally built in the 1960s, Colombian environmental legislation relating to nitric acid plants was almost nonexistent, and AMOCAR's nitric acid plant was considered to be adequate from an environmental point of view. Later, as both Colombia and AMOCAR became more knowledgeable and aware of the need to curtail nitrous oxide emissions, it was decided that an extended absorber was needed even before implementing the rest of the capacity expansion of the plant. The idea was that an extended absorber column would reduce the nitrous oxide emissions to 500 ppm.

IFDC's engineers assisted in locating a column in Belgium, inspected the operating and maintenance records of the column, and determined that it would serve AMOCAR's purpose. After the column was purchased by AMOCAR, it was placed in operation in late 1990, as the extended absorber of the nitric acid plant.

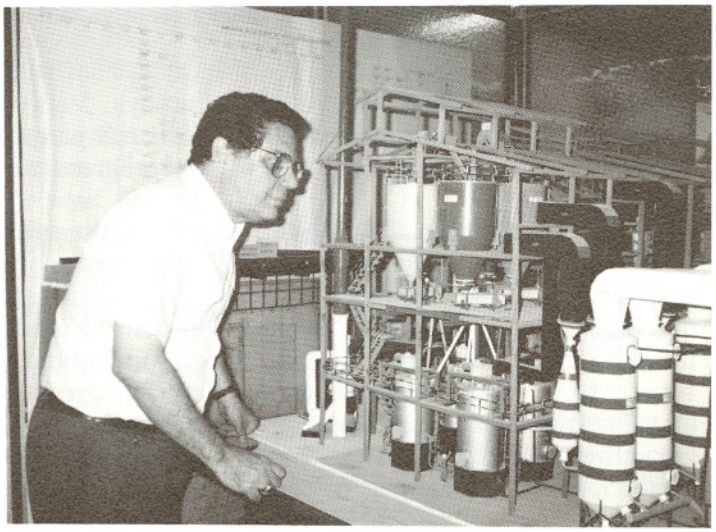
The total cost of the project was about 50% less than what it would have been if a new absorber tower had been designed, fabricated, and erected for this purpose. The nitrous oxide emissions from the nitric acid plant amounted to 2,500 ppm before and 480 ppm after the extended absorber was placed in operation. The new Colombian environmental laws require that emissions from this plant be no more than 615 ppm.

According to Manuel E. Martinez de la Hoz, Operations Vice President, AMOCAR was pleased with the results of this project and the assistance received from IFDC.



(Photo by J. R. Polo)

Above: An extended absorber column at AMOCAR's nitric acid plant.



Right: Jorge Polo, IFDC Senior Project Analyst, inspects a model of the expansion of ABOCOL's NPK Plant.

(Photo by Efraín Manotas, ABOCOL.)

Headquarters—

IFDC Completes Technoeconomic Study on the Compaction/Granulation of Minjingu Soft Rock Concentrate

At the request of the Minjingu Phosphate Company, Limited, of Minjingu, Tanzania, IFDC's engineers recently completed a technoeconomic study of the compaction/granulation of Minjingu soft rock concentrate (MSRC).

An earlier IFDC study had indicated a market potential for direct application of 25,000 tpy of MSRC in five districts within a distance of 450 km from Arusha, Tanzania. It is recognized that some effort and time will be required to develop this market because most farmers in the area are not using any type of fertilizer. In addition, there is a potential for export of MSRC to Kenya for direct application, for use in single superphosphate production, and for use in bulk blends to produce compound fertilizers.

"We recently operated the IFDC continuous laboratory-scale compaction/granulation pilot plant for the Minjingu Phosphate Company, Limited (MIPCO), to investigate the combination of MSRC and other solid raw materials to produce granular products by the compaction/granulation process," says Ramon Lazo de la Vega, IFDC Special Projects Engineer.

The solid fertilizer materials combined with MSRC were triple superphosphate (TSP), urea, ammonium sulfate, and potassium chloride (KCl). These tests were performed to evaluate the technical feasibility of producing fertilizers in granular form when MSRC is combined with other fertilizer materials that can be used as binders to increase product hardness and to provide plant nutrients for specific crops. Specifically, the objectives of the tests were to determine the compactibility of formulations and hardness (resistance) of compacted products.

These tests indicated the technical feasibility of the compaction/granulation process for the specified combinations in terms of granulation efficiency and strength of the product. These parameters were dependent on the raw materials used. For example, the formulations containing TSP or KCl were relatively easy to compact when compared with ammonium sulfate, which is known to be difficult to compact at low pressures.

The main problem with using urea is that urea cannot account for more than 15% by weight of the formulation because it is very hygroscopic and causes operating problems when used in large amounts. When urea is used in hot and humid climates, the main operating problems are sticking of the material to chutes, hoppers, and elevators and difficulty in feeding the recycle back into the compactor.

"We performed the preliminary cost assessment for the compaction process to make granular MSRC containing either urea, TSP, KCl or ammonium sulfate," Lazo says. "The investment cost was estimated for a plant to produce up to 25,000 tpy of granular MSRC. This information can be used as a first step to determine if the project has economic merit."

New Staff Member

Dr. Philip K. Thornton Economist/Systems Modeler

A former senior research fellow with the Edinburgh School of Agriculture, Dr. Philip K. Thornton recently joined the IFDC staff as an economist/systems modeler.

At IFDC Thornton is involved with the application of modeling techniques in the research and development process and in the implementation of case studies in Latin America and Africa.

At Edinburgh he was responsible for the investigation of the use of biological and economic modeling techniques in the agrotechnology transfer process in developing countries. In addition, he established and oversaw case studies in the tropics.

Prior to his tenure at Edinburgh, Thornton completed a 3-year stay at the Centro Internacional de Agricultura Tropical in Colombia, where he developed a bioeconomic simulation model of cattle production systems in the Colombian savannas.

The British economist/systems modeler is a graduate of Reading University, with a B.Sc (with honors) in agriculture and a Ph.D. in farm management and agricultural economics from Lincoln College, University of Canterbury, New Zealand.

The new IFDC staff member has served as the book review editor for *Agricultural Systems* (Elsevier) since 1988.

Dr. Philip K. Thornton, IFDC Economist/Systems Modeler.

(Photo by Charles E. Butler)

Jamaica—

CIDA/UNDP/IFDC Conduct Training Workshop on Developing the Fertilizer Dealer

Recognizing the importance of the fertilizer dealer, and with the encouragement and support of the Canadian International Development Agency (CIDA) and the Jamaican Ministry of Agriculture, IFDC organized a workshop designed to continue the process of helping the fertilizer dealer meet the needs of the small-farm sector. This workshop, held in Kingston, Jamaica, during January 21-25, 1991, was funded by CIDA and the United Nations Development Programme (UNDP).

Speaking of the rationale for conducting such a workshop, its manager—Dr. Loren E. Ahlrichs, IFDC Marketing Specialist—explained it this way: "In many countries governments are beginning to realize that a strong fertilizer dealer system is an essential element for the fertilizer sector. With the move toward a freely competitive privatized marketing system in many developing countries, such as Bangladesh, Cameroon, Ghana, Mexico, and Zambia, a stronger dealer system will become increasingly important."

The fertilizer dealer can provide a unique and vital link between the fertilizer producer and the small farmer who is often characterized by limited resources. In addition to providing the correct fertilizer, the dealer can provide the farmer with technical assistance and a number of related crop production inputs and services. Thus, he can help to bridge the gap that often exists between the researcher and the farmer. The dealer can also complement the work of the extension agent in advising the farmer on fertilizer use. Additionally, the dealer can be a source of short-term credit to the low-resource farmer.

Attracting 142 delegates from 18 countries, this workshop focused on exploring ways and means for increasing fertilizer use among small farmers through the establishment of an effective dealer network. The following five broad areas essential to the development of practical and well-informed dealers were addressed. They included: (1) the fertilizer market of small farmers, (2) market development, (3) training and development, (4) business operations of the fertilizer dealer, and (5) servicing the market.

The delegates to the workshop participated in a field trip to view fertilizer test plots and land reclamation activities and to interact with Jamaican fertilizer dealers, farmers, and others involved in the agricultural input supply system.

Encouraging discussion and the sharing of experiences and viewpoints, the informal workshop drew a striking response from the delegates. In fact, a followup is already on the drawing board. "We plan to conduct similar workshops in Africa, Asia, and Latin America," Ahlrichs says.

Other IFDC staff members making valuable contributions to the workshop included R. S. Giroti, Training Administrator; Dr. L. A. León, Soil Scientist; J. J. Schultz, Fertilizer Production Specialist; Dr. T. P. Thompson, Rural Sociologist; and C. C. Yaptenco, Marketing Specialist.

Calendar of 1991 Training Programs

Program	Dates	Location
Computer Simulation for Plant Growth and Nutrient Management	May 6-17	Muscle Shoals, Alabama, U.S.A.
Modern Techniques in Fertilizer Distribution and Handling	June 10-28	Europe
Agroeconomic Evaluation for Development of Fertilizer Recommendations	July 8-26	Muscle Shoals, Alabama, U.S.A.
Fertilizer Marketing Management Training Program	August 5-Sept. 6	Muscle Shoals, Alabama, U.S.A.
Policy Issues Affecting Fertilizer Sector Development and Sustainable Agriculture*	September 9-20	Muscle Shoals, Alabama, and Washington, D.C., U.S.A.
Fertilizer Use Strategies for Sustainable Agriculture	October 7-18	Muscle Shoals, Alabama, U.S.A.
Financial, Economic, and Environmental Impact Analysis for Fertilizer Sector Projects	November 4-22	Muscle Shoals, Alabama, U.S.A.
Fertilizer Marketing Training Program	December 2-13	Bangkok, Thailand

Program dates and locations are subject to change.
Fees do not include travel or living expenses.

*Training Workshops.

For details, please contact:

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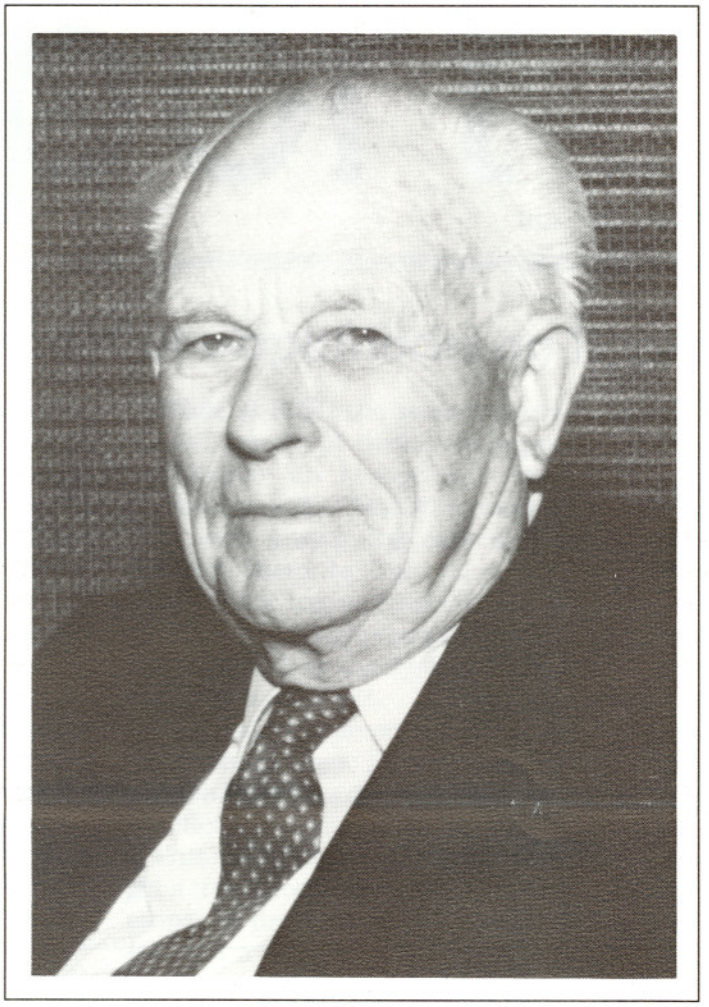
IN MEMORIAM—DR. JOHN A. HANNAH

The world of agricultural development has lost a true giant. In late February 1991, Dr. John A. Hannah, the first Chairman of IFDC's Board of Directors, died.

Anyone who knew Dr. Hannah could not help but be struck by his true wisdom. This wisdom came shining through in a speech he delivered to a graduating class at Oklahoma State University in 1980. In that speech he said, "Having lived a fairly long life, I am convinced that only people are really important . . . One of the most pervasive of all human desires for people of all races, all skin colors, all religions, and all economic philosophies everywhere is an instinctive aspiration for every human being to crave recognition as a dignified human being."



(Photo by T. L. Wright)

Dr. John A. Hannah
The First Chairman of
IFDC's Board of Directors

Also in that address, Hannah quoted Wendell Wilkie (an unsuccessful candidate for the U.S. Presidency in 1940), but the quote could just as easily have been his own: "To survive we must create a single world in which all people have the opportunity for a good life, a safe life, and a meaningful life—a world in which people matter."

This quote could serve as an appropriate epitaph for John A. Hannah. His life was an exercise in creating a better world for people all over the globe—a meaningful life and a world where people are important.

Dr. Hannah held so many distinctive positions and honors, it is impossible to mention all of them here. The graduate of Michigan State University held honorary degrees from more than 30 colleges and universities. From 1941 to 1969, he served as President of Michigan State University and was Administrator of the U.S. Agency for International Development during 1969-73. He was heavily involved in the First World Food Conference in 1974 and was Executive Director of the World Food Council of the United Nations.

Having been the first Chairman of IFDC's Board of Directors, Hannah had a deep sense of commitment to and interest in the organization. In an interview with this writer in 1981, he shared some of his hopes and dreams for IFDC. In his down-to-earth manner, Hannah reminded the IFDC staff, "In everything we do, we should ask ourselves, 'Has this in it a potential contribution to what we're supposed to be after?'"

Those of us who knew Dr. Hannah were impressed by his sense of vision. In his 1985 address during IFDC's Tenth Anniversary Celebration, he focused our thoughts on the future when he said, "As we look back on the first decade, let us look forward to the end of the second decade when hopefully IFDC will be able to say the world's hungry countries and particularly Africa is recovering and that IFDC has played a significant role in *helping the hungry nations of the world to stand on their own feet in looking forward to a peaceful and better fed world.*"

The last portion of this quote represents the essence of John A. Hannah's life. He will be missed by all who knew him. (For our readers who are unaware, Dr. Hannah's death was preceded by that of his wife Sarah, who died 4 months earlier.)

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IFDC Report

Recent IFDC Publications

Fertilizer Policy in Tropical Africa, Workshop Proceedings, SP-10 ($30).

Supplying Quality Multinutrient Fertilizer in the Latin American and Caribbean Region Emphasizing Bulk Blending and the Complementary Role of Granulation, Workshop Proceedings, SP-14 ($40).

Fertilizer Situation and Markets in Malawi, P-12 (U.S. $4.00; non-U.S. $7.50).

Production et Approvisionnement en Engrais en Afrique Sub-Saharienne: Contraintes et Options, P-13 (French version of *Fertilizer Production and Supply Constraints and Options in Sub-Saharan Africa*, P-10 (U.S. $4.00; non-U.S. $7.50).

Fertilizer Use Statistics and Crop Yield, T-37 (U.S. $4.00; non-U.S. $7.50).

ANALYSE ET PERSPECTIVES DU SECTEUR DES ENGRAIS DANS LE MONDE, 1960-95, T-38 (French version of *Global Fertilizer Perspective, 1960-95*, Executive Summary) ($10).

Perspectiva Global de Fertilizantes, 1960-95, T-39 (Spanish version of *Global Fertilizer Perspective, 1960-95*, Executive Summary) ($10).

A Model for a Fertilizer Information Unit in Developing Countries, T-40 (U.S. $4.00; non-U.S. $7.50).

IFDC Annual Report 1989, S-13 (free of charge).

Fertilizer Policy for Sub-Saharan Africa: A Review of the Literature, R-8 (U.S. $10; non-U.S. $15)

Fertilizer Situation and Markets in Zambia, P-14 (U.S. $4.00; non-U.S. $7.50).