

# Report

## Headquarters—

### Travis P. Hignett Receives Outstanding Service Award From Fertilizer Industry Round Table

Another honor has been added to the long, impressive list already bestowed on Travis P. Hignett, known world-wide as "Mr. Fertilizer" and who is currently Special Consultant to Dr. Donald L. McCune, the Managing Director of IFDC. On November 17, 1986, the Fertilizer Industry Round Table, during its 36th Annual Meeting held in Baltimore, Maryland, presented Hignett its first Outstanding Service Award.

The Fertilizer Industry Round Table, formed in 1951, is attended by representatives of the fertilizer industry from around the world. These officials convene to discuss the industry's current trends, problems, and possible solutions. Over the years the discussions have shifted from the subject of pure fertilizer technology to topics such as environmental control, pricing, agronomic considerations, trade, and management of resources to improve efficiency. However, the role of the fertilizer industry and its technology remains a key topic.

A long-standing member of the Fertilizer Industry Round Table's Board of Directors, Hignett has contributed to its evolution in many significant ways. It is largely through his efforts that the once purely U.S. group gained an international flavor, especially because of his work with the European community.

According to the Round Table's Chairman John L. Medbery, Hignett was selected for the award in "recognition of a lifetime of outstanding service and technical contributions to the fertilizer industry, farmers, and people of the world."

The son of a Christian Church minister, Hignett was born in Maxwell,

Iowa, and grew up in several Iowa towns.

Primarily because it was near his home, Hignett chose to attend Drake University where he received an A.B. degree in chemistry in 1929.

After 9 years in Washington, where he worked for the U.S. Department of Agriculture and a group called Research Associates, Hignett accepted a position at the National Fertilizer Development Center (TVA) in Muscle Shoals, Alabama, U.S.A.

During his 35-year tenure at TVA, which culminated in the position of Director of the Division of Chemical Development, Hignett participated in and led a variety of projects. One of the most unusual was not related to fertilizer. During World War II he was

the leader of a project to produce aluminum from clay.

"At that time most high-grade ores of aluminum came from overseas and the war production board thought the imports might be cut off by submarine warfare," he said. "They wanted to have a practical process to make alumina and aluminum metal from domestic ores if necessary for things like airplanes."

Another unusual project in Hignett's repertoire involved the hydrolysis of wood to make molasses, used in feed for cattle. This project led to a patent, one of 15 that Hignett has to his credit.

In 1973 Hignett retired from TVA and became IFDC's first Director of the Fertilizer Technology Division; he



Travis P. Hignett (left), Special Consultant to the Managing Director, and Dr. Donald L. McCune, Managing Director, display Hignett's Outstanding Service Award presented by the Fertilizer Industry Round Table.

was later named Special Consultant to the Managing Director.

Hignett's work for TVA and IFDC has taken him to many parts of the world including most European countries, Japan, Brazil, India, Indonesia, Mexico, and the Philippines.

Besides conducting and directing developments that contributed significantly to the evolution of the chemical fertilizer industry, Hignett has devoted much time to putting his ideas and results into writing. With approximately 150 publications to his credit, Hignett can take pride in being a master crafts-

man and effective communicator when it comes to writing.

Perhaps his most famous publication is the *Fertilizer Manual* (often referred to as the Bible of the fertilizer industry). This IFDC publication is written in a language that, as Hignett says, "you don't have to be an engineer to understand." The 400-page manual describing all of the major processes for manufacturing fertilizer is used by fertilizer technologists throughout the world.

Even though Hignett earned only one formal degree, he has since reaped

far greater honors.

In 1969 the Fertiliser Society of London awarded him the Francis New Memorial Medal. In 1972 he received the Honorary Member Award from the National Fertilizer Solutions Association. In 1980 Hignett received the first Merit Award of the American Chemical Society's Division of Fertilizer and Soil Chemistry.

Supporting Hignett in the background is his wife Kathleen, who is Hignett's equal when it comes to wit and charm. ■

#### Headquarters—

## Venezuelan Scientists Study Production of High-Potash NPK Fertilizers



Two Venezuelan scientists recently came to IFDC to learn how to produce high-potash NPK fertilizers. The scientists, José Rafael Castillo and Adriana Sánchez, are employed by Intevap, S.A., the research division of PDVSA (the government-owned petroleum company) of Venezuela.

Venezuela has resources for producing nitrogen and phosphate fertilizers, but the country must import all of its potassium requirements. At present, granular compound fertilizers containing nitrogen, phosphate, and potassium are being produced by PEQUIVEN, the fertilizer production arm of PDVSA. However, IFDC has recommended that they produce bulk-blended fertilizers rather than homogenous granular products. Because the size distribution of the currently imported potassium compounds is not well matched with other bulk-blend ingredients, PEQUIVEN cannot use this material in producing the bulk-blend fertilizer as it would result in an uneven blend of the nutrients. For this reason, Intevap is looking into ways of modifying the imported potash to produce uniformly

sized granules that could be used for bulk blending.

"We know that we can produce the right granule size by compacting the potash, but we came to IFDC to determine if this can be done using our existing granulation plant, which would result in a more economical alternative," Castillo said.

Jorge Polo, IFDC Engineering Coordinator, characterized the pilot-plant test runs for Intevap as successful. "Enough information was obtained and transmitted to Intevap so that they can make a bulk-blend ingredient

containing from 35% to 40%  $K_2O$ ," Polo said.

While at IFDC the two scientists engaged in a variety of activities. "I learned different techniques common in fertilizer analysis," said Adriana Sánchez. "I also learned how to operate a bench-scale phosphoric acid plant and how to control the different conditions of NPK high-potash trial runs."

Since her group at Intevap—the petrochemical section—is in the process of setting up its own laboratory, she was especially interested in studying fertilizer quality control and physical and chemical analyses.

The scientists were pleased with the results of their visit to IFDC. "We were exposed to a high level of training here," Sánchez said. "The facilities and working conditions are excellent; the only thing we lacked was enough time. We really needed more time to absorb all of the technical information that the IFDC scientists shared so freely with us."

During their brief visit the two researchers also gathered valuable information from the libraries at both IFDC and the National Fertilizer Development Center. ■



José Rafael Castillo (left) and Adriana Sánchez of Intevap; Jorge Polo, IFDC Engineering Coordinator; and José Ramón Lazo de la Vega, IFDC Special Project Engineer, examine high-potash NPK fertilizer produced in the IFDC Pilot Plant.

## Team Participates in Asian Development Bank Mission to Appraise Fertilizer Program Loan



An IFDC economist, Dr. M. S. Mudahar, and the Director of the Fertilizer Technology Division, O. W. Livingston, recently participated in an Asian Development Bank (ADB) mission to appraise a proposed fertilizer program loan to Sri Lanka.

The Government of Sri Lanka has requested a loan from ADB, the immediate objective of which is to finance the import of approximately 210,000 metric tons of fertilizer during 1987-89 to sustain and possibly improve upon the current level of food production. In the short term, it is hoped that the loan will relax foreign exchange constraints and improve the balance-of-payments situation in Sri Lanka.

"The long-term objective is to develop the fertilizer sector so that it can make a greater contribution to the economy of Sri Lanka," Mudahar said. It is hoped that this program will assist the Government of Sri Lanka in formulating policies designed to bring

about improvement in fertilizer procurement, marketing and use, enhance agricultural productivity and farmers' incomes, and facilitate sustained development in the agriculture sector.

The ADB mission team was asked to appraise the situation carefully—to look at the entire fertilizer sector in evaluating and justifying the loan. To be justified, the fertilizer program loan must add to the economic development of the country.

"With the exception of small quantities of local ground rock for direct application, Sri Lanka imports all of its fertilizer needs (since the urea plant is not operational) but has limited foreign exchange to use for this purpose," Mudahar said. "Of the loan amount, approximately 90% is to be used to import fertilizer."

The mission team was instructed to identify other needed items that should be financed to improve the fertilizer sector. The team identified several areas in which technical assistance is needed. For example, it was recom-

mended that the fertilizer training program be expanded, both in-country and internationally. Programs in fertilizer blending, use efficiency, economics, marketing, and price policy were suggested.

It was also recommended that a study be conducted to determine the technical feasibility and economic viability of importing fertilizer in bulk and bagging it locally. Another study that was suggested concerned the feasibility of using the country's indigenous phosphate rock resource, the Eppawala deposit, to produce fertilizer.

A whole gamut of issues was considered by the mission team. "We looked at the role of the private sector and its access to the fertilizer loan," Mudahar said. "We examined fertilizer price policies, subsidies, and many other issues. The benefit:cost ratio of the project was determined; in order for the loan to be approved, the direct economic benefits must exceed the cost."

According to Mudahar, at present the loan is in the final processing stages. Once the loan is approved, the implementation of the program will be monitored and evaluated as per the ADB requirements. ■

### Latin America—

## PHOSPHATE NETWORK PRODUCES RESULTS



A phosphate network involving seven Latin American countries, which was organized during 1985, is producing important results.

The primary objective of the network, which includes Bolivia, Colombia, Costa Rica, Ecuador, Mexico, Peru, and Venezuela, is to find ways of improving the agronomic efficiency of fertilizer products derived from Latin American phosphate rock deposits when applied to highland cropping systems. During 1986 four of the participating countries sent sample materials from their phosphate deposits to IFDC; test fertilizers were produced using these indigenous materials.

Results of the network tests indicate that partial acidulation of phosphate rock with sulfuric acid significantly improves crop response under highland cropping conditions. These were the first field tests ever conducted with the partially acidulated phosphate rock products in the home countries of the net-

work. Network tests have also provided information on the identification of the most effective management practices to use unacidulated phosphate rock, but partially acidulated phosphate rock continues to be superior to unacidulated phosphate rock for the highland cropping systems.

"Results obtained in Colombia and Costa Rica confirmed that broadcast and incorporation is the best method of application of finely ground phosphate rocks," says Dr. L. A. León, IFDC Soil Scientist posted at the Centro Internacional de Agricultura Tropical (CIAT) in Colombia. "In soils of high phosphorus sorption capacity, where phosphate rocks present very low agronomic effectiveness, sulfuric acid-based partially acidulated phosphate rocks can be applied by broadcast and incorporation or point placement (farmers' method) with no significant difference in crop response. Better agronomic results were obtained when ground phosphate rocks were broadcast and incorporated 30 to 15 days before planting than at planting time."

Applications of ground phosphate rocks as amendments are showing residu-

al effects that increase yields for the second and third crops. Promising results were obtained in Colombia and Mexico with mixtures of phosphate rocks with organic manures and ammonium sulfate.

"Next year, network activities will concentrate on field testing of the IFDC-produced partially acidulated phosphate rock fertilizers under different soils and cropping systems," León says.

Previous experience in Colombia indicates that partially acidulated products can perform agronomically as well as the more soluble phosphate fertilizers on acid infertile soils. However, the use of partially acidulated products can be extended to less acid or to neutral infertile soils.

Economic studies have been conducted to evaluate the potential role of these products in the Colombian fertilizer sector, based on present and projected production capacity as compared to demand for other phosphate fertilizers. Data indicate a strong potential for these local resources to reduce the foreign exchange drain caused by the importation of phosphorus sources and at the same time fill the gap between supply and demand for phosphate in Colombia. ■

## Dutch Accent Added to the Board of Directors

During its October meeting, the IFDC Board of Directors gained a Dutch flavor with the addition of Dr. Pieter van Burg, Director of the Netherlands Fertilizer Institute (NMI).

The Dutch citizen brings to the Board an impressive array of credentials. His curriculum vitae lists several positions of merit such as Editor-in-Chief of the international agricultural research journal, *Fertilizer Research*; President of the Fertiliser Society, London, 1985/86; Committee

member, Agricultural Group of the Society of Chemical Industry, London; and member and/or chairman of several selection committees of the Agricultural University and the Ministry of Agriculture to appoint either new professors or institute directors.

Born in Indonesia, the Dutchman returned to the Netherlands at an early age to receive his schooling. After receiving an M.S. degree in soil science, tropical plant husbandry, and agricultural economics from the Agricultural University, Wageningen, the Netherlands, Dr. van Burg began his professional career in South Africa with African Explosives and Chemical Industries, Ltd. In that company, he provided agricultural advisory services for the Eastern Transvaal and Swaziland. Later he was appointed senior soil science research officer in the Western Cape.

Upon returning to the Netherlands in 1957, Dr. van Burg was seconded by the Netherlands Fertilizer Institute to the Institute for Soil Fertility at Haren. There he was in charge of the NMI research group on soil fertility and fertilizer research.

In 1962 van Burg received a Ph.D. degree from the Agricultural University, Wageningen.

With his promotion to Deputy Director of NMI in 1974, van Burg was given the responsibility for the research groups at the Institute for Soil Fertility, the Agricultural Univer-



Dr. Pieter van Burg

sity at Wageningen, and the Research and Advisory Institute for Animal Husbandry at Lelystad.

Since 1976 he has been Director of the Netherlands Fertilizer Institute, headquartered in the Hague.

In 1981 when his organization started to cooperate with IFDC, van Burg learned of IFDC and its work. More recently, as a member of a mission to assess the progress of an IFDC global project on research and training in fertilizer technology and use, which is funded by the United Nations Development Programme, he gained an even deeper appreciation for the Center.

"I am highly impressed with the excellent progress of IFDC toward achieving and fulfilling its objectives," he said. "Its work in improving the efficiency of fertilizer and its application is commendable. I am particularly impressed with the training and transfer of knowledge from research findings to agriculturalists."

In fact, van Burg believes strongly that research should be conducted for its practical application in agriculture. In his words, "the farmer should be the focal point of research. I feel that much emphasis should be placed on the transfer of knowledge—research results. To increase his yields, the farmer must use the results of our work in research."

One of the basic premises of van Burg's own organization (NMI), which

had its origin within an earlier institution founded in 1948, is the transfer of knowledge. The 16-member foundation, in which the Dutch fertilizer industries participate and cooperate, conducts field research and transfers the results of this research to the various components of Dutch agriculture. NMI, which includes not only fertilizer manufacturers but also importers and distributors, cooperates very closely with the Government because all of its research activities are integrated within

Government institutions.

According to van Burg, he finds it "very exciting to be on the IFDC Board—to be in close contact with the problems of agriculture of the developing world." For him, the highlight of his first Board meeting was the presentation on the Africa Center.

He wholeheartedly endorses the plans for the new regional center. "I hope that IFDC will be able to generate sufficient funds so that the new center can get off to a good start," he said. "The goals of the center—the improvement of fertilizer efficiency and technology transfer—dovetail nicely with the basic premises of the Lomé agreement, which is dedicated to establishing a secure agricultural production system in west Africa."

Dr. van Burg sees the development of the Africa center as imperative, particularly in light of the present situation of the agricultural sector. "The fact that per capita food production in Africa has been decreasing during the past 15 years makes it more important that we take measures to improve the agricultural situation," he says.

Dr. van Burg enthusiastically looks forward to his tenure as an IFDC Board member. In fact, he says, "One of the roles that I would like to play as a Board member is as an ambassador for IFDC." ■

## Cardoso Rejoins IFDC Board of Directors



Fernando Penteadó Cardoso

After an absence of about 6 years, Fernando Penteadó Cardoso, President of MANAH S/A, of Sao Paulo, Brazil, has been reappointed to the IFDC Board of Directors.

With a career in agronomy spanning a period of 50 years and an impressive set of credentials, Cardoso again has the potential of making a powerful impact on the affairs of the Board.

Educated at the Jesuit's Colegio Sao Luiz, Cardoso received a B.S. degree in agronomy from the University of Sao Paulo.

Early in his career, he served as Assistant Inspector of the Fruit Farming Extension Service of the State of Sao Paulo Department of Agriculture. In this position he was asked to study the citrus fruits industry of the United States.

Later as State government officer, he published and presented several studies, reports, and papers. In 1964, he was appointed Secretary of Agriculture of the State of Sao Paulo.

Cardoso's curriculum vitae enumerates a variety of distinguished appointments and memberships. Among the major ones are Vice President of the Brazil Association of Soil Conservation, Agriculture Delegate to the InterAmerican Council of

Production and Commerce, member of the Research Council of the Biological Institute, founder member of the Latin American Food Conferences, President of the State of Sao Paulo Fertilizer Industry Syndicate, and Director of the State Industry Federation of Sao Paulo.

In 1942 Cardoso started his own small fertilizer firm. When his company was absorbed by MANAH S/A, in 1948, he was named President and Chairman of the Board. MANAH, which markets products throughout all of Brazil, specializes in the sale of fertilizer directly to farmers. The Company also provides a package of products, credit, advice, and transportation assistance to the farmers.

During an interview at the conclusion of the October meeting of the IFDC Board of Directors, Cardoso reflected on some of the changes that have taken place in the Center since his first tenure on the Board as well as some of the basic principles and concepts that have endured.

"IFDC's ideal approach toward humankind and the philosophy that science can help to produce more food needed by an increasing world population have not changed," Cardoso said. "The Center has held to the perspective that science is an overall

benefit to both developing countries and developed countries because agriculturalists everywhere are eager to improve their efficiency."

As for the evidence of change and progress of the Center, Cardoso has definite ideas also. "IFDC has expanded in a variety of ways—the Board, budget, and the number of countries that have been influenced by its work," he said.

"After 12 years the organization is quite stable," he said. "During my travels to many different countries over the past few years, in practically every country I have visited, agriculture and fertilizer people were familiar with IFDC. In China the Center is well known in the fertilizer field."

Cardoso has a feel for the impact of the Center around the world. "The work that the Center has done in fertilizer production and marketing in many countries has been of utmost importance, particularly in Asia," he said.

"In Brazil, besides making several contributions toward the development of private companies, IFDC inspired and provided the basic orientation for our technical center that specializes in fertilizer—the Centro de Estudos de Fertilizantes (CEFER)," Cardoso said. "A continuing dialogue involving training, information exchange, and advice exists between the two organizations."

Because of his long association with the Center, Cardoso has a deep appreciation for its global influence. "IFDC continues to be a kind of mecca where we come when we need advice, orientation, or an update on the fertilizer sector. There is no doubt that IFDC has been playing an important role and will continue to play this role in the future—toward better and increased farm production in which there is no substitute for fertilizer use."

"Therefore, I feel very much honored and gratified to bring my contributions to the Board again. My proposal is to give the best of my experience for the progress of this very important Center." ■

# Training Program Activities

Headquarters—

## Fertilizer Quality Control Training Sparks New Interest



The success of a new group training program in fertilizer quality control, which was held at Headquarters during September 22-October 10, prompted the Nigerian Federal Ministry of Agriculture, Water Resources, and Rural Development to request individual training in the same subject for additional members of its staff.

The goal of this training program was to provide the participants with a broad knowledge of the factors that influence fertilizer product quality. Such criteria as raw material specifications, process design and plant operation, product types, storage, physical distribution, sampling, physical and chemical analyses, regulation, and management factors were thoroughly explored.

Fourteen participants from seven countries attended the group program, which was under the direction of David W. Rutland, IFDC Physical Properties Specialist.

A plant manager with the Arab Potash Company of Amman, Jordan, N. Sadoun, attended the program in order to broaden his background in fer-

tilizer technology. "We gained a wide view of the fertilizer industry—the various types of processes used in the production of fertilizer," Sadoun said. "We also learned how to take samples of fertilizer products; we studied

for Quality Control at the Gujarat Narmada Valley Fertilizers Company Limited (GNFC), Gujarat, India, found the program to be extremely beneficial, especially because he had an opportunity to exchange ideas with other participants and also learn from their experiences.

"Armed with this information, we should now be able to make more stringent quality checks on fertilizers," Patel said. "The literature that I received is very valuable to me since it is not always available in India."

Patel was especially interested in the information on NPK fertilizers and felt that this would be very valuable to him in his work for GNFC.

The participant from India suggested possible programs for the future. "I would like to see IFDC offer programs in air pollution control and cooling water treatment," he said.

Both the group and individual programs were enhanced by field trips to various fertilizer indus-

### Individual Training in Quality Control Requested

During November the Nigerian Federal Ministry of Agriculture, Water Resources, and Rural Development sent three of its personnel to IFDC Headquarters for an individual training program in fertilizer quality control. This program was managed by J. J. Schultz, IFDC Fertilizer Production Specialist.

One of the three Nigerian participants in the special program was Bright O. Njoku, Acting Senior Agricultural Officer. The individualized training was of special interest to Njoku because his agency is in the process of developing a fertilizer regulatory law for Nigeria.

"We hope that the Fertilizer Procurement and Distribution Division of the Ministry will be in charge of that Secretariat," Njoku said. "The training that we have received at IFDC will go a long way in assisting us in this endeavor. We need to set up the machinery to determine the quality of the fertilizer that is being imported to see if the information on the bag matches the actual quality of the fertilizer."

Njoku and his two colleagues were pleased with the results of their individual training program. "We are now properly armed with the information that we need to gain a higher quality fertilizer product," he said. "Now when we put up tenders for fertilizer, we will be able to specify exactly what quality we expect to receive. In the past, we have sometimes received prilled fertilizer instead of the granulated product that we wanted. At other times, the product would be caked. Until we participated in this training program, we did not know how to properly make a complaint, but now we will be able to put this information into practice to obtain higher quality fertilizer."

the tests and procedures used in determining the quality of fertilizer raw materials and products."

Another participant, M. U. Patel, who is the Senior Manager

and regulatory agencies in Alabama, Georgia, and Florida, where the participants gained a practical appreciation for the information they had already acquired in the classroom. ■

Headquarters—

## Seventh Annual Maintenance and Production Management Training Program Conducted



The popularity and success of the Center's Maintenance and Production Management Training Program were evidenced again during the seventh annual presentation of the program at Headquarters during October 13-31.

IFDC Chemical Engineer M. T. Frederick again served as manager for the practical program attended by 21 fertilizer plant managers, maintenance and production superintendents, scheduling and procurement

engineers, and first-line supervisors working in fertilizer plants.

The participants, coming from five countries in Asia and Latin America, received training in a variety of areas. They expanded their understanding of modern management principles, ammonia and urea plant operation/maintenance problems, organization alternatives, inventory and cost control, planning and scheduling, human resource development, and coordination of maintenance and production.

"The faculty was composed of

IFDC staff, specialized industry consultants, and maintenance and production management experts from the National Fertilizer Development Center (TVA) and commercial fertilizer companies," Frederick said.

The application of maintenance and production management theories and practices was demonstrated during field trips to commercial-scale plants in Baton Rouge, Louisiana.

"The program also featured a special workshop highlighting ammonia and urea plant operations and problems," Frederick said. "Participants from ammonia/urea plants made brief presentations on operation/maintenance problems that they face in their facilities." ■

Headquarters—

## Malaysian Researcher Studies Crop Modeling at IFDC



Computer simulation modeling provides a powerful method of extrapolation of research findings from one agroecological area to another. Construction of a model can also highlight areas of deficiency in knowledge concerning key processes that determine fertilizer efficiency and yield and can thus assist in research planning. By providing the capability of rapidly examining a great many fertilizer strategies under various climatic and soil regimes, computer simulation can play an important role in helping to determine optimum fertilizer strategies.

A senior research officer from the Malaysian Agricultural Research and Development Institute (MARDI), Dr. Aziz Bidin, recently came to IFDC for a 2-month period to learn more about crop modeling. Aziz was first introduced to crop modeling during a workshop conducted by the International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT), which was held in Malaysia in June. Douglas C. Godwin, an IFDC agronomist/systems modeler, coordinated that workshop.

According to Aziz, his main reason for coming to IFDC was to learn how crop models are structured and how they can be utilized.

Two other objectives of his IFDC study were to learn about  $^{15}\text{N}$  techniques and to learn how to properly prepare samples for  $^{15}\text{N}$  analysis. "From this knowledge, we can carry out experiments in terms of components in nitrogen dynamics in soil and soil/plant systems," he said.

"At our institute (MARDI), we have conducted a lot of research on rice concerning such criteria as the method of fertilizer application and varietal trials," Aziz said. "However, when we develop a new variety, we must go through a whole series of experiments again. In our research we need to know the performance of each variety in a particular area. We may be asked to look at a certain region to determine how a crop might perform in that area. The model will help us to predict how this crop will perform in a certain region. This will save us time and money. It will serve as a valuable complement to the planning and execution of field trials."

During his stay at IFDC, Aziz worked on some developmental aspects of the CERES rice model. (The CERES rice model is being developed as a collaborative project between IBSNAT, Michigan State University, and IFDC.) When he returns to his country he will examine the performance of

the model in simulating his own field experiments.

"We must carry out initial field experiments to verify that the model will work in our country," he said. "We may need to make changes in the model to make it applicable to our country's conditions—soil types, crops, etc. Once we achieve this, we will know that the model will work in our country and can then use it primarily for decision making."

"In trying to verify a model we can conduct certain experiments that require use of  $^{15}\text{N}$  to determine the magnitude of various nitrogen components of the system," Aziz said. "In other words, we need training in  $^{15}\text{N}$  analysis, including preparation of samples prior to analysis by the mass spectrometer. This is one of the main reasons for my coming to IFDC."

There are several kinds of decisions in which crop modeling can prove helpful. For example, simulation modeling can assist a decisionmaker in deciding whether to open a certain region for growing a particular crop, which season to grow it, and how best to grow it in terms of management. A model can also be used to evaluate the performance of a crop on different soil and climatic conditions. ■

## Recent IFDC Publications

### PROCEEDINGS OF THE WORKSHOP ON UREA DEEP-PLACEMENT TECHNOLOGY



This volume provides a compilation of the papers presented and a summary of discussions and recommendations that emerged from a workshop on urea deep-placement technology, held in Bogor, Indonesia, September 27-28, 1984.

The purpose of the workshop was to review and report results of field research conducted in Indonesia relative to the agronomic and economic efficiency of deep placement of nitrogen in lowland rice. Other objectives were to determine the technical feasibility of producing and distributing large urea particles in Indonesia; to

evaluate the present technology to deep place USG and prilled urea, to ascertain the long-term applicability of deep-placement technology to Indonesia, and to identify future research areas.

The joint workshop was hosted by the Centre for Soil Research of the Agency for Agricultural Research and Development and cosponsored by IFDC. The Australian Development Assistance Bureau has funded the research conducted in Indonesia during the past 4 years.

A limited number of copies of the publication are available from IFDC. These may be ordered by requesting Special Publication, SP-6, and sending US \$15.00 to the IFDC Purchasing Department, P.O. Box 2040, Muscle Shoals, Alabama 35662.

### IFDC ANNUAL REPORT, 1985



IFDC recently released its annual report covering the Center's activities in research, training, national programs, and technical assistance for the year 1985. The theme of this edition is IFDC's involvement in Africa.

Complimentary copies may be obtained by ordering IFDC Circular S-9 from the IFDC Purchasing Department, P.O. Box 2040, Muscle Shoals, Alabama 35662.



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