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# Report

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

*Headquarters—*

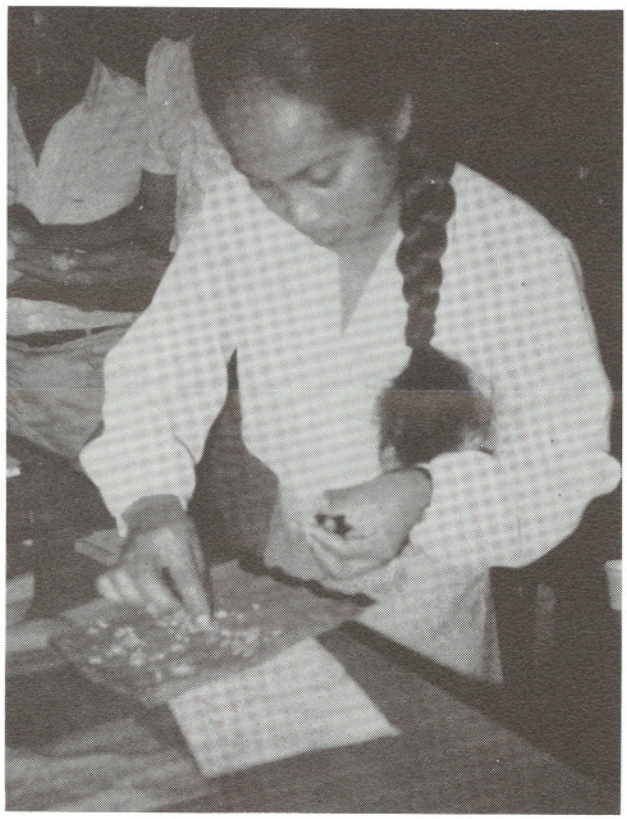
## Three New Training Programs Spark Interest in Variety of Subject-Matter Areas

Three new training programs recently offered at Headquarters sparked interest in a variety of subject-matter areas. These programs were "Advances in Fertilizer and Irrigation Technology in the United States," "Investment Analysis and Decisionmaking—Fertilizer Sector Projects," and "Fertilizer Sector Development Training Program for Graduate Students."

### Advances in Fertilizer and Irrigation Technology in the United States

This very innovative program, conducted during May 8-27, 1988, created a high level of interest and enthusiasm. The rationale for the program derives from the fact that modern fertilizer and irrigation technologies offer an opportunity for increased agricultural production in many areas of the world.

The "Advances" program explored the most advanced fertilizer-irrigation technology found in the United States. The participants visited and discussed with farmers, dealers, and researchers the use of various available technologies. The relevance of these technologies to the developing-country situation was evaluated.



Mrs. Harivololona Rasoanirainy from Madagascar, a participant in the "Fertilizer Sector Development Training Program for Graduate Students," conducts an experiment.

The program attracted 12 crop input professionals from Australia, Colombia, Egypt, India, Indonesia, Jordan, Morocco, Nigeria, Peru, Venezuela, and Zambia.

Some of the topics covered during the program included: (1) vegetable production in the Salinas Valley (California, U.S.A.); (2) digital computerized photography for crop production; (3) dry and fluid fertilizer application and use; (4) modern irrigation technology; (5) drip irrigation for small farmers; (6) application of chemicals through the pivot system; (7) reduced tillage systems in dryland farming; (8) maximum economic yield research; (9) modern fertilizer and handling systems for dealers; and (10) hydroponic systems.

Dr. L. E. Ahlrichs, IFDC Marketing Specialist, who served as Manager of this program, described it as a "forum where the participants were able to share and evaluate the ideas and concepts gained from their observations of new and different practices at the operational level."

### Investment Analysis Decisionmaking for Fertilizer Sector Projects

Another new program, conducted during June 6-24, 1988, focused on "Investment Analysis Decisionmaking for Fertilizer Sector Projects." This extremely worthwhile topic captured the interest of 20 participants from Ethiopia, Guinea, India, Jamaica, Jordan, Madagascar, Mexico, Pakistan, the Philippines, Spain, and the United States.

*In this issue...*


**Participants in the "Investment Analysis Decisionmaking for Fertilizer Sector Projects" Training Program visit a fertilizer dealer's operation.**

The capital investment required for fertilizer sector supply and distribution projects is often quite large—ranging from about US $1-5 million for a modest importation/mixing/bagging scheme to more than US $300 million for a world-scale basic production and physical distribution system. The availability of investment financing and the long-term economic feasibility of such projects depend heavily upon the integrity of the financial and economic analyses used to justify the project. This program was designed to familiarize the participants with the fundamental concepts, approaches, methods, and techniques needed to determine the technical, economic, and financial feasibility of fertilizer sector investment projects.

The "Investments" program covered all aspects of the financial and economic analysis of fertilizer sector investments and the finance of such investments. Attention was paid to the sector environment on a global basis, supply demand forecasting, cost estimating, financial analysis, economic analysis, decisionmaking, and finance services.

Basic lectures and instruction were complemented with a number of problem-solving exercises and workshops using actual case studies from both IFDC and the World Bank, designed to give the participants an opportunity to apply the basic concepts in performing several types and levels of economic assessments/investment analysis. In addition, the program included a field trip to a fertilizer dealer to illustrate the marketing type of investment, a major fertilizer manufacturing site to illustrate both cost control and financial analysis and a port to illustrate investment in infrastructure.

D. I. Gregory, IFDC Marketing Specialist, and the program manager, summarized the program in this way: "The program provided the opportunity for senior government planners and industry financial managers to develop the skills required for realistic investment analyses in the fertilizer sector. Exposure to the expertise of leading commercial organizations and international lending institutions provided a timely forum with immediate practical application. The need for this type of program will continue to grow."

**Fertilizer Sector Development Training Program for Graduate Students**

In cooperation with Purdue University (U.S.A.), IFDC offered this program to help graduate students understand the dynamics of tropical agricultural development, especially related to increased food production and increased use of fertilizers in the developing countries.

Thirteen graduate students from Malawi, Somalia, Zimbabwe, Zambia, Tanzania, Pakistan, Indonesia, and Rwanda attended this program, which was designed to help them understand the issues that impinge directly and indirectly on the efficiency of the fertilizer sectors of developing countries. The students are presently attending Colorado State University, Oregon State University, Michigan State University, University of Illinois, University of Georgia, University of Kentucky, and Pennsylvania State University.

The program focused on the following topics: (1) key characteristics of tropical environment; (2) soil fertility and crop management; (3) the role of fertilizers in food production in developing countries; (4) the economics of fertilizer use; (5) marketing and distribution of fertilizers; (6) management and communication in the fertilizer sector; (7) technologies of fertilizer production—role of indigenous resources; (8) policy environment and the fertilizer sector; (9) fertilizer database system; and (10) environmental issues related to the fertilizer sector.

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**Dr. George Van Scoyoc, Professor of Soils, Purdue University, explains the difference in soil characteristics from the temperate to tropical zones using soil profiles as Dr. L. E. Ahlrichs, Marketing Specialist; Mrs. E. M. Osanyintuyi from Nigeria; R. S. Giroti, Training Administrator; and E. H. Ekpiken of Nigeria look on.**

*Nigeria—*

# IFDC Team Assesses Fertilizer Demand and Efficiency of Fertilizer Distribution System in Nigeria

Under the sponsorship of the World Bank, IFDC recently conducted a limited assessment of the fertilizer market in Nigeria. Two IFDC fertilizer specialists visited Nigeria to conduct a 4-week study of that country's fertilizer market.

J. H. Allgood, Fertilizer Market Analyst, and Dr. W. E. Clayton, Fertilizer Distribution-Transportation Specialist, devoted 2 weeks to in-country data collection and analysis. Mr. S. S. Oridota of the Federal Fertilizer Procurement and Distribution Division (FPDD) and Professor O. Ogunfowora, Consultant to FPDD, represented the Government of Nigeria on the project and were instrumental in facilitating discussions with key organizations and agencies in Port Harcourt, Owerri, Kano, Kaduna, Lagos, and Abuja.

The two principal areas of focus for this study were the estimation of fertilizer demand and evaluation of the operating efficiencies of the fertilizer distribution system.

As a result of the study, the team estimated that in 1988 fertilizer use in Nigeria will total only about 253,000 tons of nutrients or 4% less than the 1987 consumption level. This slight downturn in use will be due to supply shortages. On a nutrient basis, nitrogen consumption in 1988 is projected to total 121,000 tons of nitrogen or about the same as the 1987 use level. Phosphate use is expected to total only about 79,000 tons of $P_2O_5$, down 14% from the previous year. Meanwhile potash is estimated at 53,000 tons of $K_2O$, up 7% from the 1987 use level.

The product mix used in 1988 will be somewhat more limited than that of previous years. However, this should not present any significant problems. Complex fertilizers will account for over 50% of the total market while calcium ammonium nitrate, single superphosphate, and urea will also continue in popularity; they will account for 19%, 12%, and 11%, respectively, of the market.

The supply constraint, which will limit fertilizer use in 1988, is expected to be corrected in 1989 and beyond. Consumption should return to the trend established during the early to mid-1980s. The projected annual growth rates in fertilizer use during 1988-93 for nitrogen, phosphate, and potash are 5.3%, 7.0%, and 3.6%, respectively. Nitrogen, phosphate, and potash use are expected to total 165,000 tons, 129,000 tons, and 61,000 tons of nutrient, respectively, in 1993.

As for the physical distribution system, the team found a very efficiently structured distribution and handling system established in Nigeria. The first benefit of the Nigerian system arises in the area of port discharge and handling. The conventional wisdom is that some storage is necessary in or near the port so that the ship can be offloaded rapidly and released. In Nigeria, however, virtually all fertilizer is offloaded directly to lorries for transportation upcountry. This reduces the number of handling and storage operations and the associated damage costs. There is some inefficiency in the system in that lorries are kept waiting at the ports to ensure continuous cargo

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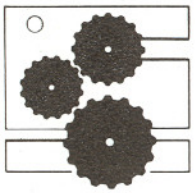
A Nigerian farm family weeds a maize crop.



*Colombia and Headquarters—*

## IFDC Team Finalizes First Complete Basic Process Design of Fertilizer Plant

An IFDC team recently put the finishing touches on the Center's first complete basic process design of a fertilizer plant. This design was completed for the NPK plant of Abonos Colombianos S.A. (ABOCOL), of Cartagena, Colombia.

The project was under the leadership of J. R. Polo, IFDC Engineering Coordinator. He was assisted in the design phase principally by V. E. León, Fertilizer Production Specialist, and J. R. Lazo de la Vega, Special Project Engineer. This project has evolved from IFDC pilot-plant tests conducted to determine the required operating conditions to a basic process design for the modification of the ABOCOL plant. The pilot-plant studies, which were carried out earlier this year, were performed in IFDC's combination phosphoric acid/nitrophosphate unit. During these tests, Polo was assisted principally by George Bolds, Pilot-Plant Operations Coordinator; J. R. Lazo; and T. Alan Nix, Assistant Pilot-Plant Operations Coordinator.

As for the intended outcome, Polo says, "The design calls for new equipment and operating conditions in order to meet the requirements of pollution abatement, process control, corrosion prevention, and material use efficiency. At the same time, the production capacity will increase by about 65% to a daily minimum of 900 metric tons."

For the past 25 years, ABOCOL has been a major producer of compound NPK granular fertilizers in Colombia; they use a nitrophosphate-type process in manufacturing this fertilizer. A variety of factors caused ABOCOL to evaluate the feasibility of modifying and improving their existing plant. These factors included (1) changes in fertilizer demand, especially the trend toward high-nitrogen and low-phosphate and -potash grades; (2) the need for increased production and production efficiency; (3) the need for improvement in control of environmental pollution; and (4) the need for maximum flexibility to make it possible to quickly respond to changes in demand (fertilizer grades). The modifications would be made to achieve these objectives with a high priority given to the production of a wide variety of NPK ratios, some of which would contain secondary and micronutrients.

Some objectives of this project were to improve the quality of different grades through optimization of process and instrumentation, to increase the production rate, to design a cleaning system for gases from the reactors in order to obtain a level of contaminants typical of U.S. standards, and to provide flexibility for production of high-nitrogen fertilizer grades.

ABOCOL expects to implement this modification within a short period of time. ■

*Headquarters and the Philippines—*

## The IFDC:IRRI Connection Produces Rice Model

Since 1978, when an IFDC scientist was first posted at the International Rice Research Institute (IRRI), IFDC and its sister center in the Philippines have been collaborating on the development of various strategies to reduce nitrogen losses on wetland soils cropped to rice.

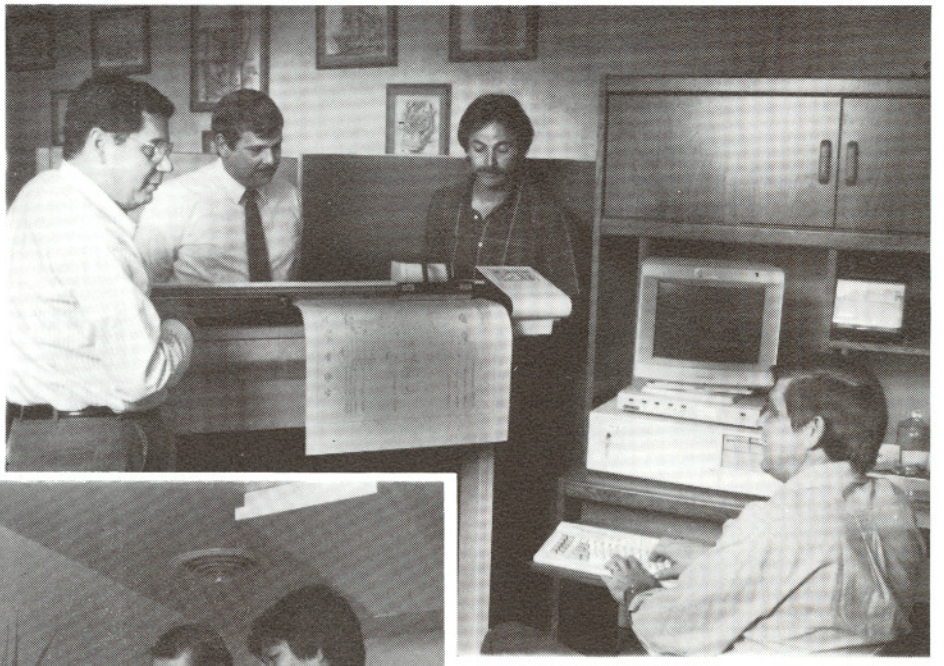
During a recent visit to IFDC Headquarters, Dr. Roland J. Buresh, IFDC Soil Scientist posted at IRRI, discussed with Headquarters staff the results of field trials being conducted in the Philippines. A mutually beneficial exchange of information has been established that allows Buresh to use the research methods being developed at IFDC Headquarters in his field trials at IRRI. In turn, the IFDC Headquarters staff are using data from field trials at IRRI to focus their research on practical problem-solving exercises.

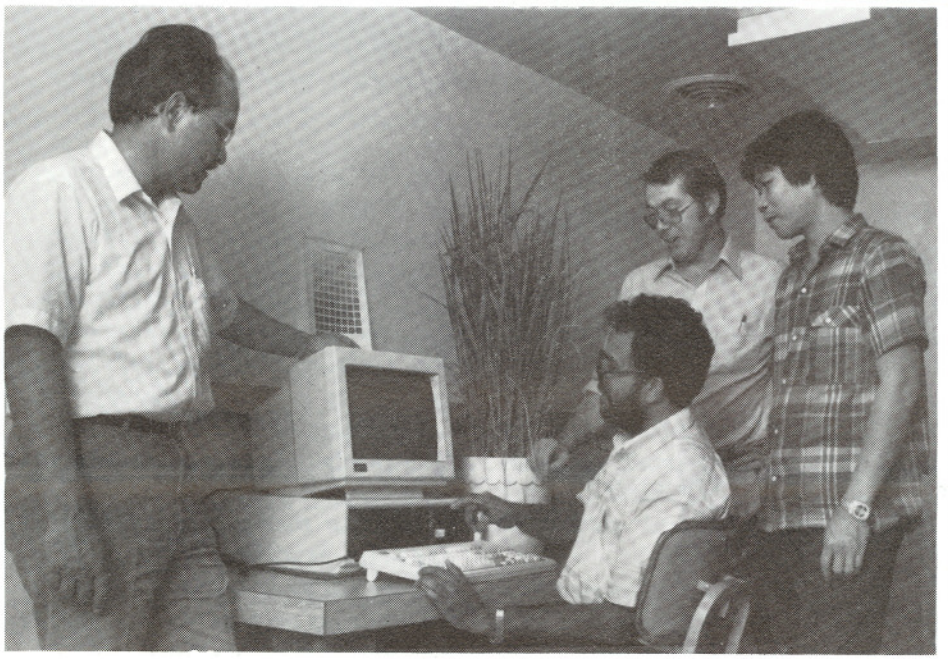
One of the latest collaborative efforts concerns the development of a rice model using past agronomic field data. Jenny Calabio, IRRI Research Assistant, recently came to IFDC to assemble a data base and data from literature that will be used in constructing a rice model. This model will provide answers to fundamental questions regarding management practices on rice, such as plant population, transplanting versus direct seeding, variety selection, and fertilizer management options.

In constructing this model, the IFDC/IRRI collaborators are building on a previous, first-generation rice model, which was developed by Professor Joe Ritchie, Dr. Upendra Singh, Dr. Susan Otter-Nacke, and Dr. Evangeline Alocilja. This latest model is an attempt to try to overcome the limitations of the earlier version. (Dr. Singh is now a Systems Modeler/Soil Scientist at IFDC, where he is continuing to work on the rice model and other modeling activities associated with the IFDC/International Benchmark Sites Network for Agrotechnology Transfer collaborative modeling project.)

One of Calabio's collaborators at IFDC, Dr. Douglas C. Godwin, Agronomist/Systems Modeler, summarized the cooperative effort leading to the evolution of the present model. "Over the past several years, numerous high-quality field data sets have served as a fundamental resource and testing base for the development of the rice model," Godwin says. "As model development

James C. Starkey, IFDC Graphic Designer (far right), generates one of the piping and instrumentation drawings for the ABOCOL modification project, using a computer-assisted design system. From left, J. R. Polo, Engineering Coordinator; V. E. León, Fertilizer Production Specialist; and Ramon Lazo de la Vega, Special Project Engineer, look on.





Dr. Upendra Singh, Visiting Scientist (second from left), demonstrates a simulation run of the rice model as Dr. C. A. Baanante, IFDC Economist; Dr. Douglas C. Godwin, IFDC Agronomist/Systems Modeler; and Jenny Calabio, IRRI Research Assistant, look on.

proceeds, we will identify knowledge gaps and communicate this information to IRRI. Dr. Buresh and his collaborators at IRRI have experiments underway to fill in these gaps."

According to Godwin, the collaboration is working very well. "We are heavily reliant on the continuation of this collaboration to obtain the data and insights that we need on the behavior of nitrogen in Southeast Asian rice-cropping systems," he says. "In addition, we hope that our efforts are continuing to develop a broader focus in research in the rice-cropping systems."

As for long-term aims the collaborators envision that upon completion of the rice model they will be able to apply it anywhere rice can be grown to identify the optimum strategies for improving nitrogen use efficiency in rice production. "In the long run we hope that the model can be used as a simple tool for quantifying gaseous losses of nitrogen to the atmosphere where it can act as a potential pollutant," Godwin says. "The model will also calculate nitrogen losses to groundwater and nitrogen runoff—both important sources of pollution."

*This model will provide answers to fundamental questions regarding management practices on rice, such as plant population, transplanting versus direct seeding, variety selection, and fertilizer management options.*

Calabio hopes that his stay at IFDC will serve as an incentive to his colleagues to come to IFDC and continue the collaboration to develop rice research methodologies.

In the meantime, research being conducted by Leella Holt, Laboratory Supervisor, and Dr. B. H. Byrnes, Research Associate, will lead to the development of better techniques for measuring gaseous losses of nitrogen in rice-cropping systems. As these new techniques evolve, they will be implemented in the field research program leading to more rigorous validation of the rice model. ■

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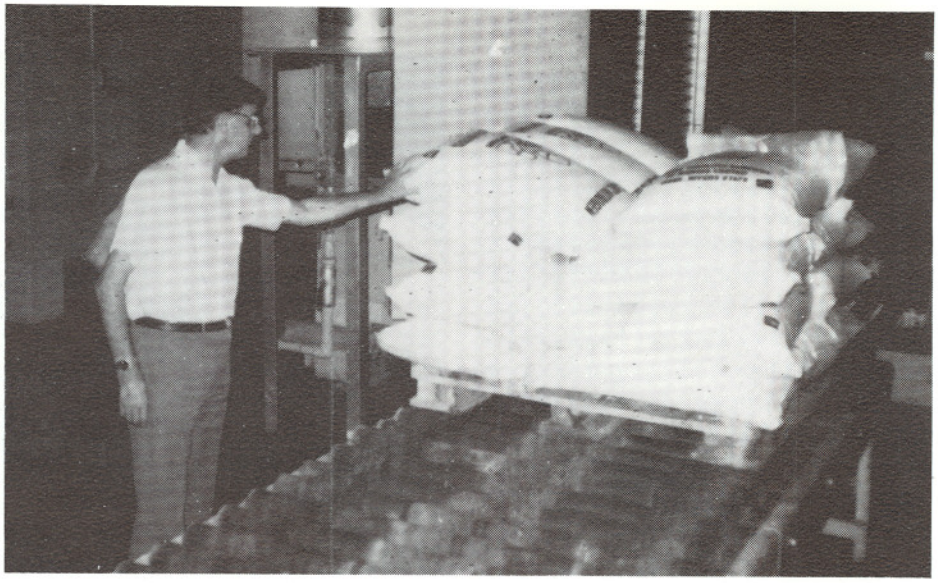
discharge. The second benefit is in direct (primary) transportation to the primary distribution point (PDP) level. Because fertilizer is moved directly to PDPs scattered throughout the country, primary transport costs are increased by a relatively small amount while secondary transport costs are eliminated.

The team concluded that the physical distribution system for fertilizer in Nigeria is an efficiently structured system, allowing little room for improvement. One area of major concern is the growing burden placed on the Government by the heavy fertilizer subsidy. At mid-1988 prices the fertilizer subsidy rate for the most popular product used in Nigeria (15-15-15) was 78%.■



Dr. W. E. Clayton, IFDC Transportation/Distribution Specialist, inspects bagged fertilizer at NAFCON's Onne plant.

*Tanzania—*

## Study of the Minjingu Phosphate Company Completed

At the request of the Finnish International Development Agency (FINNIDA), IFDC and the CSM Consulting OY of Finland recently completed a study of the Minjingu Phosphate Company (MIPCO) of Tanzania.

Minjingu Phosphate Company, Ltd., is wholly owned by the Government of Tanzania. The company was established to commercially exploit the Minjingu phosphate deposit and concentrate the phosphate rock into a salable product as well as to transport the product to the godown in Arusha, Tanzania, to be loaded onto railway wagons for sale.

The purpose of the mission was to identify each external and internal constraint to the use of MIPCO's phosphate rock production capacity and draw up plans for the elimination of these constraints. The viability and economic justification of the plans were assessed and alternative courses of action were proposed with an anticipated economic outcome for each alternative. The course of action considered to represent the economic optimum was selected.

Because MIPCO is the first link in the phosphate chain from a phosphate deposit to the farmer's field, its operations had to be analyzed both at the macroeconomic and microeconomic levels. The main areas and focus points of this study were (1) macroeconomic framework, (2) phosphate reserves, (3) fertilizer production, (4) current and potential markets, and (5) MIPCO.

The team leader of the mission was Dr. Paavo Harju, Counsellor and Lecturer in Strategic Management, CSM Consulting OY, Helsinki, Finland. Other members of the team included Lewis B. Williams, IFDC Liaison Scientist, East and Southeast Africa; Owen W. Livingston, Director of IFDC's Fertilizer Technology Division; Steven Van Kauwenbergh, IFDC Geologist; and Esco Kurvinen, Liaison Officer with MIPCO.

The specific tasks of the team included an external analysis, composed of a macro view based on policy options in agriculture, industry, and mining; the Government's imports, exports, and marketing policies; financing; and institutional aspects. The team's tasks also included a review of MIPCO's operation and phosphate reserves; an assessment of the prospects and economics of direct application; an evaluation of the prospects and economics for export and, if viable, the appropriate marketing strategies; an assessment of the transport and distribution system; a proposal for technology and necessary investments for future production; and an assessment of manpower and staffing needs as well as the production costs and pricing.

According to Williams, the conclusion reached by the team was that "the largest market for MIPCO's phosphate rock concentrate is the Tanzania Fertilizer Company (TFC) at Tanga. The continued operation of this plant is necessary for a successful operation of MIPCO."

The team compared four strategies in a preliminary way for TFC to improve operating efficiency, reduce pollution, and lower costs. All options require some investment since the plant needs major improvements. A detailed evaluation of TFC comparing indigenous production versus import of phosphoric acid to make triple superphosphate was recommended.■

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The graduate students completed exercises in field sampling and soil testing, the economics of fertilizer use, and a "How to Serve the Small Farmer" case study.

Two of the participants in this program were interviewed to ascertain their perception of the program's value and its outcome. Abdullahi Abdi, General Manager of the Northwest Region, Agricultural Development Project, Ministry of Agriculture, Government of Somalia, found the training program to be "an excellent overview of soil fertility and fertilizer materials and how they are used to increase agricultural productivity."

Mrs. Rosoanirainy Harivololona of the Applied Research Department, Government of Madagascar, plans to apply some of the technology that she learned during the program by conducting soil tests and making fertilizer recommendations based on the results of these tests and climatic conditions.■

*Headquarters—*

## Workshop Focuses on Mediterranean, Middle East, and North Africa

The United Nations Development Programme sponsored a special workshop at Headquarters during May 1-14. This workshop focused on "Fertilizer Sector Development and Agricultural Production in Selected Countries of the Mediterranean, Middle East, and North Africa."

The overall goal of the workshop was to assist target countries in accelerating food production by removing or relaxing the supply and demand constraints to increased and more efficient use of fertilizer. This was accomplished by identifying impediments to and suggesting strategies and programs for promoting fertilizer sector development in an expeditious and cost-effective fashion consistent with national and regional agricultural development objectives and plans.

The principal purpose of the workshop was to formulate strategy guidelines for strengthening existing fertilizer research, extension, and supply and marketing systems. In addition, programs were developed to transfer information needed to hasten the adoption of more efficient fertilizer and fertilizer use technologies by farmers.

In devising these guidelines the workshop addressed the following issues.

1. Relevance of existing soil fertility and fertilizer-related research and extension programs to farm-level needs.
2. Factors impacting on the socioeconomic condition of the farmer and his use of fertilizer and other agricultural inputs.
3. Development of more effective national fertilizer sectors through the integration of research, extension, and supply and marketing strategies.
4. Training requirements for developing and implementing sound fertilizer production, procurement, marketing and distribution, and use-related programs.

Twenty-four delegates representing 18 countries participated in the workshop. The countries represented were Algeria, Bahrain, Cyprus, Egypt, Jordan, Lebanon, Morocco, Romania, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, Yemen Arab Republic, and Yugoslavia.

*The overall goal of the workshop was to assist target countries in accelerating food production by removing or relaxing the supply and demand constraints to increased and more efficient use of fertilizer.*

A series of country profiles, presented by the delegates, examined the current situation and outlook for agricultural and fertilizer sector development in their countries. The country papers focused on the fertilizer supply and use constraints that impede the expanded and more efficient use of fertilizer.

Toward the end of the workshop, the delegates and faculty were organized into three working groups to discuss and identify key issues and prepare suggested strategies for speeding the development and improving the performance of fertilizer sectors in respect to the following three areas:

1. Fertilizer use—Increasing use and use efficiency.
2. Fertilizer supply—Developing appropriate and efficient fertilizer supply sources.
3. Fertilizer marketing and distribution—Determining and satisfying farm-level demand.

The findings of the working groups were presented and discussed at a plenary session of the workshop.

In addition to the formal sessions, the workshop featured field trips designed to offer delegates a practical view of various aspects of fertilizer sector development and operation in the United States. For example, a week-long field trip was made to California to observe and discuss fertilizer and irrigation research and the application of the latest technologies in irrigated agriculture.

Interested individuals may obtain a copy of the "Workshop Summary" by writing to the IFDC Purchasing Department, P.O. Box 2040, Muscle Shoals, Alabama 35662. The price of this booklet (IFDC Special Publication SP-8) is US $4.00 for U.S. addresses and US $7.50 for overseas addresses.■

# Recent IFDC Publications

## A Socioeconomic Study of Farm-Level Constraints to Fertilizer Use in Western Niger

This publication identifies farm-level constraints to fertilizer use in Western Niger and offers suggestions to relax those constraints. The study offers a socioeconomic perspective on the use of fertilizers among small farmers in their production of food crops. The authors of this publication are Dr. Thomas P. Thompson, IFDC Rural Sociologist, and Dr. Carlos A. Baanante, Agricultural Economist.

To receive a copy of this publication, please request IFDC Paper Series—P-6. The price of the publication is US $4.00 for U.S. addresses and $7.50 for overseas addresses. Orders should be placed with the IFDC Purchasing Department, P.O. Box 2040, Muscle Shoals, Alabama 35662.

## IFDC—Providing Technical Services to the Developing World

IFDC recently released a new publication outlining its many technical services available to clients in the developing countries. Some of the types of services available include market development studies; feasibility studies; investment analyses; production cost analyses; distribution, transportation, and handling studies; policy development and evaluation; mineral resource evaluations; basic process design packages; environmental and industrial hygiene studies; and training. To obtain more information on these technical services, as well as other types of services, you may receive a complimentary copy of this publication by writing to the editor of this newsletter.

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