IFDC

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

Philippines—PHILPHOS Beneficiation Plant Nearing Startup

When the Philippine Phosphate Fertilizer Corporation (PHILPHOS) begins mining and beneficiation operations this year, an IFDC-developed beneficiation process, which is designed to allow the use of an indigenous phosphate ore, will be implemented.

Reviewing the background of the PHILPHOS technical assistance project, the IFDC coordinator, Dr. Guerry McClellan, said, " At the beginning of the contract with PHILPHOS in 1981, they expressed an interest in trying to use an indigenous phosphate deposit occurring at Bantigue on Leyte Island as part of the phosphate for their phosphoric acid plant."

The principal problems with the Bantigue phosphate rock are that the ore contains dolomite, which has a high magnesium content, and that it has a high iron and aluminum content, which presents problems in the production of diammonium phosphate.

Calculations showed that unbeneficiated Bantigue rock might not be acceptable when blended with commercial rocks. This led to IFDC laboratory tests to improve the quality of the Bantigue rock.

An IFDC study determined that most of the iron and aluminum was associated with surface films of clays on the phosphate particles that could be removed by particle abrasion and sizing.

Intensive scrubbing or agitation in thick slurries caused the particles to rub against each other, freeing most of the fine-grained impurities. The dolomite occurring in the ore had a different appearance from the phosphate and could be separated by manual sorting. Laboratory-scale tests showed good results.

Pilot-scale attrition scrubbing tests on the Bantigue rock reduced the iron and aluminum to 2.7%—a reduction of 70%. The resulting concentrate is within the acceptable chemical standard of commercial phosphate rocks.

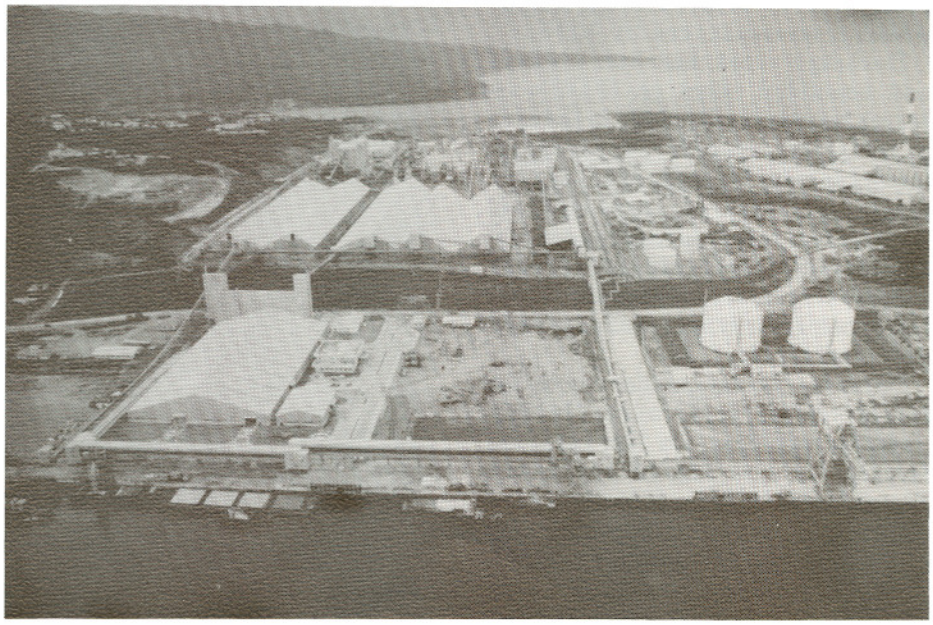
"In 1983 IFDC performed tests on commercial phosphate rocks and the Bantigue rock by itself to determine how the rocks perform in the production of phosphoric acid," McClellan said. "This work was done to provide a technical basis for selecting rocks to be used in the production of phosphoric acid."

IFDC conducted tests on the production of phosphoric acid from blends of commercial concentrates and Bantigue rock and concentrate. This work provided information on the amount of beneficiated Bantigue rock that could be used with commercial concentrates and still make acceptable end products.

PHILPHOS recognized the importance of these findings and in 1985 hired an engineering consultant to review IFDC's results. PHILPHOS decided to build a large-scale production facility using manual sorting to remove the dolomite from the ore, followed by a two-stage scrubbing process and desliming (removal of the fine particles).

"PHILPHOS recently announced that they are planning to start up their mining operation in 1985 at a production capacity of about 100,000 tons per year with plans to expand in the future," McClellan said.

"Using a simple process developed at IFDC and equipment that is readily available in the Philippines, the PHILPHOS beneficiation plant will have a rapid startup, with a minimum capital investment," McClellan said. ■



Aerial view of PHILPHOS complex.

Headquarters—

Norman E. Borlaug Visits IFDC

The recipient of the 1970 Nobel Prize for Peace, a recent visitor to IFDC, is a man whose life's work has ultimately been to place bread on the tables of mankind.

Dr. Norman E. Borlaug, wheat breeder and world-renowned international agricultural authority, was the featured speaker at the annual IFDC Century Club banquet on Tuesday, March 26. The Century Club, composed of community leaders and IFDC staff, is an organization that serves as a link between IFDC and the adjoining communities.

1985 marks the 10th anniversary of IFDC, and Borlaug was a fitting person to help celebrate this event.

During his visit Borlaug also spoke at the nearby University of North Alabama and the National Fertilizer Development Center of the Tennessee Valley Authority.

"Dr. Borlaug is most famous for developing wheat varieties that provided the basis for the Green Revolution—the vastly increased production of wheat in the developing countries of the world," says Dr. Donald L. McCune, IFDC's Managing Director. "For his work in creating the Green Revolution, Borlaug was awarded the Nobel Prize for Peace."

Because of the efforts of Borlaug and his fellow scientists in Mexico, the world's production of grain from 1948 to 1974 soared; for example, wheat production rose by 103%.

Borlaug's work has had a direct and beneficial effect on IFDC's research program, especially in the area of nitrogen research. Of particular importance to fertilizer specialists is his development of short-statured varieties to which heavy dosages of nitrogen fertilizer can be applied, thereby increasing grain yields, without causing the wheat stalks to bend over and break.

Likewise, Borlaug understands the role of fertilizer in his work. "If high-yielding varieties are the catalyst, fertilizer is the fuel of the Green Revolution," he says. Scientists have shown that fertilizers accounted for at least 50% of the increases in crop yields during the Green Revolution.

Without fertilizer Borlaug says that 38 million acres of the world's new land would have to be put into crop production each year just to keep pace with the population explosion. Since there is not that much land left in the world for this purpose, fertilizer is vital to our survival.

During his presentations, Borlaug highlighted various aspects of his career in agriculture, which spans a period of more than 40 years. He emphasized the importance of fitting together all the "pieces of the jigsaw puzzle of food production." In other words, increased food production depends on a "package of inputs," which includes not only high-yielding varieties but also fertilizer, insecticides, pesticides, irrigation, etc.

Dr. Norman E. Borlaug addresses IFDC Century Club banquet.

When Borlaug was asked which of his accomplishments had given him the greatest satisfaction, he answered, "filling some stomachs that were pretty empty. You can't build world peace on empty stomachs and human misery." ■

Colombia—

PHOSPHATE WORKSHOP PRODUCES RESEARCH NETWORK

A recent phosphate workshop, held in Colombia, resulted in the formation of a research network to increase the efficiency of fertilizer products derived from Latin American phosphate rock deposits.

Scientists from six Latin American countries joined IFDC staff members for the workshop on phosphate rock research held at the Centro Internacional de Agricultura Tropical (CIAT) in Cali, Colombia, February 13-15.

"The objective of the workshop was to develop a program of research activities to identify methods of increasing the agronomic and economic effectiveness of fertilizers produced from Latin American phosphate rock deposits for use in cropping systems typical of the Andean highlands," said Dr. L. L. Hammond, IFDC Soil Scientist and Headquarters' Coordinator of the IFDC/CIAT Phosphate Project.

During the workshop, past results from the IFDC project, sponsored by the International Development Research Centre were presented, with respect to both the agronomic and socioeconomic research (see *IFDC Report*, Volume 8, No. 3; Volume 7, No. 4; Volume 6, No. 4). Past experiences with the use of local phosphate rocks were also presented by the workshop participants. Attending the meeting were representatives from CIAT/Bolivia, the Instituto Colombiano Agropecuario/Colombia, the Ministry of Agriculture/Costa Rica, the Instituto Nacional de Investigaciones Agropecuarias/Ecuador, the Centro de Edafologia/Mexico, and the Instituto Nacional de Investigacion y Promocion Agropecuaria/Peru.

"We agreed that the benefits of our future research on the agronomic effectiveness, management, and economics of phosphate rock utilization could be maximized through a network approach," Hammond said. "We decided that collaborative agreements would be developed to promote a coordinated effort and the sharing of information. Phosphate rock samples from throughout the region will be kept in IFDC's inventory for shared use by network members." ■

Niger—

Study Assesses Use of Indigenous Phosphate

If Niger elects to use its indigenous phosphate resource for fertilizer production, a recent IFDC study may provide guidance on how it is used.

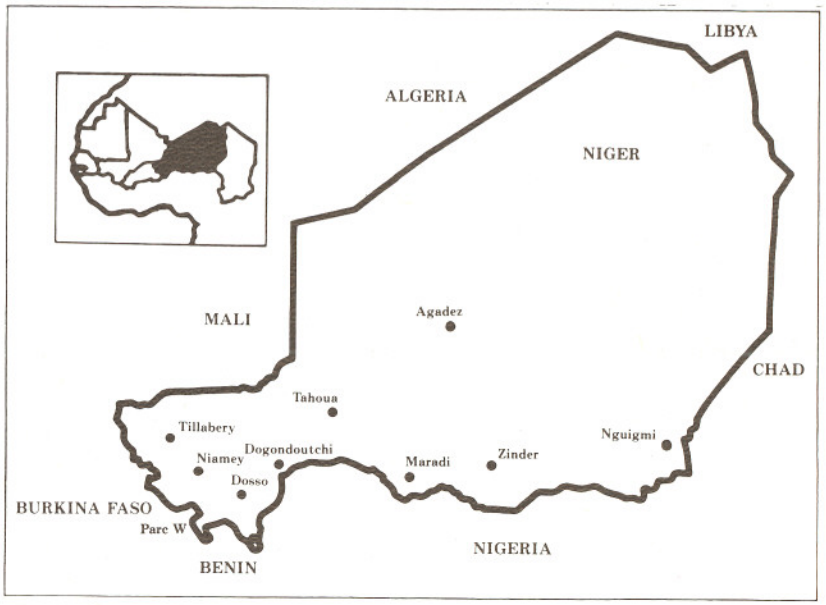
At the request of the U.S. Agency for International Development (USAID), an IFDC team visited Niger during August 5-17, 1984, to collect the necessary data for a preliminary feasibility study aimed at determining the feasibility of Niger's producing its own phosphate fertilizer. The team examined the technical and economic factors of a partially acidulated phosphate rock (PAPR) plant in Niger using Parc W or Tahoua phosphate rock.

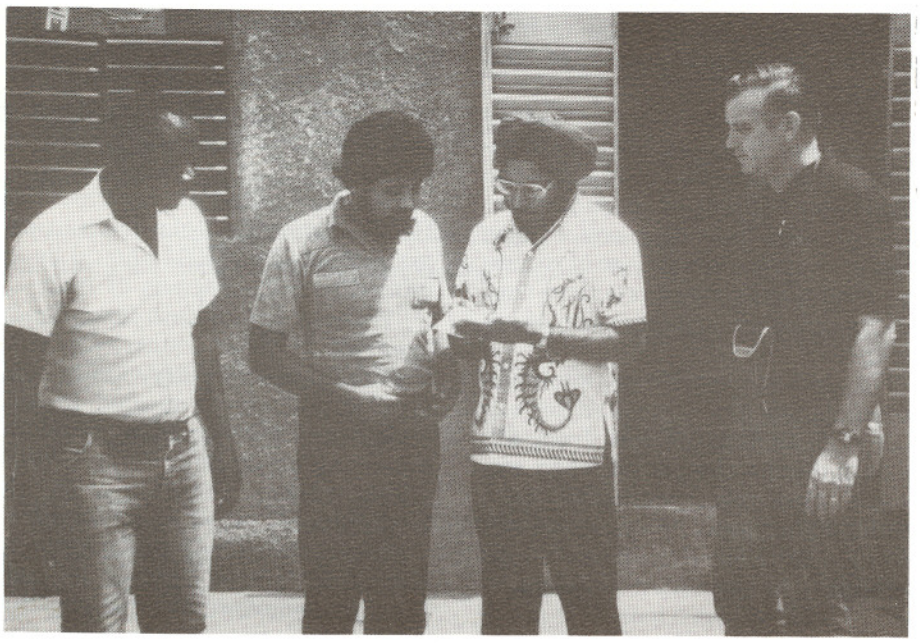
The PAPR product is a form of superphosphate in which acid is used to react with the phosphate rock to partially convert the relatively insoluble material to a form that is more available to the plant. PAPR denotes that only a portion of the acid normally required to make single superphosphate (SSP) or triple superphosphate (TSP) is used.

This project was initiated as a result of findings emanating from the Africa fertilizer research program that IFDC has been conducting during the past 3 years with support from the International Fund for Agricultural Development (IFAD). One phase of the IFAD project evaluated the use of Niger's Parc W phosphate rock in finely ground form and PAPR for millet and sorghum production. As a result of the favorable findings from this project, USAID invited IFDC to determine the feasibility of using Parc W or Tahoua rocks for producing fertilizer to meet Niger's need.

Niger presently imports all of its fertilizer. Most of the country's phosphate fertilizer is imported as SSP, with the majority of it coming from Nigeria. Since this source may prove to be unavailable in the future, Niger wanted to investigate other options.

Summarizing the findings of the IFDC study, the team leader, Dr. A. H. Roy, said, "We found it to be feasible for Niger to produce PAPR using material from its Parc W deposit. Because the technical data base on the Tahoua deposit was limited, the use of Tahoua rock for PAPR production constitutes more potential risks. These risks mainly stem from unproven reserves and variability in the rock composition. Compared with SSP imported from the world market, the PAPR product manufactured from indigenous Parc W phosphate rock looks economically attractive." ■





Team members, (from left) Dr. André Bationo, Soil Scientist; Dr. Amit Roy, Special Project Engineer; Dr. M. S. Mudahar, Economist; and A. F. Little, Industrial Project Analyst, discuss plans for collecting data for the Niger phosphate study.

IFDC In The Field

Philippines—

Collaborative Nitrogen Project Yields Significant Findings

As a result of findings of an ongoing nitrogen research project, which began in 1978 in the Philippines, rice agronomists now have a greater appreciation of the rate at which fertilizer nitrogen is lost from the flooded rice system.

After collecting extensive data on ammonia volatilization, IFDC scientists stationed at the International Rice Research Institute (IRRI) have confirmed that 30%-50% of the applied nitrogen may be lost as ammonia within 7-10 days after application. They also demonstrated in their research that improved management could substantially reduce the rate of losses.

Dr. I.R.P. Fillery, IFDC Soil Scientist, was posted at IRRI from January 1980 to July 1984. In a recent interview, Fillery discussed findings of the project.

"The nitrogen-use efficiency of urea fertilizer—the most commonly used material in southeast Asia—is notoriously low," Fillery said. "The rice crop seldom benefits from more than 20%-40% of the applied nitrogen."

The overall goal of the IFDC/IRRI nitrogen research project is to investigate why the efficiency of urea applied to flooded rice is so low and to determine ways to increase that efficiency.

The specific objectives of this research are (1) to determine how much nitrogen is lost from urea applied to irrigated and simulated rainfed rice, (2) to measure the amount lost through ammonia volatilization under actual field conditions, (3) to evaluate practices that may reduce the amount of nitrogen lost through ammonia volatilization, and (4) to assist in the development of methodologies for conducting field research on nitrogen losses using ^{15}N-enriched fertilizers.

Greenhouse studies had indicated that losses of fertilizer nitrogen were at least partly responsible for the low efficiencies of urea in flooded rice. Field trials were established in which ^{15}N-enriched urea was applied to microplots to verify this finding.

The primary approach that was used to determine the extent of losses was a micrometeorological technique. This technique is based on the direct measurement of wind speed and ammonia concentrations in the air at different heights above the floodwater. It is one of the most reliable methods for quantitatively measuring ammonia losses without disturbing the system.

Looking first at irrigated systems, we find that in typical Philippine farmer management, nitrogen fertilizer is applied 2-3 weeks after transplanting. Losses of fertilizer nitrogen generally range from 30% to 50% of the nitrogen applied. Losses of nitrogen are affected by factors such as windspeed, pH of the floodwater, buffer capacity of the floodwater, development of algae in the floodwater, the rate of nitrogen applied, and the level of urease activity at the soil-floodwater interface, affecting build-up of ammoniacal nitrogen in the floodwater.

"These findings emphasize the importance of ammonia volatilization as a loss mechanism in a wetland rice field," Fillery said. "If urea is applied to puddled soil (without standing floodwater) and incorporated, we may be able to reduce losses of the nitrogen applied."

The reduced rates of ammonia loss would result from the lower concentration of ammoniacal nitrogen in the floodwater because of the incorporation of urea into the soil. These results show the advantage of recommending management practices that ensure thorough incorporation of applied N.

"In most of our studies, ammonia volatilization has accounted for virtually all of the ^{15}N lost from the system during the period when ammonia flux measurements were made," Fillery said. "However, in two studies in Los Banos, ammonia volatilization accounted for only one-half of total nitrogen loss. It is possible that denitrification accounted for the other portion of the loss. These results highlight the need for continuing research on factors affecting nitrification-denitrification in field environments. This is one of the prime purposes of the recent secondment of Dr. R. J. Buresh, IFDC Soil Scientist, to IRRI."

The findings on the role of ammonia volatilization led to research on the effect of urease inhibitors, such as phenyl phosphorodiamidate (PPD), on the fate of urea applied to wetland soils. The micrometeorological study evaluated the effect of PPD on ammonia fluxes following the application of urea and showed that PPD reduced ammonia fluxes by 40%, compared with prilled urea without PPD.

Other improved nitrogen sources evaluated in Fillery's research were deep-placed urea supergranules (USG), sulfur-coated urea (SCU), forestry-grade SCU, and polymer-coated urea.

"Agronomic studies have clearly demonstrated the usefulness of both deep-placement and coated materials for reducing ammonia volatilization and significantly increasing grain yields of wetland rice," Fillery said. "Because of the high labor requirement of hand placement, a machine is needed. I would like to see IFDC do more research in trying to get the cost of coating technology down so that it will be economical for farmers to use it."

The soil scientist believes that IFDC's ammonia volatilization program started at IRRI should be extended to other regions of Asia.

"We need to look into farmer management in other countries besides the Philippines," Fillery said. "This type of research is needed to fully understand the significance of ammonia volatilization in Asia as a whole rather than just in the Philippines."

Moving from irrigated studies to simulated rainfed studies, we learn that intermittent flooding of rice

fields increased nitrogen losses. It was shown that point deep placement of USG does not necessarily prevent nitrogen loss contrary to findings for continually flooded systems. The explanation for this finding may be that in the Mahaas clay soil used at IRRI cracks develop immediately above the placement zone of the fertilizer granules. The nature of such cracking patterns could introduce problems in terms of improved nitrogen management of rainfed environments and for poorly managed irrigated systems.

Fillery believes that IFDC's studies continuing at IRRI should evaluate nitrogen loss in the rainfed system in the more traditional rainfed environment. Preliminary information indicates that the management system recommended for irrigated systems may not apply to rainfed systems.

Major areas of future research in the IFDC/IRRI project will be (1) direct measurement of nitrogen losses due to denitrification in field experiments, using a newly developed analytical technique, and (2) testing of newly developed urease inhibitors that are expected to be more efficient than PPD alone. ■

In a mobile field laboratory at IRRI, Dr. I.R.P. Fillery, Soil Scientist (left), is assisted by Petro Latade, Laboratory Aide, in conducting measurements of denitrification rates in wetland rice soils.

Upcoming Training Programs

Program	Location	Dates
IFDC Headquarters		
Fertilizer Marketing		
Fertilizer Marketing Management Training Program	IFDC	August 12-September 20, 1985
Fertilizer Production and Technology		
Development of Indigenous Phosphate Deposits Training Program	IFDC	May 20-June 4, 1985
Maintenance and Production Management Training Program	IFDC	September 30-October 18, 1985
Fertilizer Sector		
Advances in Fertilizer Technology, Marketing, and Use in the United States	IFDC/Other Locations, U.S.A.	May 3-24, 1985
Regional Programs		
Fertilizer Efficiency Research in the Tropics for Asian Region	Indonesia	November 18-December 6, 1985
Fertilizer Marketing Training Program for Asian Region	Singapore	December 9-20, 1985

NOTE: Dates are subject to change.

Training Program Activities

Cameroon—

IFDC HOLDS FIRST FERTILIZER EFFICIENCY RESEARCH AND TECHNOLOGY TRANSFER WORKSHOP

Thirty-one participants attended IFDC's first fertilizer efficiency research and technology transfer workshop, held in Douala, Cameroon, January 21-25.

"Workshop participants reviewed the state-of-the-art in soil fertility management and the respective roles of organic matter, biological nitrogen fixation, and fertilizers in African food production," said Dr. Dennis H. Parish, Director of IFDC's Outreach Division and Workshop Codirector. "They also formulated action guidelines for initiating or strengthening existing research and extension programs aimed at identifying and transferring more efficient fertilizers and fertilization practices."

The program focused on fertilizer efficiency in the tropics, particularly Africa. It provided a complete overview of advances in fertilizer efficiency research and related technology transfer.

"The workshop attracted senior-level managers/directors of research and extension organizations involved in the development of fertilizer use recommendations and their transfer to farmers," Parish said.

Workshop participants were from Burkina Faso, Cameroon, Chad, Liberia, Malawi, Mali, Niger, Nigeria, Rwanda, Sierra Leone, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. The U.S. Agency for International Development (USAID), the International Fund for Agricultural Development, the Food and Agriculture Organization of the United Nations (FAO), the World Bank, and the Near East Foundation sponsored workshop participants.

Dr. Jacques P. Eckebil, Director, Institute of Agronomic Research, Cameroon, was the codirector of the workshop. Keynote speakers were from IFDC, FAO, the Institut de Recherches Agronomiques Tropicales et des Cultures Vivrière, USAID, the World Bank, and various African universities.

Dr. Gibering Bol Alima, Minister of Higher Education and Scientific Research, Cameroon, delivers the welcoming address during the FERATT Workshop.

The workshop was opened by Dr. Gibering Bol Alima, Minister of Higher Education and Scientific Research, Cameroon, and closed by Mr. Kouassen Benjamin, Secretary General, Ministry of Agriculture, Cameroon.■

Thailand—

FIFTH ASIAN FERTILIZER MARKETING PROGRAM HELD

Bangkok, Thailand, was the site of IFDC's fifth Asian Fertilizer Marketing Program held during November 26-December 8, 1984.

Integrated marketing concepts, marketing planning, and marketing systems development constituted the workshop's focus. Fertilizer marketing embraces all activities involved in meeting the fertilizer needs of the ultimate consumer—the farmer.

Thirty-two participants from nine countries and one officer from the Food and Agriculture Organization (FAO) of the United Nations attended the program. India, Indonesia, Malaysia, Nepal, Pakistan, Republic of Korea, Saudi Arabia, Sri Lanka, and Thailand were the countries represented.

The program, under the direction of Dr. Y. H. Chuang, IFDC Market Development Economist, consisted of classroom activities plus field trips. Presentations were made by a core of IFDC experts supported by selected specialists from the Thai Ministry of Agriculture and Cooperatives (MOAC), Asian fertilizer industries, FAO, and FADINAP.■

A scene from the opening session of the Fertilizer Marketing Training Program for the Asian Region. Pictured (from left) are Dr. Yao H. Chuang of IFDC; Dr. Riksh Syamananda, Deputy Director General, Department of Agriculture, MOAC; Pong Sono, Deputy Permanent Secretary, MOAC; Chanuan Ratanawaraha, Director, Planning and Technical Division, Department of Agriculture, MOAC; and Luc M. Maene, Team Leader, FADINAP/ARSAP, Economic and Social Commission for Asia and the Pacific.

India, Thailand, Malaysia, and Indonesia—

FIRST MULTINATIONAL FERTILIZER PRODUCTION TRAINING PROGRAM CONDUCTED

IFDC's first multinational fertilizer production training program, having an itinerary covering four Asian countries, was conducted during February 18-March 5.

The 3-week program, covering a wide range of production technologies, was designed to train fertilizer personnel in the various areas of fertilizer production technology so that they can improve the efficiency of their plants.

Eighteen participants from Ethiopia, India, Indonesia, Malaysia, Saudi Arabia, Sri Lanka, and the United Arab Emirates observed and gained first-hand knowledge on successful plant operations in India, Thailand, Malaysia, and Indonesia.

In India the group toured Madras Fertilizers, Ltd., and E.I.D. Parry, Ltd.; in Thailand the Thai Central Chemical Company's NPK granulation plant; in Malaysia a nitrophosphate plant of the Chemical Company of Malaysia Berhad and FPM's urea-based NPK granulation plant; and in Indonesia the P.T. Pupuk Sriwidjaja and Petrokimia Gresik complexes.

In India the program was cosponsored by the Fertiliser Association of India, in Malaysia by the Chemical Company of Malaysia and FPM, in Thailand by the Thai Central Chemical Company, and in Indonesia by the Assosiasi Produsen Pupuk Indonesia.

Besides the IFDC core faculty, twenty experts from various fertilizer industries served as a resource group.

The IFDC program manager, M. T. Frederick, emphasized that "Without the assistance of the fertilizer industries and organizations in these countries, it would have been impossible to conduct such a program." ■

Program Manager, M. T. Frederick (far right), gets the attention of an Indonesian participant Haryomo (far left, above), R. V. Rajan of India, and S. P. Singh of the United Arab Emirates during the Fertilizer Production Training Program.

Recent IFDC Publications

A SEEDING PROGRAM FOR FERTILIZER MARKETING

Seeding programs for fertilizer marketing have been used on a large scale in the fertilizer industry since the early 1950s. A seeding program for fertilizer marketing can be defined as a planned marketing activity designed to introduce a new product, technology, procedure, or a combination of these on a limited basis into a market. A seeding program involves a period of trial before the initiation of a full-scale marketing effort. Proven concepts are tested in a new and previously untried area. Fertilizer seeding programs are usually initiated 1 to 3 years prior to the startup of a fertilizer factory or prior to the time when a full-scale marketing effort will be required.

This publication, prepared by L. B. Williams, IFDC Regional Coordinator—Africa, describes the nature and importance of a seeding program for fertilizer marketing. It anticipates problems and suggests solutions. The publication provides guidelines for planning and managing a successful seeding program.

The special publication, IFDC-SP-4, may be obtained by writing to the IFDC Outreach Division.

FERTILIZER SUBSIDIES IN DEVELOPING COUNTRIES

Fertilizer subsidies in recent years have received considerable attention from government policymakers. A large number of countries have recently either eliminated their fertilizer subsidies, have reduced them, or have adopted a new subsidy policy. As fertilizer consumption and the cost of fertilizer have increased, the cost of maintaining subsidies has become very high. Foreign exchange shortages, the overall world economic situation, and large debts faced by many countries coupled with large expenditures on fertilizer subsidies are causing many countries to examine carefully their subsidy policies.

IFDC felt that a publication which examines the experiences of various countries with subsidies would be helpful to policymakers. The study covers a variety of countries—some small, some large—many of whom have established subsidies for different reasons.

In this publication, edited by Gene Harris, IFDC Economist, short papers describing the current status of subsidies as of mid-1984 are presented for 17 developing countries.

To order this publication, please address your order to the IFDC Purchasing Department and request Special Publication SP-3. The cost of the publication is US $12 for both U.S. and overseas addresses.

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