IFDC

Report

Vol. 8—No. 1
March 1983

ISSN 0149-3434

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

Malaysia—

First Full-Scope Project Achieves Goal

Oil palm—one of Malaysia's economic mainstays—requires large amounts of fertilizer.

On the night of November 16, 1982, in Pasir Gudang, Malaysia, IFDC's first full-scope technical assistance project reached fruition when the FPM Sendirian Berhad Granulation Plant produced its first compound NPK fertilizer. The project has completed a full course—from product development to process design to plant construction to product manufacture.

In early 1979, at the request of Behn Meyer & Company (Pte) of Singapore, IFDC performed pilot-plant granulation studies to develop urea-based compound fertilizers to be used primarily on the large rubber and oil palm estates in Malaysia. One-half of the arable land in Malaysia is planted in oil palm or rubber. Natural rubber is the most important contributor to the Malaysian economy, and Malaysia is one of the world's largest producers of palm oil.

In these experiments about 100 tons of granular NP, NPK, and NPK-magnesium products was produced. All of the nitrogen for the products was obtained from urea, the most available source of nitrogen in that part of the world. The phosphate portion of the fertilizer was obtained from unacidulated phosphate rock. (The soil in Malaysia is quite acid; thus, a soluble phosphate is usually not needed for mature oil palm and rubber trees.) The relatively large granules (3-5 mm) were especially designed for aerial application. Additionally, homogeneous, free-flowing granular products were needed to facilitate quick loading and reliable discharge from aircraft.

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According to the IFDC project coordinator, Mr. James J. Schultz, IFDC shipped several tons of the experimental fertilizer to Malaysia in 1979 for evaluation. It was loaded into airplanes and spread onto the large rubber and oil palm estate crops. The mechanics of the experimental aerial application trials using the granular product proved quite successful.

Traditionally, the four major nutrients had been applied by hand separately or as powdered mixtures, but this procedure is very labor intensive and costly. Manual fertilization is also difficult since easy access to much of the crop is hindered because of the hilly terrain. The enormity of the application problem becomes even more obvious when one considers that each mature rubber or oil palm tree is usually treated with about three applications of fertilizer per year. The estate may be as large as 2,000 ha.

As a result of the product development work conducted at IFDC and the favorable results of the aerial application trials, a joint-venture company was established at Pasir Gudang, Johore, west Malaysia, to produce and market the new granular fertilizer. Ownership of the company is divided among the Federal Land Development Authority (FELDA) of Malaysia, the Agriculture Development Bank (KPM) of Malaysia, and Behn Meyer & Company (Pte).

After FPM was formed, its management requested IFDC to provide ongoing technical assistance during the design, engineering procurement, and startup phases of the project.

"The product development conducted at IFDC served as the foundation for the process design used in the plant," Mr. Schultz said. "IFDC served as a technical communicator between FPM and the U.S.-based engineering company that provided the detailed engineering package, which was developed according to the IFDC process specifications."

FPM constructed the factory according to the detailed engineering design using local fabrication and construction resources and IFDC technical assistance. Prior to startup of the plant, two FPM staff members received training in fertilizer production in the United States in a program coordinated by IFDC. Other pre-startup activities conducted by IFDC staff included onsite assistance with recruitment and training of operations personnel and testing of equipment.

Mr. George Bolds, IFDC Pilot-Plant Coordinator, will remain at FPM until late March to assist with continuing the operator training program and improvements designed to optimize production and costs.

"The 4-year project is an unqualified success," Mr. Schultz said. "The FPM staff are very energetic and innovative people. They are producing a fertilizer that is excellent for Malaysia's soil and crops and its year-round growing season. The technical aspects of producing a fertilizer product using the available and most cost effective raw materials were difficult to overcome. Finding solutions to these production problems was the primary reason for IFDC's involvement in the project. FPM management has indicated its desire to continue to work closely with IFDC on the optimization of the Pasir Gudang plant."

Hopefully, FPM profited from an unbiased technical assistance resource by drawing on IFDC's multidisciplinary expertise in fertilizer research and development, production, and training. It now has a urea-based NPK granulation plant capable of producing about 180,000 tons of fertilizer per year. The methods and procedures used by FPM to bring this project to a successful completion are expected to serve as a useful model for others.■

Mr. George Bolds, IFDC Production Consultant, and Mr. Ramakrishnan, an FPM production executive, inspect the first NPK shipment from the new FPM fertilizer granulation plant.

Potassium in Agriculture Symposium Planned for 1985

A Potassium in Agriculture Symposium will be held July 8-10, 1985, at the Peachtree Plaza Hotel, Atlanta, Georgia. The event will be cosponsored by the Potash and Phosphate Institute, American Society of Agronomy, Soil Science Society of America, Crop Science Society of America, National Fertilizer Development Center (TVA), and IFDC. Fifty-two international authorities on potassium production, potassium in soils, and potassium in crop production will present papers and prepare chapters for the Proceedings, which will be available at the Symposium. Major emphasis will be given to the role of potassium nutrition in maximum economic yield crop production.

Registration forms and details of the program will be widely distributed in 1984. For further information at this time contact: Potash and Phosphate Institute, 2801 Buford Highway, N.E., Suite 401, Atlanta, GA 30329 U.S.A.■

Board Member Profile

Dr. Shihata Broadens Board's Expertise in International Development Finance

Dr. Ibrahim F. I. Shihata
The Arab Countries

Dr. Ibrahim F. I. Shihata, a member of the IFDC Board of Directors since 1979, has a broad background in international development finance. Dr. Shihata has been Director-General of the Organization of Petroleum Exporting Countries (OPEC) Fund for International Development in Vienna since its establishment in 1976.

In preparation for his career in international development finance, Dr. Shihata received his LL.M. (master of laws degree) in 1962 and his S.J.D. (Doctorate of Juridical Science) in 1964 from Harvard Law School.

Prior to his assignment with OPEC, Dr. Shihata was General Counsel of the Kuwait Fund for Arab Economic Development for 8 years. During 1970-72 he served as Associate Professor of international law at the University of Cairo in Egypt; he also provided legal counsel to the Egyptian Government.

Dr. Shihata has actively participated in the creation of several international development finance institutions. These include the Arab Fund for Economic and Social Development, the Arab Bank for Economic Development in Africa, the Inter-Arab Investment Guarantee Corporation, the Arab Authority for Agricultural Development and Investment, the OPEC Fund, the International Fund for Agricultural Development (IFAD), and the Common Fund.

Besides his affiliation with the IFDC Board, Dr. Shihata has been a member of the Executive Board of IFAD since its establishment. He is also a member of the Board of Trustees of the Center for Research on the New International Economic Order (Oxford). In addition, he is a member of the Board of Trustees of the Institute for International and Foreign Trade Law, Georgetown University Law Center, Washington, D.C.

Dr. Shihata is the author of 8 books and 100 essays on legal and development issues. In his writings and through the efforts of the OPEC Fund, Dr. Shihata has advocated greater coordination among donor agencies, more direct investment in developing countries by OPEC and other sources, more expanded cofinancing arrangements between donor agencies and commercial financial sources and the simplification of lending procedures.

Dr. Shihata commented on several issues relating to IFDC's work in developing countries. It is apparent that a large part of the deficits of many developing countries is due to their huge food import bills. This is the result of the ever-increasing population growth rates, which are not coupled with similar increases in the productivity of the agricultural sector in the domestic economies.

"The rational use of fertilizer has proven to be one of the most effective means of increasing this productivity," Dr. Shihata said. "IFDC's efforts to develop new formulas and to transfer technology on production, marketing, and use of fertilizers are particularly relevant in this respect."

Dr. Shihata finds it gratifying that IFDC is trying to complement its direct efforts by providing assistance in the establishment of regional fertilizer centers in Africa and Asia.

"To the extent that these centers will assist the countries of the respective regions in improving the productivity of their agriculture, this will in turn have a direct impact on the balance of payments of the concerned countries," he said.

Dr. Shihata recognizes that the human factor is the most relevant factor in the development process. Thus, training and extension services are extremely important.

"IFDC's training programs, especially those carried out in the region concerned, for a reasonable period of time according to well-conceived curricula should be of particular relevance in this respect," he said.

In his position with the OPEC Fund, Dr. Shihata has observed that the OPEC countries demonstrate their commitment to increased food production and the elimination of world hunger.

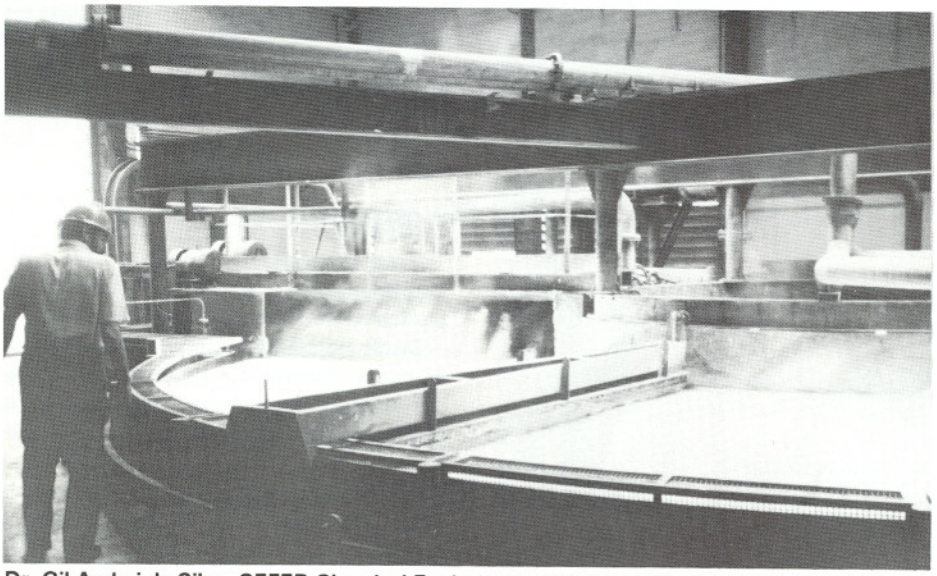
"The OPEC countries have contributed or pledged a total of US $885.5 million to IFAD," he said. "This amount represents a small part of the financial support provided by OPEC countries to the agricultural sector of developing countries. The national, regional, and global funds, established by the OPEC countries, give particular attention to agriculture, especially to food production."■

Brazil—

Technical Assistance to CEFER Continues

As part of continuing technical assistance to the Centro de Estudos de Fertilizantes (CEFER), IFDC staff conducted a study of pollution and process-related problems in selected Brazilian fertilizer industries, November 22-December 17. IFDC was represented by Mr. Owen W. Livingston, Director, and Dr. Amitava H. Roy, Special Project Engineer, Fertilizer Technology Division. Two consultants, Mr. Melvin M. Norton, Chemical Engineer, Tennessee Valley Authority, and Mr. Mabry M. Handley, Chemical Engineer, International Minerals and Chemical Corporation, also participated in the study.

The team visited 80% of Brazil's fertilizer plants. They inspected the plants, talked with key personnel, learned of existing problems, and suggested ways that CEFER



Dr. Gil Anderi da Silva, CEFER Chemical Engineer, watches the operation of a phosphoric acid filter during a visit to a Brazilian fertilizer plant.

could assist the plants in solving their problems.

One such problem is encountered in processing phosphate rock; compounds of fluorine evolve when the rock is attacked with phosphoric or sulfuric acid. Since fluorine and its compounds are very toxic to plants and animals, they cause air pollution.

"A possible solution to this problem is to remove them through scrubbing with water," Dr. Roy said. "In this system, fluorine is recovered as a byproduct such as fluosilicic acid, which is sold in the United States to cities to add to drinking water. Thus, a pollutant is turned into a saleable product."

In the production of sulfuric acid, a catalyst bed is used. The catalyst, vanadium pentoxide, converts sulfur dioxide to sulfur trioxide, which is subsequently reacted with water to form sulfuric acid.

"The disposal of spent vanadium catalyst from sulfuric acid plants is a serious problem because of the high toxicity of vanadium compounds," Dr. Roy said. "One solution is to form a pit lined with sodium bentonite clay and bury the catalyst. The bed of clay is impermeable to leaching."

The major causes of air pollution from a sulfuric acid plant are sulfur dioxide and sulfuric acid mist. With proper operating techniques and abatement equipment, these pollutants can be controlled.

Sometimes to reduce air pollution plants employ a scrubbing system, but the scrubbing creates polluted water, which many fertilizer plants use as process makeup water.

In all states visited the environmental regulatory agencies have enacted or are in the process of enacting laws to define the maximum permissible limits of pollutants. "Many of the plants are retrofitting pollution equipment to their existing plants," Dr. Roy said. "They are also designing their own equipment to try to reduce pollution."

The process-related problems that were identified range from poor quality of raw material sources to less energy-efficient processes.

"Most of the Brazilian plants were designed to accommodate imported rocks, such as Florida or Moroccan rocks, that are highly reactive," Dr. Roy said. "Now because of national laws the plants must use indigenous rocks. Therefore, they are having equipment problems in using these rocks. In addition, the indigenous rocks require longer reaction times; thus, the cost of production is increased."

Some of the plants are using domestic ammonium sulfate, such as the byproduct from caprolactam plants. These plants are experiencing problems in bulk blending because of the wide particle size range, which results in product segregation. The plants must find a way to increase the average particle size so that the product can be well matched in size with the other granular material for bulk blending.

"There are two possible solutions to this problem—granulation or compaction," Dr. Roy said. "Granulation of ammonium sulfate is much more difficult; hence, IFDC suggested compaction as an alternative. IFDC will conduct preliminary tests to determine if the ammonium sulfate can be compacted. Then CEFER will carry out an extended study on the compaction process."

For a wrap-up session with CEFER management, Dr. Donald L. McCune, IFDC Managing Director, also visited CEFER, January 17-21.

With CEFER officials he participated in a review discussion regarding the CEFER/IFDC Technical Assistance Project.■

Yugoslavia—

Consultancy Mission Conducted for World Bank

An IFDC staff member, Dr. Dennis Parish, Director, Outreach Division, participated in a World Bank consultancy mission to analyze Yugoslavia's fertilizer sector, September 15-October 10.

The objectives of the mission were to evaluate fertilizer production efficiency, capacity utilization and technology, research programs related to fertilizer, marketing and distribution networks, and the efficiency with which fertilizer is used.

Yugoslav agricultural production is based on three systems: the social sector or the state farm sector, the farmer cooperatives, and the private sector.

"Social-sector farms are often very large and are modern agro-industrial operations, while the cooperating farms and private sector farms are restricted to no more than 10 hectares," Dr. Parish said. "The latter farms vary from very intensively run units to scattered subsistence-type farming plots."

Fertilizer is an essential input for high crop yields and is already used at high rates by the social sector. The cooperative and private-sector farmers, as would be expected, use on the average much less fertilizer; to some degree this low level of fertilizer use is compensated for by the use of animal manures. The adoption of improved practices, including increased use of fertilizers, is however needed to increase agricultural production.

"Yugoslavia has a serious balance-of-payments problem," Dr. Parish said. "Since all of the phosphate and potash and much of the natural gas used in making nitrogenous fertilizers is being imported, foreign exchange must be made available; otherwise, fertilizer production, and consequently agricultural productivity, will be reduced."

The mission suggested possible solutions to the problems governing fertilizer production. A special research and extension effort to involve the small farmer in improved production practices was also recommended.■

Indonesia—

Market Analysis of Ammonium Nitrate Products Completed

At the request of P.T. Pupuk Kujang, a market analysis of Indonesian ammonium nitrate products was conducted by an IFDC team during October-December 1982. Participating in the study were Dr. V. L. Sheldon, Marketing Specialist, and Mr. L. B. Williams, Regional Coordinator—Africa, Outreach Division.

"The purpose of the study was to determine the feasibility of marketing ammonium nitrate/calcium ammonium nitrate domestically and internationally from Cikampek, Indonesia," Dr. Sheldon said.

P.T. Pupuk Kujang is considering construction of facilities to manufacture ammonium nitrate for the domestic commercial explosives market. If the facility is to be of economic size, the company will need to produce fertilizers based on ammonium nitrate. These could be ammonium nitrate, calcium ammonium nitrate, or ammonium nitrate sulfate. These products could be marketed domestically, in the Association of Southeast Asian Nations (ASEAN) countries, or in Australia.

"The objective of the study was to determine the appropriate products as well as the size and location of potential markets," Mr. Williams said.

The team determined that the primary market for the ammonium nitrate products exists on Java's estates and industrial crops. There is also a large market for the use of ammonium nitrate products on vegetables. Nitrogen from ammonium nitrate products should produce crop yields on upland soils equal to those produced by nitrogen from other sources.

"Because no ammonium nitrate-based products are now being consumed in Indonesia, a special development effort will be required to create demand for a 'new' product," Dr. Sheldon said. "The marketing company would need to establish research contracts with estates to determine nitrogen and calcium response curves for each crop under site-specific and situation-specific conditions."

The team recommended that the ammonium nitrate products be distributed directly from the factory to the estates. This method would reduce the physical cost of distribution and limit the number of customers that must be convinced of the value of the products.

Other recommendations concerning the domestic and export marketing of ammonium nitrate products were made by the IFDC team.■

Workers harvest tea in the Bogor area of Java.

Headquarters—

ADIFAL Breaks With Tradition

Breaking a 7-year tradition of holding its annual meetings in Latin American countries, the Association for the Development of the Fertilizer Industry in Latin America (ADIFAL) convened its VII General Assembly of members at IFDC Headquarters, January 27-28. Six of the twenty-three companies were represented at the meeting; these were Petroquimica de Venezuela, S.A. (PEQUIVEN), Latin American Multinational Enterprise for the Commercialization of Fertilizers (MULTIFERT), DELCHEM, PETROSUR, British Sulphur, and Norsk Hydro. Observers from Abonos Colombianos, S.A. (ABOCOL), Stamicarbon, and IFDC were also present.

Seventeen countries are represented in the ADIFAL membership; these include such countries as the United States of America, Spain, Switzerland, Norway, Kuwait, England, and Germany. Since 1981 special membership has been offered to organizations from regions of the world besides Latin America.

ADIFAL, headquartered in Mexico City, was founded in 1975 to act as a liaison between fertilizer producers and distributors in Latin America. One of ADIFAL's objectives is to serve as technical consultant to its members on matters related to fertilizer production, marketing, and use.

Ing. Jaime Cordero, Executive Secretary of ADIFAL, outlined the creation of this organization. "The impetus to organize ADIFAL originated with the energy crisis of 1974," Ing. Cordero said. "Fertilizer prices were so high that the producers wanted to invest more to take advantage of the larger market. A group of fertilizer manufacturers headed by Fertilizantes Mexicanos, S.A. (FERTIMEX), NITROVEN (now PEQUIVEN), and Venezolana del Nitrogeno, were concerned that they were not prepared to analyze information and react in time to market changes. They needed their own forum to analyze changes in the fertilizer situation."

Besides handling its regular business of assessing the past year's accomplishments and outlining plans for the future, the ADIFAL group gained a better perspective of what IFDC has to offer its members. Dr. Manuel M. Ramos, ADIFAL President

and President of PEQUIVEN, termed the meeting a success. "Our primary reason for meeting at IFDC was to learn more about IFDC's resources," Dr. Ramos said. "We now have a clearer concept of IFDC and what it has to offer the fertilizer world."

Two years ago PEQUIVEN benefited from IFDC's technical expertise as the result of a fertilizer sector study conducted for Venezuela. "We are still using this study; it served a worthwhile purpose for us because it organized and analyzed data on the fertilizer situation," Dr. Ramos said. "It provided us with conclusions reached by a neutral party."

As a result of the January meeting, the future relationship between IFDC and ADIFAL appears even more promising. "We were really surprised by the activities of IFDC in relation to our interests in Latin America," Ing. Cordero said. "We knew of IFDC's importance and growth, but we did not realize until coming here that it could be so helpful in such areas as training, technical assistance, and testing of indigenous resources. We look forward to a much closer relationship with IFDC in the future."

Participants in ADIFAL Meeting, held at IFDC Headquarters, January 27-28: From the left, Dr. Paul J. Stangel, Mr. Parminder Singh, Ing. Raúl Barnett, Ing. Régulo Perdomo V., Mr. Audun Sorbotten, Ing. Rolando A. Armuelles Boutet, Dr. Manuel M. Ramos, Ing. Rubén O. Meninato, Dr. Guillermo Archila, Ing. Jaime Cordero Basave, Mr. Max Baer, Dr. Donald L. McCune, Ing. Pedro Ramírez, Ing. Manuel Sánchez Nelson, Mr. Frans A. Kars, Mr. Hugh M. DelValle, and Mr. Murray Park.

The next important event on the ADIFAL calendar will be its participation as coorganizer (with FERTIMEX) of the 52nd International Fertilizer Association Annual Conference in Mexico City.■

Headquarters—

Potash, Calcium, and Magnesium Review Held

A review of the IPI/PPI/IFDC potash, calcium, and magnesium study was conducted during a meeting held at IFDC Headquarters on November 22-24, 1982.

Reviewers of this study included Dr. Alexander von Peter, Director, IPI; Dr. Georges de Beaucorps, Chief of Agronomic Services, Société Commerciale des Potasses et de l'Azote; Dr. Robert E. Wagner, President, PPI; Dr. Kenneth M. Pretty, Senior Vice President, PPI of Canada; and Dr. Robert D. Munson, Midwest Director, PPI.

Mr. Theodor Kaddar, Visiting Marketing Specialist, presented a slide lecture summarizing the findings of the potash, calcium, and magnesium project.

A detailed proposal for future collaboration was made jointly by IPI and PPI to IFDC. It was agreed that the final report should deal with potash in the tropics and that the findings about magnesium and calcium should be summarized in a supplement.■

Participants in the Potassium, Calcium, and Magnesium Review Meeting, listen to a discussion of the subject study conducted by Mr. Theodor Kaddar, IFDC Visiting Marketing Specialist.

Training Program Activities

Indonesia—

Third Fertilizer Marketing Training Program for the Asian Region Conducted

Cikampek, Indonesia, was the setting for the third IFDC Fertilizer Marketing Training Program for the Asian Region, November 6-19, 1982.

The program, cosponsored by the Indonesian Fertilizer Producers' Association (APPI), was held at the P.T. Pupuk Kujang Training Center. It provided an opportunity for its 28 participants from seven Asian countries to gain skills and knowledge essential for efficiently marketing fertilizers to farmers. Mr. Hartarto, Director General of Chemical Industries, Department of Industry, Government of Indonesia, welcomed the program participants from Burma (2 participants), India (6), Indonesia (12), Malaysia (3), Nepal (1), Pakistan (1), and Sri Lanka (3).

Three IFDC staff members served as full-time faculty members during the program—Dr. Yao H. Chuang, Market Development Economist; Mr. Gene T. Harris, Economist; Dr. Kerry J. Byrnes, Sociologist, who also served as the program manager. Other IFDC staff making presentations were Dr. W. E. Clayton, Transportation Distribution Specialist; Dr. V. L. Sheldon, Marketing Specialist; Dr. Brian Palmer, Soil Fertility Specialist; Dr. Robbert Wetselaar, Soil Scientist; and Dr. P. J. Stangel, Deputy Managing Director.

Visiting lecturers included Mr. Theo M. Widdershoven from FADINAP; Mr. Alain G. Vaes, with the Fertilizer Programme of the Food and Agriculture Organization of the United Nations, Indonesia; Dr. H. R. von Uexkull, Regional Director, East and Southeast Asia Program, the International Potash Institute (IPI)/Phosphate and Potash Institute (PPI); and five Indonesian speakers, including Mr. Agus Rahmad, a P.T. PUSRI Agronomist and a former IFDC Visiting Agronomist.

During the program various aspects of fertilizer marketing were examined through lectures, films, and discussions. A unique treatment of fertilizer marketing problems was given through a case study on "Reaching the Small Farmer."

"In this exercise, participants were given a problem concerning how to develop a fertilizer marketing system to serve farmers," Dr. Byrnes said. "Then the participants developed a marketing plan to solve the problem that had been presented."

Also included in the program was IFDC's computer-assisted Alpha Fertilizer Marketing Simulation. In this simulation the participants strive to achieve particular marketing objectives established by their "fertilizer marketing companies." Two of the five competing companies were successful in achieving their chosen marketing objectives. At the conclusion of the program the participants rated the Alpha simulation the highest among the program aspects.

Field trips added another dimension to the program's agenda. Participants and program leaders visited a village-unit cooperative (KUD), a P.T. PUSRI Inland Supply Depot, the National Rice Research Station at Sukamandi, and the Central Research Institute of Agriculture at Bogor.

When asked how they planned to apply what they had learned during the program, the participants were very positive about the program's results. "The training will help in forecasting fertilizer use requirements and coordinating activities to supply fertilizer to small farmers," one participant said.

In rating the program, another participant had this to add: "The program provided a total understanding of modern management and an effective marketing system that can be used to enhance my company's welfare in the future."

At the program's conclusion, Dr. Entol Soeparman, Director of Research and Development, P.T. PUSRI, and a member of the IFDC Board of Directors, wished the participants farewell. Mr. A. Salmon Mustafa, President of APPI and President Director of P.T. Pupuk Kujang, presented the program certificates to the participants.■

Malaysia—

IFDC Cosponsors Bulk-Blending Workshop

Fourteen participants and 20 observers from the Asian region benefited from a Regional Workshop on Bulk Blending and Mixing of Fertilizers for Asia and the Pacific, held in Penang, Malaysia, November 1-5, 1982. The workshop was cosponsored by the Economic and Social Commission for Asia and the Pacific (ESCAP)/the Fertilizer Advisory Development and Information Network for Asia and the Pacific (FADINAP), the National Farmers Association of Malaysia (NAFAS), and IFDC.

Mr. M. T. Frederick, IFDC Chemical Engineer, and Mr. Larry Taylor, IFDC Consultant and Vice-President, A. J. Sackett and Sons, Inc., handled many of the technical presentations. Other papers were presented by representatives of the Standards and Industrial Research Institute of Malaysia (SIRIM), NAFAS, and FADINAP.

"The presentations covered such topics as fertilizer consumption and production in Asia, the production of bulk-blended and mixed fertilizers, available equipment, and actual installation in developing countries," Mr. Frederick said.

The participants from the Asian and Pacific region became aware of the latest techniques for the physical blending of fertilizers. They learned of different types of blending equipment and various methods of handling blended products to ensure the delivery of high-quality material to the user.

The workshop participants gained new insights into fertilizer production and discovered ways of applying them to their particular situations. "Several participants from the Pacific region showed an interest in combining fertilizer imports and building a centrally located blending unit to supply several islands or groups of islands where fertilizer use is not high enough individually to support a blending unit," Mr. Frederick said.

Mr. Khalil Hassan, Secretary General, Ministry of Agriculture, Malaysia, makes the opening address to the participants of the Regional Workshop on Bulk Blending and Mixing of Fertilizers for Asia and the Pacific, held in Penang, Malaysia.

A case study on bulk blending in the Caribbean region constituted another interesting aspect of the workshop.

Finally, visiting a local blending plant at Butterworth, Malaysia, provided the participants a chance to see theory put into action.■

Future IFDC Training Programs

Fertilizer Efficiency Research in the Tropics Training Program; May 2-20; Serdang, Malaysia.

Soil Testing and Fertility Management; June 15-August 5; Auburn University, Auburn, Alabama. (One week of this course will be conducted at IFDC. For more information contact Professor J. T. Cope, Auburn University, Auburn, Alabama 36849 U.S.A.)

Regional NPK Fertilizer Production Training Program; July 10-16; Bangkok, Thailand.

Fertilizer Marketing Management Training Program; August 15-September 23; Headquarters.

Maintenance and Production Management Training for Fertilizer Producers; October 3-21; Headquarters.

Fertilizer Process Economics Training Program; October 24-November 4; Headquarters.

Regional Fertilizer Marketing Training Program for Asia; December 4-16; Manila, Philippines.

For information on these training programs, contact the IFDC Training Coordinator.

IFDC Report

Published Quarterly by the
International Fertilizer Development Center

IFDC is a public, nonprofit organization dedicated to increasing food production through the development of new and improved fertilizers and fertilizer know-how for developing countries.

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