

# Report

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

China—

## IFDC Team Observes Discipline and Determination of Chinese



A rolling river of bicycles, trucks, and buses, sixteen abreast, flows down a street during Beijing's morning rush hour. The torrent reaches the corner, but almost miraculously no traffic jam occurs.

"It takes very disciplined people to make that happen," IFDC's Managing Director Dr. Donald L. McCune said. "I don't think there are any other people in the world who are more disciplined than the Chinese."

The discipline and determination of the Chinese people was evident in several ways to the IFDC delegation visiting their country, October 17-November 6, at the invitation of the China National Chemical Construction Corporation (CNCCC). The purpose of the trip was to learn of the structure, composition, and problems of the chemical fertilizer industry. The IFDC delegation besides Dr. McCune included Dr. John A. Hannah, Chairman, IFDC Board of Directors; Mr. Owen W. Livingston, Director of the Fertilizer

Technology Division; Dr. Guerry H. McClellan, Research Coordinator, Technology Division; and Dr. Norman Chien, Soil Scientist, Technology Division.

China, the world's largest developing country, is emphasizing its traditional determination to be self-reliant and beginning to direct a greater share of investment toward agriculture. As part of this investment, it is interested in upgrading its fertilizer plants.

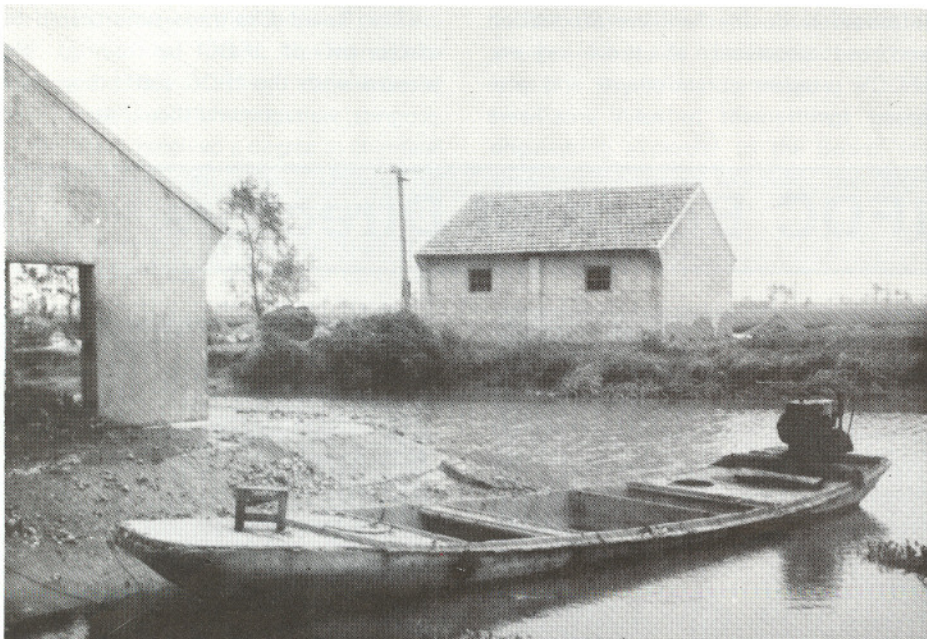
"They are very hungry for information," Dr. McCune said. "They are very interested in obtaining assistance in granulation of ammonium bicarbonate and single superphosphate.

CNCCC and IFDC will develop a cooperative agreement for assistance in beneficiation, acidulation, granulation, and the use of anhydrous ammonia for direct application.

"The trend in Chinese fertilizer technology is to build larger, more modern plants and to improve the 1,100 smaller ammonia-from-coal plants," Mr. Livingston said.

The delegation visited the Shanghai Research Institute. "The Institute is expanding and becoming more agronomic than in the past," Mr. Livingston said. "They are sponsoring field trials on the communes."

*Continued on p. 6*



Chinese farmers come to the fertilizer factories in concrete boats such as this one to buy aqueous ammonia. The boat is equipped with a tank for holding the liquid fertilizer.

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During the October Board meeting, Mr. M. F. Carter (left), IFDC Greenhouse Supervisor, discusses a sulfur-nitrogen interaction experiment being conducted on rice. Pictured (beginning second from left) are: Dr. P. J. Stangel, IFDC Deputy Managing Director; Dr. R. E. Wagner; Mr. Richard Freeman; Mr. Adolfo Sisto; Dr. D. L. McCune, IFDC Managing Director; Dr. Bukar Shaib; Dr. J. A. Hannah, Chairman; Mr. J. R. McWilliam; Dr. G. W. Cooke; and Dr. W. D. Hopper.

Headquarters—

## Board of Directors Reviews Programs

"Every year it's clear that our people (the IFDC staff) are growing and becoming increasingly conscious of the challenges they face . . . they're not fixed in their ways . . . they're malleable in their thinking and cooperate with anyone anywhere in the world who can make a substantial contribution to the achievement of the mission of increasing food production through more effective fertilizers." This was the assessment of IFDC's progress as viewed by IFDC Board

Chairman Dr. John A. Hannah in an interview at the conclusion of the Board's regular meeting in October.

The Board reviewed the research programs presently underway in the three primary regions of Africa, Asia, and Latin America during October 6-8 at Headquarters. IFDC staff members presented information on the fertilizer production and use situations of these regions. IFDC's program commitments and proposed involvement in each area were

discussed from the technological, agro-economic, and outreach points of view. Specific results were presented on research being conducted to assist developing countries in utilizing their indigenous resources.

In his down-to-earth manner, Dr. Hannah reminded the IFDC staff, "In everything we do, we should ask ourselves, 'Has this in it a potential contribution to what we're supposed to be after?'"

The Board Chairman summarized his assessment of IFDC by saying, "I'm pleased with the IFDC staff; they show progress; we commend them." ■

## Profiles of IFDC Board of Directors

### DR. DAVID HOPPER BRINGS BROAD EXPERIENCE TO BOARD

Dr. W. David Hopper's representation on the IFDC Board of Directors adds a different perspective to this group. Dr. Hopper, presently serving as Vice President for the South Asia Region of the World Bank, Washington, D.C., has had a wide range of experience in international development.

A native of Ottawa, Canada, Dr. Hopper was educated at McGill University,

Montreal, Canada, and Cornell University, Ithaca, New York, where he received a Ph.D. in the economics of agriculture and cultural anthropology in 1957. Dr. Hopper began his career as a Social Science Research Fellow, studying the economic organization of a village on the Gangetic Plain of North Central India. His next assignment took him back to his native Ontario for an associate professorship of agricultural economics at Ontario Agricultural College. Next, for a span of about 12 years, Dr. Hopper served in India with the Ford and Rockefeller Foundations



Dr. David Hopper

and Indian Agricultural Research Institute as an agricultural economist. In 1970 he was selected as President of the International Development Research Centre (IDRC), Ottawa, Canada.

During the Board Meeting Dr. Hopper recognized the IFDC/Bangladesh Agricultural Development Corporation (BADC) project. "The assistance received in Bangladesh by the World Bank from IFDC has been outstanding," he said.

Dr. Hopper has definite ideas concerning the future direction of IFDC as he revealed in an interview during the Board meeting.

"In the course of the next 10 years IFDC will have a wider responsibility," he said. "When the Center was formed, energy costs of producing fertilizer were not as high as they are today. The

potentialities of improving fertilizer application in the tropics were only dimly seen. IFDC's work has added much more understanding to what we face in improving the efficiency and cost effectiveness of fertilizer in the tropics. The recent IFDC energy study is an important source of knowledge for a great many people concerned with the problems of providing plant nutrients in developing countries."

Dr. Hopper praised the work of the Center. "Any institution that is approaching its tenth birthday can become complacent; management must continually deflate pompous complacency," he said. "IFDC has done this—it has been constantly searching for this concept of usefulness." ■

#### MR. ADOLFO SISTO ADDS ENGINEERING DIMENSION TO BOARD

Mr. Adolfo Sisto, General Manager of the Industrial Operations of Fertilizantes Mexicanos, S.A. (FERTIMEX), lends a breadth of understanding of the fertilizer industry to the IFDC Board of Directors.

As a citizen of Mexico, which is rapidly becoming a major fertilizer producer, Mr. Sisto's representation on the Board promises a broadened perspective. In the near future, Mexico will be playing a dominant role in the export of fertilizers, especially nitrogen.

Mr. Sisto received a degree in chemical engineering from the Universidad Nacional Autonoma de Mexico in Mexico City. In addition, he received training in England and France and at the Tennessee Valley Authority in the United States.

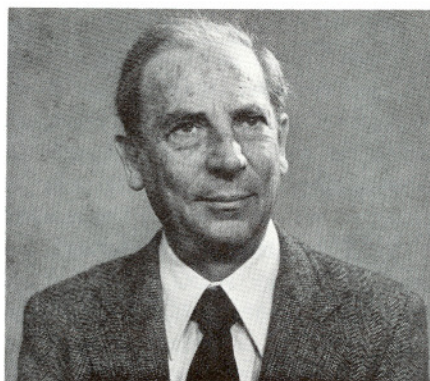
Having been with FERTIMEX (formerly Guanos y Fertilizantes de Mexico, S.A. [GUANOMEX]) for more than 20 years, Mr. Sisto has had a wide range of experience in such positions as Production Superintendent, Technical Director, Operations Manager, and Development Manager. He is one of the driving forces in the development of FERTIMEX.

In his present position as General Manager of the Industrial Operations of FERTIMEX, Mr. Sisto is in charge of production, maintenance, modifications,

and additions of operating plants, logistics, safety, and training of plant personnel.

Because of the nature of his position, Mr. Sisto has contact with the actual problems in the fertilizer industry. "In a developing country like mine, we have problems that are quite different from those of the developed countries," he said. "Everything is moving too fast; it is difficult to man the facilities with people who have sound training."

Mr. Sisto adds a practical aspect to the Board because of his contact with the human, day-to-day problems in the fertilizer industry. He brings much engineering expertise to the Board, and that will be tapped whenever the Board meets. ■



Mr. Adolfo Sisto

#### DR. BUKAR SHAIB OF NIGERIA LEND AFRICAN INSIGHT TO BOARD

Dr. Bukar Shaib, Special Advisor to the President of Nigeria, adds a unique insight to the IFDC Board of Directors.

A product of the northern region of Nigeria, Dr. Bukar Shaib received his education in veterinary medicine at the University of Ibadan, Ibadan, Nigeria; Liverpool University in England; and the University of Edinburgh in Scotland.

Dr. Bukar Shaib has had a distinguished career and has held many responsible positions, including Permanent Secretary, Ministry of Agriculture and Water Resources; Chairman of the Board of the International Institute of Tropical Agriculture (IITA); Nigerian Ambassador to Rome; and Independent Chairman of the FAO Council.

In an interview during the October Board meeting, Dr. Bukar Shaib expressed his opinion on the emphasis IFDC should place on its programs. "We in the developing countries lack fertilizer technology," he said. "IFDC has access to worldwide knowledge that is difficult for developing countries to obtain. This fertilizer technology can be applied to similar situations in different countries."

Since Dr. Bukar Shaib is from Nigeria, the most populous country in Africa with a potential deficit of approximately 19 million tons of cereal equivalent by 1985, he can lend to the Board a better insight to the problems facing many developing countries.

In conjunction with the Board meeting, Dr. Bukar Shaib presented a seminar on "Nigerian Agriculture." ■



Dr. Bukar Shaib

# Phosphate Research Enters New Phase

IFDC's phosphate field research program was initiated with a grant from the International Development Research Centre (IDRC) in 1977. This grant provided the funds to develop a phosphate project, based at the International Center for Tropical Agriculture (CIAT), involving the acid infertile soils of tropical Latin America. During this period IFDC was developing its capabilities in producing modified products, such as partially acidulated phosphate rock as part of its core-funded research. As a result of the research findings generated over the past 5 years at CIAT, IFDC's phosphate program is now spreading from South America to other continents such as Africa. Examples of spin-offs from this research are other projects in Upper Volta, Mali, and Colombia. The phosphate project has taken on a new dimension in not only geography but also types of crops. Originally the project dealt with beans, rice, and forage grasses, but the potential of phosphate rock is now being evaluated in the Colombian highlands with such crops as potatoes, upland rice, groundnuts, and cassava. An added dimension of the phosphate project is the socioeconomic aspect; an IFDC sociologist at CIAT is now investigating farmer acceptance of finely ground phosphate rock from local deposits.

*Colombia—*

## IFDC COMPLETES EVALUATION OF PESCA AND SARDINATA DEPOSITS—PHOSPHATE PROJECT AT CIAT EXPANDS TO THE HIGHLANDS



In September IFDC completed chemical process studies to determine the technical feasibility of using Colombia's Pesca and Sardinata phosphate ores for the production of wet-process phosphoric acid and several phosphate-based solid fertilizers.

This work was one part of an overall project undertaken by a consortium selected by the Government of Colombia in late 1979. The project was managed by Singmaster & Breyer, Inc.; Hansa Luftbild performed the geological and field investigations; the Colorado School of Mines Research Institute conducted the

ore beneficiation studies; and IFDC carried out chemical processing studies.

The coordinator of the IFDC chemical process studies, Mr. J. J. Schultz, outlined IFDC's involvement in the project.

"Initially, in 1979 IFDC conducted a market survey to determine existing and anticipated trends in phosphate fertilizer use in Colombia and to identify desirable phosphate products that would fit the farmers' future demands," he said. "The second phase of IFDC's work consisted of chemical processing of Colombian phosphates to produce intermediates and finished products such as wet-process phosphoric acid and phosphoric acid-based fertilizer materials."

By mid-December, the final report in English and Spanish was delivered to Singmaster & Breyer.

With the conclusion of the Singmaster & Breyer project and with the information and direction developed during the course of the study, the IFDC phosphate project at the International Center for Tropical Agriculture (CIAT) can be expanded with confidence. The research at CIAT of Dr. Larry Hammond and Dr. L. A. Leon, IFDC Soil Scientists, and Dr. Jacqueline Ashby, IFDC Rural Sociologist, will be expanded to include research on potatoes and other highland crops normally grown in the region

around the Pesca and Sardinata mines. Until this time, their research was concentrated primarily on lowland crops.

"Soaring costs of sulfur and phosphate rock have made it extremely expensive for developing countries to produce conventional fertilizers using imported raw materials," Dr. Hammond said. "In South America, there are at least 20 deposits of phosphate rock; each of these deposits exhibits distinct potential for use as fertilizer in tropical acid soil."

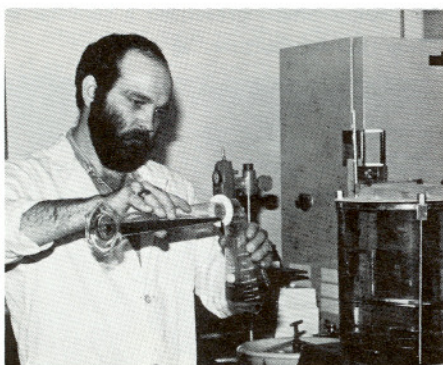
This research is designed to offer the farmers in close proximity to local phosphate rock deposits, such as the Pesca and Sardinata ores, an opportunity to decrease the cost of fertilizer without sacrificing crop yield. ■

*Upper Volta—*

## PHASE II WORK BEGINS ON PHOSPHATE PROJECT



Recognizing Upper Volta's need of assistance in improving its food production, the German Agency for Technical Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit [GTZ]) for several years has been helping the Upper Voltans utilize their phosphate rock from a deposit near Kodjari. The initial scope of the project was to mine the phosphate rock and apply it to the soil in ground form; however, due to relatively poor agronomic response, GTZ decided that chemical treatment would improve the quality of this rock as fertilizer.



Mr. David W. Rutland, Chemical Laboratory Analyst, prepares to measure the viscosity of phosphoric acid produced from Colombia's Pesca phosphate deposit.

In 1979 GTZ contracted with IFDC to conduct physical and chemical treatments of the rock to improve its value as fertilizer. As a part of this project, Mr. Martin Bikienga, counterpart of the GTZ project from the Upper Voltan government, came to IFDC and participated in the preparation and evaluation of modified products.

Dr. A. H. Roy, IFDC Chemical Engineer, outlined the progress of the Upper Volta phosphate project.

"For nine months we carried out an in-depth study whereby we conducted physical and chemical characterizations of the rock's impurities and phosphate content," Dr. Roy said. "We produced several different types of improved or modified products from the rock. These products were subsequently tested in the IFDC Greenhouse and in West Germany by Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)."

IFDC selected two products: partially acidulated phosphate rock using sulfuric acid and phosphate rock mixed with sulfur, as potential candidates for field trials in Upper Volta. Similar conclusions were also drawn by BGR.

"Before Phase I of the project ended in June 1981, we assessed the results of the greenhouse trials and selected these two products for field trials," Dr. Roy said. "We then produced partially acidulated rock in our laboratories, but we did not produce the rock with sulfur mixture because the Upper Voltans could mix this themselves."

Phase II of the project began with IFDC supplying the fertilizer materials to Upper Volta for field trials. For the next 2 years the Upper Voltans will be evaluating these materials and comparing their fertilizer value with that of Kodjari phosphate rock.

The complete details are not yet available from the first cropping, but the initial visual observation shows an improved effectiveness of partially acidulated rock, according to Mr. Bikienga.

"After the agronomic testing the Upper Voltan government and GTZ will develop a detailed action plan to establish the process parameters and assess the production economics of the partially acidulated process," Dr. Roy said.

"In 1982 the Upper Voltans/GTZ will study the effectiveness of these two materials that are being field tested, and from these trials it is hoped that preliminary estimates on application rates can be recommended to farmers by the extension workers," he said. "Of course, the economic merits of these two products have to be determined prior to recommendations to the farmers." ■

*Mali—*

### PHOSPHATE PROJECT PROMISES BRIGHTER FUTURE FOR MALI'S FARMERS



IFDC recently began a phosphate project, in agreement with the Government of Mali; its objective is to assist Mali in selecting the most efficient and economic source of phosphate to supply its farmers. This agreement was signed on July 18 and extends through 1983, and the project is being financed with funds from IDRC.

Dr. R. B. Diamond, Coordinator, Fertilizer Evaluation, is the IFDC coordinator of the project. Mr. Moussa Traoré, the former Director of the Division of Agronomic Research under the Malian Ministry of Agriculture, was directly responsible for getting the project underway.

Mali is fortunate in having its own phosphate rock deposits. About 20 million metric tons of phosphate ore is located in the Tilemsi Valley north of Goa, where pilot mining and grinding facilities were established by the German Agency for Technical Cooperation (GTZ) in 1976.

Dr. Diamond outlined the proposed work. "Ten experiment stations (see map) were selected on which a large number of field trials will be conducted," he said. First, the soils were sampled and classified. Mali's different soil classifications and levels of rainfall, ranging from 450 mm per year to 1,250 mm per year, are represented on the selected sites."

Most of the acid, phosphorus-deficient soils of Mali appear to be suitable for the use of water-insoluble and partially soluble phosphates as sources of phosphate for crop production.

The principal crop rotations of the project represent the sequences in Mali, ranging from those of the dry area to those of the more moist regions. The sequences include millet and groundnuts, sorghum and groundnuts, sorghum and cotton, and maize and cotton.

"During 1981 one of the cereal crops was planted on each of the fields," he said. "Only nitrogen and potassium were applied to these crops."

In September Dr. Diamond visited the fields and selected specific experimental designs for phosphate fertilizer trials to be located in the fields during 1982.

"Replications and individual plots were staked out for these designs," Dr. Diamond said. "Crops that were uniformly fertilized during 1981 will be harvested on an individual plot basis, and soil samples will be taken at the end of the 1981 season."

"In 1982 we will begin testing phosphate sources," he said. "Before the 1984 crop season, we will select one or two of the most promising fertilizers and begin on-farm testing." ■



Continued from p. 1

Determination toward progress shows through in practices at the Institute. Representatives of the Institute visited IFDC in 1978, and they have utilized the information they gained then. "They are working on processes for granulating urea that they learned about while they were here in 1978," Mr. Livingston said.

Three of the IFDC staff members presented seminars at the Institute. Mr. Livingston presented a seminar on granulation technology; Dr. McClellan, beneficiation/acidulation; and Dr. Chien, agronomics of fertilizer use.

A visit to Nanjing Chemical Industries Corporation revealed very clean single superphosphate and ammonium bicarbonate plants. It was understood that the technology used in these plants was developed at the Institute.

Another stop was at a county-level ammonia-from-coal plant at Jaiding that

now produces about 25,000 mt of ammonia per year as aqueous ammonia or ammonium bicarbonate.

"During the peak seasons the farmers come to the factories in concrete boats equipped with tanks for holding the aqueous ammonia," Mr. Livingston said. "According to factory personnel, the aqueous ammonia is applied directly to the paddies using hand sprayers or dippers."

At the Fujian Academy of Agricultural Science at Fuzhou, the IFDC staff saw field trials of urea for paddy rice that are being carried out in cooperation with IFDC. The treatments of the experiment included sulfur-coated urea, best split of urea (two-thirds base application and one-third top dressing), supergranule deep placement, and check. At high levels of N application of deep-placed supergranules, lodging occurred because of high N efficiency and late harvesting. The Academy has observed that, in general,

deep placement of supergranules increases the rice grain yield by 10%-15% as compared with the best split method. An additional 4%-6% increase may also be obtained by adding nitrification inhibitors to the urea supergranules.


In a cooperative program with the International Rice Research Institute (IRRI), the Academy is experimenting with machines for preparation of supergranules of urea, ammonium bicarbonate, and NPK. They are also developing a machine for deep placement and one for deep-point placement.

A workshop on improved nitrogen efficiency is scheduled for April in China. Selected participants will attend.

Through a cooperative agreement with CNCCC, IFDC intends to assist the Chinese in becoming more self-reliant by building "bridges of understanding" with them through technical information exchange and programs. ■

Turkey—

## Engineers Evaluate Akgübre Plant

 Unlike many nations, Turkey does not have the problem of raising enough food for its people, but its problem is raising the average income of farmers. This problem is closely related to that of increasing the standard of living throughout the country through industrialization and also increasing its food exports. One important part of this effort is the Turkey Fertilizer Industry Rehabilitation Project, being sponsored by the World Bank to upgrade the fertilizer plants.

As part of this project the World Bank requested IFDC to provide an evaluation of the feasibility and economic viability of installing a pipe-cross reactor system to help alleviate problems being experienced by Akdeniz Gübre Sanayii A.S. (Akgübre) in their diammonium phosphate (DAP) plant at Mersin, Turkey. The study was conducted September 2-9 by Mr. M. T. Frederick, IFDC Chemical Engineer, and Mr. M. M. Norton, Chemical Engineer, Tennessee Valley Authority (TVA), Muscle Shoals, Alabama.

The facilities at the state-owned Akgübre complex include a 148,500-tpy DAP unit, a 71,000-tpy phosphoric acid unit, and a 214,500-tpy sulfuric acid unit. Other facilities for nitrogen fertilizer production are a nitric acid unit and a calcium ammonium nitrate unit.

The study was completed in September 1981 and will be used by Akgübre and the World Bank in formulating the specific rehabilitation strategy for this complex.

"It appears that yearly DAP production would be increased significantly by the purchase and storage of phosphoric acid for use when there are problems with the phosphoric acid and sulfuric acid plants," Mr. Frederick said.

The engineering team concluded that converting to a pipe-cross reactor system would not greatly enhance the capability of increasing the on-stream operation of the plant until Akgübre improves or corrects the problems with the other units in the complex. ■



Mr. M. T. Frederick examines product from the DAP unit of the Akgübre plant.

# Training Program Activities

## Two Training Programs Help Participants Become Better Marketing Managers

IFDC recently conducted two fertilizer marketing management programs—one regional program in Thailand and one at Headquarters—serving a total of 65 participants. The purpose of the courses is to train fertilizer marketing managers so that they can develop effective marketing systems. To be effective, these systems must provide the right kind of fertilizer to farmers at the least cost, at the right time and place, and in the right quantity. Besides attending lectures on marketing systems development, the participants applied their skills in a computer marketing exercise (called Alpha). In the Alpha exercise which was developed by IFDC, the participants form companies, make decisions on a quarterly basis, and get feedback on their company progress toward objectives. The game provides a simulation of actual experiences encountered in applying marketing concepts.

### Headquarters—



A fertilizer marketing manager from Mali, Mr. Cisse Alpha Cheick, received training at IFDC that will eventually benefit the people of his country. Mr. Cheick was one of 27 participants from 13 countries who attended a 6-week course in fertilizer marketing management at Headquarters, August 17-September 25.

As head of the Marketing Division of the Societe Nationale de Recherche Minière (SONAREM), a government-owned mineral exploitation company, Mr. Cheick is responsible for developing the use of its phosphate rock deposits that now are being mined in the Tilemsi Valley of northern Mali. For Malian farmers, directly applied rock fertilizer could be lower in cost than some other fertilizers since it is produced in their own country. But Mr. Cheick's job is not a simple one.

"In my country people are not familiar with phosphate rock fertilizer, and they don't want to change to a new fertilizer," Mr. Cheick said. "People resist change, and I need to learn the best way to introduce a new fertilizer product into the market."

Training programs, such as the fifth annual Fertilizer Marketing Management Training Program, represent one way that IFDC transfers fertilizer know-how to developing countries. This training program was under the direction of Dr. Robert T. Smith, training and manpower development coordinator at IFDC.

Several field trips added a practical touch to the program. The participants spent several days at the Farmland Training Institute (FTI), Kansas City, Missouri. At the University of Missouri at Columbia, they saw the relationship between a university, state and federal extension services, cooperatives, and experiment stations. At the International Minerals and Chemical Corporation (IMC), Lakeland, Florida, the participants visited a phosphate mine and beneficiation plant.

Mr. Cheick and the 26 other participants in the marketing management training program have now returned to their respective countries. They should be better prepared to make a more effective contribution to the progress of their fertilizer companies and ultimately to their countries' people. ■

### Thailand—



Thirty-eight Asian fertilizer marketing managers from eight countries participated in a unique learning experience that provided techniques to improve marketing efficiency, October 18-30, at the UN Building, Bangkok, Thailand. This Fertilizer Marketing Training Program, cosponsored by the Economic and Social Commission for Asia and the Pacific (ESCAP) and IFDC, focused on consumer-oriented marketing. Mr. John M. Hill, IFDC Marketing Development Specialist, was the program manager, and Mr. Phiphat Tongpatanakul of ESCAP was the program coordinator.

The core faculty was drawn from the IFDC staff and supplemented by senior specialists from ESCAP, the Food and Agriculture Organization of the United Nations (FAO), the Fertilizer Advisory Development and Information Network for Asia and the Pacific (FADINAP), and the Indian Agricultural Research Institute (IARI).

IFDC's Alpha Fertilizer Marketing Simulation, under the leadership of Dr. Kerry J. Byrnes, IFDC Sociologist, was used to teach the interrelation of the 5 Ps of marketing (planning, product, place, promotion, and price) and to increase participant skills in analyzing and improving fertilizer marketing strategies.

Besides engaging in classroom activities, the participants went on a field trip. In Bangkok they visited the Thai Central Chemical Company, two private-sector fertilizer/pesticide dealers, and a cooperative fertilizer union. They also visited a vineyard and a guava orchard; they observed sugarcane production and rice cultivation in the countryside around Bangkok.

The Thailand fertilizer industry, particularly Metro and Thai Central Chemical Company, gave outstanding support to the program. ■

The Headquarters and regional marketing programs are scheduled to be repeated in 1982 at IFDC and Indonesia, respectively. Marketing managers who are interested in participating should contact IFDC's Training Coordinator because enrollment is limited.

# Recent IFDC Publications

## Energy and Fertilizer: Policy Implications and Options for Developing Countries (Executive Brief)

The executive brief provides highlights of the study which deals with economic and technical analysis of the linkages among energy, fertilizer, and agricultural sectors. The main objectives of the study are to estimate energy requirements for fertilizer manufacturing, packaging, transportation, and application; to evaluate the policy implications of energy supply and prices on fertilizer production, distribution, and prices; and to evaluate policy options to reduce the adverse impact of energy supply and prices on fertilizer and agricultural sectors.

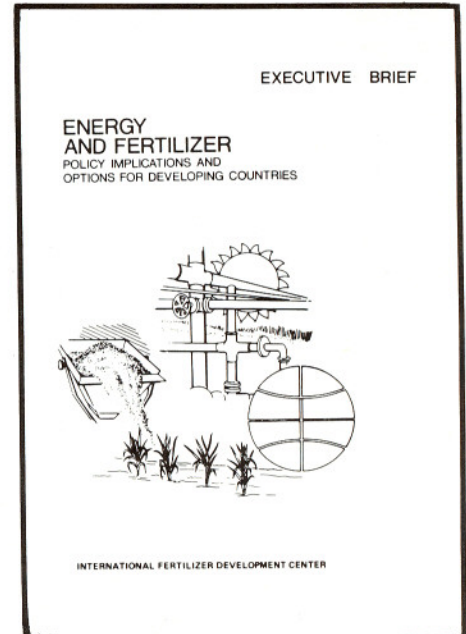
Even though the focus of the study is developing countries, policymakers, planners, and researchers dealing with different aspects of fertilizer sector planning around the world will find it

useful. The major emphasis of the study is on nitrogen fertilizers, which are not only highly energy intensive but are most popular among developing countries. However, the fertilizer sector accounts for only a small percentage of total energy used in a country.

The most promising means for saving fertilizer energy is more efficient use of fertilizer at the farm level. In fertilizer manufacturing, the greatest energy saving is likely to come from operating existing plants more efficiently. Many energy-efficient innovations are available which together promise potentially large savings in fertilizer manufacture. The potential for energy saving in fertilizer distribution is likely to be small in the short run and should be approached with caution.

This publication was prepared by Dr. M. S. Mudahar, Economist, and Mr. Travis P. Hignett, Chemical Engineer. (For costs and ordering details, see *Publications of the International Fertilizer*

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## IFDC Report

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Marie Thompson  
Editor

P.O. Box 2040  
Muscle Shoals, AL 35660, U.S.A.  
Phone No. (205) 381-6600  
TWX-810-731-3970 IFDEC MCHL

JOHN A. HANNAH, Chairman  
DONALD L. McCUNE, Managing Director  
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