IFDC

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Report

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

Headquarters—

Outside Expansion Provides New Theme For Board Meeting

IFDC Board of Directors: (front row, from left) Mr. Richard Freeman, U.S.A.; Dr. Robert E. Wagner, U.S.A.; Dr. Ibrahim F.I. Shihata, the Arab countries; Dr. Donald L. McCune, IFDC Managing Director; and Dr. Entol Soeparman, Indonesia. (Back row, from left) Dr. Bukar Shaib, Nigeria; Dr. John A. Hannah, Chairman; Mr. Adolfo Sisto, Mexico; Mr. Miguel Zosa, Philippines; Dr. David Hopper, Canada; Dr. Ola Heide, Norway; Mr. Eliseo Restrepo, Colombia; and Dr. Anton Amberger, Federal Republic of Germany.

Proposals to implement IFDC's long-time goal of establishing regional centers in developing countries met with enthusiastic response by the Board of Directors at their annual meeting at Headquarters in October.

Concurrent with the Center's eighth birthday, Board members traveled from all parts of the globe for this meeting; all 12 members were present.

A balanced representation is maintained on the Board between developed and developing countries; the Board members are experts in various disciplines ranging from science to engineering to administration.

At the conclusion of the Board meeting, IFDC's Managing Director, Dr. Donald L. McCune, commented on several issues considered by the Board.

"We recognize that we must have regional centers in the developing countries to work where the problems exist," Dr. McCune said. "Pending financing, over and above what we need to operate the Headquarters' facility, the Board approved the establishment of one center in Zimbabwe and one in Indonesia."

The Board also concurred with the recommendations made by the Program Review Committee (see page 4, this issue).

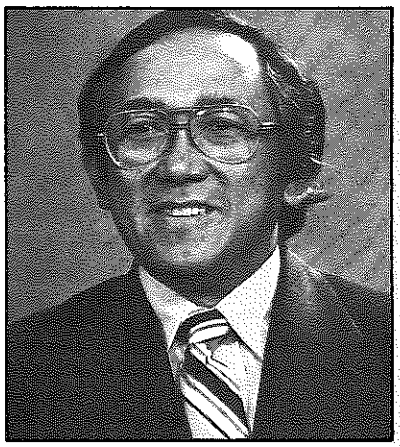
Three IFDC staff members—Mr. M. T. Frederick, Chemical Engineer; Dr. M. S. Lupin, Research Chemist; and Mr. J. R. Polo, Deputy Engineering Coordinator—presented to the Board progress reports on technology that is available to be transferred to developing countries.

Other business handled by the Board included approval of the US $9.5 million budget proposal for 1983.■

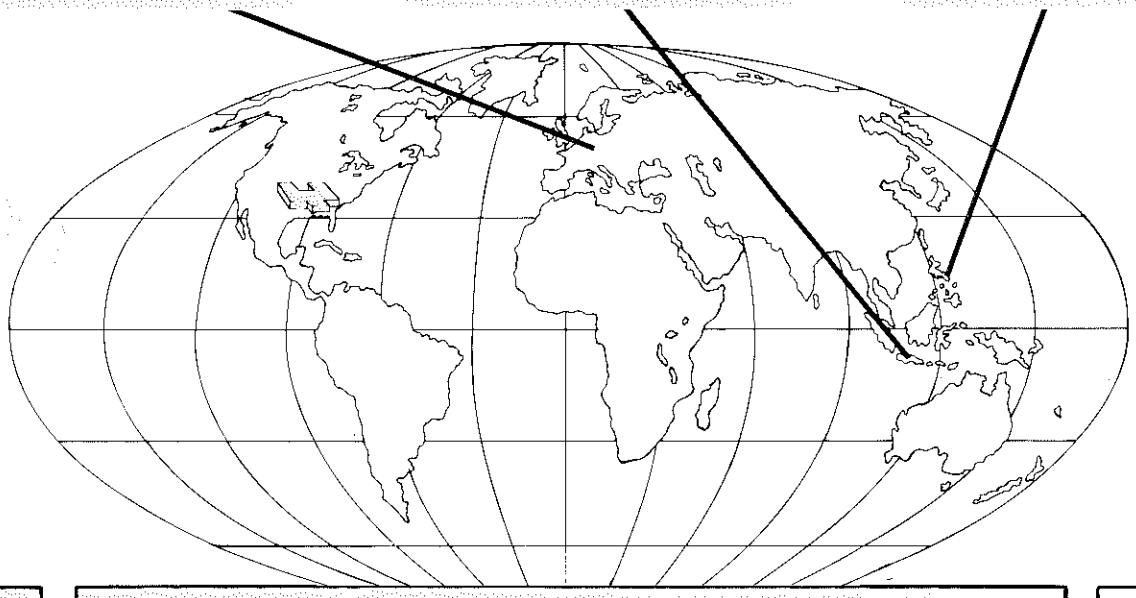
In this issue . . .

Dr. Anton Amberger
Federal Republic of Germany

Dr. Entol Soeparman
Indonesia



Mr. Miguel Zosa
Philippines



IFDC's Board of Directors Is Truly International

Dr. Anton Amberger Brings German Insight To Board

Dr. Anton Amberger's representation lends a European flavor to the Board of Directors. As Head of the Institute of Plant Nutrition of Technical University, Munich, and Head of the Institute of Agricultural Research of Bavaria, Dr. Amberger further adds to the Board's expertise on the agricultural problems of developing countries.

A prominent scientist of the Federal Republic of Germany, he specialized in agricultural chemistry at the Universities of Berlin and Munich.

For the past 15 years Dr. Amberger has served on the Scientific Board of the German Ministry of Agriculture and Nutrition concerning fertilizer testing and technology. In addition, he is a member of the Scientific Advisory Board of the Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) in Syria.

Dr. Amberger's work has focused on the application of different phosphate fertilizers. As a result, he is familiar with IFDC's phosphate project in Upper Volta, which is sponsored by the German Agency for Technical Cooperation (GTZ).

"IFDC has done a good job in Upper Volta," Dr. Amberger said. "The results of the field trials are good."

"In my opinion, using the Upper Volta rock to produce partially acidulated phosphate rock of different grades is the right direction to take," added Dr. Amberger.

Dr. Amberger believes that IFDC has a special role to play. "There is a lot of parallel research being conducted in the world. IFDC could coordinate this work more closely to avoid duplication and to share ideas and experiences," he said.■

Dr. Entol Soeparman Contributes Indonesian Experience To Board

Dr. Entol Soeparman, Director of Research and Development for P. T. Pupuk Sriwidjaja (PUSRI), brings to the IFDC Board of Directors a wide experience in fertilizer project development in Indonesia.

Preparing for a career in chemical engineering, Dr. Soeparman received his education at the University of New South Wales, Australia.

After receiving his doctorate, Dr. Soeparman began his career in chemical engineering with James Hardie and Co., Ltd., Sydney, Australia. In 1968 his association with P.T. PUSRI began. Dr. Soeparman is also a member of the Board of Supervisors of P.T. Pupuk Iskandar Muda in Aceh, a new Indonesian fertilizer plant.

Among his professional memberships are: the American Institute of Chemical Engineers; the Institute of Chemical Engineers, London; and the Indonesian Engineers Association.

Since the proposed Asian Fertilizer Center will be located in his country, Dr. Soeparman knows firsthand what its significance will be.

"We realize that to feed Indonesia's expanding population (presently 150 million) we must greatly expand our food production capacity," Dr. Soeparman said. "We need to find the most suitable and efficient fertilizers. These goals are synonymous with those of IFDC in establishing the Asian Fertilizer Center."

"Struggling with mounting population pressures, Indonesia must engage in intensive agriculture to produce sufficient food," added Dr. Soeparman.

Throughout his years of association with P.T. PUSRI, the oldest and largest fertilizer company in Indonesia, Dr. Soeparman has gained an appreciation for training programs. Because of its stature, PUSRI is expected to train the necessary personnel for each new Indonesian fertilizer facility.

"You can buy fertilizer equipment, but the plant itself doesn't mean anything unless people are trained to operate it," Dr. Soeparman said. "To develop people takes time; that's why training is so important."

Another area that Dr. Soeparman feels IFDC should emphasize is technical assistance. P.T. PUSRI was itself the recipient of IFDC technical assistance; beginning in 1977 IFDC's engineers assisted PUSRI in the conversion of the finishing section of one of its fertilizer plants from the production of prilled urea to that of granular urea.

"If any fertilizer plant is operating at low efficiency and IFDC can help this company to increase its efficiency, it not only helps that company but also the country in general," Dr. Soeparman said.■

Mr. Miguel Zosa Broadens Board's Developing-Country Understanding

Mr. Miguel Zosa, President and General Manager of the Philippine Phosphate Corporation (PHILPHOS), adds to the Board a unique insight into the problems and needs of developing countries.

Mr. Zosa's background is filled with honors. Among these honors was his selection as one of the 10 outstanding young men of the Philippines in the field of public administration and agribusiness in 1978.

In preparing for his career, Mr. Zosa began his higher education at de la Salle College in Manila, where he received a B.S. degree in mechanical engineering. Journeying to the United States, he enrolled in Rensselaer Polytechnic Institute, Troy, New York, and received an M.S. degree in management with a concentration in investments, analysis, management accounting, and finance.

In addition to managing PHILPHOS, Mr. Zosa is the administrator of the Philippine Fertilizer and Pesticide Authority. He is also a member of the Board of Supervisory Directors of the Indonesian urea project, P.T. ASEAN Aceh Fertilizer, and a member of the Board of Directors of the ASEAN Bintulu Fertilizer Berhad, Ltd., of Malaysia.

In an interview during the October Board meeting, Mr. Zosa expressed his ideas on which IFDC program should be emphasized.

"There is a package of technology that should be taken to the field; this package includes briquetting and deep placement of fertilizer using applicators," Mr. Zosa said. "We must present the small farmer with something to reduce his costs and to optimize on his limited use of fertilizer."

He recognizes that part of the problem lies in the present farmer practice of broadcasting a limited amount of fertilizer.

"Farmers do not apply the recommended rates; they only apply one-half or 60% of the recommended rates. Then the farmer suffers losses as high as 40%-50% of the nitrogen fertilizer he applies. But through improved nitrogen efficiency by briquetting or deep placement, we can possibly bring the nutrient level up to the level the farmer would receive if he were applying fertilizer at the recommended rate."

Mr. Zosa has a definite appreciation for fertilizer's role in solving the food production puzzle.

"It is recognized in ASEAN and Asian countries that fertilizer is one of their most critical outputs and probably the most critical input of agriculture," Mr. Zosa said. "Much work must be done to increase its efficiency."

Toward this end, he believes that more resources should be devoted to field testing on actual farmer fields.

"Farmers are now hungry for new technology and IFDC has it," Mr. Zosa said. "Fertilizer is their biggest cost. It behooves us all to give them a package that will increase fertilizer efficiency and that is within their limited purchasing capacity."

As a result of his experience as General Manager of the General Electric Appliance Co., in the Philippines, Mr. Zosa has a unique insight into a most practical technique of technology transfer.

"As a member of a 'think small' project group at General Electric, I learned that to transfer technology, you must make it appropriate to the needs of the intended receiver," Mr. Zosa said. "For example, a briquetter that will produce several thousand tons per day is not appropriate for developing-country needs. A developing country farmer needs a small piece of equipment that he, along with four or five other farmers, can purchase to produce the briquettes they need for their farms."

"We need to take good concepts like briquetting and 'think small' by matching the technology to the needs of the small farmer," Mr. Zosa said. "We must scale the equipment down to make it responsive to the small farmer and his resources."

"There is enough expertise at IFDC to make this idea a reality," Mr. Zosa said. "From what I have seen at IFDC, we will have a briquetting machine at the farmer level within the next 3 months—before the next planting season."

Mr. Zosa also has a message for donor countries—"I don't think IFDC is sufficiently funded. Considering the potential impact of IFDC's work, donor countries should examine carefully all the money going to other organizations."■

Headquarters—

Program Review Committee Adds New Priorities

The Program Review Committee, established by the Board of Directors in 1981, set new priorities for IFDC's research at its second meeting held recently.

The Committee includes Dr. Ola Heide (Chairman), IFDC Board member and Rector of the Agricultural University of Norway; Dr. G. W. Cooke, former IFDC Board member and now Honorary Scientist, Rothamsted Experimental Station, England; Dr. S. K. Mukherjee, former IFDC Board member, New Delhi, India; and Dr. Richard Reidinger, Economist, the World Bank, Washington, D.C. All members except Dr. Reidinger were present for the second meeting held at IFDC Headquarters on September 30-October 1, prior to the Board meeting.

"Five topics were selected as being of the highest and equal priority," Dr. Heide said. "In addition to the three selected in March—the efficiency of urea fertilizers, the development of partially acidulated phosphate rock, and sulfur research—two others were added. These two are multinutrient fertilizers and foliar application of nutrients."

"We think that with the increasing use of fertilizer in the developing world and the increased number of crops, there will be a demand for the supply of all nutrients," Dr. Heide said. "The most effective way to supply these nutrients will be to use mixed, blended, or complex fertilizers."

The Committee considers that IFDC should make a major effort to develop and evaluate multinutrient fertilizers suitable for use in developing countries. The main areas of emphasis will be evaluating the sources of nutrients, the production technology involved, and the nutrient ratios needed in the products to be offered to farmers. The ingredients should be as cheap as possible and yet effective on crops.

"IFDC should develop a limited number of multinutrient fertilizers with specific ratios of N, P, and K, which will serve the needs of farmers in developing countries," Dr. Heide said. "This procedure would avoid the confusion that results when farmers are faced with a large number of mixed fertilizers and cannot determine the relative merits of each or easily choose the best for a particular crop."

The Committee also recommended that the foliar application of nutrients should initially become part of the upland nitrogen research program in the arid and semiarid regions of the Middle East.

"The absorption of nutrients through the leaves of crops may aid the more efficient use of fertilizers by diminishing losses through leaching and by increasing both yield and quality of crops because nutrients will be supplied at critical times when uptake from soil is decreased by drought or similar causes," Dr. Heide said.

Two other important topics were also given priority but at a lower level. These are the biological fixation of nitrogen and the interactions of fertilizers with available water.

The Committee also considered training and technical assistance activities and the development and extension of IFDC's work through collaboration with other organizations.

The Committee believes that training should be intensified or initiated in (1) fertilizer use efficiency, emphasizing deep placement of nitrogen; (2) new research techniques, including those related to ^{15}N; (3) fertilizer policy research; (4) new production technologies; (5) fertilizer distribution and handling; and (6) fertilizer statistics, evaluation, and forecasting.

The Committee members were concerned that some recent courses were cancelled because potential students could not obtain funds to attend. They recommended that educational foundations be approached to provide scholarships to support students of high potential who, otherwise, would not be able to attend IFDC courses.

Regarding technical assistance, the Committee encouraged IFDC to seek contacts with fertilizer industries in developing countries to secure the transfer of the technology and expertise that IFDC has and which is appropriate to local conditions. The Committee recommended, however, that the volume of technical assistance not exceed one-third of the total budget.

"The Committee considers that because IFDC is now recognized in developing countries as the prime 'center of excellence' in fertilizer technology, it should guide national institutions in establishing standards and methods of analysis for the quality control of fertilizers," Dr. Heide said. "IFDC should develop a publication that deals with the methods of evaluation and analysis of fertilizers and make recommendations as to which techniques are most suitable for particular products in developing countries."

The Committee believes that the ultimate success of IFDC will derive from its ability to influence national research institutions and national fertilizer companies in adopting new fertilizer technologies.

At its next meeting in April 1983, the Committee will consider the economics program; work on potassium, calcium, and magnesium; micronutrient research; and the interaction between fertilizer and irrigation. ■

Headquarters—

Briquetting/Compaction of Urea Saves Energy

A team of IFDC researchers is now studying an energy-saving alternative to conventional granulation of fertilizers using chemical reaction and/or liquids. Since July 1981 the team, headed by Dr. M. S. Lupin, IFDC Research Chemist, has been evaluating the production of modified urea and urea-based products by briquetting or compacting.

"Briquetting and compaction are both roll-press operations," Dr. Lupin said. "The dust or powder is fed between two rotating rolls that compact or press the material. Briquetting rolls have indentations on them to create material, such as supergranules. Each briquette, or granule, is produced as an individual particle."

"In compaction, a whole flake or sheet of material is produced and then crushed and the desired size is screened out," Dr. Lupin said. "Smaller size particles can be made with the compaction rolls than with the briquetting rolls. The machine is basically the same for both processes."

With the urea pan granulation or prilling processes, dust is normally recovered by redissolving followed by evaporation; thus, a tremendous amount of energy is used. Compaction or briquetting of this dust may save energy.

"Another advantage of compaction over the melt granulation process is that it avoids the formation of undesirable coproducts such as biuret, created by thermal degradation of urea," Dr. Lupin said.

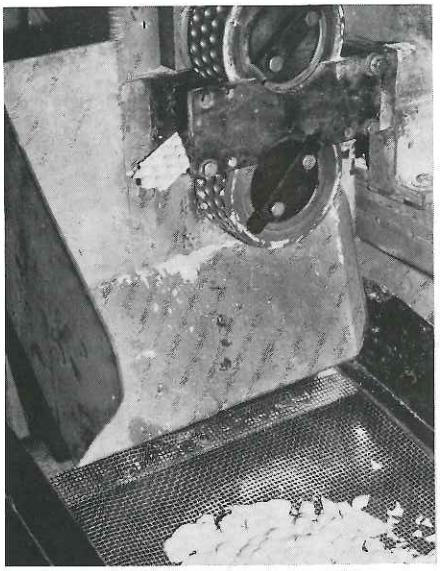
The research team started testing urea but other compounds have proven acceptable for granulating by compaction. These materials include potassium sulfate,

ammonium sulfate, ammonium phosphates, urea, potassium chloride, phosphate rock, and phosphogypsum.

"Compaction offers a convenient method for adding small amounts of micronutrients or other additives such as urease inhibitors," Dr. Lupin said. "We have prepared experimental quantities of urea with urease inhibitors, such as phenyl phosphorodiamidate (PPD), for field testing."

Under contract with the Centro de Estudos de Fertilizantes (CEFER) of Brazil, the IFDC researchers are presently evaluating granulation of NPK mixtures by the compaction process for comparison with conventional bulk blending and granulation processes.

"These tests have been conducted thus far using a laboratory-scale briquetter/compactor using a batch process," Dr. Lupin said. "We are in the process of building a continuous pilot-plant unit to examine the continuous operation."



Sheets of briquettes are being ejected from the laboratory-model briquetter/compactor in the IFDC Pilot Plant.

Although small-scale units can be developed for village-level use, it is sometimes more economical to locate a compactor/briquetter at a central location. The raw materials would be shipped in bulk to the central location, converted to granular form, and bagged.

Briquetting of urea promises to be a more economical alternative to granulation for several reasons. Among these are energy savings because the heating and cooling processes of melt granulation are not necessary and elimination of impurities such as biuret.

Because it will eliminate the drying and cooling stages, compaction of NPK granular fertilizers may be an alternative to conventional granulation in cases where all the raw materials are dry.■

IFDC in The Field

Colombia—

Phosphate Research Shifts to Farm Level

Research conducted by IFDC staff posted at the International Center for Tropical Agriculture (CIAT) has shown that finely ground phosphate rock is an effective source of phosphorus for crops such as rice, cassava, cowpea, pasture grasses, and legumes grown on the Oxisols and Ultisols of the region. For crops such as beans and potatoes, partially acidulated phosphate rock appears to be an appropriate alternative on the volcanic Andosols.

Dr. L. L. Hammond, IFDC Soil Scientist, who recently returned to Headquarters, served as coordinator of the IFDC/CIAT phosphate project for 2 years. This project, funded by the International Development Research Center (IDRC), evolved to evaluate natural sources of phosphate for the phosphorus-deficient acid soils of Latin America. (See Vol. 6, No. 4 of *IFDC Report*.)

Collaborating with Dr. Hammond on this research were Dr. L. A. Leon, IFDC Soil Chemist, and Dr. W. E. Fenster, Soil Scientist on leave from the University of Minnesota.

"Our greenhouse and experiment station research focused on the reactions of the products in the soil and on their management for use with typical crops. Many of the basic questions concerning the agronomic potential of South American phosphate rocks have been answered," Dr. Hammond said.

This research, in conjunction with basic research conducted at Headquarters by Dr. S. H. Chien, IFDC Soil Scientist, received honorable mention in the World Phosphate Institute (IMPHOS) 1982 Agronomy Award competition.

In discussing the future of the project, Dr. Hammond said, "This research entered the interdisciplinary phase at the farm level as of July 1. Because of the potential for increased use of indigenous phosphate, the research shifted emphasis from studies on fertilizer reactions to agro-socioeconomic evaluations."

Because finely ground phosphate rock may sometimes be less effective than conventional phosphate fertilizers but is commonly much less expensive, the economics of production, distribution, and farm-level use must be considered to determine its suitability for small-farm use. In addition, it is important to determine if the handling properties, method of application, and required rates are compatible with the preferences and capabilities of small farmers.

A team of scientists, under the leadership of Dr. L. A. Leon, are now studying these questions in a collaborative project with CIAT and the Colombian Agricultural Institute (ICA). Dr. J. A. Ashby, IFDC Rural Sociologist, is also outposted at CIAT to conduct studies on farmer acceptance of alternative products. Dr. C. A. Baanante, IFDC Economist, will evaluate the cost:benefit relationships determined in the farm-level experiments.■

Dr. L. L. Hammond (left), IFDC Soil Scientist, and a training course participant examine maize yield as part of the IFDC/CIAT Phosphate Project.

Headquarters—

Fertilizer Marketing Management Training Program Provides Managerial Skills

The success or value of a training program should be measured by the results, that is, by the practical application that the participant can make of his training.

Mr. Gregory Shillingford, Manager of the National Agro-Chemicals, Limited, of Trinidad and Tobago, has a definite appreciation for the value of training. Mr. Shillingford, a participant in the recent IFDC Fertilizer Marketing Management Training Program, also gained valuable training in November 1981 during the IFDC Regional Fertilizer Granulation and Bulk-Blending Seminar held in the Bahamas.

"Since I participated in the granulation and bulk-blending seminar, my company has made proposals to the Government of my country for financing a new facility," Mr. Shillingford said. "We plan to construct a granulation plant alongside a blending plant of much greater capacity. The information that I gained from that seminar greatly assisted me in developing these proposals."

Mr. Shillingford pointed out other benefits he reaped as a direct result of attending the seminar.

Participants in the Fertilizer Marketing Management Seminar visit a Florida tomato farm.

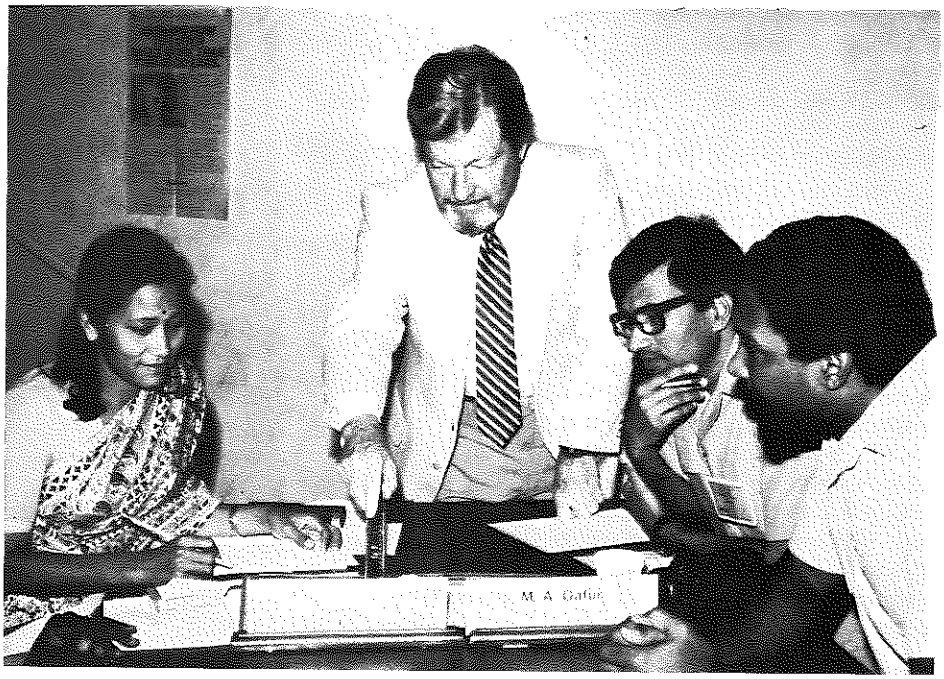
"It allowed me an in-depth look at blending. Since then we have modified the preparation of some grades of fertilizer that we produce from various materials available."

From all indications the Fertilizer Marketing Management Training Program held at Headquarters, August 16-September 24, will prove just as valuable to Mr. Shillingford and the 17 other fertilizer marketing managers who participated. The participants came from 11 countries, including Bangladesh, Burma, Colombia, India, Indonesia, Israel, Nepal, Pakistan, Trinidad and Tobago, Venezuela, and Zambia.

The purpose of the program was to help the participants improve their marketing and management skills. This aspect of the training program is especially important to Mr. Shillingford.

"In Trinidad there is a shortage of people possessing managerial skills," he said. "The emphasis in education has been on science and technology. As a result, a lot of the agronomists and engineers are employed as managers but lack managerial skills."

The recent marketing management program should help Mr. Shillingford in his position as the manager of Trinidad and Tobago's state-owned fertilizer company.



Dr. R. T. Smith, Program Manager, (standing) discusses a marketing problem with training participants, (seated from left) Mrs. Badan Pradhan, Nepal; Mr. Muhammad Abdul Gafur, Bangladesh; and Mr. Gregory Shillingford, Trinidad and Tobago.

"This seminar gave me the opportunity to put into one package all the managerial skills necessary to manage a company," Mr. Shillingford said.

Another aspect of the program that the participants found enlightening was the field trips to research farms, cooperatives, and fertilizer dealers in the U.S. Corn Belt and phosphate fertilizer producers in Florida.

"The visits to U.S. cooperatives gave me the opportunity to see firsthand how fertilizer moves from the production phase to the marketing phase," Mr. Shillingford said.

Another participant in the program, Mrs. Badan Pradhan, Marketing Officer with the Agriculture Inputs Corporation in Kathmandu, Nepal, also gained much information from visiting the cooperatives.

"We learned that the cooperative is a very good means of approaching the farmer," Mrs. Pradhan said. "There's a vast difference between cooperatives in Nepal and those in the United States. In Nepal cooperatives are state owned. They operate very slowly because they are not profit-making institutions. They don't have any incentive to give better service to the farmers."

Mrs. Pradhan has what appears to be an almost impossible task as fertilizer marketing officer in Nepal. She is responsible for managing the import and distribution of fertilizer in Nepal. Since 60% of Nepal's surface area is mountainous, transportation is an enormous problem.

Because 90% of Nepal's people depend on agriculture for a living, Mrs. Pradhan's job is a very important one. "During the seminar I gained ideas that I think will help me in solving some of the problems I encounter after fertilizer is imported into Nepal," Mrs. Pradhan said.■

Headquarters—

Fertilizer Producers Receive Practical Training

A Bangladesh engineer received training at IFDC recently that should prove beneficial to him, particularly since he is now supervising the construction of a new urea fertilizer plant at Chittagong.

Mr. Faizul Haider Choudhury, Chief Engineer for Chittagong Urea Fertilizer, Ltd., was one of 17 participants in a Maintenance and Production Management Training Program for Fertilizer Producers, conducted October 11-29. The participants traveled to IFDC Headquarters from six countries, including Bangladesh, Egypt, India, Indonesia, Taiwan, and Tanzania.

The program, under the direction of Mr. M. T. Frederick, IFDC Chemical Engineer, consisted of 2 weeks of course work and a 1-week field trip. Some of the subjects covered during the program were fertilizer supply and demand; production economics; fertilizer production technology; organization and staffing; planning and scheduling; process modifications to improve efficiency; and employee motivation, training, and safety. Also included in the course work was a 3-day intensive shortcourse on maintenance management. Leaders for these discussions were recruited from major U.S.-and international-based fertilizer production organizations, including speakers from Saudi Arabia and Mexico.

Mr. Choudhury hopes to soon apply what he learned at IFDC in the new urea fertilizer plant at Chittagong, Bangladesh.

"I now have the necessary information to measure the achievement of our maintenance program," Mr. Choudhury said. "The highlight of the program for me was having the opportunity to talk with other people in the fertilizer industry about problems that are similar to mine. This program also gave me the opportunity to learn what IFDC is doing for the world."

In assessing the success of the program Mr. Choudhury had this to say: "The involvement of the participants and the course leaders was tremendous. The course was very effectively presented."

Another participant, Mr. Fikry Abo Aref, valued the program but for different reasons. Mr. Aref, the Production Planning Manager of the Egyptian Iron and Steel Company of Cairo, found the lectures on employee motivation particularly interesting.

"It is very important to learn how to motivate people to excel in their work," Mr. Aref said.

Another area that Mr. Aref was interested in was preventive maintenance.

"We learned that a good preventive maintenance program can increase production markedly by reducing downtime due to emergency maintenance," Mr. Aref said. "In my plant, the equipment is now in working order only 50% of the time."

During the third week of the program, the participants visited fertilizer production and maintenance support facilities in Louisiana. This firsthand view of the industry offered the participants ample time to discuss maintenance and production programs and problems with plant management and technical staff.■

Mr. Faizul Haider Choudhury from Bangladesh and Mr. M. T. Frederick, Program Manager, discuss a possible solution to a production management problem.

Recent IFDC Publications

IFDC Annual Report, 1981

The IFDC Annual Report, 1981 is now available. This report provides a graphic account of IFDC's research, training, national program, and technical assistance activities during 1981. In ordering this publication, please request IFDC Circular S-5. The postage and handling fee for this publication is US $4.00 for U.S. addresses and US $7.50 for international addresses.

Fertilizer Use Statistics in Crop Production

This publication represents IFDC's first attempt to assemble statistics on fertilizer use for different crops on a country basis. This type of information is usually not readily available. Data, as presented in this publication, should provide a basis on which to develop and plan production and marketing strategies.

Through a literature review and a questionnaire developed by IFDC and mailed to approximately 300 parties throughout the world, data were gathered for 78 countries. Analysis of data showed that cereal crops, especially rice, maize, and wheat, are the main users of N, P_2O_5, and K_2O. Other important users of fertilizers include sugarcane and cotton.

The authors of this publication are Dr. Adolfo Martinez, IFDC Fertilizer-Use Economist, and Dr. Ray B. Diamond, IFDC Coordinator—Fertilizer Evaluations, now outposted to International Rice Research Institute in the Philippines.

To purchase this publication, please request Technical Bulletin T-24. The price for U.S. addresses is US $4 and for international addresses, US $7.50.

Future Training Programs

Data Collection and Analysis for National Fertilizer Sector Studies; March 20-April 3, 1983; IFDC Headquarters and Washington, D.C.

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

Regional Fertilizer Granulation and Bulk-Blending Seminar; June 20-25, Bangkok, Thailand.

Fertilizer Marketing Management Training Program; August 15-September 22; Headquarters.

Maintenance and Production Management Training for Fertilizer Producers; October 17-November 4; Headquarters.

Fertilizer Process Economics Training Program; November 7-18; Headquarters.

IFDC Report

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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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