IFDC

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

Headquarters—

Bishop Steps Down, Vlek Ascends Administrative Ladder

Dr. William D. Bishop (left), Director of the Agro-Economic Division, prepares to turn that Division's administration over to Dr. Paul L.G. Vlek.

Dr. Paul L.G. Vlek, a Soil Scientist with IFDC for the past 7½ years, has been selected to assume the position of Director, Agro-Economic Division, in December 1983. The present Director, Dr. William D. Bishop, will retire in January 1984. In this new position, Dr. Vlek will be responsible for directing and periodically reviewing research programs on fertilizer in the areas of soil science, economics, sociology, and related disciplines.

Dr. Vlek, a native of Amsterdam, The Netherlands, received a Ph.D. in soil chemistry and plant nutrition from Colorado State University in 1976. Prior to this he had received Master of Science and Bachelor of Science degrees in soil chemistry/soil mineralogy and tropical soils/soil chemistry, respectively, from the State Agricultural University, Wageningen, The Netherlands.

Since 1976 Dr. Vlek has held various positions of responsibility within IFDC's nitrogen research program. During April 1982-February 1983, he was on special assignment in South America, Africa, and Asia. The product of this assignment will be a monograph on micronutrient problems in tropical agriculture.

Major efforts in IFDC's Nitrogen Research Program are directed toward identifying ways that nitrogen fertilizers are lost and the means by which these losses can be curbed. As Research Leader of the Nitrogen Research Program, Dr. Vlek has also been responsible for coordinating activities involved in cooperative projects with the International Rice Research Institute (Philippines), International Center for Agricultural Research in the Dry Areas (Syria), International Crops Research Institute for the Semi-Arid Tropics (India and Niger), International Institute of Tropical Agriculture (Nigeria), and Indian Council of Agricultural Research (India). Dr. Vlek has been instrumental in the development of collaborative projects with national programs in Cameroon, India, Kenya, Korea, Senegal, Togo, and Upper Volta.

He has approximately 30 publications to his credit.

Dr. Vlek has definite plans for the future direction of Agro-Economic's work. "I hope to expand our research beyond nitrogen and phosphate and develop solid programs in other nutrients, pending the availability of financing," Dr. Vlek said.

He has a deep appreciation for the mission of IFDC. "The ultimate goal is to see some of our research bear fruit or to see some of our ideas accepted in the field," Dr. Vlek said. "I hope that we can do more to ensure that our technology reaches the farmer."

Prior to becoming Director of IFDC's Agro-Economic Division, Dr. Bishop was Dean of the Agricultural Extension Service, the University of Tennessee, for 5 years. The previous 10 years he held other administrative positions with the Tennessee Agricultural Extension Service. Another decade was spent as a soil fertility specialist with the University of Tennessee. In his earlier years, Dr. Bishop served as Assistant County Agent and County Agent for the Agricultural Extension Service in Marshall and Dickson Counties, Tennessee, respectively.

The retiring Director received his Ph.D. in soil fertility and agricultural economics from Purdue University. He received the B.S. and M.S. degrees in agronomy from the University of Tennessee.

In his role as Director of the Agro-Economic Division, Dr. Bishop has watched IFDC mature as a recognized authority in fertilizer research as it strives to accomplish its mission of "helping to feed a hungry world." Reflecting his humanitarian spirit, Bishop finds the greatest reward in his work by seeing the concrete results of his Division's efforts, or in his words, "helping to place a few more crumbs on the table of mankind."

In this issue...

Thailand—

IFDC Participates in Project Destined to Improve Thai Agriculture

"My grandfather never used fertilizer on his rice paddies; instead, he used rotation crops, including legumes, which he cut down and incorporated into the soil to add nutrients"—Dr. Diane Sompongse, an IFDC Soil Scientist and a native of Thailand, remembers.

Dr. Sompongse's grandfather was not alone in using this fertilization practice. Since most of Thailand's farmers consider chemical fertilizer to be too expensive to use, over the ages they have improvised by devising their own fertilization methods.

Historically, Thailand has had an abundance of good agricultural land and has been able to increase food production by increasing the number of cultivatable acres. Fertilizers have been secondary in importance in maintaining food production in Thailand.

As a result, Thailand ranks among the lowest consumers in Asia in fertilizer use per hectare as well as crop area irrigated and planted to modern varieties. Average fertilizer consumption in Thailand is less than 30 kilograms of plant nutrients per hectare. Likewise, Thailand has one of the lowest rice yields in Asia.

Thailand can no longer increase food production by expanding land under cultivation. Future increases in production must come through increasing productivity of existing land. Fertilizer is one of the inputs used to increase this productivity.

IFDC is participating in a project that should help to provide fertilizer to Thailand's farmers at an affordable price. IFDC is responsible for the marketing and agronomic portions of the study. This study comes under the larger umbrella of a feasibility study for a fertilizer complex in Thailand, which is being conducted by Foster Wheeler International of Livingston, New Jersey, U.S.A., under direct contract with the National Fertilizer Corporation of Thailand.

Dr. P. J. Stangel, IFDC's Deputy Managing Director, is Coordinator of IFDC's portion of the study. During February-March 1983 Dr. Stangel was accompanied by three other IFDC staff members to Thailand to begin the study. They are Dr. V. L. Sheldon, Marketing Specialist; Dr. A. H. Martinez, Fertilizer Use Economist; and Mr. A. F. Little, Industrial Project Analyst.

"The catalyst that created an interest in Thailand toward developing a fertilizer complex was the offshore production of natural gas in the Gulf of Thailand," Dr. Stangel said. "The Government of Thailand hopes to establish a series of projects to lead to the industrial development of Thailand."

IFDC's role is to analyze statistics on fertilizer consumption and develop demand forecasts to 1992. To the extent that data will permit, demand is to be forecast for individual products, such as urea, diammonium phosphate, monoammonium phosphate, and various NPK fertilizers.

"This study benefited from an IFDC study supported by the World Bank and conducted in 1979 at the request of the Ministry of Industries," Dr. Stangel said. "The earlier study assessed the fertilizer sector and suggested alternatives from which a future strategy might be developed. The Government of Thailand and particularly the National Fertilizer Corporation has recognized the significance of the 1979 study."

"If built, the fertilizer complex could increase the availability of fertilizer and should result in a significant decline in farmers' costs of fertilizer nutrients."—Stangel

The new study provides an update of the marketing and agronomic portions of the 1979 study. The significant findings thus far include the identification of Thailand's fertilizer demand as being below the level of the 1979 forecast. The apparent reason for the decline in consumption seems to be related to the decline of agricultural imports by food-deficit countries and resultant increased competitiveness of agricultural products in international trade.

Nevertheless, Thailand still ranks as one of ten major food-exporting countries of the world and has been the only continuous net food-exporting country in Asia for the past 20 years.

"If built, the fertilizer complex planned by the National Fertilizer Corporation could increase the availability of fertilizer and should result in a significant decline in farmers' costs of fertilizer nutrients," Dr. Stangel said. "These two factors could significantly improve the competitiveness of Thailand's agricultural exports in the international marketplace. Therefore, the per capita income would increase and fertilizer consumption would be stimulated even further."

Thailand's farmers are using fertilizer at less than one-third of potential levels. The proposed complex should result in increased use per hectare in areas likely to serve the export market and also make fertilizer available for the first time in remote areas of Thailand, where fertilizer is presently not being used.

During June 1983 Dr. Stangel again visited Thailand to review with Thailand officials IFDC's forecast of overall fertilizer demand and the products to be produced by the proposed complex. Dr. Stangel also assisted Foster Wheeler International in discussions relating to the size and configurations of the proposed fertilizer complex. He also returned to Thailand in August to participate in a final review of the project report.

This project will not eliminate the practices like those used by Dr. Sompongse's grandfather. Thai farmers like him will be able to use not only those fertilization methods but also chemical fertilizers, which will greatly increase the productivity of their land.

IFDC In The Field

Colombia—

IFDC/CIAT Phosphate Project Making Impact

The evidence is clear that the IFDC Phosphate Project is having a profound impact in Colombia.

At the time when the project was initiated in 1977, ground phosphate rock was not used in significant quantities for direct application in Colombia. As results from the field research program became available, interest in developing a market for indigenous rocks in Colombia also grew. This is illustrated by the placing of finely ground phosphate rock in the market by two Colombian producers in 1981.

In the second year of sales, the quantity purchased doubled over that of the first year. Interest was further evidenced recently when a Colombian commercial fertilizer producer visited IFDC Headquarters to learn about other products that could be made from the Huila phosphate rock.

The IFDC/CIAT/ICA Phosphate Project has received continuous financial support by the International Development Research Center (IDRC) of Canada. The project is based at the International Center for Tropical Agriculture (CIAT) in Cali, Colombia; the field research is being conducted collaboratively with the Instituto Colombiano Agropecuario (ICA).

During a recent visit to IFDC, Dr. Luis Alfredo León, IFDC Soil Scientist, and Coordinator of the IFDC/CIAT/ICA Phosphate Project, outlined the progress and future plans of this project. Besides Dr. León, three other IFDC staff members are involved in the project. Dr. J. A. Ashby, Sociologist is developing innovative methods of involving farmers in the evaluation of alternative phosphate fertilizers with cassava, bean, and potato crops and investigating constraints to phosphate rock use by farmers. Dr. Elizabeth Hansen, Anthropologist, is studying the socioeconomic aspects of using phosphate rock on upland rice and pastures. Dr. Carlos Baanante, Economist, is conducting economic evaluations of producing and using phosphate alternatives in Colombia.

"The project has now reached the farm level, and we are delineating the conditions under which local finely ground or partially acidulated phosphate rock may be the best phosphate material for farmers to use," Dr. León said. "Sixty experiments have been established on farmers' fields to try to answer the questions posed earlier by farmers during interviews. These experiments were established in three regions: (1) the high altitude tropical region, using potatoes, maize/bean association, and barley as the test crops; (2) the lowland region, using rainfed rice as the test crop; and (3) the mid-altitude tropics, using beans and cassava as the test crops."

Dr. Luis Alfredo León (second from left), IFDC Soil Scientist, and some of his Colombian farm collaborators inspect a cassava harvest in Cauca, Colombia.

While data are still being collected, some experiments have already been harvested in Nariño and Cauca departments. In Cauca department, it was observed that the average yield of beans grown in 14 locations was increased from 362 kg/ha with no phosphorus to over 1,100 kg/ha when using phosphorus. In these experiments, partially acidulated Huila phosphate rock was equally as effective as triple superphosphate at all rates of application. As was predicted by the previous research station experiments, finely ground Huila phosphate rock was not as effective when used on these soil types (Andepts).

The present phase of the project will near completion in mid-1984. A new project is being planned that will involve a more integrated approach by including nitrogen, potassium, sulfur, and micronutrients in conjunction with the phosphate rock products. The new project will also involve further research on methods of transferring project results to Colombian farmers. The researchers will be looking for combinations of fertilizer that can give the best agronomic and economic response and for the most effective approach to reaching farmers with these results.

The Phosphate Project is helping to improve the standard of living of the Colombian farmer. Dr. León summarized it this way. "Farmers who were not using fertilizer can now use a cheap fertilizer to increase their incomes. Those who were already using fertilizer now have a cheaper alternative. Farmers who practice the fallow system of farming can shorten the fallow period by using phosphates more efficiently. With the new fertilizer they can use more land per year and plant more crops per year. Thus, their yields will increase and, in turn, their standard of living will be improved."

Headquarters—

Rubber-Coated Urea Showing Excellent Handling Properties

Physical properties tests being conducted at IFDC on rubber-coated urea fertilizer are showing that the material has excellent handling qualities. The evaluation of physical properties is a very important segment of a collaborative project being conducted by IFDC, the Rubber Research Institute of Malaysia (RRIM), and Petroliam Nasional Berhad (PETRONAS).

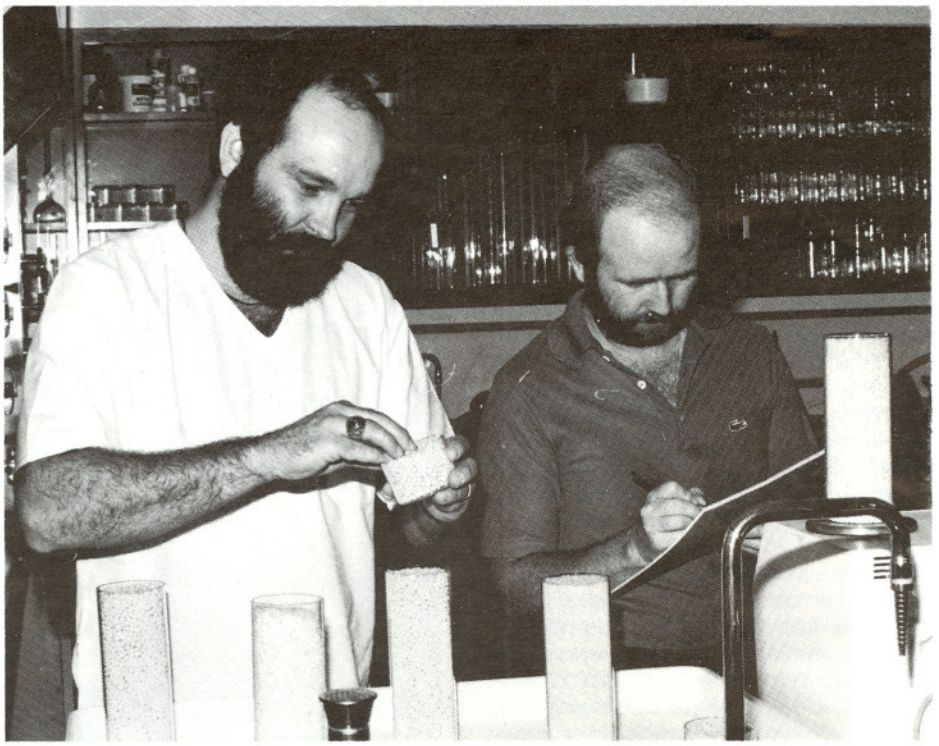
As discussed in the *IFDC Report*, Vol. 8, No. 2, the three organizations are studying the technical and economic feasibilities of rubber coating granules of urea and urea-based NPK fertilizer to control the release rate of nitrogen.

The acceptability of a fertilizer material depends not only on its nutrient content but also on its physical properties. Several laboratory methods are used for measuring the pertinent physical properties, including particle size, strength of material, caking tendency, hygroscopicity, bulk density, and angle of repose. The physical form of the product and its ability to resist deterioration during storage, handling, and atmospheric exposure are of equal importance in determining the usefulness of a product. There are no laws regulating the physical properties of fertilizer, but the farmer-user certainly evaluates the physical condition of the fertilizer. He can look at it and determine if it is caked or if it is free flowing and can be applied uniformly.

Mr. David Rutland, IFDC Chemical Laboratory Analyst, is conducting the physical properties tests portion of the PETRONAS project. After nutrient-release studies are conducted on the fertilizer samples, Mr. Rutland conducts tests on the selected samples showing promising nutrient-release characteristics to determine their physical properties. Since March 1983 Mr. Rutland has tested 30 coated samples.

One of the tests that has been performed on the rubber-coated urea fertilizer is the abrasion resistance test to determine the resistance to degradation of the material. This test simulates the handling that the material is exposed to from the producer to the farmer.

"To conduct this test, we first screened the material to a certain particle size," Mr. Rutland said. "Then we placed a weighed sample and 50 steel balls into a rotary drum, which has six lifting flights inside. After rotation, the contents were removed and screened to determine the percent degradation to fines."



Mr. David Rutland (left), IFDC Chemical Laboratory Analyst, and Mr. David B. Wright, IFDC Technical Aide, conduct hygroscopicity tests on rubber-coated urea.

A second physical properties test that has been performed on the rubber-coated urea fertilizer is the hygroscopicity test to determine the material's moisture absorption-penetration qualities. The purpose of this test is to determine how well a material will resist deterioration when exposed to humidity levels above its critical relative humidity (that humidity above which the material will absorb moisture from the atmosphere and below which it will not). The fertilizer samples are exposed to a controlled humidity and temperature; the rate of moisture absorption per unit of surface and the rate of moisture penetration into the bulk of the fertilizer are measured.

"The rubber coating apparently improves the handling and hygroscopic properties when compared with uncoated urea."—Rutland

The bulk-density test is another type of test that is conducted to determine a fertilizer's physical properties. The purpose of this test is to determine the amount of a fertilizer material that a certain volume will hold, including the spaces in between granules. A value for this property is required for bag sizing and to determine the capacity of storage bins and transport vehicles.

The angle of repose is another physical properties test; this refers to the angle to the horizontal which a fertilizer will assume in a bulk pile. This property affects the capacity of storage bins and is of interest in designing roofs of storage buildings.

"The rubber coating apparently improves the handling and hygroscopic properties when compared with uncoated urea," Mr. Rutland said.

Niger—

IFDC Specialist Participates in Assessment of Niger's Agricultural Education Sector

A recent assessment of Niger's education sector—the first study of its kind to correlate the country's educational needs with the economic realities of the government—has revealed that the cost of formal agricultural training far exceeds the cost of nonformal training of farm couples. The cost of 1 year's training for a university student in Niger in agricultural sciences is equivalent to the cost of training approximately 18 farm couples for 1 year.

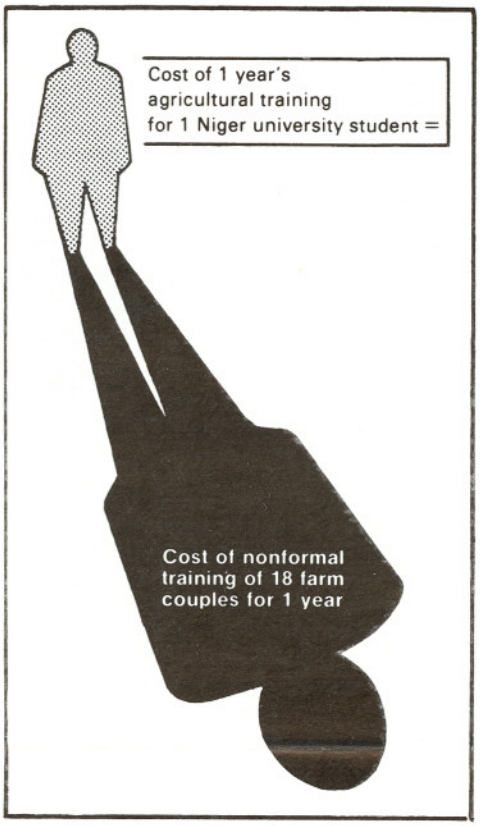
From June 5-July 29, Dr. Cynthia L. Connolly, IFDC Associate Training Coordinator, participated in a project conducted by a U.S. Agency for International Development (USAID) team to assess the education sector of Niger. Eleven specialists were assembled by the Pragma Corporation under contract with USAID. During the 6-week project, the IFDC agricultural education specialist traveled extensively throughout the Niger countryside; she visited the agricultural training centers and productivity projects in the major agricultural production regions.

"The objective of the study was to examine Niger's formal and nonformal agricultural education system and to describe and analyze agricultural education underway," Dr. Connolly said.

The study revealed that the primary constraint facing agricultural education is its cost and financing. The government cannot afford to continue to train and employ increasing numbers of rural development personnel. This constraint is a direct result of the falling world uranium market, on which Niger's economy was based.

There are several issues facing agricultural education in Niger. These include efficiency, access and equity, and the cost and financing of the different systems. For example, the major nonformal agricultural training is taking place at the Centers for Rural Promotion (CPRs), which are more efficient and less costly than the formal agricultural education. "At these centers farmer couples (man and wife teams from different villages) receive agricultural training as part of an integrated approach to rural development," Dr. Connolly said. "Twenty couples stay at each center for the 9-month growing season."

The couples are introduced to a technical package that includes fertilizer use, animal traction, and different cultural practices. Simple research is conducted at some of the centers. One field is established using traditional practices; another exhibits the new practice that is being promoted.



Presently there are 47 centers; each is capable of training 20 farmer couples each per year. Eighty centers are planned by 1985.

"The relative cost of formal agricultural training far exceeds the cost of direct training of farm couples," Dr. Connolly said. "The per-student costs for formal training ($9,500/year/student at the University School of Agronomy; $4,600/year/student at the Practical Institute for Rural Development) are very high. Partially, this is a function of inefficiency and underutilization of present facilities and faculties.

"The objective of the study was to examine Niger's formal and nonformal agricultural education system and to describe and analyze agricultural education underway.'—Connolly

After analyzing the education sector, the study group made several recommendations regarding agricultural education.

First, the training of researchers should be strengthened; research capacity beginning with the National Research Institute (INRAN) needs to be funded and developed to create an indigenous research capability.

Teacher training in agricultural education is greatly needed. The quality of education should be emphasized over the quantity or numbers trained.

Donors should focus on inservice training programs of public-sector personnel to provide needed skills among current staff.

Niger should move from training geared solely to the government service and expand the orientation of existing programs to training in agricultural skills needed by the private sector.

Cost-efficient and effective use of mass media, particularly radio and visual aids, should supplement current practices of extension and agricultural education.

Thailand—

Fourth Regional Fertilizer Production Training Program Held

Bangkok was the setting for IFDC's fourth Regional NPK-Fertilizer Production Training Program, July 10-16. This marked the second time for a program of this kind to be held in Bangkok.

Cosponsors of the program included the Ministry of Industry (MOI) and Ministry of Agriculture and Cooperatives (MOAC) of the Royal Government of Thailand.

The program was conducted under the leadership of Mr. M. T. Frederick, IFDC Chemical Engineer. Others making presentations included Mr. James J. Schultz, IFDC Engineering Coordinator; Mr. Keith Barnett, Sales Manager, Licensing and Consultancy Services, Norsk Hydro Fertilizers, United Kingdom; Mr. Larry Taylor, Vice President, A. J. Sackett and Sons Co., Baltimore, Maryland, U.S.A.; and Mr. Chan

Mr. M. T. Frederick (right), Program Manager, presents a certificate to Mr. Mahadurage W.D.C. de Silva, Works Manager, Colombo Commercial Co., Fertilizers Limited, Sri. Lanka.

Kam-Seng, Peladang Kimia, Kuala Lumpur, Malaysia.

Thirty-six fertilizer plant managers, production managers, and supervisors from seven countries attended the program. The countries represented included India, Indonesia, Malaysia, Pakistan, Republic of China, Sri Lanka, and Thailand.

"The primary program objective was to present a broad overview of traditional and emerging fertilizer granulation and bulk-blend technologies," Mr. Frederick said.

The participants also learned of the factors affecting granulation processes, process design, and operating techniques suited to regional climate and requirements. They were also exposed to the principles of plant organization and management.

Some of the subjects of the discussions included "Plant Design—Major Equipment Design," "Formulation of Traditional NPK Products," "Quality Assurance and Control, Sampling, and Testing," and "Air Pollution/ Water Pollution Problems and Control."

Mr. Barnett's presentations on granulation were well received. Other presentations of particular interest appeared to be the one on bulk blending in Malaysia, presented by one of the participants, Mr. Chan Kam-Seng, and that on fluid blends presented by Mr. Larry Taylor. These two presentations generated a great deal of discussion and questions.

"One of the highlights of the program was a tour of the Thai Central Chemical Company plant near Bangkok."—Frederick

"One of the highlights of the program was a tour of the Thai Central Chemical Company plant near Bangkok," Mr. Frederick said. "The group saw all segments of the fertilizer production operation including not only the plant itself but also the bag-making facility and the fertilizer receiving, packing, and storage operations."

"There was considerable interest among the participants, and it appears likely that NPK production will expand quite rapidly in Southeast Asia during the next 5 years," Mr. Schultz said.

"This program was the most outstanding one that IFDC has held thus far on the subject of NPK production," Mr. Frederick said.

Headquarters—

One-Week Segment of Soil Testing Program Held at IFDC

A 1-week segment of a Soil Testing, Soil Classification, and Fertility Management Training Program was held at IFDC during July 11-15, 1983. This 8-week program is offered annually by the U.S. Department of Agriculture (USDA) and conducted by Auburn University in cooperation with IFDC.

This year 15 participants from 13 countries attended. The countries included Belize, Benin, Guinea-Bissau, Jamaica, Jordan, Nepal, Saudi Arabia, Sri Lanka, Sudan, Swaziland, Tanzania, Upper Volta, and Zaire.

The course was under the direction of Dr. A. Martinez, IFDC Fertilizer-Use Economist. Presentations were made by IFDC and Tennessee Valley Authority (TVA) personnel.

During their stay at IFDC, the group discussed the role that fertilizers play in crop production; the relation between soil testing, soil classification, and fertilizer recommendations; and the impact of different soil types and agroclimatic factors on research design and planning. The participants also learned about different IFDC projects throughout the world.

Participants in the Soil Testing, Soil Classification, and Fertility Management Training Program Inspect a Rice Experiment in an IFDC Greenhouse.

Recent IFDC Publications

Briquetting—Alternative Process for Urea Supergranules

This bulletin describes a process, briquetting, which is an agglomeration process using the application of pressure to powdered dry fertilizer materials. Results of tests by IFDC and other organizations show that considerable improvement is achieved in the agronomic efficiency of urea in wetland rice production by deep placement of urea supergranules compared to broadcast application of urea prills. The physical and chemical characteristics of urea make the material well suited for production of urea supergranules by briquetting. Urea briquettes of 0.8 to 2.0 grams produced by IFDC in a small briquetting machine were of a good quality.

Conceptual process designs were developed for the manufacture of 1- to 2-gram urea briquettes considering different types of urea feed material. The conceptual designs were used for developing cost estimates for the production of urea briquettes. For briquetting plants added to an existing urea complex, production costs were calculated to be quite competitive with other granulation alternatives but varied with the type of urea feed and capacity of the briquetting plant. The two plant capacities studied were 300 and 700 metric tons per day.

The authors of this publication are Dr. M. S. Lupin, Research Chemist; Mr. J.R. Lazo de la Vega, Special Project Engineer; Mr. N. D. Le, Chemical Engineer; and Mr. A. F. Little, Industrial Project Analyst.

To purchase this publication, please request IFDC Technical Bulletin T-26. The price for U.S. addresses is US $4.00 and for international addresses, US $7.50. Please address your orders to the IFDC Purchasing Department.

IFDC Annual Report, 1982

IFDC has just released its Annual Report covering 1982 activities. The theme of this year's report is "Transferring Fertilizer Technology to the Developing World." The publication provides a graphic account of how IFDC transfers fertilizer technology to the developing world through research, national programs, technical assistance, and training—the Center's four primary program areas.

Interested parties may order the publication by requesting IFDC Circular S-6.

Upcoming IFDC Training Programs

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

Regional Fertilizer Marketing Training Program for Asia; December 5-16; Manila, Philippines.

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

1984 IFDC Training Programs

Program	Location	Dates
IFDC HEADQUARTERS		
Fertilizer Marketing		
Use of Microcomputers for Fertilizer Sector Personnel	IFDC	July 16-20
Statistics and Economics of Fertilizer Use	IFDC	July 23-August 10
Fertilizer Marketing Management Training Program	IFDC	August 13-September 21
Fertilizer Production and Technology		
Ammonia/Urea Plant Operations Workshop	New Orleans, Louisiana (U.S.A.)	April 7-18
Fertilizer Production Economics Process Training Program	IFDC	May 14-25
Maintenance and Production Management for Fertilizer Producers	IFDC	October 15-November 2
Fertilizer Efficiency Research in the Tropics		
Fertilizer Efficiency Research and Technology Transfer Workshop	IFDC	June 14-July 3
REGIONAL PROGRAMS		
Fertilizer Marketing		
Fertilizer Distribution and Handling Training Program	India, Singapore, Indonesia	February 20-March 9
Regional Fertilizer Marketing Training Program for the Asian Region	Thailand	November 5-16
Fertilizer Efficiency Research in the Tropics		
Fertilizer Efficiency Research in the Tropics—Africa (in French)	Mali	October 29-November 16
Fertilizer Efficiency Research in the Tropics—Latin America (in Spanish)	Colombia	May 7-25

Note: Dates are subject to change.

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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