

Nitrogen Research—

Mini-Network for ¹⁵N Experiments

Nitrogen fertilizer is a key input for the production of high-yielding rice crops. Use of nitrogen on rice in Asia is increasing, but the present fertilizer management practice of broadcasting urea on the surface of floodwater is inefficient. To study this problem and to seek improved methods of nitrogen fertilizer application, 10 Asian countries, in collaboration with the International Rice Research Institute (IRRI) and IFDC, formed the International Network for Soil Fertility and Fertilizer Evaluation in Rice (INSFFER).

Early results from INSFFER experiments show that slow release through the use of sulfur-coated urea and deep placement through the use of urea supergranules usually are effective means for increasing nitrogen fertilizer efficiency for rice. At some sites and in some seasons, however, one or both of these methods has proved ineffective. The results are difficult to interpret without a better understanding of what happens to the fertilizer nitrogen in soil-plant systems.

In April 1979, during the International Rice Research Conference at IRRI, a meeting was held to discuss and plan an experiment to determine how the soil-plant systems use or lose the different fertilizers used in the INSFFER experiments. IFDC, with partial funding by the Australian Development Assistance Bureau, has assumed the leadership role in establishing a mini-network to work with INSFFER to evaluate ¹⁵N balance of fertilizer.

Mini-network experiments will involve using fertilizer labeled with the stable isotope ¹⁵N. At different times after fertilizer application, the soil and rice crop will be sampled and carefully analyzed for nitrogen and ¹⁵N. Losses will be determined indirectly from the ¹⁵N balance in plant and soil. The data obtained will provide valuable support to the agronomic experiments of INSFFER to determine



Participants in CSIRO/IFDC/IRRI Workshop on ¹⁵N and Rice:

Back (left to right): Dr. Bijay Singh, Dr. W. D. Bishop, Mr. Young Soo Hwang, Dr. L. Youngdahl, Ms. Patoom Snitwongse, Dr. E. R. Austin.

Front: Ir. R. Wetselaar, Dr. E. T. Craswell.

the effects of fertilizer source and management on the efficiency of fertilizer nitrogen in different soils and environments in which rice is grown.

The basic experimental design for the mini-network experiments was planned at the IRRI meeting which was attended by scientists from India, Korea, Thailand, People's Republic of China, IRRI, and IFDC. The key to the success of ¹⁵N balance experiments is exact adherence to correct analytical procedures. ¹⁵N samples from the experiments will be analyzed in IFDC laboratories.

IFDC scientists—Dr. E. T. Craswell, Dr. I. R. Fillery, Dr. E. R. Austin, and Mr. B. H. Byrnes—and Commonwealth Scientific and Industrial Research Organization (CSIRO) scientist Ir. Rob Wetselaar conducted a course to train research workers to sample and analyze soil and plant material so that ammonium sulfate can be prepared in small vials and sent to IFDC Headquarters for isotope analysis.

Colombia—

Economics of Direct Application of Rock Phosphate

IFDC is working to help developing countries identify potential sources of phosphate rock suitable for direct application. One part of this effort is the economic evaluation of the residual effect of phosphate sources on food crop yields.

IFDC Economist Dr. C. A. Baanante recently completed such an evaluation. The data used was based on experimental work conducted in the phosphate research project at the International Center for Tropical Agricultural (CIAT). IFDC Soil Scientist Dr. L. L. Hammond initiated the field experiment to evaluate the effects of different phosphate sources on cassava in the Eastern plains of Colombia. IFDC Soil Scientists Dr. W. E. Fenster and Dr. L. A. Leon,

(continued page 2)

(from page 1)

who are stationed at CIAT, are continuing and have expanded the project.

The model used for the economic evaluation captures the residual effects of P_2O_5 from different material which are discounted and expressed in present values. A similar approach was previously used by IFDC Economist Dr. S. S. Sidhu to evaluate phosphate sources using data from Thailand.

Results of the evaluation include: (1) estimates of cassava crop response to P_2O_5 from each source during the first, second, and third consecutive crop year; (2) present value (discounted) response functions obtained at two different rates of discount—0.10 and 0.30; and (3) economic analysis to compare the profitability of various P_2O_5 sources with respect to the use of TSP at current prices and also to determine the sensitivity of profits to change in prices of P_2O_5 sources other than TSP.

Phosphate sources used in the experiment included TSP, basic slag and Huila, Gafsa, Pesca, Tennessee, Central Florida, and North Carolina phosphate rocks. Basic slag and TSP were found to be the most profitable sources. Using the 0.10 rate of discount, the phosphate rocks were found to be between 71% (Tennessee) and 96% (Gafsa) as profitable as TSP during the 3-year period. Residual value studies are continuing with a series of other crops in addition to this one with cassava.

Sri Lanka—

Phosphate Fertilizer Using Eppawala Rock

As a part of the Dienst Internationale Technische Hulp (DITH), Holland and IFDC joint research project on the utilization of Eppawala phosphate rock from Sri Lanka, Dr. S. L. Amarasiri, Soil Scientist with the Central Agricultural Research Institute, Colombo, Sri Lanka, is working at IFDC Headquarters. Dr. Amarasiri is conducting incubation and greenhouse studies with finely ground Eppawala phosphate rock for direct application as well as with TSP, SSP, fused Mg phosphate, and Rhenania-type phosphates produced from the Eppawala phosphate rock. Dr. Amarasiri will be at IFDC for 5 months. An engineering counterpart from Sri Lanka, Mr. Nanda Malalasekera, has assisted in the preparation of all experimental

Upper Volta—

Use of Local Resources for Phosphate Fertilizer Production

The German Agency for Technical Cooperation (GTZ) and IFDC have initiated a research project to produce phosphate fertilizer that is agronomically effective and lower in cost than imported phosphates in Upper Volta. Upper Volta, being a landlocked country, is at a disadvantage to participate on an equal basis with other countries in world fertilizer trade. The importation of fertilizers is costly and complicated. Fertilizer consumption is low.

The Kodjari phosphate deposit offers potential as a fertilizer source for Upper Volta farmers. The first phase of the GTZ-IFDC project consists of research to determine the best method or methods for using Kodjari phosphate rock for fertilizer production in Upper Volta. Experimental products of different types are being made by IFDC researchers. These materials will be tested in laboratories and greenhouses at IFDC Headquarters and in West Germany.

Mr. Martin Bikienga, counterpart scientist from Upper Volta is currently working at IFDC Headquarters with IFDC scientists, Dr. A. H. Roy, Chemical Engineer, Dr. S. H. Chien, Soil Chemist, and Dr. L. L. Hammond, Soil Scientist.

products made in IFDC for agronomic evaluation.



S. L. Amarasiri (left) and L. L. Hammond discuss greenhouse studies on corn using Eppawala phosphate rock.



A. H. Roy (left) and Martin Bikienga examine Kodjari phosphate rock used in the GTZ-IFDC research project.

Twenty-Seven Participants—

Fertilizer Marketing and Distribution Course

The third annual 6-week course on fertilizer marketing and distribution was conducted at IFDC Headquarters from August 13 to September 21. Twenty-seven participants from 8 countries were enrolled in the course. All participants have managerial responsibilities in their countries for marketing and distribution of fertilizers. Eight participants were from Bangladesh, four from Indonesia, three each from Sri Lanka, Malaysia, Israel, and India, and one each from Zambia and Peru, plus one from FAO, Rome.

The course was an intense study of the current world fertilizer marketing and distribution situation and its relationship to food needs of developing countries. Specific subjects included (1) the current fertilizer situation, both in the world and by country, (2) the economics of fertilizer use, (3) latest recommended fertilizer use practices, (4) developing fertilizer marketing plans, (5) managing marketing functions, and (6) procuring fertilizers on the world market.

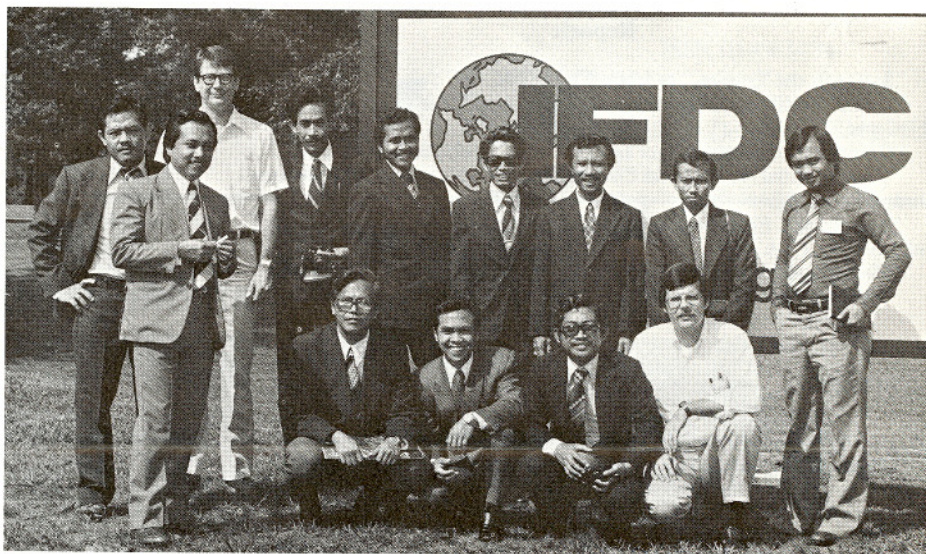
Field trips to U.S. farms and industries were conducted to study national and international fertilizer production, marketing, and use. The University of Illinois College of Agriculture, the Brownstown Illinois Experiment Station, and extension services were also visited.

Training Program for Startup Crew

Eleven supervisory personnel from PUSRI participated in a 30-day training program at IFDC Headquarters during August. This program is part of IFDC's overall commitment to provide technical assistance to PUSRI to replace the original prilling tower of the No. 1 urea plant with a granulation unit.

The training program was a combination of classroom lectures, seminars, discussions, and hands-on operation of pilot-plant equipment. Mr. M. T. Frederick, Chemical Engineer, Outreach Division, was Program Coordinator. Actual pilot-plant operation was under the supervision of Mr. George Bolds, Pilot Plant Operations Coordinator, Technology Division.

Pilot-plant tests were designed to simulate operating conditions for the PUSRI plant that is scheduled to be completed in 1980. Tests included both startup procedures and routine operation. Two extended tests of 11 hours each were made. PUSRI personnel operated the plant, under IFDC supervision, for three tests and a total of 23 hours. They observed IFDC personnel operation for 37 hours.



P. T. PUSRI Urea Granulation Program Participants:

Standing: Matsoka Syam, Sigit Rahardjo, George W. Bolds, Suradal, Suparmin, Abdul Hanan, Kuswawi, Suyadi, M. Muchsin.

Kneeling: Ahmad Soufyan, Wardiyaka, Wibisono, M. Terry Frederick.

Indonesia-

Fertilizer Efficiency Planning Work Group

As the first step toward developing a fertilizer efficiency program in Indonesia, seven senior scientists from Indonesia spent 3 weeks at IFDC Headquarters in September. Partial funding for the planning work group was provided by

P. T. PUSRI and the Australian Development Assistance Bureau.

The Indonesian scientists, together with IFDC, IRRI, and Australian scientists, established a strategy and planning document that hopefully will lead to a program of improved efficiency of fertilizer use for the major food crops of Indonesia.

Through a series of seminars, workshops, and consultations, the scientists (1) identified specific fertilizer efficiency problems with N, P, K, and S in Indonesia for lowland and upland rice, maize, soybeans, and peanuts; (2) established what technology is available to solve these problems; and (3) developed a plan that, if implemented, will provide solutions that are profitable to the farmer and the nation. The planning document will be presented to senior officials of the Government of Indonesia at a workshop to be held in Indonesia in early 1980.

The Indonesian scientists visited agricultural research stations at the University of Arkansas, Texas A&M University, and the University of California before returning to Indonesia.



Participants of the 1979 Marketing and Distribution Course:

Bangladesh—Mofizul Islam, Muhammad Mozammel Hossain Khan, Md. Nurun Nabi Miah, Md. Abdul Hamid Mondal, Md. Golam Mustafa, Md. Aminur Rahman, K. Z. Rahman, and Md. Abdur Razzaque; India—Vijay Chandra, M. K. Guha, and G. P. Singh; Indonesia—M. Alfian Ismail, Enar Kusdinar, L. Sinulingga, and Mustafa Umar; Israel—Yechezkel Baron, Shaul Ben-Zeev, and Eitan Bilu; Peru—Ricardo Fort Larco; Republic of Zambia—W. Kumwenda; Sri Lanka—R. M. Fernando, C. Gamage, and M.D.K. Jayawardene; Malaysia—Che Yusof bin Che Omar, Mohd Salleh Simon, and Mohd Sarit Hj. Yusoh; and FAO—Niels Thorsen.

PUBLICATIONS AND REPRINTS AVAILABLE FROM IFDC

Reports

- "Sulfur in the Tropics," published by IFDC.
"World Fertilizer Situation and Outlook-1978-85," published by IFDC and TVA.
"Granular Urea-Advantages and Processes," published by IFDC.
"The Potential for Regional Cooperation in Fertilizer-A Methodology Study of the ASEAN Group," published by IFDC.
"Supplying Fertilizers for Zaire's Agricultural Development," published by TVA.
"West Africa Fertilizer Study (Volumes I-VII)," published by IFDC.
Volume I-Regional Overview
Volume II-Senegal
Volume III-Mali
Volume IV-Upper Volta
Volume V-Niger
Volume VI-Chad
Volume VII-Mauritania
"Economic and Technical Aspects of Fertilizer Production and Use in West Africa," T. Zalla, R. B. Diamond, and M. S. Mudahar, IFDC/MSU Working Paper No. 22, 1977.
"Ghana-Progress in Fertilizer Production, Marketing, Education," published by TVA.
"Suggested Fertilizer-Related Policies for Governments & International Agencies," published by IFDC.
"Progress Report, 1976-1977," published by IFDC.
"The Bangladesh Fertilizer Sector, 1978," published by IFDC.

Papers and Reprints

- "An Analysis of N Nutrition on Yield and Yield Components for the Improvement of Rice Fertilization in Korea," P.L.G. Vlek, C. W. Hong, and L. J. Youngdahl, *Agronomy Journal*, Vol. 71, September-October 1979.
"Dissolution of Phosphate Rock in Acid Soils as Influenced by Nitrogen and Potassium Fertilizers," S. H. Chien, *Soil Science*, Vol. 127, No. 6, 1979.

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"Bench-Scale Studies of Utilization of Problem Rocks in Wet-Process Phosphoric Acid Production," A. Varsanyi, E. B. Winn, and P. H. Peng, Proceedings of ISMA Technical/Economic Conference, pp. 133-149, Orlando, Florida, October 23-27, 1978.

"Reactions of Phosphate Rocks, Rhenania Phosphate, and Superphosphate with an Acid Soil," S. H. Chien, *Soil Science Society of America Journal*, Vol. 42, No. 5, September-October 1978.

"Effect of Nitrogen Source and Management on Ammonia Volatilization Losses from Flooded Rice-Soil Systems," P.L.G. Vlek and E. T. Craswell, *Soil Science Society of America Journal*, Vol. 43, No. 2, March-April 1979.

"Effects of Solution Chemistry and Environmental Conditions on Ammonia Volatilization Losses from Aqueous Systems," P.L.G. Vlek and J. M. Stumpe, *Soil Science Society of America Journal*, Vol. 42, No. 3, May-June 1978.

"Fate of Fertilizer Nitrogen Applied to Wetland Rice," E. T. Craswell and P.L.G. Vlek, *Nitrogen and Rice*, Symposium proceedings, International Rice Research Institute, Manila, Philippines, 1978.

"Needed Information and Economic Analysis for Fertilizer Policy Formulation," M. S. Mudahar, Presented at FAO/FIAC Seminar on Fertilizer Pricing Policies and Subsidies, Bangkok, Thailand, 1978.

"A Simple Chemical Method for Evaluating the Agronomic Potential of Granulated Phosphate Rock," S. H. Chien and L. L. Hammond, *Soil Science Society of America Journal*, Vol. 42, No. 3, May-June 1978.

"Dissolution of Phosphate Rocks in Flooded Acid Soil," S. H. Chien, *Soil Science Society of America Journal*, Vol. 41, No. 6, Nov.-Dec. 1977.

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Barbara Holder
Communications Specialist
P.O. Box 2040

Muscle Shoals, AL 35660, USA
Phone No. (205) 381-6600
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