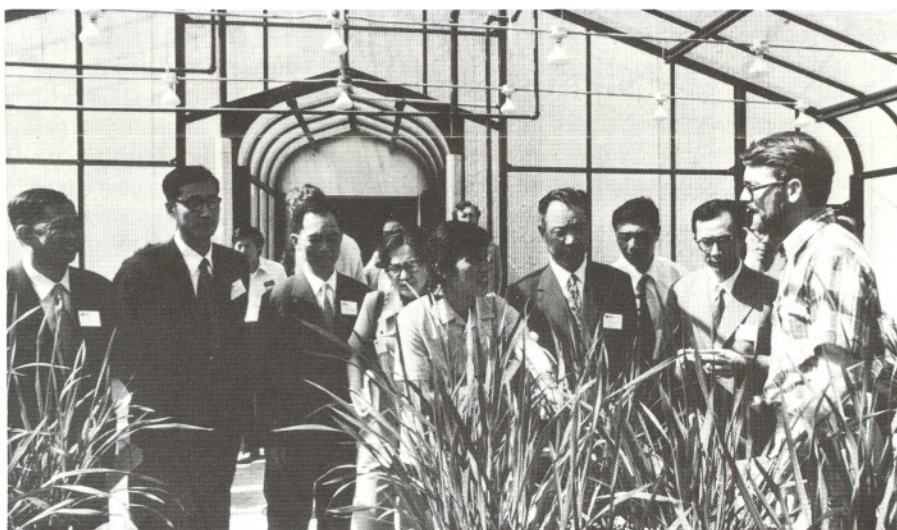


CHINESE SOCIETY OF CHEMICAL ENGINEERING—

Study Group from People's Republic of China Visits IFDC



Members of the study group included Pin Liu, Zhen-hua Zhang, Cheng-ji Wang, and Jin-wen Fan, Shanghai Institute of Chemical Industries; Fang-ding Huo and Shao-bai Xie, Peking Institute of Petrochemical Engineering Industries; Ben-ren Shi and Huai-fu Shang, Nanking Chemical Industries Company; Yu-man Pan, Chinese Society of Chemical Engineering; Bai-sheng Guo, Chinese Metallurgy Society; and Rui-ying Zhang, Translator.

A delegation of chemical engineers from the People's Republic of China (PRC) arrived in Muscle Shoals in May for discussions with staff members at IFDC.

The visit was organized by the U.S. Committee for Scholarly Communication with the People's Republic of China and coordinated by Mr. Alex De Angelis, Professional Associate of the Committee.

The Chinese delegation, headed by Mr. Pin Liu, President of the Shanghai Institute of Chemical Industries and Council Member of the Chinese Society of Chemical Engineering, included members of research institutions as well as Chinese fertilizer industries. Discussions at IFDC centered around new developments in improving the nutrient efficiency of nitrogen fertilizers as

well as efforts to economically utilize indigenous phosphate raw material deposits for the production of phosphatic fertilizers.

In addition to meetings with IFDC fertilizer specialists, the delegation visited TVA and toured various fertilizer facilities in Alabama, Louisiana, Utah, and California.

20 NOVEMBER TO 8 DECEMBER 1978—

Training Course on Fertilizer Use in the Tropics

IFDC, in cooperation with the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, is offering a three-week intensive training course at IITA for workers engaged in fertilizer research and extension on food crops in tropical Africa, Asia, and Latin America.

The course covers both the theoretical and practical aspects of fertilizer use. It is designed to help participants develop improved skills in the planning and execution of fertilizer trials at experiment stations and on farmers' fields.

The course includes instruction on field plot techniques, analytical methods, and statistical analysis. Some emphasis will also be given to such areas as the chemistry and fertility of soils in relation to fertilizer use and new experimental fertilizers.

Approximately one-half of the total training time will be devoted to classroom instruction and one-half to laboratory, greenhouse, and field practice.

Participants must be practicing agronomists/soil scientists with a minimum qualification of a B.S. in agronomy/

soils. Instruction will be in English.

For further information regarding fees, accommodations, and Nigerian entry visa requirements contact:

Assistant Director
Training Program
IITA PMB 5320
Ibadan, Nigeria

Since enrollment is limited, applications should be submitted as soon as possible.

Fertilizers for Deep Placement and Slow Release of Nitrogen for Rice

In growth chamber, greenhouse, and field experiments, a number of modified urea materials are being compared with normal urea and ammonium sulfate as part of IFDC's program to improve the nutrient efficiency of fertilizers used in the tropics.

The primary objective of the current work is to better match nutrient release with nitrogen uptake by rice. Other food crops will also be studied as part of the overall improved nitrogen efficiency project.

In a recent greenhouse experiment, a variety of conventional and experimental fertilizers were used for rice grown in two soils subjected to continuous or intermittent flooding.

The experimental results demonstrated a dramatic increase in fertilizer nitrogen recovery by the plant where deep placement and controlled release are combined. The mean apparent recovery of fertilizer nitrogen by the sulfur-coated urea supergranule was 84% compared with only 48% for split applications of urea.

Data from the experiment suggest that ammonia volatilization was a major

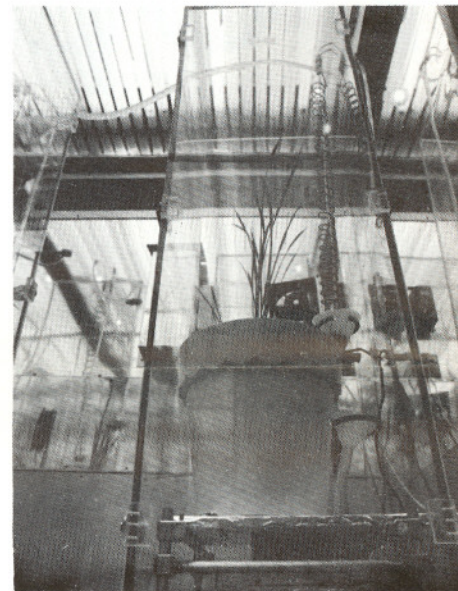
mechanism of nitrogen loss in the experiment. Other greenhouse and growth chamber research has pointed out the importance of ammonia volatilization as a mechanism of N loss, particularly from broadcast urea. Use of modified urea products such as SCU and urea supergranules placed in the reduced soil zone effectively reduced this loss in greenhouse trials.

The poor performance of surface-applied urea—the prevailing practice of most rice farmers—points to the urgency of introducing more effective N fertilizer practices and materials in tropical areas.

IFDC has a soil scientist, Dr. Eric Craswell, outposted at the International Rice Research Institute (IRRI) in order to establish more field-level experiments to complement the research in IFDC laboratories, growth chambers, and greenhouse. Dr. Craswell will provide field data on the mechanisms of nitrogen loss in tropical soils.

IFDC technologists are providing a number of experimental nitrogen materials for agronomic screening in combination with various placement methods. The research is being expanded to

include studies of organic nitrogen compounds and coatings for urea not based on sulfur. Indigenous coating materials are to be tested for comparison with sulfur since many developing countries do not have sulfur.



In IFDC growth chambers, researchers are utilizing an IFDC-designed lysimeter to collect detailed information on ammonia volatilization as a nitrogen loss mechanism.

SPECIALTY PHOSPHATE FERTILIZERS—

Upgrading Phosphate Rock Through Thermal and Chemical Methods

IFDC's phosphorus research program is oriented toward assisting developing countries to make better use of indigenous resources, while at the same time improving agronomic performance for use in tropical and subtropical areas. Thus, the program requires a high degree of flexibility in product preparation and testing.

Specialty phosphates include a variety of products under investigation which are not commonly used but for various reasons may have potential for developing countries.

One such type is a thermally chemically altered phosphate generally having low water solubility and varying degrees of availability as measured by solubility in neutral ammonium citrate. These products can be made from nonpremium grade and nonreactive rock by promoting chemical reactions through heat (800^o to 1450^oC) which alter structures of the apatite and allow recombination of the (PO₄)⁻³ into more reactive compounds of higher solubility.

IFDC is reexamining the literature as well as engaging in some laboratory studies to determine if thermal phosphates have a role in tropical soils with high phosphorus fixing capacity and in light of fertilizer cost:price trends.

Although thermal phosphates require energy intensive processing and are inferior to modern water-soluble materials in terms of P₂O₅ content, they may offer certain cost advantages in allowing indigenous raw materials with low reactivity, low grade, and unusual composition to be utilized. Also, the controlled-release characteristics and retained contents of secondary- and micro-nutrients of thermal phosphates may enhance their usefulness for some tropical areas; this still must be proven. Small quantities are being made for greenhouse testing at IFDC.

Laboratory research on ways to use unbeneficiated siliceous ores to produce 40% P₂O₅ phosphoric acid directly is another project in IFDC's specialty phosphate program. Exploratory work has been launched to modify the so-called "clinker" process where ore is directly acidulated to a superphosphate-like composition and then extracted to produce the acid. This process eliminates the need for beneficiation and, also, the problems associated with slime disposal and if clinker stability is achieved, the conventional filtering step is eliminated.

In previous work, the clinker process has not been successful because phosphate extraction efficiency and clinker

stability were inversely related. However, with siliceous ores, such as those found in Colombia and Upper Volta, the process problems previously encountered may be overcome. A statistical analysis of process variables is now being made.



IFDC Chemical Engineer, Dr. Amitave Roy, has been assigned leadership in research on specialty phosphates. Dr. Roy's laboratory is equipped with a thermal furnace and small-scale clinker process unit to produce small quantities of experimental materials.

IFDC Market Development Study in Bangladesh

A technical assistance team, under the leadership of IFDC Market Development Economist Dr. Yao Chuang, recently traveled to Bangladesh to assist USAID in the preparation of a project paper on ways to strengthen fertilizer distribution and marketing in Bangladesh.

In spite of considerable increases in fertilizer use in Bangladesh since the early 1950's, only 27% of the total cultivated land is fertilized as recommended rates despite heavy government subsidies.

SURVEYS AND ANALYSES—

Fertilizer Market Development Studies

The need for timely and reliable fertilizer-related information is a vital requirement if policymakers are to make appropriate decisions regarding fertilizer supply, distribution, and use.

IFDC is gathering profile information on many developing countries through a series of national, regional, and global market development surveys. These studies focus on fertilizer demand, supply, and distribution and offer preliminary assessments of fertilizer supply strategies.

Four such studies are currently underway:

World Fertilizer Study—USAID has requested that IFDC make a world fertilizer survey to be published by mid-1979. The goal of this research, under the direction of IFDC Economist Gene Harris with TVA cooperating, is to provide high-level governmental planners and decisionmakers with current information on world fertilizer production, consumption, and trade. Demand projections and plant investment cost indicators will be included.

ASEAN Study—An updated study of alternative fertilizer investment strategies for the ASEAN group of southeast Asian countries is in the final stages of completion. The study team, under the coordination of IFDC Visiting Economist, Dr. Lueder von Bremen, included representatives from the Philippines, Indonesia, and Malaysia. This group developed and evaluated a series of alternative fertilizer supply and distribution strategies and evaluated each scenario in terms of benefits and costs through 1990. Each scenario represents varying levels of self-sufficiency in fertilizer production for the region and for each individual country within the region.

Aside from the generation of preliminary data for analysis, the ASEAN study also has provided IFDC with an analytical framework and computer model which can be used for other national and regional studies.

The present marketing and distribution system is capable of handling and moving fertilizer from supply sources to thana-level warehouses. However, to meet government goals for expanded fertilizer use, new distribution strategies will be required.

The IFDC team, which also included Marketing Specialist, Mr. John M. Hill, and Civil Engineer, Mr. Bill Barnett, visited with Bangladesh public and private sector individuals at both the national and local

level and contributed to the USAID project paper in several areas: (1) five- and ten-year outlook on public and private sector involvement in fertilizer distribution and marketing; (2) technical requirement for a stronger private sector involvement in local distribution; and (3) preliminary benefit:cost assessments of TSP versus DAP as the main source of P_2O_5 .

A report profiling the Bangladesh fertilizer sector in 1978 will be released shortly by IFDC.

Caribbean Basin Study—Profiles are being developed for 20 countries located around the Caribbean Basin. Objectives of the study, under the leadership of Mr. David Braude, IFDC Visiting Economist, are to identify the constraints on fertilizer production, supply, and use in the area.

The role of fertilizer as an input to agriculture and its potential contribution in strategies to increase food production are under evaluation. Ways to expand fertilizer use to its full potential will be explored in partnership with organizations within the Caribbean Basin countries.

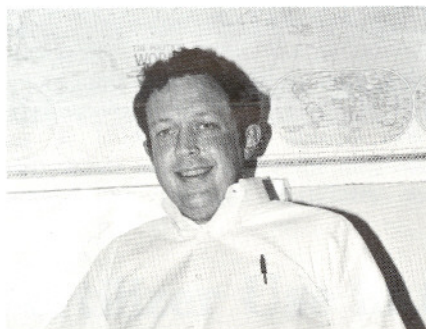
Economics of Phosphate Rock for Direct Application—A market study has been launched by IFDC to determine criteria for potential success of phosphate rock (PR) for direct application in the tropics and subtropics.

An IFDC preliminary evaluation indicates that as the cost per ton of P_2O_5

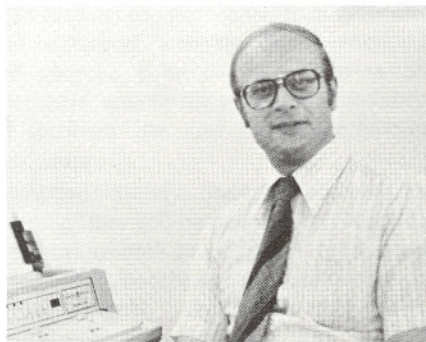
rises, PR may have an increasing advantage over more highly processed phosphates. This is due to the relatively small capital requirement needed to produce fine-ground PR. However, this production cost advantage is countered with higher transportation costs per unit of P_2O_5 from PR due to the lower analysis per unit of product.

This study under the leadership of Mr. John M. Hill, IFDC Marketing Specialist, will provide cost information on alternative phosphate fertilizers. Important market areas of PR for direct application will be surveyed. Information on the character of phosphate rock currently being marketed will be included.

Data on marketing conditions, distribution constraints, costs, agronomic suitability, and availability of supply will be collected and analyzed with a report of the findings scheduled for completion by mid-1979.



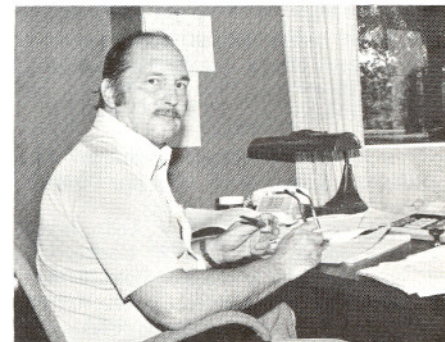
Mr. Gene Harris



Dr. Lueder von Bremen



Mr. David Braude



Mr. John Hill

Fertilizer Use Constraints in the Guatemalan Highlands

How fertilizer decisions are made by the small farmer and the range of factors he has to deal with (e.g., soils, weather, prices, risk, credit, fertilizer, availability, knowledge, etc.) are the focus of a study being conducted in selected regions of Guatemala by Dr. Christina Gladwin, IFDC - Rockefeller Foundation Post-doctoral Fellow.

Building on decision tree methodology and field level research techniques applied earlier in her study of farmers' decisions on fertilizer use in Puebla, Mexico, Dr. Gladwin is interviewing farmers operating under diverse conditions as a basis for developing both an understanding of Guatemalan highland agriculture and a series of models or hypotheses which specify the factors affecting farmer decisions on adoption and use of fertilizers and improved fertilizer practices.

These models will be tested with data from a representative sample of farmers in the same region. The data will also be



In a recent visit to Guatemala, IFDC adoption/demand team members, Dr. Carlos Baanante, Economist (left), and Dr. Kerry Byrnes, Sociologist (far right), assisted Dr. Gladwin with farmer interviews on fertilizer practices.

used to develop estimates of the farm-level demand for fertilizer in the region. The results of Dr. Gladwin's study will be made available to interested Guatemalan agricultural agencies such as

the Institute of Agricultural Science and Technology (ICTA) and DIGESA, the Ministry of Agriculture agency responsible for provision of various agricultural services, including extension.

PUBLICATIONS AND REPRINTS AVAILABLE FROM IFDC

Reports

"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

"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, 1975-1976," published by IFDC.

Papers and Reprints

"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.

"Interpretation of Bray I Extractable P from Acid Soil Treated with Phosphate Rocks," S. H. Chien, *Soil Science*, Vol. 126, No. 2, Aug. 1978.

"Thermodynamic Considerations of the Solubility of Phosphate Rock," S. H. Chien, *Soil Science*, Vol. 123, No. 2, 1977.

"Dissolution Rates of Phosphate Rocks," S. H. Chien, *Soil Science Society of America Journal*, Vol. 41, No. 3, May-June 1977.



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