

Energy and Fertilizer—

New Study Completed

“Energy and Fertilizer: Policy Issues and Options for Developing Countries” was the topic of a major study completed in June by Dr. Mohinder S. Mudahar, Economist, and Mr. Travis P. Hignett, Special Consultant to the Managing Director.

In the study Dr. Mudahar and Mr. Hignett examine the policy issues and linkages between energy and fertilizer sectors, with emphasis on nitrogen; assess the implications of energy supply and prices on fertilizer production and prices; estimate energy requirements for fertilizer manufacturing, packaging, transportation, and application; and evaluate policy options and prospects for energy saving in order to reduce the unfavorable impact of scarce energy supply and high prices on fertilizer and, hence, on food production sectors. Even though the study focuses on developing countries, policymakers, planners, and researchers around the world who deal with different aspects of the fertilizer sector may find it useful.

The study points out that not only is fertilizer a major factor in expanding food output, but its production is highly energy intensive, especially with respect to nitrogen fertilizers which are the most popular fertilizers used in developing countries. Even though the proportion of total commercial energy used in agricultural production is small, it is required and thus becomes critical to human survival.

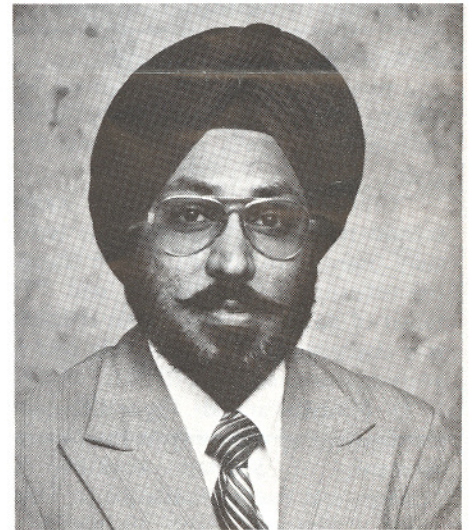
For the world as a whole, fertilizer manufacture and distribution consume only about 1.5% of the total commercial energy, and approximately 3.5% is used in the entire agricultural production sector. Of the total commercial energy used in agricultural production for the world as a whole, 45% is used to supply fertilizers. In developing countries, however, 68% of the energy used is for fertilizers.

The amount of energy required in fertilizer distribution is relatively small. In the case of phosphate and potash, however, more energy is used in their distribution and application than in their production. For the world as a whole, 81% of the total commercial energy used in the fertilizer sector during 1978/79 was used in the manufacture of nitrogen, phosphate, and potash and 19% in their distribution. During the same period the share of energy used in manufacturing and distributing fertilizers was 82% for nitrogen, 11% for phosphate, and 7% for potash. However, nitrogen accounted for 94% of the energy used in manufacturing all the fertilizers consumed in developing countries.

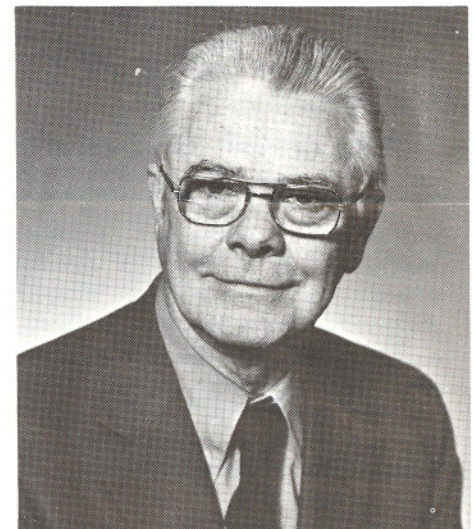
So far as potential saving in energy use is concerned, Dr. Mudahar and Mr. Hignett state that changes and modifications in present ammonia/urea manufacturing processes possibly could result in a maximum energy saving of 32% per ton of urea. But there do not seem to be any commercially feasible technological breakthroughs on the horizon which would result in a major energy saving in nitrogen, phosphate, and potash fertilizer manufacturing.

Energy consumption in fertilizer transportation accounts for the largest amount of energy needed in fertilizer distribution and application. This consumption can be reduced through better planning of fertilizer imports and transportation. However, the underlying objective of fertilizer distribution—to deliver the right kind of fertilizer to the farmer on time, in good condition, and at least cost—must not be jeopardized.

Dr. Mudahar and Mr. Hignett conclude that an improvement in fertilizer use efficiency through improved fertilizer management and technology promises the greatest saving in energy use. The potential economic benefits and energy saving are substantial enough to justify major



Dr. Mohinder S. Mudahar

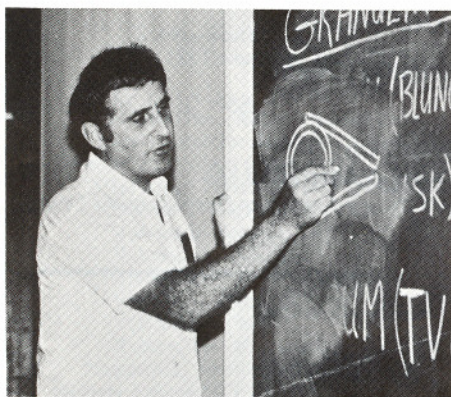


Mr. Travis P. Hignett

research, extension, and policy efforts to improve fertilizer use efficiency. Doubling efficiency of the world's nitrogen use alone, for example, is estimated to result in an annual saving of 20.6 million metric tons of nitrogen worth US \$11.3 billion, a saving of energy equivalent to

(continued page 2)

IFDC Century Club Honors Two



Mr. James J. Schultz, Recipient of the IFDC Century Club Outstanding Service Award.

(from page 1)

262 million barrels of oil worth US \$7.8 billion, or a production of 200-300 million metric tons of additional food grain.

"Greenhouse and field plot experimental results indicate that it is technically possible to at least double nitrogen use efficiency," Dr. Mudahar said. "The target of doubling nitrogen use efficiency is a challenging and worthwhile goal for everyone involved in the fertilizer sector."

Dr. Mudahar and Mr. Hignett discussed the findings of the study at the National Academy of Sciences workshop on "Energy and Food Production in Developing Countries," June 29-July 1, in Washington, D.C.

Headquarters—

New Greenhouse Completed

IFDC completed construction of a second greenhouse in May. The addition of the new greenhouse doubles IFDC's facilities for conducting greenhouse experiments to evaluate the agronomic effectiveness of nitrogen, phosphate, sulfur, and other nutrients as fertilizers.

This research is vital to the development and evaluation of new and modified fertilizer materials before testing in field experiments in collaboration with national institutions and other international centers.

The additional space will enable IFDC scientists to determine more effectively the characteristics that a crop needs in a fertilizer so that chemists and engineers can develop products that meet these requirements. According to Dr. Donald L. McCune, IFDC Managing Director, "The new greenhouse not only gives us the opportunity to evaluate more fertilizers, but I hope it gives us the impetus to develop more fertilizers."

The IFDC Century Club awarded Mr. James J. Schultz, IFDC Technical Assistance/Training Coordinator, the Outstanding Service Award and Mr. Jacob Mbua Ngeve, a University of Georgia graduate student, a study travel grant at the annual Century Club banquet held in April in Muscle Shoals.

The Outstanding Service Award is presented to the employee who has made the most significant contribution to IFDC. Mr. Schultz was chosen to receive the award by a selection committee from a group of nominations furnished by coworkers and supervisors. He has been active in research, technical assistance, and training activities for developing countries since he came to IFDC in 1977. "I am pleased that I was selected," Mr. Schultz said, "but I realize that many other IFDC staff members are also deserving of the award."

The Century Club travel study grant is awarded to a graduate student in agriculture who is dedicated to eliminating world hunger. Mr. Ngeve, a native of

Cameroon, is conducting research on the sweet potato in the Department of Plant Pathology at the University of Georgia. He is studying the factors affecting *Fusarium* wilt disease. This disease is one of the major diseases affecting sweet potato yield in west Africa.

Mr. Ngeve said upon receiving his award, "I believe that by traveling to other U.S. institutions where research is being conducted on the sweet potato I can learn more about the crop and the way other scientists are tackling sweet potato problems. Thanks to the generosity of the IFDC Century Club, I can obtain valuable information that will enable me to help my fellow countrymen."

The IFDC Century Club was formed in 1978 to serve as a liaison between IFDC and the North Alabama area. In addition to many IFDC employees, the membership is also composed of local citizens who have an interest in and appreciation for the worldwide mission of IFDC.



Eleven Bangladesh scientists attended a "Fertilizer Supply and Use Policy Workshop," April 10-17, at IFDC Headquarters. They met with IFDC staff members to draft a report that summarizes the consensus views of the workshop participants regarding suggested policies to be followed by the Government of Bangladesh concerning the efficient supply and use of fertilizer in Bangladesh. From left to right (kneeling) are: Dr. Carlos A. Baanante, IFDC; Mr. A. Razaque, Bangladesh Agricultural Development Corporation (BADC); Mr. A.F.M. Maniruzzaman, Bangladesh Agricultural Research Institute (BARI); Mr. A.J.M. Azizul Islam, Bangladesh Rice Research Institute (BRRI); and Mr. Ata Elahi, BARI; (standing) Mr. John M. Hill, IFDC; Mr. Fred J. Klem, IFDC; Mr. Kobbad Hossain, BADC; Mr. A. Zaman Khan, BADC; Dr. Ray B. Diamond, IFDC; Mr. Alauddin Siddique, Directorate of Agriculture; Dr. Surjit S. Sidhu, IFDC; Mr. Ekramul Ahsan, Bangladesh Agricultural Research Council (BARC); Dr. Dennis H. Parish, IFDC; Dr. Darrell A. Russel, TVA National Fertilizer Development Center; Mr. Munirul Huq, Department of Soil Survey; Mr. Carl R. Amstrup, IFDC; Mr. Nurul Islam Bhuiyan, BRRI; and Mr. Mukhlesur Rahman, Bangladesh Chemical Industries Corporation (BCIC).

Strictly Personal

Obituary

Mr. Robert C. Horn, Research Chemist, died unexpectedly on May 24 of a heart attack. Mr. Horn was 62.

Before coming to IFDC in 1975, Mr. Horn served as research engineer with Hazen Research, Inc.; as chief chemist with Terra Chemicals International, Inc.; as quality control supervisor with Nipak, Inc.; and as senior research chemist with John Deere Chemical Co. His work at IFDC centered around developing ways to modify and economically manufacture modified urea products with nutrient release characteristics that are more closely matched to crop requirements and other nitrogen materials having improved use efficiency. His contribution to planning and layout of IFDC facilities is appreciated by the IFDC staff.

His dedication and leadership will be long remembered. His friends at IFDC will miss him. "There was almost no one that Bob Horn could not get along with," said Dr. Guerry McClellan, Research Coordinator at IFDC. "He was extremely helpful and outgoing."

Another member of the IFDC staff, Jerry R. Clemmons, Chemist, said of Mr. Horn, "His experience was so varied, in both fundamental research and applied research, that he could contribute to several diverse areas of technology besides his own."

Mr. Horn is survived by his wife, Maxine; a son, John Robert, of Florence, Alabama; and a daughter, Mrs. Celia Horn Gabel of Republic, Missouri.



Mr. Robert C. Horn

IFDC's First Retiree

Mr. Sidney Painter, Personnel Officer, became IFDC's first retiree on April 30. He began his career with IFDC in 1975 after having worked with the Tennessee Valley Authority since 1935.

Dr. Donald L. McCune, Managing Director, said, on Mr. Painter's retirement, "Your performance at IFDC during the past 6½ years has been outstanding. You have handled routine as well as complex domestic and international employee situations tactfully and efficiently. Without your sense of responsibility and resourcefulness, I am certain IFDC's development during these critical first years would have been impeded."

Among the gifts presented to Mr. Painter upon his retirement was a plaque with the word "friend" translated into eleven languages. This was an appropriate gift since Mr. Painter was a friend to people from many different countries.

"Mr. Painter was always there when my family had a problem," said Mr. David Braude of Petach Tikva, Israel, and a former IFDC staff member.

Others from throughout the world have a warm appreciation for Mr. Painter.



Mr. Sidney Painter

IFDC Staff Update

Arrivals

Mr. Gene T. Harris—Economist—with the Outreach Division.

Departures

Dr. El-Esawy M. El-Zahaby—Soil Scientist with the Fertilizer Technology Division—returning to the University of Alexandria, Egypt.

Dr. Peter H. Peng—Chemical Engineer with the Fertilizer Technology Division—now with Davy McKee Corporation, Lakeland, Florida.

Mr. Yorio Utsumi—Chemical Engineer with the Fertilizer Technology Division—now with the Tennessee Valley Authority for a 1-year training period.

1981 IFDC GROUP TRAINING PROGRAMS

Maintenance and Production Management Training for Fertilizer Producers, July 13-31 at IFDC Headquarters

Fertilizer Marketing Management Training Program, August 17-September 25 at IFDC Headquarters

Fertilizer Marketing Training Program for the Asian Region, October 18-30 in Bangkok, Thailand

Fertilizer Efficiency Research in the Tropics Training Program, November 2-20 at the International Institute of Tropical Agriculture, Ibadan, Nigeria

Regional Fertilizer Granulation and Bulk-Blending Seminar for Latin America, November 16-20 in Freeport/Lucaya, Grand Bahamas Island

Interested individuals can obtain additional information by writing to the IFDC Training Coordinator.

PUBLICATIONS AND PAPERS AVAILABLE FROM IFDC

Publications and papers are available at no cost except that a shipping and handling charge is required—**Continental United States**, \$3.00 for first publication or paper, \$1.00 for each copy thereafter; **Other Countries**, \$5.00 for first publication or paper, \$2.00 for each copy thereafter.

IFDC Publications

- "Granular Urea—Advantages and Processes," T-1.
- "The Potential for Regional Cooperation in Fertilizer—A Methodology Study of the ASEAN Group," T-2.
- "West Africa Fertilizer Study (Volumes I-VII)." Volume I—Regional Overview, T-3
Volume II—Senegal, T-4
Volume III—Mali, T-5
Volume IV—Upper Volta, T-6
Volume V—Niger, T-7
Volume VI—Chad, T-8
Volume VII—Mauritania, T-9
- "Suggested Fertilizer-Related Policies for Governments & International Agencies," T-10.
- "The Bangladesh Fertilizer Sector, 1978," T-11.
- "Sulfur in the Tropics," T-12.
- "World Fertilizer Situation and Outlook—1978-85," T-13.
- "Organic Nitrogen Compounds for Use as Fertilizers," T-14.
- "Bolivia Fertilizer Situation and Recommendations," T-15.
- "Mexico: The Fertilizer Industry," T-16.
- "Thailand Strategy for Fertilizer Development—A Prefeasibility Study," T-17.
- "Fertilizer Manual," R-1, Price—US \$15.00.
- "International Fertilizer Market Information Sources," R-2.
- "Progress Report, 1976-1977."
- "Annual Report 1978."
- "Annual Report 1979."
- "Seminar on Phosphate Rock for Direct Application," S-1.

Papers

- "Testing the Difference Between Limiting Yields in Quadratic Fertilizer Response Curves," Hernan R. Tejeda, *Agronomy Journal*, Vol. 73, January-February 1981, p. 136-138.
- "Rate Control of Ammonia Volatilization from Rice Paddies," Reinier J. B. Bouwmeester and Paul L.G. Vlek, *Atmospheric Environment*, Vol. 15, pp. 131-140, 1981.
- "Comparison of Modified Urea Fertilizers and Estimation of Their Availability Coefficient Using Quadratic Models," Hernan R. Tejeda, Chong W. Hong, and Paul L.G. Vlek, *Soil Science Society of America Journal*, Vol. 44, No. 6:1256-1262, November-December 1980.
- "Research on Modified Fertilizer Materials for Use in Developing-Country Agriculture," D. H. Parish, L. L. Hammond, and E. T. Craswell, IFDC Paper Series, No. 2, December 1980.
- "Dissolution of North Carolina Phosphate Rock in Acid Colombian Soils as Related to Soil Properties," S. H. Chien, L. A. Leon, and H. R. Tejeda, *Soil Science Society of America Journal*, Vol. 44, No. 6: 1267-1271, November-December 1980.
- "Mineralogy of Carbonate Fluorapatites," Guerry H. McClellan, *Journal of the Geological Society*, Vol. 137, part 6, p. 675-681, November 1980.

"Urease Activity and Inhibition in Flooded Soil Systems," P.L.G. Vlek, J. M. Stumpe, and B. H. Byrnes, *Fertilizer Research*, Vol. 1, No. 3:191-202, July-September 1980.

"Deep Placement: A Method of Nitrogen Fertilizer Application Compatible with Algal Nitrogen Fixation in Wetland Rice Soils," P.A. Roger, S. A. Kulasooriya, A. C. Tirol, and E. T. Craswell, *Plant and Soil*, Vol. 57, p. 137-142, 1980.

"Reactions of Partially Acidulated Phosphate Rock With Soils from the Tropics," U. Mokwunye and S. H. Chien, *Soil Science Society of America Journal*, Vol. 44, No. 3, May-June 1980.

"Recent Developments in Research on Nitrogen Fertilizers for Rice," E. T. Craswell and S. K. De Datta, IRRI Research Paper Series, No. 49, May 1980.

"Production of Wet-Process Phosphoric Acid," T. P. Hignett, Second International Congress on Phosphorus Compounds, Boston, Mass., April 21-25, 1980, *Proceedings*, IMPHOS, Paris, France.

"Kinetics of Dissolution of Phosphate Rocks in Soils," S. H. Chien, W. R. Clayton, and G. H. McClellan, *Soil Science Society of America Journal*, Vol. 44, No. 2, March-April 1980.

"Application of Elovich Equation to the Kinetics of Phosphate Release and Sorption in Soils," S. H. Chien and W. R. Clayton, *Soil Science Society of America Journal*, Vol. 44, No. 2, March-April 1980.

"Phosphorus Availability from Partial Acidulation of Two Phosphate Rocks," L. L. Hammond, S. H. Chien, and J. R. Polo, *Fertilizer Research*, Vol. 1, No. 1, January-March 1980.

"Effect of Urea Placement on Leaching Losses of Nitrogen from Flooded Rice Soils," P.L.G. Vlek, B. H. Byrnes, and E. T. Craswell, *Plant and Soil*, Vol. 54, 441-449 (1980).

"Greenhouse Evaluation of Nitrogen Fertilizers for Rice," E. T. Craswell and P.L.G. Vlek, *Soil Science Society of America Journal*, Vol. 43, No. 6, November-December 1979.

"Transportation and Storage of Ammonia," Travis P. Hignett, to be published in the proceedings of the Fertilizer Industry Round Table, Washington, D.C., October 30-November 1, 1979.

"Technology of Production of Fertilizers Containing Ca, Mg, and S," Travis P. Hignett, to be published in the proceedings of the Colombian Soil Science Society, Colloquium on Saline Soils and Secondary Elements in Colombian Agriculture, Palmira, Colombia, September 19-21, 1979.

"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.

"Impact of a Training Program on Participant's Mastery of Fertilizer-Related Subject Matter: An Evaluation of a Fertilizer Marketing and Distribution Course," K. J. Byrnes, presented at the Annual Meeting of the Rural Sociological Society, Burlington, Vermont, August 24-25, 1979.

"Quality Factors of Phosphate Raw Materials," Guerry H. McClellan, Proceedings of the Fertilizer Raw Materials Resources Workshop, pp. 359-378, Honolulu, Hawaii, August 20-24, 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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