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Report

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

IFDC Phosphate Research Impacts Malaysian Fertilizer Sector

"We would like to thank IFDC and Dr. S. H. Chien for his contribution toward changing the concept of the use of phosphate rock for direct application in Malaysia," says Peter Sze, General Manager of Pengedar Bahan Pertanian Sendirian Berhad (PBP).

During a Southeast Asia Conference in Kuala Lumpur organized by the International Fertilizer Industry Association (IFA) and the Fertilizer Advisory Development and Information Network for Asia and the Pacific (FADINAP) in 1994, the PBP General Manager first heard Chien present his research findings on the use of phosphate rock for direct application. Chien's research has shown that direct application of phosphate rock may be more cost-effective than the use of expensive water-soluble phosphate fertilizers such as triple superphosphate and diammonium phosphate, under certain soil, crop, and agroclimatic conditions. Primary factors affecting the agronomic effectiveness of phosphate rock for direct application are sources of phosphate rock, soil properties, and crop species.

"We realized that we must get this important information out to the plantations and the end users," Sze says. "For a long time, we had traditionally been using the lower reactive rocks without question; we now know that these are not the best for our acidic soil conditions."

In Malaysia, use of phosphate rock for direct application is ideal because of the acidic nature of soils, relatively high temperature, and high rainfall. These conditions are favorable to the use of phosphate rock for production of long-term plantation crops such as rubber and oil palm. Selection of a proper source of phosphate rock for use, however, requires some understanding of the phosphate rock's properties, which vary widely among rock sources in chemical and mineralogical compositions. A good choice of an effective source is the first step to maximize the benefit of using phosphate rock for direct application.

Although Malaysia has been using phosphate rock for a long time, many of its researchers were not aware that phosphate rock varies widely in reactivity and agronomic effectiveness. In the past limited research has been done to study the reactivity and agronomic effectiveness of various sources of phosphate rock. Because of the lack of this information, the question regarding whether reactivity would affect the agronomic effectiveness of phosphate rock for plantation crops was frequently raised. Some researchers began to study this question 3-4 years ago. However, it would take several more years to answer this important question in Malaysia, where different sources of phosphate rock are now being sold in the market.

Two additional seminars presented by Chien in 1995 and 1996 have created an awareness such that the basic concepts including the availability of P_2O_5 based on reactivity now assume an importance that they never did before. Many estate farmers have now changed to the use of highly reactive phosphate rocks for direct application. The Malaysian company is now trying to encourage the use of highly reactive phosphate rock for short-term crops such as rice and pineapples and longer term crops like fruits and plantation crops such as oil palm and rubber trees.

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(Photo courtesy of Pengedar Bahan Pertanian Sendirian Berhad)

Dr. S. H. Chien, IFDC Senior Scientist—Soil Chemistry, presents a seminar in Kuala Lumpur, Malaysia, on the direct application of phosphate rock.

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IFDC is a public, international, nonprofit organization, governed by an international board of directors with representation from developed and developing countries. The Center is supported by various bilateral and multilateral aid agencies, private foundations, and national governments. IFDC focuses on increasing and sustaining food and agricultural productivity in developing countries through the development and transfer of effective and environmentally sound plant nutrient technology and agribusiness expertise.

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Center to Benefit from Newest Board Member's Agribusiness Expertise

The newest IFDC Board member brings a wealth of experience in the agribusiness arena at a time when the Center is expanding its activities in the various facets of agribusiness.

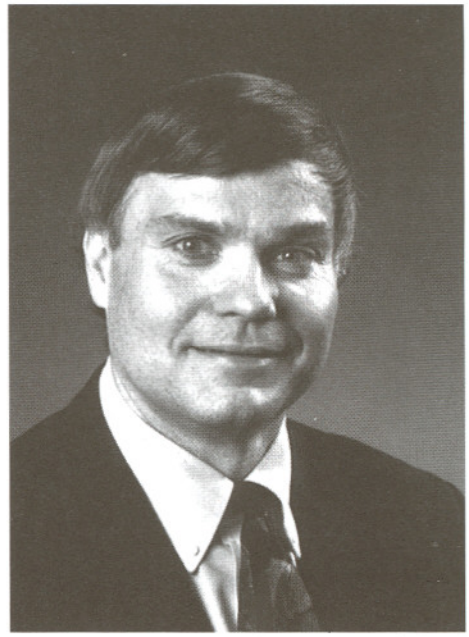
A. J. (Al) Giese, Senior Vice President, Agronomy – Cenex/Land O'Lakes, attended his first IFDC Board meeting in November. After beginning his career with Land O'Lakes in 1971, Giese has held management positions in the Petroleum, Plant Food, Agricultural Chemicals, and Seed Divisions of the Company.

Besides serving on the IFDC Board, Giese is a member of the Board of The Fertilizer Institute; he serves on the Executive Committee and has served as Board Chairman. In addition, he serves on the Boards of Ag-Chem Equipment Co., Inc., Minnetonka, Minnesota; and RDI Technologies, Spicer, Minnesota. Giese is an elected member of the Industry Advisory Council to the University of Minnesota College of Agricultural, Food, and Environmental Sciences. A product of a Northwest Iowa family farm background, Giese is a graduate of Buena Vista College, Storm Lake, Iowa.

Giese sees a bright future ahead for the fertilizer industry. "The (fertilizer) industry has a critically important future role to play in a global agricultural system that meets the world's food requirements. With the world experiencing significant population growth and with developing economies in the third world, increased and sustainable food production is a need that must be met. Maintaining adequate soil fertility levels is one of the most obvious ways to accomplish these goals."

In the pursuit of global food security, he envisions that IFDC has a critical role to play. "IFDC's expertise, experienced personnel, and global infrastructure are well positioned for the organization to positively impact global food security. Improving and increasing food production, and providing expertise for agricultural based economic development and environmental stewardship are roles for which IFDC is well suited to allow the Center to contribute dramatically to world food security."

Because of Cenex/Land O'Lakes' heavy involvement in international agribusiness, IFDC should benefit greatly from Giese's tenure on the Center's Board. "Since 1981, we (Cenex/Land O'Lakes) have been transferring our expertise to farmers and agribusinesses worldwide. Our international mission is to provide commodities and services to our customers that will stimulate economic growth; assist their countries' emergence into worldwide markets; and establish long-term relationships with them. The Company has provided services and products in Latin America, the Caribbean, Central and Eastern Europe, Asia, Africa, and the Far East/Pacific Rim. We specialize in, but are not limited to, management and technical assistance; short and long-term farm production and agribusiness training; dairy industry, cooperative, product and market development; needs assessment and sector studies; licensing agreements for the production of Land O'Lakes food and agricultural products; selling cattle; coordinating the selection, purchase, and export of breeding stock."



(Photo courtesy of Cenex/ Land O'Lakes)

Mr. A. J. (Al) Giese, Senior Vice President, Agronomy – Cenex/Land O'Lakes, and Member, IFDC Board of Directors

Fertilizer's Role in Food Security and Environmental Protection: Subject of IFPRI 2020 Vision Paper

"The Role of Fertilizer in Sustaining Food Security and Protecting the Environment to 2020" is the title of a new discussion paper that has been published as part of the 2020 Vision initiative by the International Food Policy Research Institute. The paper, authored by IFDC's Senior Economist, Dr. Balu L. Bumb, and IFDC's Director of Research and Development Division, Dr. Carlos A. Baanante, reviews past trends in fertilizer use, estimates future needs, and assesses technical and policy measures for dealing with environmental and energy concerns related to fertilizer use.

According to Dr. Per Pinstrup-Andersen, Director General of IFPRI, policymakers will find the contents of the paper useful in making informed decisions to help meet the challenge of reducing hunger and poverty by 2020.

The paper points out that the world's population is growing by about 90 million people per year. To feed future generations adequately will require gains in output that are only possible with a plentiful supply of plant nutrients to sustain the needed increases in crop yields. However, in recent years heavy use of fertilizer has come under attack for its possible contribution to environmental ills ranging from nitrate leaching to greenhouse gas emissions to wasteful use of hydrocarbons. There is no doubt that misuse of fertilizer (organic or inorganic) can cause environmental damage, but as the authors point out here, failure to replenish nutrients in soils, especially nutrient-poor tropical soils, "can initiate and perpetuate a downward spiral of soil degradation, increased deforestation, and depletion of the natural resource base," ultimately leading to increased poverty, hunger, malnutrition, and environmental degradation.

During the mid-1960s many analysts predicted that the world's population was bound for starvation. Then no one questioned the importance of fertilizer in increasing food production in the developing countries. Quite the contrary, fertilizer was considered a key component of a technology package--seed, water, and fertilizer--that was responsible for creating the Green Revolution, which helped many food-deficit countries such as India and China achieve food self-sufficiency in a short period of time. More recently, fertilizer has been attacked because of heavy use in the developed countries where it is suspected of having detrimental effects through nitrate leaching, eutrophication, and greenhouse gas emissions. Therefore, fertilizer use per se has been falsely accused of being an enemy of the environment. Although fertilizer use has increased rapidly in the last few decades, especially in East Asia, it is still too low to cause environmental damage in many developing countries. In fact, in most countries of sub-Saharan Africa, the low fertilizer application rates are causing soil erosion and low crop productivity. In some areas, such as the Punjab in India, Java in Indonesia, and the Delta region of Egypt, where application rates are high, the environmental impact should be monitored to avoid potential damage.

The paper indicates that the projected fertilizer demand in developing countries is expected to fall short of the amount needed by 2020 to meet goals for food security and sustainable agriculture (resource conservation and nutrient replenishment). Hence, additional efforts must be made to promote increased levels of fertilizer use, especially in sub-Saharan Africa. In the future, however, fertilizer's role should be approached differently. Emphasis should be on environmentally sustainable growth so that the goals of food security, agricultural growth, and environmental protection are not sacrificed.

To obtain a copy of this publication, interested parties should address their requests to the International Food Policy Research Institute (IFPRI), 1200 Seventeenth Street, NW, Washington, D.C. 20036-3006; FAX: 1-202-467-4439; Email: ifpri@cgnet.com; http://www.cgiar.org/ifpri.

Agribusiness Credit Fund in Bangladesh Achieves Record Rates of Utilization

Within its first 5 months of operation, the US $26 million Agribusiness Credit Fund (ACF) has exceeded all previous rates of utilization for business loan programs in Bangladesh. Other longer running internationally funded agribusiness loan programs have achieved utilization rates of only 15%-20%. The ACF – funded by USAID and the Government of Bangladesh and managed by IFDC's Agrobased Industries and Technology Development Project (ATDP) – has disbursed or sanctioned more than 31% of the entire fund to the private sector since July. Through its nine participating lending institutions, this fund has already provided more than 708 million Takas (almost US $17 million) – including the matching funds of the banks themselves – to Bangladeshi agribusinesses.

"Banks grant ACF loans more quickly because we have not imposed unfamiliar procedures or conditions," says Ronald P. Black, ATDP Chief of Party. "We agreed with the (nine participating) banks (which process and grant the individual

AGRIBUSINESS *continued on page 4*

AGRIBUSINESS *continued from page 3*

loans) to let them use their own lending procedures. We helped make more money available for lending to the agricultural sector, and let the banks do the rest." Now, when an agribusiness entrepreneur visits his local bank, the funds are readily available and the local banker can quickly lend them without special procedures or external reviews.

ATDP/IFDC complements this approach of noninterference with intensive proactive technical assistance to the participating lending institutions. The project provides training to loan officers in agricultural loan processing, prepares technical and financial feasibility studies on different types of agribusiness enterprises for the banks' reference, and consults with bankers on individual loans on request. In this way, ATDP encourages sound lending practices while allowing the market to determine which areas of the agricultural sector will naturally emerge.

The banks seem to appreciate both the project's willingness to allow them to follow their own lending procedures for granting ACF loans and their ability to obtain specialized technical assistance when needed. They are encouraging their loan officers to increase their lending in the agribusiness sector.

The results have been outstanding. Loan officers who previously were not interested in agricultural loans are now encouraging applications and processing them faster than previously thought possible. The excitement for agribusiness investment has even become contagious. After reviewing a feasibility study on poultry farming, one bank officer said to an ATDP credit specialist, "I am thinking of getting out of banking and going into the poultry business!"

At a time when other business loan programs are disappearing because of low utilization, it is encouraging that the ACF program – which is demand-driven and goes with the flow – is being flooded with loan requests.

Seminar on Large-Scale Use of Burkina Faso Phosphate Rock Produces National Action Plan

In cooperation with its national collaborators in Burkina Faso, IFDC-Africa conducted a seminar on the large-scale use of Burkina Faso phosphate rock; this seminar took place during October 21-24, 1996, in Ouagadougou, Burkina Faso. The purpose of the seminar was to enhance the commitment of all the actors for the development and implementation of a national strategy for the large-scale use of Burkina phosphate. In addition, the seminar identified the main elements of an action plan for the use of Burkina phosphate for the coming cropping season, 1997-98.

Participants in the seminar included farmers, development specialists from different ministries, researchers, policymakers, the private sector, nongovernmental organizations, projects, and donors. One researcher from Niger and one from Mali with experience in the use of phosphate rock also attended the seminar.

"During the seminar five primary issues were discussed," says Dr. Niama Nango Dembele, Rockefeller Foundation Fellow, based in Burkina Faso with the IFDC Soil Fertility Unit. "These issues include the physical characteristics of Burkina phosphate, its agronomic potential, and the application techniques. In addition, pricing, financing, and credit arrangements were also covered. Information on the use of Burkina phosphate, to be disseminated via the extension service, was also discussed. Research regarding the application techniques and complementary technologies and the supply and marketing of Burkina phosphate were also included in the topics for discussion."

Six working groups that considered these issues developed a national strategy after agreeing on the need for using Burkina phosphate to correct the soil's phosphorus deficiency. The national strategy is comprised of two phases: one phase to promote the involvement of the state and another phase that would rely on the private sector for the production and distribution of Burkina phosphate.

"The promotion phase will extend for 5 years and will focus on five main elements," Dembele says. "First, publicity, education, and training will convey information on the benefits of using Burkina phosphate as a soil amendment; farm-level trials will be implemented. A decentralized distribution system to ensure farmers' access to Burkina phosphate will be established. The supply of Burkina phosphate will be increased through the expansion of the production capacity over the years with a target level of 60,000 tons per year. The use of Burkina phosphate, including the quantities distributed, prices, agronomic and economic effects at the micro and macro levels, will be monitored and evaluated."

The promotion phase is targeted to create a strong demand for Burkina phosphate within the farming community during the first 5 years. After the initial phase, the private sector will assume from the state the production and distribution of the product. However, it will require another 5-year period to develop a strong private production and distribution system. Thus, the implementation of the national strategy will require a total of 10 years.

A pilot project is scheduled to begin during the coming year's cropping season, 1997/98. Given the current production capacity of 3,500 tons per year of Burkina phosphate, approximately 1,000-1,500 tons of Burkina phosphate will be available for the pilot project. Current demand is approximately 2,000-2,500 tons per year.

SEMINAR *continued on page 6*

IFDC and Kenyan Ministry of Agriculture Conduct Plant Nutrient Management Training Program

In cosponsorship with the Ministry of Agriculture, Livestock Development and Marketing, Government of Kenya, IFDC organized in Nairobi an international training program on plant nutrient management for sustainable agriculture during October 14-19, 1996.

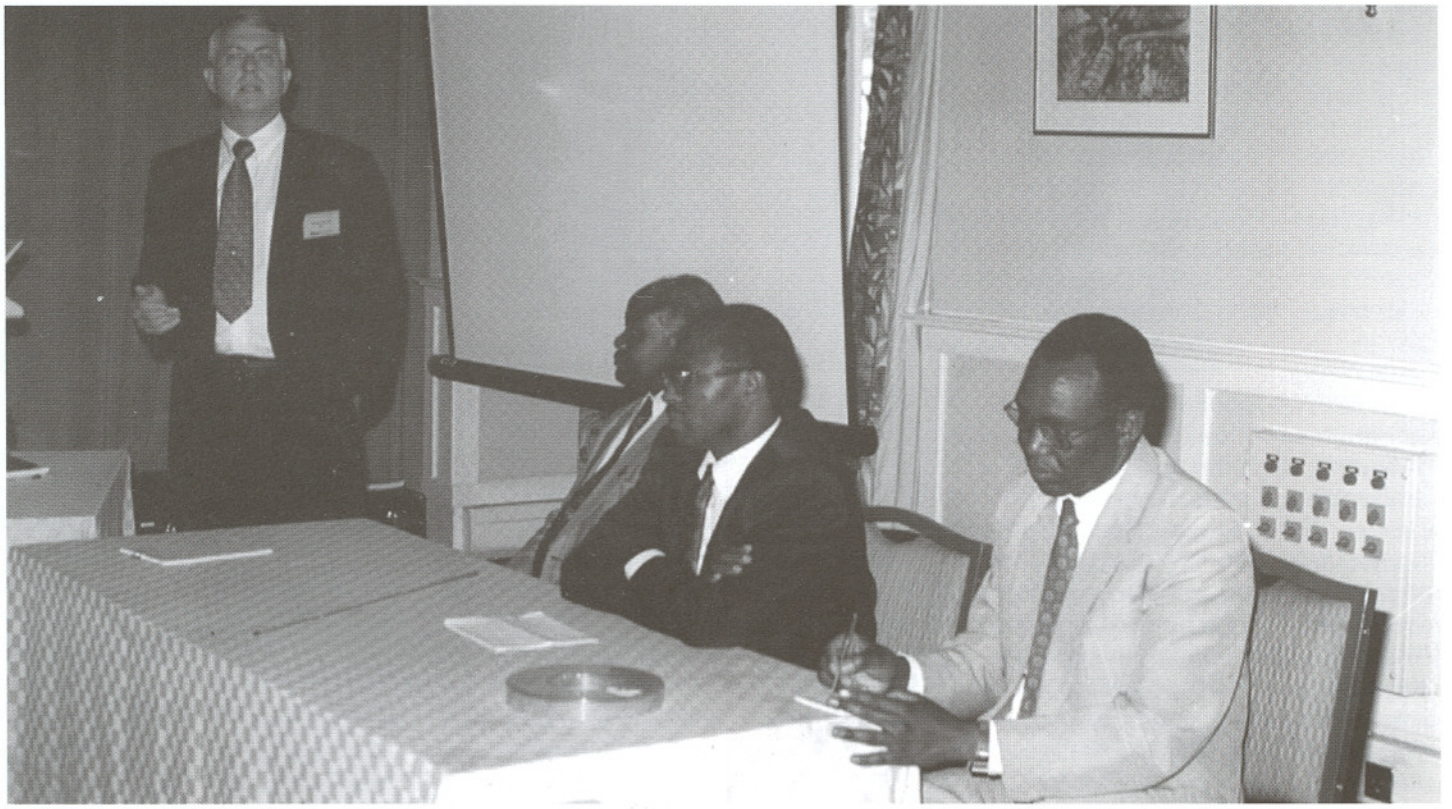
This training program was designed to develop an understanding by senior agricultural researchers and extension personnel of the factors affecting soil fertility within a sustainability context, that is, to increase and maintain crop production and farm profitability with a minimum of off-farm inputs through protection and conservation of natural resources, and to develop an understanding of the root causes of unsustainable practices. The program included discussions on improving the efficiency of the use of external inputs, multiple benefits from more sustainable practices, protection of soils from erosion, and use of onfarm sources of nutrients.

Twenty-two agriculturalists participated in the program; they were from Egypt, Ghana, India, Kenya, Mozambique, Nigeria, Pakistan, Republic of South Africa, Saudi Arabia, Sri Lanka, and Tanzania.

Conducting this program were Dr. B. H. Byrnes, IFDC Soil Fertility Scientist; R. S. Giroti, Director, IFDC Human Resources Development Unit; and Dr. A. M. Bationo, IFDC-Africa Senior Soil Fertility Scientist. In addition, speakers from national and international institutions presented lectures; these included A. H. Ali, International Centre of Insect Physiology and Ecology (ICIPE); P.J.M. Cooper, International Centre for Research in Agroforestry (ICRAF); P.K. Thornton and J. Tanner, International Livestock Research Institute (ILRI); D. Odee, Kenya Forestry Research Institute; J. I. Itabari, Katumani Research Station; M. Gichura, Tropical Soil Biology and Fertility Program (TSBF); I. Mulagoli, German Association for Technical Cooperation (GTZ); and J. Ransom, International Center for the Improvement of Maize and Wheat (CIMMYT).

Professor Karega Mutahi, Permanent Secretary to the Government of Kenya, Ministry of Agriculture, opened the program. Also present were T. Tuei, Director of Agriculture, Ministry of Agriculture, and P. Amukoa, Deputy Director of Agriculture. In his opening remarks, Professor Mutahi discussed the importance of sustainability in the present agricultural situation. He described the agricultural situation in Kenya and the various measures that the Government was taking to improve Kenyan agriculture. Dr. Cyrus Nderitu, Director of the Kenyan Agricultural Research Institute, presented the certificates to the participants.

During field trips to farms located in Kabaa, Lumbwa, and Mwala, and the Agricultural Experiment Station in Katumani, the participants observed techniques for water harvesting and use of organic material.



Dr. B. H. Byrnes, IFDC Soil Fertility Scientist, makes a presentation during the IFDC Plant Nutrient Management International Training Program conducted in Kenya.

(Photo by R. S. Giroti)

RECENT IFDC PUBLICATIONS

Direct Application of Phosphate Rock and Appropriate Technology Fertilizers in Asia: What Hinders Acceptance and Growth, the proceedings of an international workshop, was recently published by IFDC. This is the proceedings of an international workshop that was conducted in Sri Lanka and was cosponsored by IFDC and the Institute of Fundamental Studies (IFS) of Kandy, Sri Lanka. The publication, which was edited by Steven J. Van Kauwenbergh, IFDC Senior Specialist – Project Engineering/Geology; Dr. Deborah T. Hellums, IFDC Scientist – Systems Modeling (Soil Fertility); and K. Dahanayake, IFS Professor of Geology, contains the presentations and country reports that were presented during the workshop. The topics of the presentations include the technical, economic, environmental, and practical considerations in the development and use of direct application phosphate rock and appropriate technology phosphate fertilizers. The country reports focused on the agricultural situation, use of fertilizer, and use and demand for direct application phosphate rock or appropriate technology fertilizers in the delegates' countries. Interested parties may address their orders to the IFDC Purchasing Department and request IFDC Publication SP-24; the price of the publication is US $35.00.

The Basics of Zinc in Crop Production, an IFDC technical bulletin, was recently released. The publication was coauthored by Dr. Raman G. Menon, IFDC Senior Soil Fertility Scientist, and K. Z. Rahman, Liaison Officer. This bulletin describes the functions of zinc in plants and discusses zinc deficiencies and toxicity, geographical distribution of zinc deficiencies, zinc interaction with other nutrients, soil tests, and plant analysis, types of zinc fertilizers, application methods and rates, and crop response to zinc. Some commercial sources of agronomic zinc are also indicated. The price of this publication is US $30.00; to order a copy, please address your inquiries to the IFDC Purchasing Department and request IFDC Technical Bulletin, T-34.

Restoring and Maintaining the Productivity of West African Soils: Key to Sustainable Development, a miscellaneous fertilizer study, was recently published by IFDC-Africa; the Agricultural Economics Research Institute, The Hague, Netherlands (LEI-DLO); and the Winand Staring Centre for Integrated Land, Soil and Water Research (SC-DLO). This publication, which was edited by Dr. A. Uzo Mokwunye, Director of IFDC-Africa; Dr. A. de Jager of LEI-DLO; and Dr. E.M.A. Smaling of SC-DLO, discusses the primary problems associated with agricultural development in West Africa; the diagnosis: farming systems and soil fertility; the tools required – policy and technology options, including economic policies, fertilizer market development, institutions, and support services; technologies for restoring soil fertility; and needed interventions. Orders for this publication should be addressed to IFDC-Africa, BP 4483, Lomé, Togo; please request Miscellaneous Fertilizer Study No. 14 (price, US $20.00).

IFDC Annual Report, 1995 – IFDC recently released its annual report for 1995. In this report the compelling issues of poverty, population pressures, hunger, and malnutrition are seen through the eyes of representative individuals from the developing countries and Eastern Europe. The activities and success stories that are presented in this report represent only a small segment of IFDC's achievements during 1995. This complimentary report, Circular IFDC – S-19, can be ordered from the IFDC Purchasing Department.

SEMINAR *continued from page 4*

The second phase of the strategy will focus on the withdrawal of the state from the production and distribution of Burkina phosphate; the private sector will then assume these functions. When production reaches 60,000 tons per year, the private sector will be encouraged to use Burkina phosphate as raw material for fertilizer production in Burkina Faso.

During the second phase, the state will focus primarily on quality control of Burkina phosphate and the provision of facilitating services to the private sector.

For the successful implementation of the overall strategy, three complementary policy actions were identified. These actions include the improvement and construction of a rural road system, the construction of storage facilities in rural areas, and the improvement of farmers' access to farm implements through adequate investment credit arrangements.

MALAYSIA *continued from page 1*

"A significant development in all of this is that the government organization, Standard Research Institute of Malaysia (SIRIM), that sets minimum standards for the use of phosphate rock, has now modified its standards to accommodate the use of reactive phosphate with regard to particle size." Sze says. "Previously the emphasis was on total P_2O_5 and particle size of the phosphate rock. This shows that Dr. S.H. Chien and IFDC have contributed tremendously in influencing government policy regarding the concept of phosphate rock use for direct application in Malaysia. The experience in Malaysia where research work carried out at IFDC is put to use for commercial applications augurs well for IFDC to continue to do the same in other South East Asian countries."

ANNOUNCEMENTS

Dr. Hendrik Breman, an agricultural development specialist with 25 years experience in sub-Saharan Africa, has been named Director of IFDC-Africa. One of his most recent positions was project leader of Production Soudano-Sahelienne, a joint research project of the Institut d'Economie Rurale in Mali, Research Institute for Agrobiology and Soil Fertility (AB-DLO) and the Departments of Nature Conservation and Development Economics, Agricultural University, Wageningen, the Netherlands. For the past 6 years, Breman has served as Deputy Head of the Department of Agrosystems Research of AB-DLO. He is a member of several advisory committees, including the Board of Trustees of the International Service for National Agricultural Research (ISNAR).

Mr. Jorge R. Polo was recently named Director of the Outreach Division. A long-time employee of IFDC, Polo served as Coordinator of the Engineering and Technology Program for several years. He has made numerous contributions to that IFDC program over the past two decades. Polo succeeds **Mr. James J. Schultz**, who retired at the end of August 1996, after directing the programs of the Outreach Division for the past 4 years. Schultz served as a Fertilizer Production Specialist for several years and coordinated much of the technical assistance work of IFDC.

Mr. R. S. Giroti was recently promoted to Director of Human Resources Development. Giroti has coordinated IFDC's training programs during the past two decades. Under Giroti's able guidance, IFDC's training component has experienced exceptional growth. During his tenure more than 6,500 participants from 140+ countries have been trained in IFDC's programs.

Dr. Willem Geert Koster recently joined IFDC-Africa as a policy economist/project coordinator. Koster has more than 10 years of professional experience, acquired in Sri Lanka, Peru, North Yemen, and Indonesia. He has served on the faculty of development economics, Agrarian Research and Training Institute in Sri Lanka; participated in an Inter-American Institute of Agricultural Sciences (IICA) research project in Peru; worked on a Directoraat Generaal voor Internationale Samenwerking (DGIS) agricultural sector project in North Yemen as an associate agricultural economist; participated in another DGIS project designed to strengthen the socioeconomic department of the Lembang Horticultural Research Institute in Indonesia; and participated in the Kalimantan Upland Farming Systems Development Project.

Mr. Gildardo Carmona, IFDC Greenhouse Services Coordinator, recently received a Mexican award. He was honored on September 4, 1996, for his leadership as former President of the Mexican Association of Higher Agricultural Education. Carmona was cited for his significant contributions to agricultural research and education in Mexico during the past 25 years.

Dr. Uzo Mokwunye, former Director of the IFDC Africa Division, Lomé, Togo, has accepted a position as Director of the Institute for Natural Resources in Africa, United Nations' University in Accra, Ghana. Mokwunye, who had been with IFDC for 16 years, had previously held the position of Coordinator of Agronomic Research of IFDC-Africa. In his new position with the U.N. University in Ghana, Mokwunye will be responsible for developing scientific and technological capacities in Africa for effective management of the continent's natural resources.

Dr. Hiram Grove, a former IFDC Board member, passed away recently in Chile. IFDC benefited from his guidance and wisdom from 1989 to 1995.

Mr. Owen W. Livingston, former Director of the Administration Division, recently passed away in Florence, Alabama. Livingston was one of the first IFDC employees and for many years headed the former Fertilizer Technology Division and the Outreach Division. He retired from IFDC in April 1996.

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International Fertilizer Development Center
1997 Training Calendar

Training Program/Study Tour	Dates	Location
1. ICAR-IFDC International Training Program on Computer Simulation for Crop Growth, Soil-Water Nutrient Dynamics, and Fertilizer Management	February 17-28	Modipuram, India
2. EFDC-IFDC Regional Fertilizer Marketing Training Program	April 12-25	Talkha, Egypt
3. International Workshop on Development of National Strategies for Soil Fertility Recapitalization in Sub-Saharan Africa (Including the Use of Phosphate Rock and Other Amendments)	April 22-25	Lomé, Togo
4. International Training Program on Computer Simulation of Crop Growth and Management Responses	May 12-23	Muscle Shoals, Alabama (U.S.A.)
5. IFDC-FSSA International Training Program on Fertilizer Marketing and Soil Fertility Management	July 14-25	Johannesburg/Pretoria, South Africa
6. International Training Program and Study Tour on Fertilizer Marketing Challenges	August 11-29	Tampa, Florida; Muscle Shoals, Alabama; St. Louis, Missouri; Chicago, Illinois (U.S.A.)
7. International Workshop on Environment and Fertilizers	September 17-19	Atlanta, Georgia (U.S.A.)
8. International Study Tour/Workshop on Management of Fertilizer Production and Marketing Units	October 14-29	Venezuela; Trinidad/Tobago; Tampa, Florida; New Orleans and Baton Rouge, Louisiana (U.S.A.)
9. IFDC/APPI/FADINAP International Fertilizer Marketing Training Program: New Challenges	December 1-12	Jakarta, Indonesia