

Report

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

Tampa, Florida, U.S.A.—

International workshop explores environmental issues facing phosphate fertilizer industry

Organized by IFDC with funding assistance from the United Nations Development Programme (UNDP), a recent workshop on phosphate fertilizers and the environment examined a number of environmentally driven technical, economic, regulatory, and political issues and assessed their ever-increasing impact on the global phosphate fertilizer industry. The workshop was conducted during March 23-27, 1992, in Tampa, Florida. Seventy-nine delegates and invited speakers from 19 countries participated in this workshop.

J. J. Schultz, IFDC Fertilizer Production Specialist and Manager of IFDC's Environmental Assessment Program, served as the workshop manager. "The goal of these deliberations was to reach an improved understanding of the issues and the initiatives that may be needed to sustain industrial development while at the same time ensuring responsible environmental stewardship and abundant agricultural production," Schultz says.

The workshop deliberations considered a number of issues including the following:

- What phosphate fertilizer production technologies and products are needed for optimum agricultural productivity?
- What are the environmental issues facing the phosphate fertilizer industry?
- How are management and technology being mobilized to cope with the existing and emerging environmental issues?
- What is the cost of responding to existing or proposed regulatory sce-

narios in the phosphate fertilizer industry?

- What alternatives are available for structuring a more environmentally benign phosphate fertilizer industry?
- How do these environmental issues affect the farmer and his ability to produce abundant supplies of food and fiber at an affordable cost in the developed and developing economies?

Despite the differences in opinion, by the end of the workshop a consensus emerged relative to a number of issues, according to Schultz. The conclusions were as follows:

1. Progress is being made by the industry in responding to real and perceived environmental pressures, but there is still much to do.
2. Much more research is needed to ensure that environmental regulations are more soundly based on science.
3. The economic implications of environmental regulations are global in nature; therefore, the global economic impact of proposed regulations must be more fully researched and addressed.

(Continued on page 8)



(Photos courtesy, IMC Fertilizer, Inc.)

Workshop delegates view mined land prior to reclamation.



Wetlands reclamation is a major priority in Florida (U.S.A.).

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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 creating sustainable agricultural productivity and food production in the tropics and subtropics through the development and use of improved and environmentally sound fertilizers and fertilization practices.

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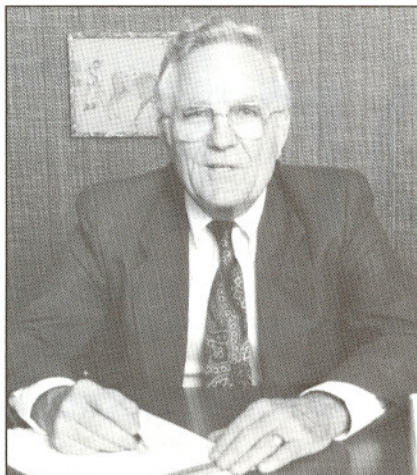
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President's Report



(Photo by Charles E. Butler)

Dr. Paul J. Stangel
IFDC President and
Chief Executive Officer

The events of the recently completed quarter continue to reflect IFDC's commitment to broaden the scope of its program activities, sensitize these to consumer demand/need, strengthen existing partnerships, and develop new ones with international and national institutions, agencies, and companies dedicated to carrying out research that will ensure efficient use of soil, water, and nutrients necessary to conserve the natural resource base and sustain agricultural production of a given country. Two areas of activities illustrate this overall effort.

Sustainable land management coalition takes shape

During May IFDC, along with several other international organizations, formed a coalition to discuss and identify areas for closer collaboration in research on soil, water, and nutrient management in rainfed systems of the tropics. The other members of the group include the International Board for Soil Research and Management (IBSRAM), the International Centre for Research in Agroforestry (ICRAF), TropSoils, and the Tropical Soil Biology and Fertility Programme (TSBF). By pooling their resources in research and support services, the coalition members should reduce duplication of research and, in turn, be more efficient as they work together.

The coalition members noted that the most significant gap in international agricultural research is in the area of soil/

water/nutrient studies, particularly as these relate to sustainable land management and environmental concerns. Sustainable land management (SLM) is a "system of technologies that aims to integrate ecological and socioeconomic principles in the management of land for agricultural and other uses to achieve intergenerational equity."

The newly formed coalition, working with the Food and Agriculture Organization of the United Nations, the International Society of Soil Science, and Agriculture Canada, plans to develop a framework for evaluation of SLM to synthesize the concepts and provide the context to evaluate land. This framework is expected to have significant applications in all aspects of research and development and in environmental assessment. It will provide the scientific basis for evaluating the environmental impact of proposed land-use changes. When coupled with recent computer technology such as simulation modeling, geographic information systems, and expert systems, it has the potential of emerging as one of the most powerful tools for the sustainable management of land. Effective use of plant nutrients is likely to be a key element in determining the success of this overall effort.

The coalition partners met in Washington, D.C., on May 28 and discussed the details of a position paper that will outline the key issues of soil, water, and nutrients and how these relate to sustainable land management, the resources available to the group, and the priorities of research and other activities that will be addressed by the individual institutions.

Three members of the coalition (IFDC, IBSRAM, and TropSoils) along with representatives from national institutions from Ghana, Mali, Burkina Faso, and France (ORSTOM and CIRAD) met June 16-19 at IFDC regional offices in Lomé, Togo, to develop a series of watershed projects dealing with soil, water, nutrient use, and sustainability. This is a first effort to bring some of the collaborating institutions into an interactive capacity. More such projects are likely to emerge.

Subsequently, in October 1992 the coalition will conduct a workshop in Washington, D.C., which will be open to other

international and national institutions, as well as donors. The delegates to this workshop will discuss the position paper, agree on an overall plan for collaborative research and other activities, consider the possibilities of expanding membership of the coalition, and explore more effective mechanisms for communication and coordination.

IFDC increases activity in Eastern Europe and the former Soviet Union

As Eastern Europe and the former Soviet Union move from a command to a market-driven economy, there has been an increase in demand for consumer-oriented products and services needed to sustain crop production. Nowhere is this more evident than in the distribution and marketing of agricultural inputs and services as related to seed, fertilizers, and pesticides. As the changeover takes place in the newly independent republics fostering marketing economies, there is a serious gap in consumer-oriented products and ser-

vices. This has led to a partial collapse of the present distribution systems, a decline in input use, and a subsequent decline in crop production.

IFDC is responding to the need for assistance in this area. A technical assistance team is now in Albania helping the U.S. Agency for International Development implement an emergency assistance program involving fertilizer, seed, truck transport, the privatization of the agricultural inputs sector, and development of a dealer-distributor system to better serve the agricultural sector.

IFDC staff have also participated in two World Bank missions to Russia—one dealing with emergency food aid and the other with the import of critical agricultural inputs. The Center's staff have also participated in two missions to Poland, both financed by the United Nations Industrial Development Organization and designed to assess the needs of the fertilizer sector (see article below on the Poland project). An exploratory

mission has also been conducted in Rumania to respond to a request for assistance and to assess the agricultural input needs of that country.

Attention to the agricultural input subsectors of these countries is a global concern because collectively the republics of Eastern Europe and the former Soviet Union produce and consume about 40% of the world's fertilizer and other agricultural inputs.

Donors' meeting slated for October

IFDC's 1992 Donors' Meeting is scheduled for 9:30 a.m. on Saturday, October 24, in the International Monetary Fund H Building, Washington, D.C. Results of new programs will be reviewed, and plans for upcoming initiatives will be outlined.

Paul J. Stangel

Poland—

IFDC marketing specialist provides technical assistance to Poland

An IFDC team visited Poland during April 28—May 15, 1992, to implement a project for the United Nations Industrial Development Organization (UNIDO) to assess the fertilizer sector situation in the country and make recommendations for its restructuring and revitalization. The team included Dr. Loren E. Ahlrichs, IFDC Marketing Specialist; Jorge R. Polo, IFDC Senior Project Analyst; and Heinz Birkenberg, an independent consultant from Austria.

Prior to this latest mission, Ahlrichs had visited Poland during January-February, 1992, to provide expertise in marketing and agronomics. Ahlrichs gathered data and analyzed the fertilizer situation prior to recommending strategies to remove the current constraints to fertilizer use.

In carrying out its mission, the latest team to visit Poland met with officials from several ministries, officers from fertilizer-producing facilities, members of other governmental bodies, and representatives from the U.S. Agency for International Development (USAID)

and European Community (EC) missions in Poland. The main thrust of the various meetings was to exchange ideas and obtain support for the recommendations that will be included in the mission's report.

"The fertilizer industry in Poland is working at an extremely low percent of installed capacity," Polo says. "The main reason for this is that use of fertilizers is not cost effective for the farmer under current economic conditions. Fertilizer prices have sky rocketed in recent years as prices for raw materials and intermediate products were deregulated and the producing companies began having to pay higher prices (and in hard currency) for their inputs, while at the same time the farm products have remained static or decreased because of bumper crops resulting primarily from ideal weather conditions."

Upon Poland's shift to a market economy, the distribution systems for farm inputs and outputs collapsed. This is seen by the team members as the most important aspect in need of

outside assistance in order to restructure and revitalize the fertilizer sector and farming in general.

Other major activities to be undertaken include training in marketing and the technical and environmental aspects of fertilizer production; the development of a fertilizer information system; a comprehensive review of the fertilizer policies in place; the establishment of a center for fertilizer development; and a critical analysis of the different fertilizer production facilities considering their needs for modernization from the technical, economical, and environmental points of view to determine their fair market value for privatization.

According to Ahlrichs, the overall goal of the project is to advise the Polish fertilizer industry in making it more responsive in a free market economy. "UNIDO is working with the Government to reverse the situation and make recommendations to improve the conditions of the fertilizer industry," Ahlrichs says.

IFDC establishes Asia Division

During its last meeting, the IFDC Board of Directors decided to establish an IFDC regional office or Asia Division in Bangladesh. According to Kenneth L. Moots, IFDC Director of the Asia Division, "The purpose of this move is to allow IFDC to better regulate its activities in the Asia-Pacific Rim region. IFDC has a similar office in Togo, West Africa, to serve sub-Saharan Africa. The Dhaka office, like the Togo facility, will work to improve the agriculture sector in all of Asia by promoting improved uses of fertilizer, technology transfer, research, and training."

Moots further explained the establishment of the new division in Dhaka. "By selecting Bangladesh as its first choice, IFDC has clearly displayed its confidence in Bangladesh as an emerging country both willing and capable of supporting an Asia Division of an international center."

IFDC's involvement of the private sector in fertilizer marketing in Bangladesh is producing dividends for the country and its farmers. Since 1979 IFDC has made progress in Bangladesh helping the private sector move ahead on marketing development and distribution of fertilizer—in most cases through USAID financing. As witness to its commitment to this project, USAID recently extended the Bangladesh contract through August 1994 by providing additional funding in the amount of US \$9.1 million.

The Dhaka-based project clearly has the support of its host country. Evidence of this support was obvious in a recent article in the *Dhaka Courier*, which heralded the Bangladesh project for its continuing successes. "The Government allowed for the first time in 1990/91 the import of fertilizer by the private sector, which is

considered as a major breakthrough of the Government policy reform program," the *Courier* reports. "The price of urea in real terms declined by 27% over that of 1988/89 and again by 6% in 1990/91 compared to that of 1989/90. In addition, private distributors were allowed to take delivery of imported fertilizers directly from the ships at the ports. The impact of these policies on the fertilizer market has been dramatic. By now, a rapidly expanding private distributor network is marketing 84% of all fertilizers sold in Bangladesh. Urea marketing has been entirely taken over by the private sector. Decline in farm-level prices of urea alone contributed to the saving of TK 740 million by the farm sector during 1989/90 and TK 924 million (at 1988/89 prices)."

IFDC teams up with CIRAD and TECHNIFERT to study indigenous phosphate fertilizer production

A prefeasibility study conducted recently by IFDC and the Centre de Cooperation Internationale en Recherche Agronomique pour le Developpement (CIRAD) and Technifert, both of France, concluded that the process proposed for the production of fertilizers locally in Burkina Faso appears to be economical. The study team recommended that four base materials (designed for each of the major crops) be produced using the country's Kodjari phosphate rock as the primary raw material.

The three organizations performed the study at the request of Projet Engrais Vivriers of Burkina Faso and the World Bank.

The Government of Burkina Faso had previously selected the process proposed by CIRAD and Technifert in their 1987 study as the process which they wished to pursue further through the prefeasibility phase. Recent developments in Burkina Faso con-

cerning the Projet Perkoa—a zinc mining project being undertaken jointly by BOLIDEN of Sweden and the Burkina Faso Government—have resulted in renewed interest in the possibility of a local supply of sulfuric acid to be obtained from byproduct pyrites and is part of the basis of renewed interest in this project. The process to use the phosphate material from Kodjari in the manufacture of a partially acidulated product is not dependent on local production of sulfuric acid but is also possible if economically attractive sources of imported acid can be identified.

The study team included M. Terry Frederick from IFDC, Truong Binh from CIRAD, and Christian Fayard from Technifert. The team met individually with the fertilizer users, import and transport agents, financial institutions, and fertilizer researchers to obtain the required data for the study.

"We found that the present demand for fertilizers in Burkina Faso is about 47,500 tons per year and has been steadily increasing at an annual rate of about 12% over the past 4 years," Frederick says. "The team estimated that about 60,000 tons of fertilizer product will be needed by 1995. Cotton growers use about 70% of all fertilizer now imported into Burkina Faso."

The tripartite team calculates that the use of these four base materials plus imported urea and potassium chloride would result in a savings of up to US \$145 per hectare, depending on the crop, compared with the recommended doses of cotton formula NPK plus urea. The greatest savings was on sugarcane, which is intensively fertilized, while the least amount of savings, estimated at only US \$6.30/ha, would derive from fertilizer use on peanuts. It was recommended that the feasibility study of

local production of these base products be performed and that the process engineering be undertaken.

Field trials in Burkina Faso that were performed in cooperation with the Institut National d'Etude et des Recherches Agronomiques (INERA) have shown that crop response to these materials plus urea and potassium chloride is in the range of 85% of that received from the use of the imported cotton-grade NPK material plus urea.

(Photo by M. Terry Frederick)

The fertilizer market in Burkina Faso is dominated by the cotton growers who use about 70% of all fertilizer presently imported into that country.



Togo—

IFDC-Africa's research profiles West African sustainable cereal production systems

By instituting a comprehensive research program in the Sudano-Sahelian zone of West Africa, IFDC scientists have identified two of the major components of improved and sustainable cereal production systems in the region. Results from soil and multinutrient research conducted by IFDC soil scientists in conjunction with national counterparts from nine West African countries in this agroecological zone indicate that the combined use of inorganic fertilizers and organic materials and the rotation of cereal crops with legumes gave the highest and most sustainable yields of maize and sorghum.

IFDC has made a major effort to assess external needs and management required to increase the productivity of the soils of the region. With funding from the United Nations Development Programme (UNDP), IFDC and national scientists from West African countries have conducted research on soil fertility and cropping systems in all of the agroecological zones of West Africa since 1989. Previous research by both IFDC and other institutions in the 70s and early 80s provided basic data on the physical and chemical

properties of soils, their fertility levels, and crop responses to fertilizer application in the Sahelian, savanna, and forest zones.

IFDC has conducted this research in partnership with scientists from the national agricultural research and extension systems, primarily through networks. The West African Fertilizer Management and Evaluation Network (WAFMEN) has coordinated regional collaborative research on soil fertility in West Africa over the past decade. Involving over 30 scientists from 19 national research and extension institutions in West Africa, WAFMEN has four goals.

First, it aims to assess the chemical and physical properties of representative soils throughout the primary regional agroecologies and the effects of crop residues and various fertilizer combinations on crop yields, soil fertility maintenance, and the prevention of soil erosion and degradation.

Second, it seeks to quantify the nutrient needs of the primary soils, crops and cropping systems of the region and to assess the environmental impact of the use of external inputs. The use of indigenous phosphate rocks and the quantification of

the residual effects of phosphate fertilizers form a primary component of these studies.

Third, the Network conducts studies on the interaction between the primary plant nutrients to determine the effects of various combinations and application levels on cereal crop yields. Finally, it assesses the benefits of cereal-legume rotations, especially for nitrogen availability and the extent and efficiency of uptake.

The Director of IFDC-Africa, Dr. Uzo Mokwunye, who coordinated IFDC's agronomic research in Africa for over 10 years, provides some background on that research. "To ensure that our research effort was ultimately beneficial to the farmer, we conducted broad-based applied and adaptive research that examined the scientific basis of the farmers' and alternative cropping systems and practices, with particular emphasis on soil fertility, crop productivity, and nutrient management," Mokwunye says. "From the start we operated under a sustainability perspective on soil fertility research. In quantifying the key aspects of the crop nutrient cycle and assessing the viability of alternatives for soil and crop improvement, we were able to

pinpoint the key production components necessary for stable increases in yields and identify optimal systems for the use of all soil amendments—inorganic or organic.”

The IFDC-coordinated multinutrient research program has generated several tangible results. First, inadequate quantities of phosphate and nitrogen available in soils—not moisture—represent the overriding constraint to crop production in West Africa.

Second, although native phosphorus contents of soils in the region are low and have a low adsorption capacity, modest applications of phosphate (20-60 kg P₂O₅/ha) can quickly increase both yields and the level of phosphate in the soil available to plants.

Third, field trials conducted at five benchmark sites in Togo and three sites in Niger and representing a broad transect of agroecological conditions revealed that fertilizer needs vary with the crop grown, level of soil fertility, and amount of moisture available to the crop. For example, maize grown with adequate rainfall in Togo required 60 kg P₂O₅/ha, 100 kg N/ha, and 60 kg K₂O/ha to achieve near maximum yields.

On the other hand, in Niger where available moisture was more limiting, the fertilizer requirement for millet was 40 kg P₂O₅/ha and 40 kg N/ha to achieve near maximum yields.

In addition, where phosphate and potash were applied in sufficient quantities, a nitrogen rate of 60 kg/ha was found to be adequate to sustain yields for sorghum grown in most areas of the savanna and Sudano-Sahelian zones.

Of equal interest was the fact that although naturally occurring Togo or Parc-W phosphate rock were finely ground and acidulated to only 50% of that required to make finished phosphates, these products were as agronomically effective as fully acidulated phosphates (single superphosphate or triple superphosphate) in supplying phosphate to the major crops grown in the region.

Finally, long-term multinutrient trials established at the benchmark sites within each of the eight experiment stations revealed strong interactions between nitrogen and phosphate fertilizer additions. For example, when inadequate levels of nitrogen are applied, the amount of phosphate required to achieve a given yield increases. However, when both

nitrogen and phosphate are applied at near optimum levels, the effectiveness of each in raising yields is increased.

Because of IFDC's close collaboration with national research and extension programs through WAFMEN, all national scientists involved in soil fertility research in West Africa are fully aware of the findings of this research program, and many are already actively involved in promoting the basic components of sustainable cereal production within their countries.

Despite the value of the results generated to date, there is a need for further long-term research on many aspects of soil fertility in West Africa including the long-term nutrient economy of fragile soils and the array of factors that affect soil fertility restoration, the prevention of soil degradation and erosion, and the development of sustainable and environmentally sound farming practices. Such research can help to better define the basis on which West African communities can increase food production while conserving the key renewable resource—the soil—to sustain this and future generations.

Jamaica—

IFDC provides training in support of CIDA's soil nutrients for agricultural productivity (SNAP) project

Kingston, Jamaica, was the setting for a farm services training program tailored specifically to meet the needs of that country's fertilizer suppliers (distributors and retailers), researchers, and extension workers regarding CIDA's soil nutrients for agricultural productivity (SNAP) project.

This was a followup activity to the International Workshop on Dealer Development (Phase I) conducted in January 1991 and organized by IFDC, with the assistance of the Jamaica Ministry of Agriculture (JMOA) and the Canadian International Development Agency (CIDA).

“The five-day training program, held during June 1-5, 1992, is Phase II and part of an integrated farm services project for the small-farm sector of Jamaica,” says C. C. Yaptenco,

IFDC Marketing Specialist and the manager of this project. “The program focused on the effective promotion and use of fertilizer and other farm inputs to improve the productivity of farmers in root crops and vegetables. It was designed to train the trainer. Besides CIDA and IFDC, the collaborators on this project include the Jamaican Ministry of Agriculture and the Jamaica Commodity Trading Company.”

The other part or phase III of the project will involve activities in the farmers' fields to bring about beneficial changes in farmers' practices. Farm demonstrations to be conducted will not only serve as educational programs for farmers but will also provide data on crop responses to fertilizer recommendations.

“The Government's current priority for its agricultural program is to attain self-sufficiency in food production,” Yaptenco says. “If the food production program is to succeed, however, the necessary and appropriate services similar to those currently available for the traditional export crops must be made available also to the small-scale farmers, whose farms comprise the main food production areas. Deficiencies in the functional linkage between research, extension, credit, and farm input suppliers in the delivery of services and farmer education programs will have to be corrected to benefit the small food crop farmers and thereby achieve the goals for national food security for the country.”

Speaking on behalf of CIDA at the opening of the program, Canadian High Commissioner, Jennifer R. McQueen, said "Our business in this training program and in the other aspects of the project is to see that farmers have available to them the supplies of fertilizers and the appropriate technology necessary to enable them to capitalize on the very

favorable food-producing environment available to them.

"We want to ensure that our efforts will have a sustainable impact. We realize through experience that providing a commodity is not sufficient to sustain agricultural productivity. Research, technical assistance, human resource development through extension—all of these services are

key ingredients to sustainability."

Other inaugural program speakers included the Honorable Roger Clarke, Minister of State in the Ministry of Agriculture; Dr. Paul J. Stangel, President and Chief Executive Officer of IFDC; and Dr. Garnet Brown, Executive Director of Rural Agricultural Development Authority.



(Photo by Charles E. Butler)

Dr. Dennis H. Parish, Director of the Resources Management Research and Development Division, retired from IFDC on May 29, after a 16-year tenure. In his latest position, Parish, a British citizen, was responsible for supervising programs in nutrient characterization and production, nutrient dynamics and agroecosystems, information management sys-

Headquarters—

Dennis H. Parish retires after 15 years at IFDC

tems, and economics and policy.

Prior to the appointment to his present position in 1989, Parish was Director of IFDC's Outreach Division for approximately 13 years. In that capacity, he was responsible for supervising a multidisciplinary team of fertilizer specialists working on technical assistance projects, fertilizer sector studies, field research programs, and human resource development programs.

Parish began his scientific career with a B.S. in chemistry from Leeds University, England, and followed this with a Master of Agriculture degree and a Ph.D. from Queen's University, Belfast, Northern Ireland.

In 1954 he left for Mauritius to work with the Sugar Industry Research Institute as Chemist and later as Chief Chemist. During this period he published several papers on the fertilization of sugarcane and was an active member of the International

Society of Sugar Cane Technologists.

He left Mauritius for Uganda in 1966 when he was appointed Professor and Department Chairman in the Faculty of Agriculture of the University of East Africa.

In 1970 he joined the Food and Agriculture Organization of the United Nations as Regional Leader of the FAO Fertilizer Programmes, first in Africa and then in Asia.

Parish has spent most of his life outside his native Britain and at the last count had made technical missions to more than 50 countries for FAO, the United Nations Development Programme (UNDP), the International Fund for Agricultural Development (IFAD), the World Bank, and the U.S. Agency for International Development (USAID).

Malawi—

Workshop tests CERES-maize model

The Chitedze Research Station near Lilongwe, Malawi, was the setting for a maize modeling workshop, organized by IFDC and conducted 24-28 February. This activity was part of the collaborative project being conducted by the Department of Agricultural Research, Malawi; the University of Edinburgh; and IFDC, with funding from the Rockefeller Foundation.

Twenty-one participants in research and extension from throughout the country attended the workshop. Leaders of the workshop in-

cluded Dr. Philip Thornton, IFDC Economist/Systems Modeler; Dr. Upendra Singh, IFDC Systems Modeler/Soil Scientist; and Dr. Gareth Edwards-Jones of the Scottish Agricultural College, Edinburgh, United Kingdom. Making the opening and closing presentations was Dr. Greenwell Nyirenda, Chief Agricultural Research Officer of the Ministry of Agriculture, Malawi.

"The workshop covered the following areas: field trial design, data collection procedures, the use of databases for data storage and retrieval,

and the use of the CERES-Maize model and its application to research and development," Thornton says. "A specially planted field trial, involving two varieties and six dates of planting, was harvested by the participants, and such things as component biomass and leaf area were measured."

Two days of the workshop were devoted to running the CERES-Maize Model on computers using data from three regions of Malawi. Most of the participants were

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(Photo by Dr. Philip K. Thornton)

Dr. Upendra Singh explains data collection procedures to some participants in the maize modeling workshop in Malawi.

impressed with the model simulations, and the simulated yield responses of maize to different planting dates, planting densities, and fertilizer applications generally were in accord with their own experience of maize performance in these regions.

“We hope to conduct a followup workshop during 1993, at which time the participants will be asked to provide their own agronomic data for analysis and for running the CERES-Maize model,” Thornton says.

(Continued from page 1)

4. There is an urgent need for improved and continued communication at all levels including the fertilizer manufacturer, the regulator, the user, and the general public. Certain sectors of the general public are calling upon governments and industry to be more responsive to environmental issues that seem to be threatening their interests.

A proceedings volume is being published by IFDC, which will include the 37 papers presented during the workshop, questions/answers, and summary statements made by the delegates during the closing session of the workshop. The publication should be available in October 1992.