

Report

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

Using Crop Models to Develop Sustainable Agriculture in Albania

An IFDC project in Albania is developing a decision support system for that country that incorporates knowledge of soil resources, climatic variability, and crop growth potential. Specifically, the project is assembling quantitative descriptions of the major agricultural soils, constructing a historical weather database, incorporating both soil and weather information into a Geographic Information System (GIS), and validating the CERES wheat and maize models.

"A dynamic agricultural system in Albania is being created as a result of the liberalization of state controls, the distribution of land for private cultivation, and the establishment of private sector dealers for agricultural inputs," says Dr. Walter T. Bowen, IFDC Systems Modeling Scientist. "To perform efficiently, participants in this process must have access to information that is relevant, accurate, and timely. The types of information needed range from improved production technologies that are economically and environmentally sound to reliable reports on market conditions."

Presently, however, the public infrastructure and other components needed to generate and to provide such information in Albania are either lacking or in need of revitalization. As it attempts to correct these deficiencies and assist Albanians in taking advantage of new economic opportunities, the Ministry of Agriculture and Food is seeking access to the latest information technology tools. These tools, developed from advances in computer technology and information science, include crop growth simulation models, models of social and economic systems, geographic information systems, and database management systems.

Crop growth simulation models can significantly enhance the efficiency of the research, development, and extension processes by allow-

ing extrapolation of field trial results to other locations in other seasons. Once set within the framework of a comprehensive management information system, the crop models can facilitate the effective analysis of issues related to agricultural production, resource allocation, risk, environmental quality, and land use.

In collaboration with the World Soil Resources Division of the United States Department of Agriculture (USDA), IFDC is constructing a GIS database for the major agricultural soils. Initial information was obtained at a scale of 1:200,000 and will be refined to a larger scale as time and resources permit.

"Automated weather stations that record daily rainfall, solar radiation, and minimum and maximum temperatures have been set up at

(Continued on page 8)



(Photo by Dr. Walter T. Bowen)

Two staff members from the Agricultural University of Tirana (from left), Bardhyl Tuholli, Experimentalist, and Dr. Zydi Teqja, Professor, visit one of the IFDC wheat experiments near Kamza, Albania.

IFDC Report

Publisher:
International Fertilizer
Development Center

Editor
Marie K. Thompson

IFDC Report is a quarterly publication of the International Fertilizer Development Center (IFDC), Muscle Shoals, Alabama, U.S.A. Telephone: 205-381-6600, Telex: 810-731-3970 IFDECMCHL, Telefax: 205-381-7408. Unless otherwise noted, printed material published in the *IFDC Report* is in the public domain and may be freely reproduced. Source acknowledgment and a copy of any reproduction are requested. Subscriptions are free. French- and Spanish-language editions of the *IFDC Report* are available from IFDC.

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.

IFDC President and Chief Executive Officer:

Amit H. Roy

Board of Directors:

David Hopper (Canada),
Chairman

Joseph C. Wheeler (U.S.A.),
Vice Chairman

Norman E. Borlaug (U.S.A.)

Baba Dioum (Senegal)

Hiram Grove V. (Chile)

Ann Hamblin (Australia)

Luc Maene (Belgium)

Gary D. Myers (U.S.A.)

Pratap Narayan (India)

Christian Pieri (France)

Bukar Shaib (Nigeria)

Kunio Takase (Japan)

Robert E. Wagner (U.S.A.)

Change of Address:

To avoid missing copies, allow six weeks for change of address. Send details to: *IFDC Report*, P.O. Box 2040, Muscle Shoals, Alabama 35662, U.S.A.

President's Report



(Photo by Charles E. Butler)

Dr. Amit H. Roy
IFDC President and
Chief Executive Officer

Development Assistance Efforts in Bangladesh Continue

Implementation of the Agro-Based Industries and Technology Project (ATDP) in Bangladesh began on May 7, 1995. The 30-month project will build on the lessons learned and accomplishments of the recently completed Fertilizer Distribution Improvement Project.

The ATDP was collaboratively designed and will be implemented collaboratively by the Government of Bangladesh, the United States Agency for International Development (USAID), and a consortium comprised of IFDC, as prime contractor, Winrock International, and Ronco Consulting Corporation. The goal of the project is to increase productive employment in agriculture and related enterprises. The purpose of the project is to create competitive markets for agricultural and agribusiness inputs, outputs, and technologies.

The ATDP will involve development efforts in five key commodity subsectors: seeds, fertilizer, agricultural machinery, poultry and livestock, and agriprocessing. The project will promote reforms in trade policy, industrial and agricultural policy, fiscal and commercial policy, foreign-investment policy, and legal and regula-

tory practices in Bangladesh. These reforms will facilitate the free flow of capital and technology from domestic and international sources and create employment opportunities, diversification and intensification of crop production, and poverty alleviation. The project will also encourage private sector, market-driven technology development and transfer and provide agri-entrepreneurs with information and access to credit to foster private agribusiness in Bangladesh.

The ATDP is a broad-based project involving a number of ministries. The Bangladesh Ministry of Agriculture is the implementing agency for the project. An inter-ministerial steering committee will coordinate the implementation of actions to be taken by different ministries and Bangladesh agencies.

Workshop on Developing Russian Fertilizer Market

In April the International Fertilizer Industry Association (IFA), the European Fertilizer Manufacturers' Association (EFMA), and IFDC organized and conducted in Moscow a workshop to develop the Russian fertilizer market. The purpose of the workshop was to arrive at a general consensus among the Russian stakeholders, including producers, policymakers, trade associations, and public officials, regarding the main constraints to increased domestic fertilizer demand through a free market system. The Workshop sought to establish the priority tasks in a development program that will seek to ensure that agricultural producers are able to purchase their fertilizer requirements through a competitive and efficient private sector marketing and distribution system, which also meets the needs of the manufacturers, distributors, and dealers. It recognized the need for policy developments that will ensure adequate rewards for operators throughout the food chain, the development of commercial credit sources, and competitive market outlets. The Workshop participants confirmed their commitment to the implementation phase of the program, prioritized future tasks, and demonstrated the unity of purpose required to obtain international funding. IFA, EFMA, and IFDC collec-

tively have access to the analytical, commercial, and technical skills necessary to contribute towards solving the problems encountered in the Russian fertilizer market and to assist in the regeneration of the domestic market.

IFDC's Role in the Extension of the Soil Management Collaborative Research Support Program (SM-CRSP)

At North Carolina State University, Raleigh, North Carolina (U.S.A.), I represented IFDC on an advisory panel convened in April to refocus the activities of the newly reactivated SM-CRSP to move toward integrated nutrient management. The advisory panel met for the purpose of identifying and prioritizing the primary constraints to integrated nutrient and tropical soils management for sustainable food

production and management of natural resources in developing countries for the mutual benefit of the developing countries and the U.S.A.

The report of the panel will be reviewed by the SM-CRSP's Board of Directors and Technical Committee. After that review preproposals will be sought from U.S. land-grant universities and other institutions to address one or more of the identified constraints.

Africa Committee Reviews IFDC-Africa's Programs

Three members of the Africa Committee, Luc Maene of France (Chairman), Baba Dioum of Senegal, and Kunio Takase of Japan, visited IFDC-Africa in Lomé, Togo, during June 20-21, to review the programs of that division. These Committee members are also new members of

the IFDC Board of Directors, and this meeting was their first opportunity to review IFDC's programs in Africa. Dr. Bukar Shaib of Nigeria was unable to attend.

During the meeting IFDC management and staff made presentations on such topics as "Restoring Soil Fertility in West Africa: Key to Sustainable Agriculture," "The Phosphate Rock Initiative," "An Integrated Approach to Soil Fertility Management," and "Soil/Water/Nutrient Management." During a trip to IFDC-Africa's field trials at Davié and Amoutchou, Togo, the Committee members learned about agronomic research being conducted to devise strategies to improve the fertility of sub-Saharan Africa's soils.

Amit H. Roy

IFDC-Africa Launches Phase III of Market Development Project

On April 26, 1995, an agreement, witnessed by the Netherlands' ambassador to Ghana and Togo, was signed thus putting into effect a four-year extension of IFDC-Africa's market development project. The signing signaled the beginning of Phase III of the Netherlands development assistance to one of the important activities of IFDC-Africa.

Phase III is expected to build on the successes of Phases I and II, which realized the creation and growth of AFTMIN (the African Fertilizer Trade and Marketing Information Network). Obtaining information on the fertilizer and soil fertility situation in different West African countries had been an important activity during the first two phases of the project.

In September 1989, IFDC-Africa adopted a new approach to country studies—to conduct more in-depth studies of the situation in each country and to relate the ensuing recommendations to each country's national policy goals of increasing food security and reducing soil degradation. In six years, the project has resulted in the following:

- The West African fertilizer market is more transparent. The monthly African Fertilizer Market (AFM) bulletin is distributed in English and French to 228 individuals in 52 countries.
- Seven annual AFTMIN meetings were organized with a steadily growing number of participants from the fertilizer sector attending each meeting. AFTMIN participants have more than tripled from 30 participants in 1988 to 100 in 1994.
- A knowledge base now exists for the fertilizer sector in West African countries. In-depth fertilizer sector studies have been carried out throughout West Africa with both country-specific studies and thematic studies dealing with bulk-blending, privatiza-

tion, and the use of phosphate rock.

- IFDC-Africa has established an African Fertilizer Information Database, which now contains national fertilizer supply and demand statistics, national fertilizer prices, fertilizer trade information, and addresses of participants in the sub-Saharan fertilizer market.



(IFDC-Africa Photo)

As the Honorable Ambassador H.C.R.M. Prince of the Netherlands looks on, Dr. A. Uzo Mokwunye, Director of IFDC-Africa, signs the agreement launching Phase III of the Market Development Project.

- Alternative fertilizer policy and marketing strategies have been identified, each with the goal of developing sustainable agricultural production systems.

Phase III seeks to contribute to the following objectives:

1. To restore the productive base of degraded soils in areas with agronomic potential for crop production and develop sustainable agricultural production systems that will generate increased farm production and income.
2. To support national governments in West Africa as they change from manager, controller of fertilizer production, procurement and marketing to facilitator of competitive, private fertilizer marketing.

Phase III will target a consolidation of ongoing regional fertilizer market and trade information services of the AFM bulletin, regional seminars/training programs, and the fertilizer information database. In addition, the project will implement special activities in Burkina Faso. The major focus in Burkina Faso will be to sensitize decision-makers to take action to restore and maintain soil fertility on a sustainable basis.

A major activity of the project will be the creation of a multidisciplinary team that will deal not only with soil fertility but also with the development of input/output markets. The Burkina Faso government has agreed to create the Soil Fertility Management Unit (SFMU) to develop sound methods of fertility management.

The first task, even before the creation of the SFMU, will be the creation of a multidisciplinary national ad-hoc committee composed of individuals representing the research, extension, finance, agricultural marketing boards, and regional development agencies and also including as observers the representatives of international organizations and the donor community.

The SFMU will concentrate on helping to elaborate a set of integrated strategies for soil fertility restoration and maintenance and con-

ceiving action plans for development activities to improve soil fertility and promote a sustainable agricultural production.

The four main functions of SFMU will be the following:

- Promoting national and international awareness of the need to create an environment favorable to the implementation of an integrated strategy for the restoration and maintenance of soil fertility. The SFMU will collect the basic data necessary for informed decisionmaking on soil fertility and other related subjects.
- SFMU will formulate a national strategy for soil fertility restoration and maintenance. This strategy will be developed from a farmer's perspective. The focus will be on reducing the mining of plant nutrients from the soil and on increasing the nutrient status of the soils. Therefore, technologies must be designed and implemented with the full participation of farmers as well as other people active in the rural sector. Concrete efforts will be made to involve women in the implementation of the project and the design of activities meeting their specific needs and conditions.
- Elaboration of action plans for development activities to improve soil fertility and promote a sustainable agricultural production.
- Coordination at the national level of the different measures to control soil degradation.

Although Burkina Faso will be the primary focus during the first half of phase III, opportunities exist in countries such as Togo, Ghana, and Benin to use the same approach for their own benefit during the latter part of the program. IFDC-Africa will prepare in-country workshops to promote the establishment of multidisciplinary "think tanks" that will be in charge of formulating soil fertility management strategies.Ⓜ

West African Farmers Participate in IFDC Research

Thirty West African farmers have been partners in an IFDC research project that is producing results that could impact the lives of all farmers of sub-Saharan Africa and their families.

In the small village of Gobery, Niger, located 120 km southeast of Niamey, Niger's capital city, millet farmers face the risks of uncertain rainfall, disease, and pest damage and cropping in areas where the soils are seriously infertile. In the IFDC project, which was designed to help farmers increase millet yields, the farmers tested the effect of applying 30 kilograms of phosphorus per hectare as phosphate rock from Niger, or its partially acidulated form (PAPR), or as a commercially available single superphosphate.

"Technicians assisted the farmers in laying out the various treatments," says Dr. André Bationo, IFDC Senior Soil Scientist, who has been stationed at the Sahelian Centre of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in Niamey, Niger, since 1982. "The farmers performed all operations from fertilizer application to harvesting of the millet crop. A resident technician visited the farmers on a daily basis during the season and took notes on such items as the timing of weeding operations by each farmer. The technicians also answered questions posed by the farmers. Village meetings, attended by participating and nonparticipating farmers as well as research personnel from IFDC, ICRISAT, and Niger's National Institute for Agronomic Research (INRAN), were held routinely throughout the season.

As a result of this partnership, farmers in Gobery increased their yields of millet by an average of

250% in the plots to which the phosphate fertilizers had been applied. What was perhaps more striking was that fertilizer consumption increased in Gobery from less than 2 mt of single superphosphate (SSP) in 1982 to more than 115 mt of SSP, urea, and compound NPK fertilizers in 1988. In 1994, 98% of the farms in Gobery were fertilized.

As early as 1982, IFDC was conducting collaborative research with the ICRISAT Centre and INRAN to assess the nutrient needs of the major food crops and soils of the Sahel and to develop technologies to improve the fertility of the soils. Earlier the research was devoted to on-station trials at the ICRISAT station and at INRAN research sites. The results suggested that certain fertilizer-use and soil management technologies could be adopted by farmers to improve the fertility of the soils, improve crop production, and increase their incomes. In 1986,

the research was moved to farmers' fields.

"Use of phosphate fertilizers is only one of several technologies that we have tested with farmer participation in Gobery since 1986," says Bationo. "The other technologies include correct planting density for sole-crop millet, legume-millet rotations, and the use of millet residue as mulch. We are particularly excited about the rate of adoption of the millet-legume rotation technology. In 1994, 86 households out of the total of 136 in the village planted a portion of their fields to pure cowpea for rotation with pearl millet the following season. The introduction of cowpea as a cash crop will allow the farmers to purchase inputs such as fertilizers. Use of millet straw as mulch and as a source of plant nutrients has become a common practice in the village."

Even though very little of the increased millet production was sold

during the first few years of this program, farmers felt more food secure and used a greater proportion of their off-season income to purchase fertilizers. Perhaps more significantly in terms of soil fertility maintenance, farmers who applied fertilizers increased crop residue production which was used as fuel, fodder, and building materials. The leftover material served to protect the soil from wind erosion and to improve the organic matter content and overall fertility of the soil.

IFDC has tested the success of Gobery in Mali and Nigeria, and farmer participation in the validation of fertilizer-use technologies has become a fixture of the West African Fertilizer Management and Evaluation Network (WAFMEN), which is composed of 19 member countries and is coordinated by IFDC.Ⓢ

Management Staff of Two Chinese Fertilizer Companies Receive IFDC Training

Officials representing two Chinese fertilizer companies, Jingxiang Phosphate Chemical Company (JPCC) and Huangmailing Phosphate Chemical Company (HPCC), recently visited IFDC to participate in a special short-term training program. These two companies are involved in the Hubei Phosphate Project, which consists of mining and processing the indigenous resources of the Hubei Province phosphate deposit.

During the formal segment of the program that was held at IFDC Head-

quarters, the President of JPCC, Zeng Chungou, discussed the outcome of the training program, the prospects for the future of the Chinese phosphate fertilizer industry, and IFDC's role in that future.

"This course has achieved our expectations," Zeng says. "Technical matters are not the only factors that a fertilizer company must consider; the managerial side is equally important. From the management

level, it is most important to find competent people; in fact, a company's human resources is its most valuable asset."

This training program was designed to increase the participants' knowledge of the management practices in U.S. fertilizer plants and to allow them an opportunity to interact with their counterparts. Managers of this program included John H. Allgood, IFDC Director, Finance,

The President of JPCC, Zeng Chungou (seated, center) listens intently to a lecture by Catalino C. Yapenco, Jr., IFDC Senior Marketing/Credit Specialist, during the Hubei Phosphate Management Training Program.



(Photo by Charles E. Butler)

Administration, and Support Services Unit; Dr. Balu L. Bumb, IFDC Senior Economist; and Jorge R. Polo, IFDC Coordinator, Engineering and Technology Program. Overall coordination of the program was handled by R. S. Giroti, IFDC Coordinator, Human Resources and Development Unit.

After a series of presentations by IFDC and outside speakers on all phases of fertilizer company management, the group observed management operations in fertilizer factories during visits to a number of installations in Florida. Included in the field visits were IMC-Agrico's phosphate rock mining operations and phosphate rock flotation plant, reclamation sites, the diammonium phosphate plant, and New Wales facility. At the Tampa (Florida) port, the participants observed loading and unloading of fertilizer. At the U.S. Agri-Chemicals Plant at Fort Meade, meetings with department managers provided the participants an opportunity to discuss management strategies, factory operations, and maintenance programs. During a tour of U.S. Chem Resources, Inc., the delegates from China met with management officials to discuss that firm's operations, management structure, and future business prospects. ☉

Spinoff of Training Program for Chinese Officials: Technical Assistance Contract

The training program for JPCC and HPCC officials afforded the participants an opportunity to discuss the latest phosphate fertilizer products that have been developed by IFDC scientists. These discussions resulted in the first technical assistance contract between IFDC and JPCC.

"During a training program presentation by Dr. S. H. Chien, IFDC Senior Soil Chemist, we gained a very good understanding of partial acidulation of phosphate rock and compaction of phosphate rock and triple superphosphate (TSP)," Zeng says. "For the past two years we have been aware of IFDC's very rich experience in the development of phosphate fertilizer, and we are now pleased to enter into a contract agreement with IFDC to help us diversify our products and reduce our production costs."

The Chinese company has definite goals in mind as it enters into this new agreement with IFDC. "We need to produce more cost-effective fertilizer products in order to increase our profits. The phosphate industry in our country has a much shorter history; therefore, we have a lot of work to do. The agricultural authorities in China have their own traditional practices; thus, we must convince them to produce and use new types of fertilizer products."

The research program, to be conducted by IFDC and JPCC, will determine the benefits of producing PAPR from the Jingxiang phosphate rock with different grades of P_2O_5 . A compacted product containing a very low-grade phosphate rock and triple superphosphate will also be produced. The main objective of this research program is to evaluate the agronomic effectiveness of these types of cost-effective phosphate fertilizers. JPCC will soon operate phosphoric acid and TSP plants. Therefore, since the cost of sulfuric acid is relatively high in China, it would be desirable to save some of the sulfuric acid being used to produce SSP for the use of phosphoric acid and TSP production. This can be done by producing PAPR from the Hubei phosphate rock, instead of producing SSP. Similarly, saving phosphoric acid is also very critical to the company since it is very expensive in China.

Recent IFDC Publications

Applying Crop Models and Decision Support Systems

This publication was a collaborative effort of the International Consortium for Agricultural Systems Applications, the University of Florida, and IFDC. The publication was a spinoff of a training program on computer simulation of crop growth and management responses, which is held annually alternating between the University of Florida and IFDC. During the 1994 program that attracted 34 scientists from 17 countries, the participants were asked to contribute a brief outline of their current and future applications of crop modeling techniques in their own research programs. The 32 summaries that appear in this publication are the result of this exercise. These summaries serve as a reminder of two facts: (1) that training scientists in the use and application of modeling is no less crucial than model development, model testing, and model documentation; and (2) that modeling is not an end in itself but a means to solving real-world problems that are often of considerable urgency.

To order the publication, IFDC-SP-22, please place your order with the IFDC Purchasing Department. This publication is being distributed free of charge while stocks last.

Global Fertilizer Perspectives, 1980-2000: The Challenges in Structural Transformation

World population is projected to increase from 5.5 billion in 1993 to 6.3 billion in 2000 and 8.5 billion in 2025. Thus, by 2025 the world must be able to feed an additional 3 billion people—equivalent to the total world population in 1960. Over 95% of this additional population will live in Asia, Africa, and Latin America, where poverty, hunger, and resource degradation pose major challenges. In meeting these challenges, fertilizers will play an important role by promoting growth in food production while preserving the natural resource base through nutrient replenishment.

Against this background this new IFDC study, authored by Dr. Balu L. Bumb, IFDC Senior Economist, analyzes past and future fertilizer trends. Specifically,

(Continued on page 8)

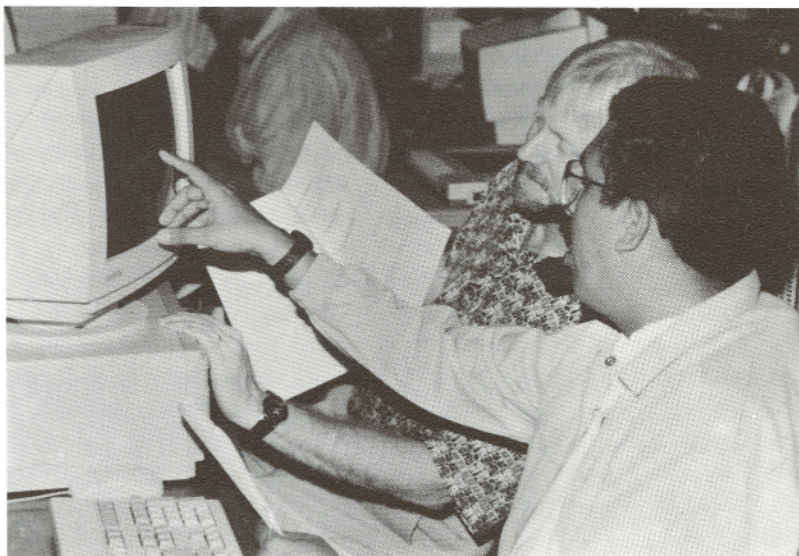
Training Activities

Pictured here are the participants and leaders of a crop modeling training course that was conducted in Uruguay by IFDC staff. La Estanzuela Research Station of Instituto Nacional de Investigacion Agropecuaria (INIA) in Uruguay was the site of the 1-week course held during April 24-28, 1995. Dr. Walter E. Baethgen, IFDC Soil Fertility/Biometrics Scientist, and Dr. Philip K. Thornton, IFDC Senior Systems Modeling Scientist, conducted the program, which was organized under the auspices of the Comision Nacional sobre el Cambio Global. The twelve participants from INIA and the university system included soil scientists, crop protection scientists, economists, agronomists, and agrometeorologists. The course was designed to give participants practical experience in using the models and assembling the necessary data files, rather than concentrating on details within the models. The emphasis was on climate change and the Rockefeller-funded farm-level modeling project with the Federacion Uruguaya de Grupos CREA (FUCREA) in Uruguay. The training activity should serve as an excellent base for promoting modeling activity in the country and for stimulating the collection and assimilation of the large amount of data that exist (weather, soils, and crop). There is much interest in the potential uses of crop modeling in Uruguay, as evidenced by the enthusiasm of the participants.



(Photo by Dr. Philip K. Thornton)

Roman Gordón of Panama, a participant in the Training Program on Computer Simulation for Crop Growth and Nutrient Management gains assistance from Dr. Walter T. Bowen, IFDC Systems Modeling Scientist, and Manager of the program. The training activity, conducted during May 8-19 at IFDC Headquarters, was a collaborative effort of the International Consortium for Agricultural Systems Applications (ICASA), the University of Florida, and IFDC. The thirty-five participants from 24 countries learned how comprehensive simulation models of crop growth and nutrient dynamics can be applied to help solve real world problems. Faculty for the program included experts from Wageningen Agricultural University of the Netherlands, University of Florida, University of Georgia, ICASA, and IFDC.



(Photo by Charles E. Butler)

Revision of the *Fertilizer Manual*

IFDC is collaborating with the United Nations Industrial Development Organization (UNIDO) to revise the second edition of the *Fertilizer Manual*, which was published in 1979 mainly through the efforts of the late Travis P. Hignett, Special Consultant to the Managing Director of IFDC. The third edition, which is expected to

be published in early 1996, will provide up-to-date information on fertilizer production processes, the current status of the industry, and future challenges facing the industry. Eleven of the twenty-three chapters are being prepared by IFDC staff, while the others are the responsibility of experts contracted by UNIDO. IFDC also has responsibility for technical and English editing and publication of the Manual.⊕

**International Fertilizer Development Center
P.O. Box 2040
Muscle Shoals, Alabama, U.S.A. 35662**

(Continued from page 1)

two locations where field trials are being conducted to validate the models," Bowen says. "To the extent possible, we are using field data from earlier experiments to calibrate and test the models. We are using training programs to introduce the systems approach and simulation tools to professionals in Albania."

Albanian institutions cooperating on this project include the Agricultural Research Institute, Lushnja; Hydrometeorological Institute, Tirana; Agricultural University of Tirana; and the Institute for Soil Studies, Tirana.

Winter wheat and maize experiments were conducted in Lushnja and Kamez during 1993/94 to collect data for testing the capability of the model to simulate yield response

to nitrogen fertilizer. Data from these experiments were used in a 2-week training program held at the Agricultural University of Tirana for 23 Albanian professionals from various public and private institutions. The systems research approach using simulation tools has proven beneficial to Albanian scientists by providing a framework for making recommendations to farmers even as support for further experimental work has been decreasing. As restructuring of the agricultural sector in Albania proceeds, the institutionalization of data collection techniques and simulation analysis capabilities will be an important prerequisite to the productive management of information.⊕

(Continued from page 6)

trends in nitrogen, phosphate, and potash fertilizer use, production, trade, and prices are discussed. The impact of projected growth in fertilizer use on food production is also assessed.

To order this technical bulletin, T-42, please place your order with the IFDC Purchasing Department. The cost of the publication is US \$50.00.⊕