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Report

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

Former Nigerian Head of State Addresses IFDC-Africa's Resource Mobilization Meeting

"Together we can find practical solutions to some of Africa's agricultural challenges. For successful and sustainable agriculture, there must be consistency in government policies and the farmer who is the linch-pin in the chain must be seen and treated as a king." This was the way that His Excellency, General Olusegun Obasanjo, Former Nigerian Head of State, concluded his keynote address to IFDC-Africa's Resource Mobilization Meeting, conducted in Lomé, Togo, during April 7-8, 1994.

This meeting was conducted at the suggestion of the United Nations Development Programme (UNDP) and the Netherlands Ministry of International Cooperation (DGIS), two of the agencies that have provided support to IFDC-Africa for the past several years. Twin purposes of the meeting were to inform the donor community and African leaders of the severity of Africa's agricultural crisis and to harness more support for activities geared to promoting sustainable agricultural production and food security in sub-Saharan Africa.

General Obasanjo reminded his audience that "there can be no permanent progress in the battle against hunger until all agencies that fight for increased food production and those that fight for population control unite in a common effort. Fighting alone, individually and in compartments, we may win skirmishes and even battles but certainly we will not win the war. But united and concerted, we can win a decisive and lasting victory that will provide adequate food, improved quality of life and other amenities for a progressive, well-planned, peaceful, politically stable, socially just, and economically buoyant society for the benefit of humanity."

At the beginning of the meeting, B. L. M'Poko, Senior Regional Manager, UNDP, Côte d'Ivoire, emphasized that it is time for Africa to assume responsibility for feeding and clothing its people because the continent will never be free as long as people continue to die of starvation. He emphasized that IFDC-Africa's mission in this regard is noble and deserves the needed support from the donor community.

The Acting Resident Representative of UNDP (Lomé, Togo), S. Ursino, pointed out that IFDC-Africa's mission complements UNDP's global effort to promote human resource development in both developed and developing countries. He appealed to the donor community to provide support to IFDC-Africa's program activities because they are designed to ensure food security and alleviate rural poverty in Africa.

(Continued on page 8)

(IFDC-Africa photo)

His Excellency General Olusegun Obasanjo, Former Nigerian Head of State, a farmer and an advocate for African agricultural development, delivers the keynote address during the Resource Mobilization Meeting held at IFDC-Africa, Lomé, Togo, April 7-8, 1994.

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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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President's Report

(Photo by Charles E. Butler)

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

The past quarter's calendar was filled with a number of meetings, projects, official visits, study tours, and other activities. Selected items from that schedule are highlighted here.

Japanese Development Official Joins Board of Directors

Dr. W. David Hopper, Chairman of IFDC's Board of Directors, recently announced the appointment of a new Board member—Dr. Kunio Takase, an Executive Director of the International Development Center of Japan (IDCJ), Tokyo, Japan.

Coming from an organization that is a private, nonprofit think tank specializing in international development policy, Takase will make an important contribution to the deliberations and decisions of the Board. IDCJ's program embodies three closely knit functions: (1) as a training institute, it provides training courses for development planners and economists; (2) as a policy consultant, it conducts a wide variety of studies on macro economy, development planning, and projects; and (3) as a research institute, it analyzes thematic issues and formulates conceptual frameworks for development strategies.

Bangladesh/IFDC Connection

Bangladesh Officials Visit IFDC—Two Bangladesh officials visited IFDC Headquarters during the past quarter to learn more about IFDC and its programs and to visit selected agencies/organizations in the United States. They were the Secretary, Ministry of Industries, A.H.M. Abdul Hye, and the Chairman of Bangladesh Chemical Industries Corporation (BCIC), Waseq-al-Azad. In reviewing the impact of IFDC's Fertilizer Distribution Improvement-II Project, which introduced the free market system to Bangladesh's fertilizer sector, Secretary Hye expressed appreciation for the "significant role that IFDC played in dismantling the state-owned fertilizer marketing system and setting up a privatized one—also in helping the government agencies and private sector in bringing about necessary changes through training and technical assistance."

Hye expressed precisely IFDC's future role in Bangladesh. "IFDC will be instrumental in making the free marketing system operate more smoothly," he says. "The Center will help us by increasing the system's competitiveness so that farmers receive more of the benefits. IFDC can provide the expertise to help us solve problems, especially in matters of processing and marketing of agricultural products."

As Chairman of BCIC, Azad presides over the four subsectors of his company: fertilizer, paper and pulp, cement, and chemical industries. Besides serving the needs of Bangladesh's farmers, BCIC's six fertilizer factories export approximately 500,000 metric tons of urea per year to Sri Lanka, Nepal, India, Philippines, Thailand, Vietnam, and China.

Azad found the visit to IFDC extremely helpful and enlightening. "Until I visited IFDC Headquarters I had no idea that IFDC had such a wide orientation. My association with the Center concentrates on IFDC's direct involvement in the privatization of urea fertilizer marketing and distribution in my country."

Bangladesh Team Observes U.S. Environmental Regulations in Action—A 7-member team of Bangladesh fertilizer plant officials recently gained a better understanding of environmental issues

and regulations in the United States as they affect the fertilizer industry. During the study tour conducted May 26-July 1, 1994, the officials assessed the environmental and safety programs of U. S. fertilizer factories. With their U.S. hosts, the team members discussed fertilizer production processes; quality control, marketing, and distribution techniques for solid and liquid fertilizers; and environmental issues related to production plants.

IFDC/Bangladesh Collaborators Conduct Environmental Assessment of Fertilizer Factories—During April 21-May 17, 1994, a team of fertilizer experts from BCIC and IFDC conducted an environmental assessment of ammonia/urea factories in Bangladesh. The team also evaluated the health and safety practices, observed operating procedures, and suggested improvements in standards and conditions under which the factories were operating.

The team found the factories to be orderly, well-operated, and well maintained. The factories were producing at, or above, full design capacity. Modifications are available to decrease energy consumption at five of the six factories. No unusual pollutant discharges were found.

Additional standards were proposed to be added to the Bangladesh Department of Environment's Environmental Quality Standards. Observance of proper health and safety practices varied by factory but were generally good.

Attendance at IFA Board Meetings

At the invitation of the Secretary General of the International Fertilizer Industry Association (IFA), Luc Maene, I attended a meeting held on April 12 in Brussels, Belgium, under the auspices of IFA and the European Fertilizer Manufacturers' Association (EFMA). The meeting focused on Central and East Europe. The fertilizer situation in Russia and its impact on the fertilizer producers in Western Europe were assessed, and actions that would stabilize the Russian situation were identified. I also attended the 62nd IFA Annual Conference held in Istanbul, Turkey, during May 9-12. The Russian fertilizer situation was discussed in a special session, and an outline of a project was developed for implementation. Potential donors were also identified.

Amit H. Roy

PEQUIVEN Marketers Design Training Program for Free Market System

"Since the Venezuelan fertilizer industry has now been opened up to any supplier and subsidies are gone, we must include in our working processes a new set of rules to participate in the increasingly competitive game of fertilizer marketing in Venezuela," says Roberto Mantellini, Business Analysis Manager, Fertilizer Business Unit, of the Petroquímica de Venezuela, S.A. (PEQUIVEN).

To help improve its competitive edge in this new game, PEQUIVEN sent five key players of its marketing team to IFDC during April to participate in a "train-the-trainers" program, which was especially tailored to meet the specific needs of PEQUIVEN and its personnel. This customized program, under the direction of Catalino C. Yaptenco, Jr., IFDC Senior Marketing Specialist, was developed in response to the requirements for skills training identified and recommended by IFDC in an earlier-conducted Stage 1 Evaluation Report on the future development of the Fertilizer Business Unit of PEQUIVEN.

"As PEQUIVEN shifts its focus and direction in marketing in the new customer-oriented environment, it has become evident and vital that its marketing personnel must acquire practical marketing skills necessary to function effectively and efficiently in a competitive, market-oriented marketing system," Yaptenco says. "The training and development of its own corps of trainers to train its personnel in the proficiency of commercial marketing are crucial to PEQUIVEN's growth in the fertilizer market."

The overall objective of this training program was to increase the knowledge of the participants in customer-oriented marketing so that they can later train PEQUIVEN's marketing personnel, including dealers, salesmen, and managers, on how to function in a competitive, free marketing system.

The five participants in the "train-the-trainers" program included José Chacín Molina, Henry Quintero, Luis Mogollón, Guillermo Mayorga, and Marden Vásquez.

Prior to the beginning of the program, the team members were involved in a pretraining assignment, which included individual study of selected fertilizer marketing publications and the establishment of a model dealer in Venezuela, who would be a cooperator with PEQUIVEN in the field training activities. PEQUIVEN would assist the dealer in setting up an agroservice center and agricultural supply store.

One-half of the 8-week program was conducted in the United States, and the other portion was held in Venezuela. The first week of the program, conducted at IFDC Headquarters, consisted of classroom lectures, discussions, and case studies. The following 2 weeks were spent in on-the-job field training with IMC Fertilizer, Inc., Rainbow Division, Winston-Salem, North Carolina, and Lebanon Chemical Company, Lebanon, Pennsylvania, on their fertilizer retail business operations. During the fourth week of the program, the participants returned to IFDC Headquarters to design and develop the training program that

(Photo by Charles E. Butler)

Reggie Shook, Manager of Lauderdale County Cooperative in Florence, Alabama (U.S.A.), briefs the PEQUIVEN marketing team on fertilizer packaging. From left to right: Reggie Shook (Lauderdale Co-Op); Luís Mogollón (PEQUIVEN); Ram Giroti (IFDC Coordinator of Human Resources Development); Jimmy McGee (IFDC Technician); Guillermo Mayorga (PEQUIVEN); Marden Vásquez (PEQUIVEN); Henry Quintero, partially hidden (PEQUIVEN); José Chacín (PEQUIVEN); and Catalino C. Yaptenco, Jr. (IFDC).

they will conduct for their colleagues in Venezuela. After returning to Venezuela, they spent the next month in organizing and implementing a training program for Venezuelan fertilizer dealers, salesmen, and management personnel.

One member of the marketing team, Henry Quintero, gained new insights in marketing that he plans to use at PEQUIVEN. "To accomplish our goals, we must pass on to the marketing managers and our other contemporaries, the concepts of 'customer service,' learned in the United States," Quintero says. "Service entails being able to handle a direct situation face to face with a customer in order to understand his needs and problems. We must convince him that we are his friend."

Luís Mogollón remembers his on-the-job training with the Lebanon Fertilizer Company and the new ideas that he gained from that experience. "With the Lebanon fertilizer salesman to whom I was assigned, I walked across farmers' fields, inspected their crops for diseases, and made recommendations to improve yields," Mogollón says. "I was impressed by the fact that the salesman had computerized information on all of his farmers' needs, available at his fingertips. We need access to this type of information in my company. With this information at our disposal, we can easily plan our activities for the coming year."

Marden Vásquez studied the techniques used by the salesmen to whom he was assigned. "I discovered that each salesman used different methods to reach his farmers, but each was a communicator. They developed a rapport with the farmers; they were customer-oriented."

José Chacín values the training program because it gave him the "theoretical and practical background that he needs to prepare a program for managers, dealers, and salesmen—to redirect the philosophy of his company to be more customer-oriented." To Chacín, service is the only tool that allows for differentiation in an increasingly competitive market.

Guillermo Mayorga gained an understanding of what an open market is and how dealers survive. "I am impressed with the fertilizer operation of IMC's Rainbow Division in the field—the relationship of its salesmen with dealers and farmer-customers. The dealers are close to their customers—the farmers. They build a good relationship with their customers to instill trust. By offering his customers a package of services, including fertilizer application, technical assistance, and transportation, a dealer will gain the trust of his customers and retain them."

The five-member marketing team has designed an innovative training program that will introduce new concepts in fertilizer marketing in PEQUIVEN. They will soon implement the program, which will emphasize a customer-oriented company personality based on service as the differentiation in the increasingly competitive Venezuelan fertilizer market.

IFDC Scientist Participates in Environmental Meeting

At the invitation of the Intergovernmental Panel on Climate Change (IPCC), Dr. Walter E. Baethgen, IFDC Soil Fertility Scientist/Biometrician, presented a paper at a recent meeting of IPCC's Working Group II—Agricultural Section. This meeting was held at the U.S. Department of Agriculture's Economic Research Service, Washington, D.C.

IPCC was established by the United Nations Environmental Programme (UNEP) and the World Meteorological Organization (WMO). Its purpose is to assess the information in the scientific literature related to various components of the climate change issue. The IPCC's three working groups are charged with preparing different portions of the scientific/technical assessment of issues related to climate change. Working Group I is charged with the state of science with respect to the functioning of the climate system and possible changes to it resulting from human activities. Working Group II is assessing potential impacts, adaptation, and mitigation measures. Working Group III focuses on assessment of economic implications of climate change and of available emission scenarios.

To date IPCC has produced a First Assessment Report, which established a common basis of scientific opinion on climate change issues. This report was used by governments to negotiate the Framework Convention on Climate Change signed at the U. N. Conference on Environment and Development held in Rio de Janeiro.

IPCC is now preparing the Second Assessment Report charged by UNEP and WMO to consider the likelihood and degree of future climate change, the effects on natural and human systems, and possible strategies for avoiding climate change or adapting to unavoidable change.

Baethgen was invited to participate in this meeting as a lead author for the agricultural chapter of Working Group II for the IPCC Second Assessment Report. The IFDC contribution will cover the potential impacts of climate change, adaptation, and mitigation measures in Latin America.

During the Washington meeting, the lead authors presented background papers covering various aspects of climate change, agricultural impacts, and adaptations. In his presentation Baethgen gave an overview of the agricultural system of the Latin American region and challenges for the region; major issues and policy concerns; and priorities of government actions.

According to Baethgen, the largest area with clear vulnerability to climate variability in the Latin American region is the Brazilian northeast. "Like most agricultural areas of Latin America, this region has a rainy season when crops are grown and a dry season with practically no rain," he says. "In the case of the Brazilian Northeast the rainy season is relatively short, and periods with no rainy season occur frequently. These dry years are characterized by the occurrence of famine and large-scale migrations to metropolitan areas. Climatic variations that would result in shorter rainy seasons and/or increased frequency of rainless years would have extremely negative consequences for the region."

A certain degree of vulnerability to climatic variability exists in the majority of the agricultural lands of the region. As stated above most of these areas present two well-defined seasons, rainy and dry. Any climatic changes that would lead to shorter rainy seasons could result in conditions similar to those existing in the Brazilian northeast, drastically affecting agricultural production.

To adjust to possible climate change, Baethgen suggests certain socioeconomic considerations and adaptation. For example, increased temperatures and shorter growing seasons would require adaptive strategies for the existing crop production systems. Three major stages would probably be needed to adapt to these conditions. The simplest adaptive strategies would involve planting earlier to ensure that the grain-filling stages would occur during periods of adequate temperatures. However, these strategies would only be meaningful in areas with clear temperature seasonality, and where sufficient rainfall occurs during such earlier time periods. Other adaptive strategies in this first stage would also cover improved plant nutrient management and better crop-pasture rotation systems.

"A second stage in adaptive strategies would involve establishing plant breeding programs especially oriented to produce cultivars adapted to high temperatures," he says. "These breeding programs will probably be developed under crop disease pressures, which will be higher than currently experienced if temperatures increase."

The third and most costly stage in adaptation strategies would typically involve the development of irrigation infrastructure. These strategies would be especially important for regions where rainy seasons would become shorter or more variable. However, irrigation costs for the region have been considerably high, and major commitments would be needed from the governments of the region.

Polish Fertilizer Industry Managers Gain Free Market Perspective

After touring several fertilizer production and marketing facilities in the United States, ten Polish fertilizer industry managers now have a better understanding of the operation of fertilizer factories and fertilizer distribution networks as they operate in the United States under a free market system.

Now that the Polish economy is being transformed into a market-oriented system, the country's businesses and industries are eager to learn how to make their enterprises more efficient and competitive. Polish managers are looking for ways to develop previously unfamiliar entrepreneurial skills in order to adapt to market-driven systems. In this new environment they have been suddenly thrust into making the hard decisions regarding production goals and costs, pricing, product selection, distribution, and marketing.

To assist the Polish fertilizer industry in making this transition, IFDC organized a specialized study tour of the United States for ten of Poland's leading fertilizer industry managers. According to the IFDC manager of the study tour, Donald C. Young, IFDC Senior Phosphate Production Specialist/Financial Analyst, the objectives of the tour were to provide these managers with an in-depth look at fertilizer granulation techniques and commercial factories operating in a free market economy. Equally important was to observe how one goes about forming a dealer network that serves as a private extension service. Assisting Young with this program was Steven J. Van Kauwenbergh, IFDC Geology Specialist.

"The Polish fertilizer producers are improving their operations in order to compete in the agricultural marketplace," Young says. "This study tour is part of a longer term assistance for the fertilizer producers in which they will learn how to form dealer networks that advise farmers on the types of fertilizers that meet the needs of their soils and crops and how to apply them economically and according to environmentally sound practices."

After a series of lectures and discussions at IFDC on NPK fertilizer granulation and marketing, the group went on a tour of several U.S. compound (NPK) fertilizer granulation plants that routinely use run-of-pile (powdered) single superphosphate (SSP) as a primary feedstock to produce granular multinutrient fertilizers that often contain secondary and micronutrients. This concept has value to the Polish fertilizer industry as the producers look for ways to improve the physical properties of powdered SSP and add value, including customer service, at the same time. The group also toured a bulk-blending and fluid fertilizer facility and two large phosphoric acid and diammonium phosphate fertilizer complexes. The tour included the IMC Fertilizer, Inc., SSP/NPK granulation plant, Florence, Alabama; Gold Kist Fertilizers' solids blending and fluid fertilizer plant, Athens, Alabama; IMC Fertilizer, Inc., SSP/NPK granulation plant, Americus, Georgia; C. F. Industries Plant, Plant City, Florida; the C. F. Industries bulk fertilizer-loading facility and ammonia handling facility, Tampa, Florida; and IMC-Agrico Company's Four Corners phosphate mine and New Wales phosphate complex near Mulberry, Florida.

(Photo by Charles E. Butler)

Charles Meadows (second from right), Manager of Gold Kist, Athens, Alabama, conducts Polish fertilizer industry managers on a tour of his company's fertilizer plant. They are from left: K. Zagozda, J. Drobotowski, H. Turbiarz (partly obscured), S. Grzebieluk, A. Szymańczak, J. Przybyła, P. Rozwadowski, (Meadows), and J. Świtecki (partly obscured).

IFDC Participates in FAO/IAEA Research Program on Phosphate Rock

A new research program on the use of nuclear and related techniques for evaluating the agronomic effectiveness of phosphate fertilizers, in particular phosphate rock, was launched recently by the Joint Division of Nuclear Techniques in Food and Agriculture of the Food and Agriculture Organization (FAO) and the International Atomic Energy Agency (IAEA). This is a 5-year project funded by the French Government.

The research collaborators involved in the network program include eleven from the developing countries and six from developed countries. Dr. S. H. Chien, IFDC Senior Soil Chemist, serves as a consultant and a research collaborator for the program. Currently he is conducting greenhouse experiments at IFDC Headquarters using radioactive phosphorus-32 as a tracer to investigate the enhancement effect of water-soluble phosphate on the phosphorus availability of phosphate rock. Crops being tested are maize, cowpea, and upland rice. Preliminary results showed that water-soluble phosphate acted as a starter to promote the early plant growth and root development so that the plant used the phosphate rock more effectively than the plant that was fed with phosphate rock alone. By using radioactive phosphorus-32 as a tracer, this enhancement effect can be precisely quantified.

IFDC will also contribute the following activities to the program: (1) conduct chemical and mineralogical characterization of phosphate rock samples to be used by the research collaborators from developing countries, (2) produce modified phosphate rock products (e.g., partial acidulation, and compaction of phosphate rock with water-soluble phosphate fertilizers) for agronomic trials, (3) develop crop and soil modeling framework for phosphate rock utilization, and (4) train research collaborators from developing countries on the use of radioactive technique in soil-plant research. It is hoped that, at the end of this project, more research information will be obtained to encourage the use of cost-effective indigenous phosphate rock for direct application in some developing countries, especially by the resource-poor farmers to increase crop production.

Recent IFDC Publications

Summary Report: Area Sampling Frame and Crop Yield Surveys in Albania—1993

IFDC recently published a paper entitled *Summary Report: Area Sampling Frame and Crop Yield Surveys in Albania—1993*, as part of its Paper Series; this publication was prepared by Dr. Julio Henao, IFDC Senior Biometrician.

This publication contains the results and methodology for area estimation of agricultural land in Albania during the 1993 cropping season. The area sample frame designed for Albania will enable agricultural officers and survey designers to select representative samples and collect data for a variety of purposes.

The publication outlines a methodology for survey, data collection, and analysis of land areas and suggests the establishment of a national agricultural statistical system. To make better decisions regarding the future of Albanian agriculture, its policymakers must have access to a reliable national agricultural statistical system. The system is designed to be similar to those currently used throughout Western Europe and the United States.

To order copies of this publication (IFDC Paper Series P-20), please address your orders to the IFDC Purchasing Department. The price of this publication is US $4.00 for U.S. addresses and US $7.50 for overseas addresses.

Ghana: Policy Environment and Fertilizer Sector Development

As the result of a cooperative project with the Institute of Statistical, Social, and Economic Research, IFDC recently released a new technical bulletin entitled *Ghana: Policy Environment and Fertilizer Sector Development.* This latest IFDC bulletin was prepared by Dr. Balu L. Bumb, IFDC Senior Economist; Dr. J. F. Teboh, Economic Scientist, IFDC-Africa; and J. K. Atta and W. K. Asenso-Okyere of the Institute of Statistical, Social and Economic Research.

This publication contains the results of a comprehensive collaborative study of Ghana's policy environment and how it affects the fertilizer sector operations in Ghana. The selected components of macroeconomic, microeconomic, sectoral, and organizational policies having a significant impact on the fertilizer sector operations were analyzed.

The study clearly brings out that a conducive and stable policy environment is essential for promoting growth in fertilizer use and thereby ensuring food security and environmental protection. A proper sequencing and phasing of policy reforms is also critical to achieve sustainable policy reforms and socioeconomic gains.

To order this publication, please address your request to the IFDC Purchasing Department. The price for this bulletin (IFDC Technical Bulletin T-41) is US $4.00 for U.S. addresses and US $7.50 for overseas addresses.

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The First Secretary and Regional Rural Development Adviser of the Netherlands Embassy, J. Koster of Ouagadougou, Burkina Faso, represented DGIS at the meeting. Koster expressed the commitment of the Netherlands Government to continue its support for IFDC-Africa's program activities. He also called on other donors to lend their assistance and support to enlarge the resource base needed by IFDC-Africa.

Welcoming all participants to Togo was His Excellency, the Minister of Planning and Territorial Management, Y. Yentchabre. The Minister noted with satisfaction that the meeting was especially timely because the African continent is experiencing a deep crisis: land shortages, population pressure, soil erosion and degradation, deforestation, desertification, limited supply of agricultural inputs, declining per capita food production and currency devaluation. To mitigate this crisis African countries urgently need to formulate coherent and appropriate agricultural policies leading to concrete actions and positive results.

The President and Chief Executive Officer of IFDC, Dr. Amit H. Roy, presented a historical overview of IFDC's activities in Africa since 1977. These efforts laid the foundation for developing national capacities to cope with the ongoing challenges in the agricultural sector.

Dr. A. Uzo Mokwunye, Director of IFDC-Africa, discussed the major constraints to African agricultural development: population pressure, environmental degradation, and rural poverty. He elaborated on the action plan and strategies pursued within the two programs at IFDC-Africa to address these constraints.

Delegates to the meeting attended an exhibition of IFDC-Africa's research and development programs. The purpose of this exhibition was to explain the rationale for IFDC-Africa's programs, to show the major activities within each program, and to summarize salient achievements of these programs over the past 6 years. Over 200 people visited the exhibits to learn more about IFDC's activities in Africa.

Vice Chairman Joseph C. Wheeler, IFDC Board of Directors, closed the meeting by conveying a special vote of thanks to the delegates and the representatives of the donor community. He emphasized that "the world's poor—both urban and rural—rely heavily on agriculture, either as the source of the foodstuffs on which they spend the bulk of their limited budgets or as their principal source of income or employment."

Wheeler reassured Africans and all friends of the continent by stating that IFDC's Board of Directors will work to ensure that support and resources needed to promote sustainable agricultural production in Africa are made available.