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INTERNATIONAL FERTILIZER DEVELOPMENT CENTER  
PROGRAMS AND BUDGET FOR CY 1984

August 1983

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## THE MISSION OF IFDC

The International Fertilizer Development Center (IFDC) was created in late 1974 to assist the developing countries in improving fertilizers and fertilizer know-how. Special emphasis is given to tropical and subtropical agriculture because this is where information is most lacking, food is already in short supply, and population growth is most rapid.

The tropics and subtropics have great potential for producing food, fiber, and fuel. Over one-half of the potentially arable land and nearly one-half of the potentially grazeable land lies within the tropics. Also, the potential exists for double cropping and even year-round agriculture where there is adequate rainfall or irrigation potential and this further multiplies agricultural potential.

The use of chemical fertilizers on other than export crops is a relatively recent development in the developing countries. Although approximately 70% of the world's population lives in these countries, less than one-third of the total fertilizer is presently being consumed there. Even though there is much new land that can eventually be brought into production, the development of new land is difficult and costly. The World Bank estimates that no more than a 1% increase per year in development of new land will occur in the developing countries.

Most of the increase in food and fiber must come from an increase in yields from land that is already under cultivation; thus, much greater use of fertilizers is required.

With rising costs of fertilizer, it is imperative that the right kinds of fertilizer be available to the farmers and that these fertilizers be used efficiently. Although fertilizers only account for about 1.5% of the total energy required, energy supply and costs are important especially with nitrogen fertilizers. A recent IFDC study shows that one 50-kg bag of urea, delivered to the farm, requires an energy equivalent to about 15 U.S. gallons (57 liters) of gasoline. With little potential for significantly reducing this requirement in either production or delivery, the greatest hope for conserving energy lies in improving the efficiency of nitrogen use. In fact, if IFDC efforts could improve the efficiency of nitrogen by only 1%-2% in the developing countries, this saving alone would more than finance IFDC and the other international centers. The hope for improving efficiency is not 1%-2% but in the neighborhood of 50% or more.

Although raw materials for fertilizers are in adequate supply worldwide and are being discovered at a faster rate than they are being used, it is sometimes in the interest of developing countries (for economic and other reasons) to develop even small indigenous resources. IFDC has assisted in this primarily in phosphorus. Technology for developing and conserving these resources has been and continues to be developed and is playing an important role in the rational development of these resources. We are taking steps to assist with other nutrients,

especially sulfur, potassium, calcium, and magnesium. In 1982, IFDC began a program to delineate what IFDC should do relative to micro-nutrients as fertilizers for the tropics.

Fertilizer use varies greatly between countries and the differences often can be associated with government actions that are taken or not taken. Simple adjustments by a country can go a long way toward the success or failure of a fertilizer industry and whether farmers use or do not use fertilizers in adequate quantities. Risks or perceived risks that can be overcome by policy changes may go a long way toward assuring an adequate and continuing food supply and, at the same time, encourage the development and continuance of a dynamic fertilizer industry. IFDC helps to identify these constraints and show opportunities for alleviating them.

Skilled manpower at all levels are in the shortest supply in the developing countries. Gaps of trained and experienced personnel occur in all phases of fertilizers. Successful fertilizer programs in a country require many disciplines working together. These disciplines must address exploration, mining, fertilizer manufacturing, transport, research, extension, production, marketing, etc. IFDC's multidisciplinary staff attempts to bring all these disciplines to focus in its human resource development activities.

Country planners require information and know-how to properly guide the development of successful fertilizer programs. Seldom can countries work in isolation and be successful. IFDC is attempting to

function as an unbiased entity to provide such information on a timely basis. The growing number of visitors and contacts indicates that considerable success is being achieved in gaining this status.

The growth and development of IFDC has resulted in a corresponding increase in budget. This growth has been in line with available resources, such as staff, facilities, and collaborating institutions.

OBJECTIVES OF IFDC

1. To develop new and improved fertilizers and fertilizer know-how for the developing countries with special emphasis on the tropics and subtropics.
2. To guide the developing countries, wherever economically and technically feasible, in the utilization and conservation of their indigenous fertilizer resources.
3. To help identify socioeconomic and other constraints that may affect fertilizer production, marketing and use, and to suggest policies that would overcome these constraints.
4. To assist the developing countries in the development of their human resources in all aspects of fertilizers.
5. To become functional as a world center for information on availability of fertilizer raw materials as well as fertilizer production, marketing and use in the developing countries.

## IFDC PROGRESS AND OUTLOOK

IFDC is now 9 years old. Our permanent facilities have been available since August 1977.

### Staff

We now have approximately 180 staff members. About 80 of these staff members are either scientists or engineers with 35 representing 22 countries other than the United States. IFDC also maintains two to four visiting scientist positions. These positions often require some funding but usually funds are provided to cover transportation and salaries (at least partially).

Seventeen positions are now operative in the developing countries; four in the Philippines, three in Colombia, three in Bangladesh, three in Indonesia, two in Niger, one in Nigeria, and one in India.

### Facilities

During 1983, facility expansion was minimal. An intermediate-scale granulation pilot plant has been installed on a permanent basis. Funding restrictions have prohibited the construction of a storage building to alleviate congestion in the pilot plant, soil headhouse area, and to expand office and laboratory space in the main building. The budget outlook for 1984 is such that no funds will be available for expanding these facilities.

## Budgets

Expenditures for 1982 reached \$9.3 million. The USAID grant (\$4.0 million) made up approximately 43% of IFDC's total income.

Income for 1983 is projected to be about \$9.5 million. This is equal to IFDC's approved budget of \$9.5 million (Table 1). Strict curtailment of expenditures and hiring has been continued during 1983. Even with these curtailments, expenditures may exceed our projected income, which would result in further depleting our small reserve.

Furthermore, additional curtailments may be required in 1984 if funding is not forthcoming. The main reasons for the income shortfall could be: (1) failure to attract additional major donor support; (2) changes in currency exchange rates, especially Australia and Canada; (3) general tightening of money worldwide, resulting in less support for technical assistance and/or training; and (4) some default in payment of commitments on small accounts.

The outlook for income in 1984 is little or no better than for 1983. Thus, we seek approval for a budget of \$10 million since we are not confident that more than this amount can be raised (Table 2). We do, however, seek approval to expand expenditures beyond \$10 million if additional funding through restricted core or special projects is forthcoming.

IFDC's Program Review Committee has met and set priorities; the program categories as well as the budgets assigned to the various categories in this document are generally in line with these priorities.

To cover the \$10 million 1984 budget request, we anticipate the following income:

Unrestricted Core:		
USAID	\$4,000,000	
ADAB	200,000	
Other	<u>240,000</u>	
Subtotal		\$4,440,000
Restricted Core:		
ADAB	\$ 600,000	
IFAD	1,000,000	
IDRC	250,000	
UNDP	710,000	
Unidentified	<u>440,000</u>	
Subtotal		3,000,000
Special Projects:		
BADC	\$1,000,000	
PHILPHOS	150,000	
Unidentified	<u>1,185,000</u>	
Subtotal		2,335,000
Miscellaneous Income		<u>225,000</u>
TOTAL		<u>\$10,000,000</u>

Table 3 indicates an operating expense summary projected through 1987; a total of \$12.9 million is anticipated for CY 1987.

Table 1. IFDC Operating Expense Budget Summary  
CY 1983

<u>Cost Classification</u>	<u>OMD</u>	<u>Out reach</u>	<u>Agro-Economic</u>	<u>Fertilizer Technology</u>	<u>Total</u>
Salaries & Benefits	\$1,240,740	\$1,365,335	\$1,452,420	\$1,587,570	\$5,646,065
Travel	99,290	414,385	164,105	75,730	753,510
Rent, Communications & Utilities	297,185	31,325	22,600	15,200	366,310
Printing & Reproduction	14,150	51,535	7,900	8,205	61,790
Contractual Services	550,135	146,250	1,043,835	129,250	1,869,470
Supplies & Materials	<u>85,580</u>	<u>116,550</u>	<u>208,325</u>	<u>175,750</u>	<u>586,205</u>
TOTAL	\$2,287,080	\$2,105,380	\$2,899,185	\$1,991,705	\$9,283,350
Fixed Assets & Equipment Modification	<u>49,650</u>	<u>-</u>	<u>71,500</u>	<u>95,500</u>	<u>216,650</u>
GRAND TOTAL	<u>\$2,336,730</u>	<u>\$2,105,380</u>	<u>\$2,970,685</u>	<u>\$2,087,205</u>	<u>\$9,500,000</u>

Table 2. IFDC Operating Expense Budget Summary  
CY 1984

<u>Cost Classification</u>	<u>OMD</u>	<u>Outreach</u>	<u>Agro-Economic</u>	<u>Fertilizer Technology</u>	<u>Total</u>
Salaries & Benefits	\$1,461,100	\$1,449,125	\$1,375,855	\$1,706,330	\$ 5,992,410
Travel	142,835	332,755	215,495	108,880	799,965
Rent, Communications & Utilities	312,050	36,875	11,300	17,200	377,425
Printing & Reproduction	23,940	43,175	18,700	7,700	93,515
Contractual Services	603,705	356,525	552,780	118,425	1,531,435
Supplies & Materials	<u>266,000</u>	<u>111,000</u>	<u>405,750</u>	<u>206,000</u>	<u>988,750</u>
TOTAL	\$2,809,630	\$2,329,455	\$2,579,880	\$2,164,535	\$ 9,883,500
Fixed Assets & Equipment Modification	<u>19,500</u>	<u>-</u>	<u>6,000</u>	<u>91,000</u>	<u>116,500</u>
GRAND TOTAL	<u>\$2,829,130</u>	<u>\$2,329,455</u>	<u>\$2,585,880</u>	<u>\$2,255,535</u>	<u>\$10,000,000</u>

Table 3. IFDC Operating Expense Budget Summary  
CY 1983-1987  
US \$

<u>Program Summary</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
I. Fertilizer Technology					
Personnel	\$ 1,587,570	\$ 1,706,330	\$ 1,875,000	\$ 2,350,000	\$ 2,526,250
Operating	404,135	458,205	505,000	650,000	698,750
Subtotal	\$ 1,991,705	\$ 2,164,535	\$ 2,380,000	\$ 3,000,000	\$ 3,225,000
II. Agro-Economic					
Personnel	\$ 1,452,420	\$ 1,375,855	\$ 1,510,000	\$ 1,661,000	\$ 1,785,575
Operating	1,445,765	1,204,025	1,510,000	1,430,000	1,537,250
Subtotal	\$ 2,899,185	\$ 2,579,880	\$ 2,810,000	\$ 3,091,000	\$ 3,322,825
III. Outreach					
Personnel	\$ 1,365,335	\$ 1,449,125	\$ 1,590,000	\$ 1,749,000	\$ 1,880,175
Operating	740,045	880,330	940,000	1,034,000	1,111,550
Subtotal	\$ 2,105,380	\$ 2,329,455	\$ 2,530,000	\$ 2,783,000	\$ 2,991,725
IV. General Administration					
Personnel	\$ 695,440	\$ 938,305*	\$ 1,000,000*	\$ 975,000	\$ 1,048,125
Operating	112,300	498,875	500,000	225,000	241,875
Subtotal	\$ 807,740	\$ 1,437,180	\$ 1,500,000	\$ 1,200,000	\$ 1,290,000
V. Support Services					
Personnel	\$ 545,300	\$ 538,845	\$ 590,000	\$ 649,000	\$ 697,675
Operating	127,390	63,050	70,000	77,000	82,775
Subtotal	\$ 672,690	\$ 601,895	\$ 660,000	\$ 726,000	\$ 780,450
VI. General Operating	\$ 806,650	\$ 770,555	\$ 820,000	\$ 900,000	\$ 967,500
VII. Equipment Modification and Improvement	\$ 216,650	\$ 116,500	\$ 300,000	\$ 300,000	\$ 322,500
<b>TOTAL</b>	<u>\$ 9,500,000</u>	<u>\$10,000,000</u>	<u>\$11,000,000</u>	<u>\$12,000,000</u>	<u>\$12,900,000</u>

\*Includes bulk of ADAS/Indonesia.

Programs

Expansion during the past year has been in overseas positions (see Staff). Headquarters staff have actually declined since a few vacancies have not been filled because of the budget constraint. The budget constraint has been caused by overall inflation, some reduction in donor support (UNDP), sizeable reductions due to currency exchange declines (ADAB and IDRC), new donors not allowing their funds to be utilized to cover Headquarters support for overseas projects (IFAD), and a decline in special project technical assistance and training support. Thus, core funds have become further depleted and core-supported research, development, and training have declined.

Research--No new initiatives in research have been possible. More effort has been required to service overseas programs. The preparation and shipment, usually by airfreight, of experimental materials and equipment has increased. Still major accomplishments have been made in the various established research efforts. These accomplishments are summarized in the individual programs.

Technical Assistance--Special project assistance during 1983 will be provided to around 20 different countries. This activity will provide income of between \$2.5-\$3.0 million. Assistance to Bangladesh, the Philippines, Malaysia, Thailand, and Indonesia provided about \$1.7 million income.

In addition, core funds have been utilized to provide short-term (2 weeks or less) assistance to a few countries that needed assistance but did not have the ability to pay in convertible currencies.

Even here, local costs and often times international airfares were provided by the country, company, or a donor agency. Assistance by mail or cable also continues to increase as does assistance to visitors.

Assistance was provided in most all facets of fertilizers from mining through production, marketing and use. IFDC is rapidly being recognized as the provider of unbiased advice and council with the well being of the developing country foremost in its mind.

Training--IFDC has held nine group training programs so far during 1983. In October a Maintenance and Production Training Program will be held at IFDC Headquarters and in December a Regional Fertilizer Marketing Training Program will be held in Manila. This will make a total of 11 group training programs offered in 1983. Only one program, the FERITT Training Program for Latin America, failed to have the necessary enrollment and was cancelled. Fertilizer Process Economics Training Program, originally planned for 1983, was rescheduled for 1984 because IFDC staff were overcommitted. So far there have been 168 trainees participating in the nine group and other individual training programs that have been offered by IFDC in 1983. Requests for scholarships and financial assistance have been increasing in number. If more funds were available for participant scholarships, there would be greater representation from Africa and perhaps Latin America as well as other developing countries.

There has been growth in the range of training programs offered and the quality, number, and diversity of participants attending.

The applicants for enrollment are better qualified in terms of their level of education, proficiency in English as a second language, and the level of responsibility in their present position.

The Data Collection and Analysis for National Fertilizer Sector Studies Training Program was offered for the first time in 1983 and a new course in the Use of Microcomputers for Fertilizer Sector Personnel is being planned for 1984 as well as a program in Statistics and Economics of Fertilizer Use. A senior-level FERITT program is also planned for 1984.

NITROGEN RESEARCH

	<u>1983</u>	<u>1984</u>
Work Years	23.7	33.1
Budget	\$ 1,495,890	\$ 1,795,850
Salaries and Benefits	727,645	943,955
Travel	107,295	156,255
Operations	660,950	695,640

IFDC efforts to understand the magnitude and pathways of nitrogen loss from rice paddies have been successful. Work in wind tunnels, growth chambers, greenhouses, and recently in field studies, have all confirmed ammonia volatilization as the principal loss mechanism from flooded and puddled paddies. By keeping the ammonia level low in the floodwater, ammonia volatilization can be minimized. Research has shown that ammonia levels in the floodwater can be kept low by deep placement of the nitrogen or by using controlled-release nitrogen fertilizers to meter nitrogen release in relation with plant demand.

Deep placement can, theoretically, be accomplished by a number of mechanisms. The most satisfactory and repeatable method has been to place large urea granules or briquettes about 10 cm into the soil. This is satisfactorily done by hand but efforts by IRRI, the Chinese, and others give hope that this operation can soon be mechanized to speed up adoption. Supergranules (granulated products or briquettes) have been made by IFDC and others. With the growing interest in the use of these materials for deep placement throughout southeast Asia, production technology research efforts in Japan, Netherlands, Norway, and by TVA in

the United States, give promise of commercial processes becoming available. The advantages of briquetting are: (1) probably less sensitive to scale economically, (2) it can utilize many feeds such as dusts, off-grade materials, crystals, or even prills, (3) low energy requirement, and (4) simple technology. Briquetting could be accomplished in small units in the village or as an adjunct to either prilled or granular production.

Coated materials have shown to be very effective with rice yield results similar to deep placement. The advantage of coated materials is that farmer practice does not have to be changed and fewer applications of nitrogen are needed. The disadvantage is the cost. The cheapest effective product known is sulfur-coated urea (SCU) and the best estimates indicate that nitrogen in this form will cost at least 50% more than uncoated prilled urea delivered to the farmer. Unless these costs can be reduced, this approach may have to be abandoned. Work continues, however, with the approaches being to: (1) coat a larger substrate, thus requiring less coating, (2) seek out areas where sulfur as a nutrient can have an economic value, (3) find cheaper and more readily available indigenous coating materials, and (4) simplify the coating process.

Another promising approach is through the use of urease inhibitors. Laboratory and greenhouse work indicate that concentrations of inhibitors as low as 0.5%-1.0% by weight can keep ammonia levels in floodwater low. It has not been proven, however, that this enhances nitrogen uptake to the degree necessary. Initial field work has not

increased yields as anticipated. IFDC chemists are now beginning to understand the mechanism of inhibition and are encouraged that inhibitors (cheaper than those presently available) can be synthesized.

The focus of efforts to improve the nitrogen efficiency for rice is now shifting to rainfed rice. Preliminary data indicate that rice grown under wetting and drying cycles may well have different loss mechanisms, magnitudes, and patterns and may, therefore, require different management and/or products to attain good efficiency.

IFDC's upland crop nitrogen program now has 3 years of field data, primarily from India in cooperation with ICRISAT. Some information is becoming available from the Middle East (ICARDA) and Africa (ICRISAT and IITA). This work shows losses of a smaller magnitude than anticipated and, even though uptake of applied nitrogen is not as high as would be desirable, the nitrogen is not lost from the system and does become available for future crops. It has also shown that, with adequate nitrogen in the soil, better water use efficiency is attained and double cropping is possible on deep soils where, without additional nitrogen, these soils are limited to only one crop per year. Additional research sites have been incorporated into the program, notably Senegal and Kenya.

Funding for the 1984 nitrogen program will come from core funds (mainly USAID), UNDP funds (work with ICRISAT), IFAD funds (west Africa--IITA and ICRISAT), ADAB funds (Indonesia), and special project funds (BADC for work in Bangladesh and PETRONAS funds to study natural rubber latex coatings for Malaysia).

PHOSPHORUS RESEARCH

	<u>1983</u>	<u>1984</u>
Work Years	34.5	33.2
Budget	\$ 1,727,400	\$ 1,761,375
Salaries and Benefits	1,011,685	1,068,335
Travel	73,140	109,980
Operations	642,575	583,060

IFDC has made real progress in its ability to help developing countries utilize problem phosphate ores. More capability has been gained in the ability to evaluate small samples, to advise on the potential for direct application, the possibilities for beneficiation, the use of direct acidulation, the potential for utilizing limited amounts of acid to produce partially acidulated products, the utilization of fines (dusts or slimes), the utilization of acids with impurities to make finished fertilizers, the granulation of phosphate fertilizers, and the utilization of acids with high impurities for making triple superphosphate (TSP), nitrogen and phosphorus (NP), or nitrogen, phosphorus, and potassium (NPK) fertilizers.

Evaluations of phosphate rock sources indigenous both to Latin America and Africa have been initiated at the farm level to confirm the experimental station results and to further define the influence of soil properties and farm-level management on the effectiveness of the sources for direct application or partial acidulation. In Colombia, 72 experiments

have been established in three agro-climatic zones during the first year of a 2-year funding agreement with IDRC. The project is interdisciplinary with input from soil scientists, a sociologist, and an economist. Verification of the hypothesis developed earlier regarding source solubility, the role of partial acidulation, and differences in plant type with respect to efficiency in source utilization is being obtained in collaboration with ICA who is responsible for agricultural extension in Colombia. Factors affecting cost and adoption by small farmers is also being obtained.

Funding sources have dictated, to a significant degree, IFDC's efforts on phosphates. Loss of UNDP funds and a reduction of IDRC funds have reduced the Latin American project with CIAT. IFDC core funds are being utilized to keep the Latin American project going at a minimal level. Also, funding for the work in Peru, Venezuela, and Mexico has not materialized as originally anticipated. The Latin American program will probably have to be reduced even more in 1984.

IDRC of Canada has provided some funding for a project in Mali. It is hoped that the early success of this work will encourage other donors to participate and that core funds now in this program can be replaced for Headquarter efforts. IDRC is trimming its agricultural budget for 1984 but, hopefully, the third and final year of the original Mali project will be funded. Some World Bank support for work with CMDT is anticipated.

IFAD has furnished funding for work in West Africa, Niger, and Nigeria. This allows work to be carried out with ICRISAT and IITA in

the principal ecological zones from the arid to the humid tropics. It also provides funds for studying the potential of utilization of indigenous ores in this region (deposits in Upper Volta, Niger, and Togo) for the benefit of local agriculture.

To maintain the efforts in phosphorus that are now outlined depends heavily on obtaining significant funding for special project and/or restricted core work. Funding, available at present, comes from core, IFAD, IDRC, ADAB--for some work in Indonesia, and from special projects such as PHILPHOS for the Philippines or FPM in Malaysia. Additional donors or special projects must be found.

SULFUR RESEARCH

	<u>1983</u>	<u>1984</u>
Work Years	2.5	2.1
Budget	\$ 90,535	\$ 56,915
Salaries and Benefits	80,835	39,540
Travel	500	12,275
Operations	5,200	5,100

The sulfur program still has not really gotten off the ground. At present, due to budget problems and loss of the principal investigator, this program is on hold as far as research and development (R&D) are concerned. Some field work continues in Indonesia utilizing ADAB funding and in Bangladesh utilizing BADC funding for 1984.

Due to lack of funding and interest, essentially no activity has been initiated on assisting the developing countries in the development of their indigenous raw materials.

An outline for a redefined sulfur program has been developed which has been discussed with scientists in Australia. A proposal for funding of field research on sulfur in Indonesia, Thailand, and Malaysia has been submitted by the University of New England to ACIAR for funding. This proposal is written to include collaboration with IFDC on the evaluation of the efficiency of sulfur-coating fertilizers and the fate of applied sulfur as influenced by source and soil properties. Indigenous materials will be included. Progress in this area depends heavily upon whether or not ACIAR comes through with funding. Field research on

sulfur is also expected to be initiated in Latin America as a portion of the project which is being submitted to IDRC for continued collaboration with CIAT.

Headquarters research in 1983 has been limited to studies on the fate of applied sulfur as affected by nutrient interactions.

During 1984, Headquarters research will be augmented by the arrival of an experienced Australian scientist who will spend his sabbatical with IFDC.

MICRONUTRIENT RESEARCH

	<u>1983</u>	<u>1984</u>
Work Years	0.5	-
Budget	\$ 33,255	\$ 8,250
Salaries and Benefits	28,405	-
Travel	2,850	-
Operations	2,000	8,250

Zinc, boron, molybdenum, manganese, and occasionally, copper have been reported as being deficient for crop production in tropical and subtropical agriculture. Many scientists report increases in yields of major food crops when certain micronutrients are added--zinc for rice and maize, boron for alfalfa, manganese toxicity in acid soils, and molybdenum on leguminous plants in acid soils.

In April 1982, a senior agronomist was assigned to determine the extent to which micronutrients are critical to food production in developing countries of the tropics and subtropics. This information is being organized into a monograph entitled "Micronutrients and the Agricultural Ecology of Tropical Food Crop Production." IFDC's role in research and development concerning micronutrients should soon become clarified.

POTASH AND COMPLEX FERTILIZERS (RESEARCH)

	<u>1983</u>	<u>1984</u>
Work Years	1.0	2.0
Budget	\$ 42,140	\$ 58,950
Salaries and Benefits	31,440	53,325
Travel	1,500	3,825
Operations	9,200	1,800

Many countries that have relied primarily on the use of nitrogen to increase their food crop yields are now finding that increased nitrogen usage no longer increases yields. In a few cases, yields have decreased over what formerly was attained. This is due to an imbalance in fertilization in that the soil cannot furnish other nutrients-- $P_2O_5$ ,  $K_2O$ , S, Mg, micronutrients--to maintain high yields. A more balanced and complete fertilizer matched to the soil and crop needs of an area is needed. Since many developing countries have only urea as a nitrogen source and superphosphates as a  $P_2O_5$  source, it is not possible to make complete fertilizers by conventional granulation nor by bulk blending. IFDC has initiated programs to gain knowledge in the use of these and other products, particularly potassium salts, to make complete fertilizers of proper grades that can be stored, transported, and applied with minimal difficulty in tropical and subtropical agriculture.

IFDC's experience in numerous technical assistance projects has pointed to the need for research in this area. Also, IFDC's excellent facilities for granulation--ranging from laboratory granulation on a

continuous basis through the intermediate granulation unit to the full-scale pilot plant--can be utilized for developing the necessary technology at minimal cost. These facilities can provide adequate quantities of the material for the necessary tests to determine shipping, handling, and application techniques, if necessary.

A study jointly funded by the Potash and Phosphate Institute (PPI), the International Potash Institute (IPI), and IFDC was completed in 1983. This, along with a study entitled "Potassium, Calcium, and Magnesium in the Tropics and Subtropics," should help IFDC define its future efforts in potassium and, to some degree, in magnesium and calcium as plant nutrients and/or soil amendments. Once these reports are available, PPI, IPI, and IFDC will meet to produce a position on what IFDC can and should do. We also anticipate guidance from IFDC's Program Review Committee on setting priorities. Hopefully, once the program is developed, projects can be developed to seek funding and this part of our program can become a reality.

Although some core funds are likely to be required, it is anticipated that a number of organization and/or country-specific projects can be obtained to help cover the costs of this activity.

FARM-LEVEL ECONOMICS AND EQUITY STUDY

	<u>1983</u>	<u>1984</u>
Work Years	3.5	2.4
Budget	\$ 182,250	\$ 158,135
Salaries and Benefits	126,620	105,845
Travel	29,130	24,040
Operations	26,500	28,250

Ongoing studies in this area of research are aimed at:

1. Developing a clear understanding of the nature, magnitude, and relative importance of various factors (farm-level constraints) on the expansion of fertilizer use in the developing countries.
2. Providing the socioeconomic and technical information that is necessary for the development of improved fertilizer technology.
3. Assessing the manner and extent to which the benefits of fertilizer use are shared among different groups of farmers.
4. Assessing the employment effects of fertilizer use.
5. Developing improved methodologies for estimating and forecasting fertilizer demand for development of public policy.

Recent findings of research activities in Bangladesh and India have created considerable interest on the part of national and international

organizations for additional farm-level information to improve the design and implementation of agricultural development policies.

During 1982 and 1983 a concentrated effort has been made to train both Bangladesh and Indian counterparts to conduct their own research on this subject. It is anticipated that by mid-1984 much of this research will be turned over to these counterparts, freeing IFDC to function in an advisory capacity. This will free staff and resources to initiate this work in other countries or work on other projects. Funding has been from the BADC contract (USAID loan--Bangladesh), IFIAS and IDRC (Colombia), and ADAB (Indonesia) as well as core. The decrease in budget and manpower for 1984 shows some decrease in effort and staffing.

ECONOMIC EVALUATION OF SELECTED FERTILIZER MATERIALS

	<u>1983</u>	<u>1984</u>
Work Years	0.3	0.1
Budget	\$ 8,940	\$ 4,820
Salaries and Benefits	7,140	4,220
Travel	-	-
Operations	1,800	600

This area complements IFDC's technological research in the development of new or modified fertilizer materials, such as coated urea, urea supergranules and briquettes, or partially acidulated phosphate rock. The economic evaluation of these materials, conducted once their agronomic effectiveness is known, attempts to identify the potential that these materials may have to expand food production in developing countries through economically sound use of fertilizers.

Although much of this type of work is done as a part of other projects such as Fertilizer Production Technology, the need for more effort to guide research and technical assistance activities is badly needed. It is hoped that budgets can soon be found whereby these activities can be given the attention they deserve.

FERTILIZER POLICY

	<u>1983</u>	<u>1984</u>
Work Years	1.8	1.9
Budget	\$ 69,220	\$ 83,110
Salaries and Benefits	60,820	69,260
Travel	4,100	8,550
Operations	4,300	5,300

Generating appropriate information based on sound economic analysis is a prerequisite for decisionmakers to design effective agricultural policies. The main objectives of fertilizer policy at IFDC are:

1. To evaluate alternative fertilizer policies with respect to their economic implications at the farm and national levels in achieving stated national goals.
2. To generate relevant information which will assist national planners and policymakers in formulating appropriate fertilizer policies.
3. To provide guidelines for designing, implementing, and monitoring fertilizer policies at the farm and national levels.

The 1982 and 1983 work included several projects. One is the Energy and Fertilizer Project from which two IFDC publications resulted (Energy and Fertilizer--Policy Implications and Options for Developing Countries and an Executive Brief of the Energy and Fertilizer publication). The IFPRI/IFDC/IRRI Rice Policy project for Southeast Asia continued, although funding for the entire project since 1982 is still being sought.

In addition to these projects, work on the World Fertilizer Economy: Performance, Prospects, and Policy Project will continue.

RESEARCH AND MISCELLANEOUS SUPPORT SERVICES

	<u>1983</u>	<u>1984</u>
Work Years	24.9	25.9
Budget	\$ 788,265	\$ 823,990
Salaries and Benefits	663,320	687,640
Travel	7,730	8,675
Operations	117,215	127,675

The growth of IFDC's research and development programs has caused the expansion of research support services. Expansion in nitrogen, phosphorus, and sulfur research activities, as well as research by visiting scientists, results in the need for adequate support facilities. Likewise, the data processing facilities have grown to provide staff members with the analytical capability to evaluate new fertilizer materials and processes. Additional uses of the computing facilities include accounting, personnel files, and inventory control. The equipment is also used to generate graphical representations of research findings for incorporation into reports or presentations.

The use of scientific instruments as research tools continues to grow along with technological advancements. It provides IFDC with an increasing capability to serve the needs of food production in developing countries. Even though expenditures made for many research activities where scientific instruments are used can be charged to specific projects, other expenditures are made which may not be directly chargeable to special projects. Some examples are listed below:

1. Testing fertilizer physical properties and studying methods for improvement.
2. Routine wet-chemical analysis of raw materials, intermediates and products.
3. Maintenance labor, and supplies for IFDC buildings, laboratory and pilot-plant equipment, greenhouses, growth chambers, and for fabrication of research equipment.
4. Safety program that involves checking safety equipment, providing personnel safety apparel and accessories, and disposing of hazardous chemicals and waste.
5. Charges incurred through time spent with visitors (not covered by special project funds).
6. Receipt of all supplies and deliveries to IFDC, such as: chemicals, equipment, office supplies, and fertilizer materials. Packaging of materials for overseas shipment. Maintaining and inventoring equipment and raw materials for products. Freight charges for incoming shipments of raw materials (not specifically assigned to special projects).
7. Maintaining a small staff to perform adjustments and minor repair to the sophisticated analytical instruments in the research divisions. In most cases, this is supplemented by maintenance contracts with equipment vendors.

RESEARCH ADMINISTRATION  
(Agro-Economic and Fertilizer Technology)

	<u>1983</u>	<u>1984</u>
Work Years	7.9	7.0
Budget	\$ 420,060	\$ 328,305
Salaries and Benefits	259,940	213,375
Travel	10,795	8,850
Operations	149,325	106,080

This category of the budget includes funds to cover the administrative costs for monitoring of work in the respective division and for monitoring of contractual work. It further includes funds for:

1. Project proposal development.
2. Division secretarial support.
3. Communications costs--visual aids and report preparation (not specifically assigned to other projects).
4. Office supplies and furniture.
5. Telex and telephone charges (not specifically assigned to other projects).
6. Travel for the Division Directors.
7. Technical aides assigned to administrative duties.

In IFDC, the Division Director is held responsible for all aspects of the research program and its output. Output consists of a wide range of reports (Activity, Progress, and Annual Reports; Technical

Bulletins; Trip Reports; Reports to Project Sponsors) and for technical presentations at meetings and seminars. The Division Director is also heavily engaged in project proposal development and project implementation.

TRAINING

	<u>1983</u>	<u>1984</u>
Work Years	7.5	9.3
Budget	\$ 451,785	\$ 576,110
Salaries and Benefits	309,975	350,080
Travel	104,325	118,205
Operations	37,485	107,825

IFDC conducts training through organized group and individual programs. This activity is administered by the Outreach Division, but all divisions participate by providing faculty and/or technical coordination.

Group training has been divided into three broad categories:

(1) Fertilizer Marketing, (2) Fertilizer Production and Technology, and (3) Fertilizer Efficiency. Recently, management effectiveness training has been introduced into the marketing and production-oriented course.

Plans for 1984 include offering courses in production economics, handling and distribution, economics and statistics, and microcomputers.

IFDC sponsored group training courses are conducted either at Headquarters or regionally. Fully reimbursed internal programs with IFDC as the executing agency have also been carried out, e.g., FERTIMEX (Mexico)--at IFDC Headquarters, in Sri Lanka and in Bangladesh and with CEFER in Brazil. Training fees that range up to \$1,800 per course (per person) are usually charged. Also, transportation to and from the participants country and all living costs are covered by the participant (a few scholarships are provided to those that do not have a sponsor).

Individual training programs on specific subjects are also offered and may be for a few weeks to 2 years. Individual training program costs are generally covered in full or in part by a sponsoring agency.

Highly specific courses such as data processing (in Bangladesh) and research techniques with  $^{15}\text{N}$  are also provided.

Ongoing evaluation of these training efforts is conducted to:

1. Assess the impact on the participants' technical knowledge.
2. Determine the relevance of training to participants' needs.
3. Identify ways to improve training and expand into other areas.
4. Development of criteria for better selection and grouping of trainees.

FERTILIZER MARKETING SYSTEMS

	<u>1983</u>	<u>1984</u>
Work Years	8.9	9.6
Budget	\$ 959,290	\$1,036,800
Salaries and Benefits	565,355	634,400
Travel	190,635	162,150
Operations	203,300	240,250

The Outreach Division coordinates and carries out a broad range of fertilizer marketing projects. Examples include marketing information services, nutrient and product supply-demand studies, and fertilizer price analysis. These projects serve as a base to answer the large number of requests that IFDC continually receives for market-related information.

One of the larger ongoing special projects in this program area is the BADC/IFDC/USAID-funded project in Bangladesh, which was expanded in 1983.

Also included in this category are a number of country-specific studies dealing with various aspects of fertilizer marketing, projections, procurement, transportation, storage, etc.

FERTILIZER PRODUCTION TECHNOLOGY

	<u>1983</u>	<u>1984</u>
Work Years	4.7	4.3
Budget	\$ 272,795	\$ 247,045
Salaries and Benefits	243,350	237,945
Travel	23,295	5,850
Operations	6,150	3,250

The principal function under the Fertilizer Production Technology Program is to provide engineering assistance to developing countries in the planning, design, and operation of fertilizer manufacturing facilities. Engineers from the Outreach and/or Fertilizer Technology Divisions provide engineering support for IFDC training programs, core and reimbursable studies involving fertilizer manufacture and distribution, and the evaluation of IFDC research and development (R&D) processes. Inquiries related to fertilizer manufacture are handled.

Technical publications related to fertilizer manufacture and distribution are developed. Time, during 1983-84, is also budgeted for the development of a fertilizer-distribution handbook. Based on prior years' experience, it is anticipated that there will be several reimbursable study projects involving the preliminary evaluation of new fertilizer manufacturing facilities. A technical assistance-type project at PHILPHOS in the Philippines where IFDC has two engineers stationed to provide engineering expertise is also included.

FERTILIZER EVALUATION UNIT

	<u>1983</u>	<u>1984</u>
Work Years	3.3	3.8
Budget	\$ 273,600	\$ 384,830
Salaries and Benefits	143,500	172,280
Travel	87,750	32,850
Operations	42,350	179,700

This program covers the principal activities involved in agronomic and socioeconomic studies of new fertilizers and fertilization practices at the adaptive research level using the international networks and the national programs. A cooperative project has been initiated to assist the Government of Mali (GOM) in the evaluation of modified Malian phosphates. This is an initial phase in advising the GOM on possible developments for the fertilizer sector using local rock as a basis for development. Involvement continued in the International Network for Soil Fertility and Fertilizer Evaluation for Rice (INSFFER) in collaboration with IRRI and various national institutions. Also, cooperative work continued with the West Africa Rice Development Association (WARDA) and the Hindustan Fertilizer Corporation (HFC) of India involving both agronomic and socioeconomic studies. Other ongoing activities include the statistical and economic analysis of field-trial results, and a study of worldwide N used by crops and crop groups.

The above projects and activities will be continued. In addition, the possibility of initiation of national evaluation projects

will be investigated for Thailand, the Philippines, and Colombia. In Bangladesh, activities are underway (funded by the BADC project) and negotiations for extending activities have been held with the Secretary of Agriculture, BARC and AID.

AFRICAN CENTER FOR FERTILIZER DEVELOPMENT

	<u>1983</u>	<u>1984</u>
Work Years	0.4	1.5
Budget	\$ 100,000	\$ 200,000
Salaries and Benefits	27,125	100,185
Travel	26,075	47,675
Operations	46,800	52,140

The need for an African fertilizer center has been recognized by UNIDO, FAO, and OAU. The purpose of the Center is to provide an informational unit in Africa. The Center concept has been approved by the OAU. A Site Selection Committee, of which IFDC was a participating member, was nominated at a STRC/OAU meeting held June 1-4, 1981, in Cairo, Egypt.

In January 1982, IFDC hosted the Site Selection Committee Meeting at IFDC Headquarters. The countries of Senegal, Cameroon, Kenya, and Zimbabwe were selected for further evaluation as potential sites for such a Center. Visits were made to each of these countries in March, April, and May. Zimbabwe was rated as the most desirable country. In late August, the OAU informed IFDC that negotiations had proceeded to the point that Zimbabwe was the selected country and had agreed to host the Center. OAU has asked IFDC to function as executing agency to develop plans and organize this endeavor. Funding to date has come from IFAD.

The African Center for Fertilizer Development (ACFD) has not progressed to the stage of becoming a reality as was anticipated 1 year ago. A Donors' Meeting was hosted by the OPEC Special Fund at their Headquarters in Vienna, Austria, in March 1983. Donors coming forth at this meeting were the OPEC Special Fund, IFAD, and USAID with a number of other organizations indicating interest once the nucleus of ACFD was established.

A meeting of a Board of Directors was attempted in Zimbabwe in May 1983, but could not be officially seated due to lack of signed agreements between OAU and Zimbabwe and clearances of the Charter by OAU. Charter clearance still is lacking on September 1, 1983; thus establishment of the ACFD has been delayed. IFDC cannot proceed until it has formal agreement with OAU and with the ACFD Board once it is officially seated. Delay is a definite threat to pledges previously made by donors and it appears further delays will be necessary.

Consequently, the budget for this activity is still only tentative with a USAID contribution of \$200,000 for 1984 as the only secure funding.

OUTREACH ADMINISTRATION

	<u>1983</u>	<u>1984</u>
Work Years	4.7	4.7
Budget	\$ 165,325	\$ 219,865
Salaries and Benefits	131,125	157,515
Travel	6,950	35,350
Operations	27,250	27,000

The Outreach Division, being a microcosm of IFDC's total expertise, seeks to develop the widest spectrum and highest level of fertilizer-sector contacts within developing countries. From such contacts, information flow affecting both the national decisionmakers and IFDC's orientation and activities is stimulated. Contacts vary from personal discussion, to group training, to the much broader based national-level program. The flow of visitors and technical queries are increasing.

All technical queries are answered using the resources of IFDC, TVA, and often, with great reliance on industry contacts in Europe and the United States, and the U.S. university system.

Technology transfer, that is the provision of technical guidance based on the most advanced technology, is increasing with expertise on granulation and bulk blending being particularly in demand. Technical assistance requests cover all aspects of fertilizer use and their diversity is such that restriction by selection is necessary.

Finally, adaptive research in the field and conceptualization of possible research directions complete the list of activities.

IFDC ADMINISTRATION

	<u>1983</u>	<u>1984</u>
Work Years	19.5	18.2
Budget	\$ 819,560	\$ 766,700
Salaries and Benefits	700,765	615,665
Travel	75,460	63,485
Operations	43,335	87,550

This category includes salaries and benefits plus operation expenses for the Office of the Managing Director, Deputy Managing Director, Administrative Director, Accounting, Purchasing, Budgeting, Personnel, Visitor Relations, Receptionist/Telephone Operator, and the Board of Directors.

This unit is responsible for overall management and fiscal responsibility. This is essentially an overhead function. Funding is, therefore, provided from indirect costs against all activities. In certain cases, salaries of the Managing Director and Deputy Managing Director and their secretaries are charged directly to special projects when they participate in a line function (e.g., McCune, African Center; and Stangel, ADAB, Foster Wheeler International, in 1983).

GENERAL SUPPORT SERVICES

	<u>1983</u>	<u>1984</u>
Work Years	26.9	25.5
Budget	\$ 576,390	\$ 601,895
Salaries and Benefits	523,020	538,845
Travel	2,380	1,950
Operations	50,990	61,100

This category supports the centralized services including the Word Processing Center, Communications Unit, Mail Unit, IFDC Library, and Central Files. These functions support all divisions and management.

Word Processing Center--is the core of the secretarial and publications function of IFDC. This unit is now comprised of one supervisor, word processors, and an editor.

Communications Unit--is made up of one supervisor, layout specialists, artists, and editors. It is responsible for the final layout of all reports, general artwork for visual aids, and producing the annual report. This unit is also responsible for final editing of all publications, reports, and papers produced by IFDC. The writing, layout, and editing of IFDC's quarterly newsletter--IFDC Report--is performed by this unit.

Mail Unit--assures the smooth flow of correspondence and information both within and outside of IFDC. It also provides for the packaging and mailing of publications and training materials for trainees and visitors to IFDC.

IFDC Library--functions as a branch of the TVA Technical Library. The Library staff is made up of one full-time librarian and two part-time assistants. They maintain close liaison with the Library at TVA which IFDC helps to fund on a per capita basis. They maintain library materials most used by IFDC. The services are available to all IFDC staff members as well as trainees and visitors to IFDC. The support to the TVA Library is budgeted along with other contracts under the category General Operations.

GENERAL OPERATING COSTS

	<u>1983</u>	<u>1984</u>
Work Years	-	-
Budget	\$ 806,650	\$ 770,555

These activities are operated in the Managing Director's Office by the Administrative Director and staff. Costs are accumulated in this category to cover the entire organization and include: utilities, security and fire protection, insurance, janitorial services, buildings and grounds maintenance, legal services, auditing, etc. All of these costs are indirect and go to make up the overhead account that is spread to all activities.

EQUIPMENT MODIFICATION

	<u>1983</u>	<u>1984</u>
Budget	\$ 216,650	\$ 116,500

Much of the equipment basic to IFDC's programs has been purchased and installed. Equipment will have to be altered and/or replaced, especially pilot-plant facilities, because the nature of research on fertilizers dictates this as new findings evolve. As new programs evolve (work on sulfur, microbiology, secondary nutrients, micronutrients, production of inoculum, etc.), additional equipment will be required. The availability of specific and functional research equipment and tools will be necessary for IFDC to remain at the forefront in its R&D and outreach efforts.

SUMMARY

<u>Program</u>	<u>1983</u>	<u>1984</u>
Nitrogen Research		
Work Years	23.7	33.1
Budget	\$1,495,890	\$ 1,795,850
Phosphorus Research		
Work Years	34.5	33.2
Budget	\$1,727,400	\$ 1,761,375
Sulfur Research		
Work Years	2.5	2.1
Budget	\$ 90,535	\$ 56,915
Micronutrient Research		
Work Years	0.5	-
Budget	\$ 33,255	\$ 8,250
Potash and Complex Fertilizers (Research)		
Work Years	1.0	2.0
Budget	\$ 42,140	\$ 58,950
Farm-Level Economics and Equity Study		
Work Years	3.5	2.4
Budget	\$ 182,250	\$ 158,135
Economic Evaluation of Selected Fertilizer Materials		
Work Years	0.3	0.1
Budget	\$ 8,940	\$ 4,820
Fertilizer Policy		
Work Years	1.8	1.9
Budget	\$ 69,220	\$ 83,110
Research and Miscellaneous Support Services		
Work Years	24.9	25.9
Budget	\$ 788,265	\$ 823,990
Research Administration		
Work Years	7.9	7.0
Budget	\$ 420,060	\$ 328,305

Program	1983	1984
Training		
Work Years	7.5	9.3
Budget	\$ 451,785	\$ 576,110
Fertilizer Marketing Systems		
Work Years	8.9	9.6
Budget	\$ 959,290	\$ 1,036,800
Fertilizer Production Technology		
Work Years	4.7	4.3
Budget	\$ 272,795	\$ 247,045
Fertilizer Evaluation Unit		
Work Years	3.3	3.8
Budget	\$ 273,600	\$ 384,830
African Center for Fertilizer Development		
Work Years	0.4	1.5
Budget	\$ 100,000	\$ 200,000
Outreach Administration		
Work Years	4.7	4.7
Budget	\$ 165,325	\$ 219,865
IFDC Administration		
Work Years	19.5	18.2
Budget	\$ 819,560	\$ 766,700
General Support Services		
Work Years	26.9	25.5
Budget	\$ 576,390	\$ 601,895
General Operating Costs		
Work Years	-	-
Budget	\$ 806,650	\$ 770,555
Equipment Modification		
Work Years	-	-
Budget	\$ 216,650	\$ 116,500
TOTAL - WORK YEARS	176.5	184.6
TOTAL - BUDGET	\$9,500,000	\$10,000,000

CONTRACTUAL SERVICES FOR IFDC

	<u>1983</u>	<u>1984</u>
TVA (Security, Fire, Grounds, Roads, Library, Computer, Steam and Water, Storage, Graphics and Artwork, Supplies, Raw Materials, Medical Services, Personal Services, Waste Monitoring, etc.)	\$ 450,000	\$ 333,300
Insurance (RLR, Buildings, Cars, etc.)	\$ 150,000	\$ 60,655
Building Services (Janitorial, Waste Disposal, Pest Control)	\$ 65,000	\$ 52,250
Professional Services (Attorney, Auditor)	\$ 35,000	\$ 33,000
IIE Administration Fee	\$ 130,000	\$ 109,130
Maintenance Service Agreements (Typewriters, Copiers, Printers, Photographics, Computer, Lab Equipment, etc.)	\$ 125,000	\$ 119,075
Cooperative Contracts (Universities, Companies, Storage Fees, Education and Training Courses, and Institutions to Whom IFDC Advances Monies for Cooperative Agreements--Such as BARC, CIAT, IITA, ICRISAT, etc.)	\$ <u>915,000</u>	\$ <u>924,025</u>
TOTAL	<u>\$1,870,000</u>	<u>\$1,631,435</u>