# 1990 Workplan
# Fertilizer Policy Research Program
# for Tropical Africa
# IFDC/IFPRI Cooperation

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## I. Introduction

The aim of the research being undertaken by the Fertilizer Policy Research Project (FPRP) is to aid in the design of an appropriate fertilizer policy framework for the countries of sub-Saharan Africa. The lack of knowledge about how key policies influence the supply and demand for fertilizer and in which crops and sub-regions investment should be a priority has constrained the design of a comprehensive fertilizer policy framework. To this end, the project addresses both short and long term fertilizer policy concerns. With respect to short-term issues, the study examines the impact of current policy changes on the fertilizer sector. Specifically the study will examine the effects of changes in macroeconomic and sectoral policies as well as institutional arrangements on fertilizer supply and demand in the sub-Saharan region. With regard to long-term concerns, the study attempts to assess the level and determinants of economic potential of fertilizer use in different agro-ecological zones in the sub-Saharan region. The study will also describe the process required to increase and convert this potential into effective fertilizer demand by farmers.

Several new sub-projects have been initiated for 1990 but most of the research to be undertaken follows from previous FPRP workplans. Many of the research sub-projects take advantage of completed or on-going research by IFDC and IFPRI. The use of data and information from these projects provides a high return in research output from small investments in researcher time and supplemental surveys.

The core of the research addresses the question of what are the specific crops and subregions within countries where investments in the fertilizer and supporting sectors should be a priority if there is to be an accelerated growth in fertilizer use. Sub-Saharan African countries possess limited institutional and financial resources and if they are to be successful in using fertilizer as a key input in their agricultural development programs, priorities must be made to target investment in the fertilizer and supporting sectors. Research is thus being carried out to identify those crops and subregions where fertilizer use can have a sustained impact.

The identification of specific crops by subregion that have significant potential for fertilizer use provides the foundation for the design of an appropriate fertilizer policy framework. The remaining sub-projects in the workplan examine fertilizer

supply and demand constraints and how key policies can influence the supply and demand for fertilizer. In several sub-projects, research is being conducted to examine the key factors constraining the use of fertilizer at the smallholder farm level and what policies might overcome these constraints. Smallholder farm level studies are also examining the key factors affecting farmer's investment and consumption decisions, the determinants of fertilizer use and the characteristics of fertilizer users.

Several studies examine fertilizer price policy liberalization and fertilizer sector institutional reforms, many of which are taking place within individual country structural adjustment programs. Several of these studies also examine the influence of macroeconomic policy variables on fertilizer demand and supply.

The workplan also includes the design of a fertilizer policy information system. The computerized system will be used to systematically identify, classify, retrieve, and analyze fertilizer and related data for policy analysis purposes. Preparations will also be undertaken in 1990 to hold a policy research workshop in Lome, Togo in January 1991.

## II. The 1990 Work Plan by Sub-Project

### A. Priority Setting of Crops by Subregion for the Accelerated Growth of Fertilizer Use in Sub-Saharan Africa

**Researchers: J.G. Nagy, J. Henao**

This research is a continuation of the analysis of the economic potential of fertilizer use described in the 1989 workplan which had been termed the "mapping" exercise. The title of this research has been changed to better reflect the focus of the research.

The main thrust of the research is to identify those crops by subregion within a country where policies for increasing fertilizer use can have a positive and sustained impact on increased crop yield. Two main criterion are used for the delineation. The first criterion is the size of the increase in crop yield per unit of fertilizer used (the fertilizer-crop response curve). The second criterion is the fertilizer-crop price ratios at the farm level. Increased yields from fertilizer use need to be sufficiently high and the fertilizer-crop price ratios sufficiently low to allow satisfactory value cost ratios (VCR) so that it will be economical for farmers to adopt the technology.

For the main food crops (maize, sorghum, millet, cassava, rice and yams) and main export crops, the above criteria will be used to identify the following three categories:

a. Subregions where the fertilizer-crop response and crop and fertilizer prices make fertilizer use attractive to farmers.

b. Subregions where the fertilizer-crop response is sufficiently high but existing prices and other supply and demand factors do not make fertilizer use attractive at the farm level.

c. Subregions where the fertilizer-crop response is very low and where only highly subsidized crop and fertilizer prices would make fertilizer use attractive to farmers.

Categories (a) and (b) identify the priority crops by subregion where a country's limited institutional and financial resources can best be invested in the fertilizer sub-sector and in supporting services and infrastructure for the accelerated growth of fertilizer use. Category (c) identifies crops by subregions that require further research on the nature of the fertilizer-crop response curve. For categories (a) and (b), a detailed analysis will be undertaken of supply and demand factors affecting fertilizer use at the farm level.

Based on research findings from the sub-projects of the Fertilizer Policy Research Program and from the findings of IFDC, IFPRI and other research, the next phase is to provide a policy framework for subregions or subregion groups for the accelerated growth in fertilizer use.

For 1990, work will be undertaken to complete the crops by subregion delineation for the countries of West Africa. Work in 1989 outlined methodological procedures and an initial gathering of fertilizer-crop response and related information and data. This work included a contact with the Institut Senegalais de Recherches Agricoles for fertilizer-crop response information and the work on fertilizer-crop response function estimation from the IFDC WAFMEN West African data. Some initial work will also be done on information and data collection in other parts of sub-Saharan Africa for similar work to be completed in 1991.

## B. Analysis of Farmer Investment Behavior and Implications for Fertilizer Use in Togo

**Researcher: T.B. Tshibaka**

The scarcity of agricultural liquidity at the household level and the rigidity in credit markets have been shown to be some of the key factors constraining the use of fertilizers and other modern inputs in the smallholder farm sector, not only in Africa, but also in other parts of the developing world. While this result holds, it has also been established that even where cash flow is not the most binding constraint, such as in cash-crop growing areas, farmers show little interest to invest in agricultural productivity-enhancing inputs such as fertilizers, high-yielding varieties and improved agricultural tools, but try to diversify away from farming by investing in the education of their children, trade, livestock, or migration. This diversification of income sources has been a sound approach to income portfolio management as it confers a greater income stability and security.

Thus, the purpose of this study is to identify key factors affecting farmer's decisions to spend part of their cash income on farm inputs including fertilizers, high-yielding seeds, pesticides, hired labor, and improved tools. More broadly, the study attempts to estimate farmers' propensities to invest in farming and other productive activities. Specifically, the study identifies the sources and levels of household income, examines the profile of its allocation between consumption, agricultural and non-agricultural production, and saving, and assesses key factors that determine the pattern of this allocation. Finally, the study will provide policy recommendations on how to alter the pattern of household cash income allocation in favor of fertilizers and other productivity-improving farm inputs. This study will also have significant implications for policy regarding credit and capital markets.

Household level surveys will be conducted to supplement secondary data from various national data sources. The farm household surveys will start in April, 1990, the beginning of the cropping season. Arrangements are being made to have the Togolese Ministry of Rural Development as a collaborating institution. A Report will be produced near the end of the current Fertilizer Policy Research Project.

## C. Farmers' Investments in Fertilizer Within the Context of Household Decisionmaking

**Researchers: T. Reardon and V. Kelly**

A first draft of a paper "Impact of Liquidity sources on chemical fertilizer use in semi-arid West Africa" by Reardon and Kelly has been completed. The paper was presented as a selected paper at the 1989 American Agricultural Economics Association meetings in Baton Rouge. The analysis uses probit and OLS estimation techniques to explain fertilizer use in the Guinean and Sudanian savanah zones of Burkina Faso.

A second draft of the paper is in progress and will be available in early 1990. The analysis is to be expanded to better capture the effects on fertilizer use from differences in agricultural years, the seasonality of income receipts, institutional versus private credit facilities, and infrastructure.

## D. Examination of the Processes Required to Convert the Potential for Fertilizer Use into Effective Farmer Demand

**Researchers: V. Gandhi and G. Desai**

This study continues from that outlined in the 1989 workplan. The study will examine the processes which are important in converting the potential for fertilizer use into effective demand and observed consumption on farms in an African setting. The study will facilitate discussion of issues related to dualism in the input delivery systems and how it constrains growth in fertilizer use even in countries with relatively high levels of fertilizer consumption.

Data and information from a Zimbabwe farm survey of 300 households (collected by Dr. Wanmali, IFPRI in collaboration with the government of Zimbabwe) along with additional information and data specifically collected for the study has been assembled for analysis. The sample of farms is from different farming systems ranging from commercial farms to peasant holdings. The preliminary analysis and the write-up of available results will be done in 1990.

## E. Analysis of Farmers' Fertilizer Adoption and Use Practices – Second Phase

**Researcher: D. Jha**

This study is a follow-up from the study outlined in the 1989 workplan. An analysis of fertilizer distribution, quantities and lot sizes, and changes in farmers' marketing practices will be undertaken using the 300 household survey results from the Eastern Province of Zambia that IFPRI collected in collaboration with the Rural Development Studies Bureau, National Council, and Eastern Province Agricultural Development Project. A small survey will be undertaken to augment the existing Zambia data. A report will be completed by the end of 1990.

## F. Agricultural Growth and Prospects for Fertilizer Use in Rwanda

**Researcher: T.B. Tshibaka**

The most pressing issue facing Rwanda today is how to achieve a level of agricultural growth that matches both the consumption and investment needs of its fast growing population. The goal of achieving high agricultural growth rates for this small sub-Saharan country is made difficult by its land locked geography, poor natural resource base and high population density and growth rates. Since Rwanda's agricultural sector is the most important sector of the economy, efforts to increase the growth rate of agricultural output in a more sustainable manner need to be addressed.

The study examines the sources of past growth in agricultural output and the prospects for future growth as well as the role of both organic and mineral fertilizers as an important source of productivity growth. Appropriate use of these soil-fertility enhancing inputs has been shown to improve the productivity of land, labor and other technology carrying inputs such as high-yielding seeds and irrigation. It is unfortunate to note, however, that fertilizer use in Rwanda is still very limited and most farmers are unfamiliar with this input. Finally, the study analyzes the effects of domestic economic policies on the supply and demand for fertilizers and proposes policy actions that are needed to promote the use of fertilizers in Rwanda.

This work relies heavily on secondary sources of data and is conducted for the benefit of the Ministry of Agriculture of Rwanda. A Rwandese colleague from the National Agricultural Research Center (Institute des Sciences Agronomique de Rwanda – ISAR) will participate in this study. The work is planned for a two year period.

## G. Fertilizer Use in Burkina Faso

**Researchers: T. Reardon, Lisa McNeilly**

The work will be based on both secondary data sources and on primary data from a completed ICRISAT/IFPRI survey. The survey regions include the Sahelian, Sudanian savanah, and Guinean savanah agroclimatic regions of Burkina Faso. The work will identify country-wide fertilizer use patterns and source of supply, the determinants of fertilizer use and characteristics of users, government policies impinging on fertilizer use (price, subsidies, credit, imports, supply and distribution and infrastructure), and a review of fertilizer-crop response information. A paper will be available at the end of 1990.

## H. Fertilizer Pricing Policies in Sub-Saharan Africa: A Survey

**Researchers: B.L. Bumb, J.F. Teboh**

A preliminary survey of existing pricing policies in 10 selected sub-Saharan African countries was initiated in 1989 and will be continued in 1990. The survey focuses on three aspects: (1) the evolution of pricing policies, (2) the impact of pricing policies on fertilizer use, and (3) fiscal implications of pricing policies for fertilizer use. A report based on secondary data will be produced by the end of 1990.

Work in 1990 will also include an in-depth analysis of pricing policies in a few countries. Benin, Cameroon, Ghana, Zambia, and Togo appear possible candidates for such in-depth studies. However, the final selection of countries will depend on the enthusiasm and cooperation of the country collaborators.

## I. Structural Adjustment and Fertilizer Policies in the Gambia

**Researcher: J. von Braun**

Gambia is in the midst of its Economic Recovery Program and institutional changes have been made in the fertilizer sector. An analysis will be undertaken to determine the extent of private sector response within the Gambian fertilizer industry from the Gambia's Economic Recovery Program. Specific analysis will focus on who is getting fertilizer and the timeliness and type of fertilizer being distributed. The data for the analysis comes from data sets collected in collaboration with the Ministry of Agriculture. A report is expected by the end of 1990.

## J. Macroeconomic Policy and the Senegalese Fertilizer Sector

**Researcher: T.B. Tshibaka**

The study examines the impact on the Senegalese fertilizer sector from changes in recent maco-economic policy. The analysis will compare the fertilizer sector over time contrasting the effects of current structural adjustment policy reforms with pre-policy changes on the supply and demand for fertilizer.

A collaborative arrangement has been made with Mr. Ibrahima Sene, Regional Inspector of Agriculture, Thies, Senegalese Ministry of Rural Development. Mr. Sene will contribute to data collection, analysis, and also to the write-up of the report which is expected at the end of 1990.

## K. Macroeconomic Policies and Fertilizer Use in Malawi

**Researcher: T.B. Tshibaka**

In 1981, Malawi launched a structural adjustment program designed to improve the balance of payments, cut the budget deficit, and give the market mechanisms greater influence in determining prices, wages, resource allocation, and the structure of production. This involved, among other things, phased elimination of fertilizer subsidies, increases in smallholder producer prices, elimination of consumer price subsidies, exchange and interest rate adjustment, higher fees for public utilities and services, cuts in public expenditures, shifts away from the National Rural Development Program (NRDP) towards agricultural research and extension and restructuring of the Agricultural Development and Marketing Corporation (ADMARC) which included market liberalization for smallholder grain crops.

The debate on the pricing policy reforms aspect of the structural adjustment program, and on what socially acceptable measures to take in order to address the issues of agricultural productivity and alleviate the financial burden that has fallen particularly on food deficit smallholder farmers who derive no direct benefit from higher producer prices and are faced with rising prices for purchased fertilizers and food, has not yet received substantive analysis that could bring together both advocates and opponents of the reforms.

The basic reason for this state of affairs is that up to now little attention has been paid to the fundamental questions of:

1. Whether the need for fertilizer subsidy is economically legitimate; whether fertilizer use cannot be profitable in the absence of subsidy; and why fertilizer cannot enter the domestic market and be traded like any other commodity.

2. Why there is still no widespread adoption of improved maize varieties despite massive agricultural extension campaigns; and whether the benefit-cost ratio for fertilizer application on local maize is still insufficient to compensate for additional costs and risks associated with the use of this input, despite the advent of high analysis fertilizer; and whether the inclusion of local maize in credit packages particularly for food deficit smallholder farmers could be justified on economic grounds.

A sustained rapid growth in fertilizer consumption is essential for the improvement of productivity of Malawi's smallholder agricultural sector in which the majority of the people are engaged as smallholder farmers. The present study is, therefore, based on the premise that growth of fertilizer consumption occurs as a result of smallholder farmers' effective demand for this input. And this demand is determined by the interaction between fertilizer prices, producer prices, and crop response to fertilizer application, as well as by the fertilizer supply system which is facilitated by institutional factors. Thus the analysis will integrate ecological, agronomic, economic and institutional factors affecting the consumption of fertilizers in Malawi.

More specifically, the study seeks to propose appropriate policy and institutional reforms required to achieve agricultural productivity within the smallholder agricultural sector through increases in crop response to fertilizer use, reduction in fertilizer prices, increases in producer prices and reduction in consumer prices, as well as reforms in non-price factors such as accessibility to farm credit, encouragement of local entrepreneurs' free entry into markets, promotion of financial markets to support commodity markets, and creation of adequate infrastructure for efficient movement of goods.

The work is being conducted in collaboration with Mr. Grey M. Limwado, Principal Scientific Officer at the National Research Council of Malawi. Arrangements have been completed to work with the National Research Council of Malawi as a collaborating institution. The work is planned over a two year period as of January, 1990.

## L. Institutional Reform and the Fertilizer Sector: A Case Study

**Researcher: J.F. Tebeh with assistance from B.L. Bumb and J.G. Nagy**

Work for the coming year will continue to keep abreast of the Cameroonian Fertilizer Sub-Sector Reform Program (FSSRP) through the previously established contacts made with the FSSRP and with USAID/Cameroon. The principle objective for the coming year will be to observe the process of institutional reforms in Cameroon and document changes in institutional arrangements under the FSSRP. A synthesis paper describing fertilizer policy and changes in the fertilizer sector under the FSSRP will be produced at the end of the current Fertilizer Policy contract. Work will continue on the annotated bibliography of publications on the issues of "privatization" in the agricultural sector with special reference to the fertilizer sector.

The documentation of the changes in institutional arrangements under the FSSRP and the information from the annotated bibliography will serve as information for other countries contemplating similar price liberalization and institutional arrangement changes.

## M. Fertilizer Policy Data Information System

**Researchers: J. Henao with assistance from J.G. Nagy**

The design of effective government policies and actions depends on the availability of information and knowledge about farmers and their circumstances. Within this context, efforts should be given in the present project to systematically identify, classify, retrieve and analyze the different factors required for the design and analysis of government policies that promote fertilizer use and efficiency in sub-Saharan African agroeconomic environments.

Fertilizer offtake, crop area, crop production, and area characteristics data are generally available and manually kept in reports or files in government institutions. However, these published reports and generated data can not be easily retrieved for various policy studies, which in most cases, requires the evaluation of relationships among different factors affecting fertilizer use and efficiency. The establishment of a manageable fertilizer data base system which leads to the use of a comprehensive information system will have modules on the following

- fertilizer data (offtake, production and prices)
- crop data (area and production)
- agroecological data (soil, weather, management)
- fertilizer field trial indicators

- land and agricultural development indicators
- economic development indicators.

The system will be used, mainly, for the identification of constraints that require further studies or decisions on items such as products, fertilizer marketing and distribution systems, fertilizer production and import policies. Constraint identification and analysis and the current policies related to fertilizer use can then lead to policy recommendations that span from the farm or area level to the fertilizer supply and macro policy level.

The work in 1990 will include the completion and verification of the computer programs for the fertilizer policy data information system. Loading of available country data will begin in 1991.

## N. Constraints on Fertilizer Production in Sub-Saharan Africa: A Policy Perspective

**Researcher: B. L. Bumb**

In 1990, information on availability of agrominerals for fertilizer production will be collected and analyzed to determine whether domestic production of fertilizer products is possible and viable in the countries of sub-Saharan Africa. Information for the analysis will be collected from secondary sources and unpublished reports and documents. This analysis is important because in many sub-Saharan countries, fertilizer use is constrained by supplies. Inadequate and untimely supply of fertilizer products is one of the factors that keep fertilizer use levels low in sub-Saharan Africa. Fertilizer supplies are also constrained by the availability of foreign exchange. The debt crisis and foreign exchange shortages affected fertilizer imports adversely in the 1980s. Many countries could sustain growth in fertilizer use because donor financing was available for importing fertilizers. In 1985, about two-thirds of fertilizer imports in sub-Saharan Africa were donor financed. The viable domestic production of fertilizers can benefit sub-Saharan countries by providing an adequate and timely fertilizer supply and by alleviating foreign exchange constraints.

A report on the constraints on fertilizer production in sub-Saharan Africa and policy implications will be produced by the end of 1990.

## III. Fertilizer Policy Workshop

**Researchers: J.G. Nagy, J.F. Teboh**
**and Assistance from IFDC and IFPRI Personnel**

Preparations will be undertaken in 1990 to hold a workshop in January-February, 1991 in Lome, Togo. The thrust of the workshop will be to outline the methodologies and present preliminary findings of some of the on-going FPRP research. A selected group of FPRP and collaborating country researchers will discuss their work with representatives invited from several sub-Saharan African countries. The invited Country representatives would be those who attended the April, 1988 workshop held in Lome which initiated discussion on fertilizer research needs. Invitees would also include other contacts that have been made while carrying out the FPRP project.

The workshop scheduling is a departure from the initial intention of having workshops on an annual basis. It is our view at this time that the project would be better served by having fewer but well focused workshops on actual project work. A substantive body of research will be available for discussion at the January-February 1991 workshop. At the 1991 workshop, a proposal would be made to hold a workshop in the Spring of 1992 to present and discuss the final findings of the project's research.