

## **AGRICULTURAL MARKETING IMPROVEMENT STRATEGIES PROJECT**

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Assisting AID Missions and Developing Country Governments  
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**MONITORING AND DATA COLLECTION  
SYSTEM FOR THE FERTILIZER  
SUB-SECTOR REFORM PROGRAM  
OF CAMEROON**

**MAY 1989**

MONITORING AND DATA COLLECTION SYSTEM FOR THE  
FERTILIZER SUB-SECTOR REFORM PROGRAM

Submitted to

The Technical Supervisory Committee  
Government of Cameroon

and

USAID/Cameroon  
Yaounde

May 1989

THE AGRICULTURAL MARKETING IMPROVEMENT STRATEGIES PROJECT

Abt Associates, Washington D.C.  
and  
The University of Idaho/Postharvest Institute

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## GLOSSARY OF ACRONYMS

- FSSRP - Fertilizer Subsector Reform Program
- TSC - Technical Supervisory Committee
- MINAGRI - Ministry of Agriculture
- DEP- Directorate of Studies and Projects (in MINAGRI)
- MIDENO - Northwest Development Authority
- PEM - Project Evaluation and Monitoring Unit (in MIDENO)
- MINPAT - Ministry of Plan and Regional Development
- IRA - Institut de Recherche Agronomique  
(Agricultural Research Institute)
- TLU - Training and Liaison Unit
- IFDC - International Fertilizer Development Center
- UCAL - Union des Cooperatives du Littoral  
(Cooperative Union of the Littoral Province)
- NWCA - North West Cooperative Association
- UCCAO - Union Centrale des Cooperatives Agricoles de l'Ouest  
(Central Union of Agricultural Cooperatives of the West Province)
- BCCC - Banque de Credit et Commerce de Cameroun
- ONCPB - Office Nationale de Commercialisation des Produits de Base  
(National Produce Marketing Board)

## EXECUTIVE SUMMARY

This report presents a design of a monitoring and data collection system to support the Cameroon Fertilizer Sub-sector Reform Program. It begins with a description of the objectives of the program and proceeds to identify the information requirements related to each objective. From the list of information requirements, a strategy is developed relying on five types of information sources. Finally, the roles of USAID and the government of Cameroon in the monitoring and data collection system are described and a tentative schedule of activities established.

The goal of the Fertilizer Sub-sector Reform Program is to establish a sustainable system for efficient fertilizer importation, distribution, and use, relying on a private, subsidy-free marketing system. The four objectives derived from this goal are 1) to maximize the efficiency with which the fertilizer is imported and distributed, 2) to ensure that supply is responsive to demand with respect to quantity, type of fertilizer, place of delivery, and time of delivery, 3) to increase the effectiveness of fertilizer use, and 4) to establish institutional arrangements which promote sustainability, efficiency and adaptability.

The data collection system should monitor progress toward each of these objectives and help to diagnose problems in the fertilizer sub-sector. In addition, some of the information collected will directly serve participants in the sub-sector, such as the information on the effective use of fertilizer. Monitoring the efficiency of fertilizer distribution requires information on prices and costs all along the marketing channel, information on the size of sea shipments, on the managerial capacity of the cooperative/distributors, and possibly a pre-feasibility study of a bulk-blending and bagging facility. In order to track the responsiveness of supply to demand, it is necessary to collect information on the patterns of supply (e.g the geographic distribution of fertilizer, timing of importation and distribution, etc.), as well as on the characteristics of demand (preferred date of purchase, preferred types, volumes demanded by each region, etc.). A key issue is whether there are farmers who are not able to buy fertilizer due to its unavailability. As for the effectiveness of fertilizer use, this can be improved with information about current knowledge and practices of farmers with respect to fertilizer and with agronomic trials to determine the best application rates and techniques as a function of crop, soil type, prices, and so on. Finally, the sustainability and adaptability of the system can be evaluated by examining the degree of competitive conditions, the level of understanding and support for the program, and the existence of linkages among institutions which facilitate information flow.

Five sources of information are proposed to meet the information needs defined above. First, the program should take advantage of existing materials to the extent possible. Second, it should establish a system of regular reporting by the fiduciary bank and by the distributors to provide timely, useful information. Third, a series of farm surveys are proposed in order to investigate current patterns of fertilizer use. One survey,

implemented by MINAGRI/DEP, would cover general topics over the seven provinces in which the program operates. More intensive surveys concentrating on a smaller area would be implemented by the University Center at Dschang, MIDENO, MINAGRI/DEP, and perhaps some of the Testing and Liason Units (TLUs) affiliated with the Institut de Recherche Agricole. Fourth, the agronomic trials would focus on determining the economically desirable combinations of nutrients for each soil type, in preparation for the time when the choice of fertilizer types is opened up by the removal of subsidies. The trials would be carried out by the TLUs, focusing primarily on maize, but possibly also on coffee and other foodcrops. And finally, a series of special studies would fill in any gaps left by the other information sources. Of particular interest are a study of credit and risk in the fertilizer sub-sector, an assessment of management training needs at the cooperatives, and the annual assessments of the program.

With regard to the distribution of responsibilities between the Technical Supervisory Committee (TSC) and USAID, it is proposed that the TSC be responsible for most of the monitoring and dissemination activities, and the organization of the annual fertilizer seminar to review the evolution of the program and recommend modifications. USAID, on the other hand, would concentrate on working with the collaborating institutions to design the surveys and trials and to interpret the result.

The scheduling of the different activities is difficult to define precisely, but some guidelines can be established. The periodic reporting could begin almost immediately, with the fiduciary bank filing monthly updates and the distributors submitting them every six months. The questionnaire design and testing for the farm surveys would begin in the summer of 1989. Data collection would begin with the general, multi-province survey at the end of 1989. The more intensive, localized surveys would be implemented in the first half of 1990, thus allowing the results of the general survey to guide the issues to pursue in the intensive surveys. The agronomic trials will not start until the beginning of the next main cropping season in early 1990, but this will allow time for the development of the methodology and to carry out soil tests on the trial sites. The timing of the special studies is somewhat flexible, although the credit and risk study is urgent and should be done as soon as possible, perhaps this summer. The cooperative management training would be most useful if it took place before the end of the year when ordering begins again.

## INTRODUCTION

### 1.1 Background

Although industry, trade, services, and petroleum production have grown to the point where they represent a large share of the Cameroon economy (around 70% of the GNP), agriculture still serves as the base of the economy. Over three quarters of the the 9.3 million inhabitants (1982) depend primarily on agriculture for their livelihood. Agricultural production is carried out by a small-farm sector, with 1.1 million farms averaging 1.7 hectares, and a plantation sector. Small farms account for virtually all the food crop production, as well as the bulk of the production of coffee and cocoa, the two most important export crops. The plantation sector produces other export crops such as rubber, oil palm, pineapples, and bananas.

Fertilizer consumption in Cameroon in recent years has varied between 90 and 105 thousand tons per year, all of which is currently imported. The government of Cameroon subsidizes the fertilizer for coffee growers, which accounts for around 60% of the total. Fertilizer use in the traditional-sector varies greatly, being quite important in the coffee-growing areas of the West, Littoral, and North West, where over half the farmers use it, but practically non-existent in the South and East (see section 3.3 and Annex D). Growing amounts of subsidized fertilizer are being channeled to foodcrops, particularly maize, due to the declining profitability of coffee production.

In 1985, the U.S. Agency for International Development (USAID) contracted the International Fertilizer Development Center (IFDC) to do a study of the fertilizer sector in Cameroon. The study highlighted a number of problems with the system of subsidized fertilizer imports: it was costly to the government (FCFA 9.6 billion or \$ 24 million per year), the fertilizer was consistently delivered late due to shortages of funds and cumbersome purchasing procedures, and the system of uniform prices for all regions and types of fertilizer had the effect of encouraging inefficient use of fertilizer. The report recommended a transfer of marketing functions from public institutions to a public/private joint-venture and the phased elimination of the subsidy.

### 1.2 Fertilizer Sub-sector Reform Program (FSSRP)

In September 1987, responding to the recommendations in the IFDC report, as well as to increasing budgetary pressures, the government of Cameroon signed an agreement with the USAID creating the Fertilizer Sub-sector Reform Program (FSSRP). The overall goal of the FSSRP is to establish a sustainable system for efficient importation, distribution, and use of fertilizer. This is to be accomplished through the privatization of importation and distribution, the provision of credit to finance these operation, and the gradual removal of fertilizer subsidies, among other activities. Under the agreement, USAID will provide \$ 17 million in program

funds for a revolving credit fund and \$ 3 million in project funds for research and monitoring activities in support of the reform program.

Although a more complete assessment is found in the accompanying report<sup>1</sup>, it is worth listing the highlights of the first year of the program. The systems of public tender, government monopoly, and quantitative allocations to end-users were eliminated, and the subsidy rate was reduced from 65% to an average of 33%. The total cost of delivering the fertilizer fell by 16%, partially offsetting the reduced subsidy. In spite of the increase in the retail price, around 63,000 metric tons of fertilizer were imported under the program, roughly the same amount as the year before. This is partly due to the fact that under the new system, the delivery time was reduced from 12-18 months to 4-6 months.

Nonetheless, several problems remain. First, the program started several months later than planned. Second, the terms of the loans offered under the program were found to be inconvenient by importers and distributors. Third, several coffee cooperatives had difficulties finding guarantors for the loans. Fourth, a few coffee-producing provinces did not participate, most notably the South West Province, due to confusion about the provisions of the program. And fifth, data collection and monitoring activities were slow to start and need to be further developed. For the second year of the program, steps have been taken to streamline procedures, improve the credit terms, and increase participation among distributors and importers. This report addresses the fifth problem, presenting a recommended design for a monitoring and data collection system for the fertilizer reform program.

### 1.3 Monitoring and Data Collection System for the FSSRP

The goal of the monitoring and data collection system is to provide information necessary to achieve the objectives of the FSSRP. More specifically, the system should facilitate the task of raising the performance of the fertilizer sub-sector with respect to 1) the efficiency of importation and distribution operations, 2) the responsiveness of supply to demand, 3) the effectiveness of fertilizer use, and 4) the sustainability and adaptability of the sub-sector as a whole. (These objectives are discussed in more detail in section 2.)

These requirements imply the collection of information on a broad range of topics including the institutional and economic aspects of the current distribution system, the determinants of fertilizer use, current knowledge and practices concerning fertilizer, and the profitability of fertilizer use under different circumstances. Although the initial focus will be on the distribution system for subsidized fertilizer, increasingly it should be expanded to incorporate the delivery systems for non-subsidized fertilizer.

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<sup>1</sup>Privatization of Fertilizer Marketing in Cameroon: A First-Year Assessment of the Fertilizer Subsector Reform Program, The AMIS Project, May 1989.

In addition, we are interested in the interaction between fertilizer markets and related markets such as those of other inputs and of the crop itself.

The information collected should serve several groups of users. First, the government of Cameroon and USAID need timely data on the functioning of the program in order to make necessary modifications to improve its effectiveness. This is a short to medium-term need, limited to the life of the project. Second, the information should serve participants of the fertilizer sub-sector, such as the banks, importers, distributors, and farmers, by allowing them to make more informed decisions with respect to their functions within the sub-sector. An important example is the data on effective use of fertilizer, which is to serve the farmers directly. This is a long-term need which continues after the life of the project. Part of the fourth objective mentioned above, creating a sustainable and adaptable system, involves the institutionalization of these information collection and dissemination activities. Third, the information will help to document the evolution of the Fertilizer Sub-sector Reform Program as a case study for project designers and policy makers both within Cameroon and elsewhere. The lessons learned will be of interest to many governments contemplating privatization in the face of inefficient public sector organizations and severe budget constraints.

It should be noted that throughout the design of the monitoring and data collection system, we have followed several principles. The first is to use existing information resources to the extent possible to avoid duplication of effort. When data collection is necessary, we have tried to make use of existing organizations with data collection capacity. In particular, we have sought to buy into existing USAID projects in Cameroon which are already active in the area we wish to investigate (e.g. farm surveys, agronomic trials, etc.)

A second principle in the design of the system is that there is a legitimate role for the government in collecting, analyzing, and disseminating information to the public as part of its broader role in facilitating the smooth operation of the private sector. We would like to institutionalize some of the data collection activities, so that the information continues to be available to users after the end of the project.

And third, the design of the data collection activities should create and strengthen linkages among various organizations participating in the fertilizer sub-sector. An important example is the linkages between research and extension activities to ensure that recommendations are delivered to the farmer and to allow feed-back to the researchers. Other examples include the linkages among organizations involved in research in the rural sector and linkages between the public and private sector which facilitate a clearer definition of their respective roles.

#### 1.4 Organization of the Report

Following this introduction, section 2 evaluates the information needs of the fertilizer reform program in light of the four objectives described

above. In other words, it concentrates on the question of what information is to be collected. Section 3 considers the various information needs and identifies a method for collecting this information: the source of information, the frequency of data collection, and the duration of data collection. Thus, it focuses on how the information is to be collected. It includes recommendations regarding a system of regular reporting by key participants in the program, as well as a discussion of the type of special studies which could be done to supplement our knowledge of the functioning of the fertilizer sub-sector. Section 4 considers the roles of USAID and the Technical Supervisory Committee in assembling, interpreting, and disseminating the information, that is, defining who is to collect the information. Lastly, section 5 discusses the scheduling of the various activities contemplated in the proposed information system, determining to the extent possible when each might be carried out.

It should be noted that the information on which this report is based and the information needs and priorities to which this report is addressed were current at the time of the field mission in March 1989. It is recognized that in order to be responsive to the evolving situation in the Cameroon economy in general, and in the fertilizer sub-sector in particular, modifications in the timing and scope of some of the activities may be necessary. However, the overall purpose of the system and the proposed information gathering strategy are unlikely to change over the life of the project.

### 1.5 The AMIS Project

The Agricultural Marketing Strategies Project (AMIS), core-funded by the Agency for International Development's Bureau for Science and Technology, is a five-year project designed to assist AID Missions and developing countries to:

- diagnose agricultural marketing system constraints, using rapid appraisal techniques,
- conduct in-depth analysis of specific marketing problems identified during rapid appraisal or by other studies,
- pilot-test and monitor selected marketing innovations.

The rationale for the AMIS Project, which began operations in October 1987, was the realization that benefits from increases in agricultural production, often the result of successful AID or other donor-sponsored projects, frequently do not reach farmers and others in the marketing chain because of constraints or bottlenecks in marketing systems. Likewise, inefficient distribution systems for fertilizer and other inputs may result in late deliveries and high costs to farmers. These constraints may be technical, insitutional or infrastructural, but they are often the result of government policies with disincentive effects -- policies that discourage private sector participation in marketing. Through analysis and active interventions, AMIS hopes to promote a better understanding and appreciation of the importance of marketing in the agricultural development process.

The AMIS Project is being implemented by Abt Associates, a Cambridge, Massachusetts-based policy research and economic analysis firm, through its Washington D.C. office. Abt is assisted by two subcontractors: the Postharvest Institute for Perishables at the University of Idaho, a research and information center dedicated to improving postharvest handling and marketing of perishable crops, and Deloitte, Haskins and Sells, an accounting, management and development consulting firm with special expertise in market liberalization studies.

## 2. INFORMATION NEEDS

In this section, we analyze the information needs of the Fertilizer Sub-sector Reform Program in light of its objectives. In other words, we consider what is to be collected and how it fits into the objectives of the FSSRP. It is useful to begin with an examination of the goal and objectives of the program mentioned.

As mentioned in section 1.3, the goal of the program is to establish a sustainable system for efficient fertilizer importation, distribution, and use, relying on a privatized and subsidy-free fertilizer market. This overall goal can be broken down into four objectives, as summarized in Figure 1. The first objective is to maximize the efficiency with which fertilizer is imported and distributed. This means reducing to a minimum the actual costs of importing and distributing the fertilizer (i.e. operational efficiency in fertilizer marketing). In addition, it means that prices reflect the true cost of delivering the commodity to a given place at a given time (i.e. price efficiency). The second objective is to ensure that supply is responsive to demand with respect to the type of fertilizer, the quantity, the time of delivery, and the location (i.e. allocative efficiency). The third objective is to raise the effectiveness of fertilizer use at the farm-level. Effective use of fertilizer in terms of rate, timing, and technique minimizes the cost of producing a given quantity of output (i.e. operational efficiency in agricultural production). And lastly, the fourth objective is to create institutional arrangements which promote efficiency, sustainability, and adaptability to changing conditions (i.e. dynamic efficiency).

In the following subsections, the information needs are organized according to the objective which they facilitate. The relationship between the four objectives and the respective information requirements is summarized in Figure 1, with each column corresponding to a subsection.

### 2.1 Cost-efficiency of Supply

The correspondence between price and cost promotes efficient use of the product in the sense that the product is used in a fashion consistent with its true scarcity. (Refer to the first column of Figure 1.) For example, under the old system, all five types of fertilizer were sold at the same price so that NPK 20-10-10, was used as if it were equal in cost to urea, when in fact it incurred a higher total cost to the country (including the cost of the subsidy).

In addition, the correspondence of price and cost is an index of the degree of competition in the market because competitive pressures force firms to set prices which reflect actual costs (including return on investment, management, and risk). Thus, we can monitor the efficiency of the system by comparing prices and estimated costs. There are several dimensions of this. Retail prices of different types of fertilizer should correspond to their costs; retail price differences among regions should

FIGURE 1: RELATIONSHIP BETWEEN GOALS, STRATEGIES, AND INFORMATION NEEDS OF FSSRP

<b>GOAL:</b>	Establish a sustainable system for efficient fertilizer distribution, importation, and use			
<b>OBJECTIVES:</b>	Cost-efficient supply	Responsive supply	Effective use	Sustainable institutions
<b>EXPLANATION:</b>	Promotion of efficient importation and distribution of fertilizer (price efficiency and operational efficiency)	Supply corresponds to demand with respect to quantity, type of fertilizer, and timing for each location (allocative efficiency)	Minimize agricultural production cost through efficient use of fertilizer, i.e. optimal timing, applications, etc. (operational efficiency)	Creation of institutional arrangements that promote efficiency, sustainability, and adaptability to changing conditions (dynamic efficiency)
<b>INFORMATION NEEDS:</b>	Prices at different stages in marketing chain and different locations; costs of transport, storage, etc., size of shipments,	Current availability and characteristics of demand in terms of quantity, types, location, and timing; demand studies	Economics of fertilizer use (trials), current knowledge and practices, extension and publicity methods	Level of support and understanding of system among participants, level of communication, incentive systems

roughly correspond to transportation costs; price differences from one season to another should not greatly exceed storage costs (including financial costs and a "reasonable" risk premium); and price differences at different stages in the marketing channel should reflect the cost of the intervening steps (transport, handling, processing, etc.).

To verify that markets are operating competitively, it is therefore necessary to collect prices in different regions (for example, at provincial capitals) and at different points in the marketing chain (for example, the landed price in Douala, the price paid by the distributor, and the retail price). At the same time, the costs of transport, port handling, and storage should be collected to form a basis of comparison. This information will be particularly important to the extent that private distributors begin to play a major role in the distribution network since their profit motive is presumably greater than that of the cooperatives.

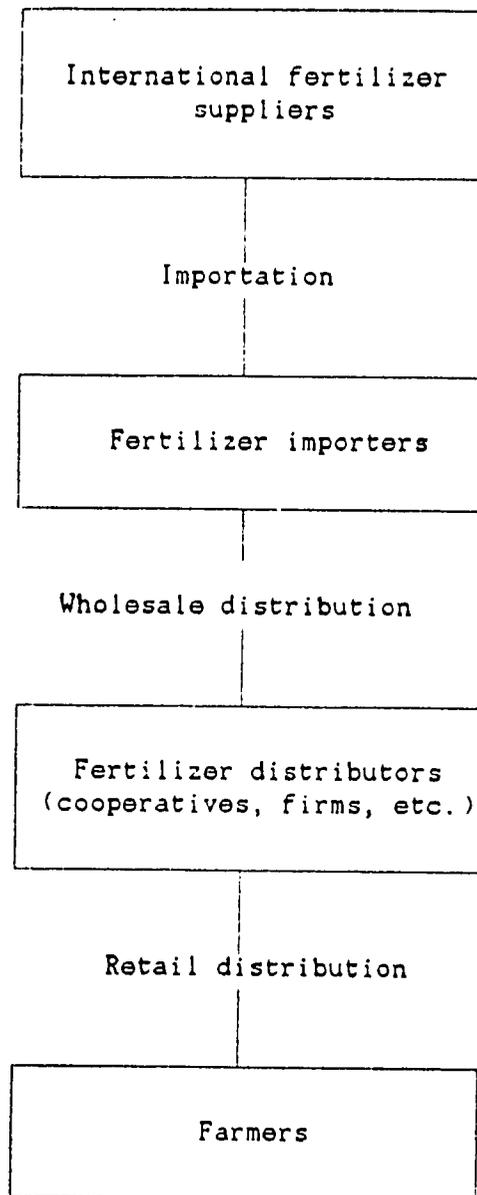
Even if prices reflect costs, costs themselves may be unnecessarily high due to lack of information, management deficiencies, inefficient scale, and so on. As an example, the IFDC study reported that fertilizer was often ordered in relatively small lots from suppliers in Europe. Although none of the participants was making excessive profits, the costs of delivery were higher than they would have been had orders been consolidated.

Under the new system, summarized in Figure 2, importers and distributors face strong incentives to seek the least costly means of delivering fertilizer. Nonetheless, it might be useful to collect information in two areas. The first concerns the management of purchasing, transport, and inventory by the cooperative. Although UCCAO appears to be well organized and experienced in these operations, the program may be able to assist NWCA, UCAL, and other cooperatives ensure that supply management is handled efficiently. The second topic of interest is the possibility of developing a bulk blending and bagging facility in Cameroon. The 1984 IFDC study of the fertilizer sub-sector in Cameroon included an evaluation of the economics of such a plant, but a more thorough study may be warranted, particularly given the changes in the fertilizer sector since the IFDC report was written.

## 2.2 Responsiveness of Supply

The second objective is to ensure the responsiveness of supply to demand. The information needs related to this objective are described in this section and summarized in the second column of Figure 1. Under the old system, there were serious imbalances between supply and demand with respect to a number of variables: timing, location, type of fertilizer, and quantity. The timing of fertilizer supply was determined more by the availability of subsidy funds and administrative hurdles than by the demand for fertilizer on the part of farmers. The privatization of the fertilizer distribution under FSSRP has already simplified, and thus accelerated, the procedure, although more progress needs to be made. Under the old system, uniform national prices discouraged distribution to more remote regions, creating unmet demand in these locations. The liberalization of prices

FIGURE 2: ORGANIZATION OF FERTILIZER SUPPLY



provides greater incentive to deliver fertilizer to these areas. The types of fertilizers that were available corresponded to the administrative decision to subsidize five types rather than to a real demand for these fertilizers. As the subsidies are reduced, this distortion will be similarly diminished. And finally, the quantitative restrictions made necessary by the limits on subsidy funds are disappearing as the subsidy itself shrinks toward zero.

Although some improvements have been made in matching supply and demand, it is important to continue to monitor this aspect of the fertilizer sub-sector. On the demand side, we need to know the timing of fertilizer application, the geographic distribution of demand, the demand for different types of fertilizer, and the quantities required. The timing of demand and preferred types are relatively easy to determine. However, the quantities demanded as a function of region are more difficult to estimate, requiring an analysis of the distribution of crops likely to be fertilized (principally coffee and maize) and current rates of application.

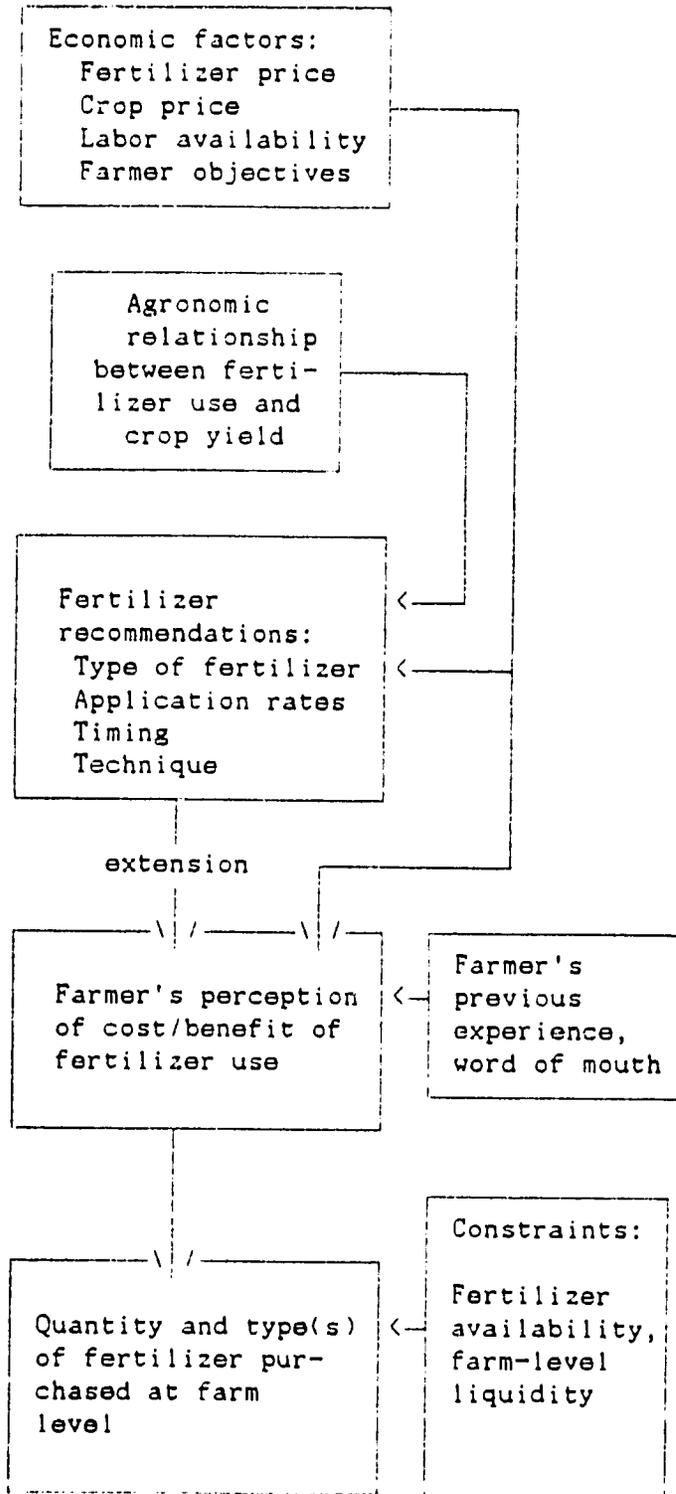
On the supply side, we need to consider the actual distribution of fertilizer in terms of timing, geographic distribution, available quantities, and available types of fertilizer. In order to more accurately diagnose the problem, it is convenient to have information not just at the farm-level, but also further up the marketing chain. For example, late fertilizer deliveries could be the result of a late start of the program, delays in distributors and importers reaching agreement, delays in shipping, in clearing customs, and in transport from Douala. Thus, it is helpful to collect information on the dates of these events for each shipment. Similarly, it is helpful to have information on the physical distribution of fertilizer from the supplier to the farmer. This information could be provided by type of fertilizer and by destination.

### 2.3 Effectiveness of Fertilizer Use

This section describes the information needs which correspond to the third objective, improving the effectiveness of fertilizer use at the farm-level. It is summarized in the third column of Figure 1.

Fertilizer purchase and utilization is a function of a number of variables, illustrated in Figure 3. Since fertilizer is an intermediate good, a key factor is the farmer's perception of profitability of fertilizer use and the risks involved. The perceived profitability is, of course, influenced by his or her previous experience with fertilizer, word-of-mouth, prices, labor availability, and so on. Unfortunately, it is not easy for the farmer to evaluate its profitability even after the fact because of the number of intervening factors such as soil type, weather, and crop variety. Furthermore, the profitability varies greatly depending on the application rate, the timing of application, and the application technique. Hence, the need for research and extension activities to generate and disseminate information on the appropriate use of fertilizer. Ideally, the recommendations made by the extension service are derived from research

FIGURE 3: FACTORS AFFECTING THE DEMAND FOR FERTILIZER



which takes into account both agronomic trials and economic analysis. However, as illustrated in Figure 3, even if the farmer is persuaded of the profitability of fertilizer use, other constraints may prevent its purchase. The fertilizer may be physically unavailable at the time required, or the farmer may have neither the cash nor the access to credit necessary to make the purchase. In sum, there are a variety of types of information necessary to diagnose and improve the effectiveness of fertilizer use.

As illustrated in the third column of Figure 1, one element in achieving this objective is to determine the current practices concerning fertilizer. A thorough understanding of current practices will help identify the areas in which the greatest improvement could be made with the least cost. This would include the type of fertilizer applied, in what volumes, on what crops, at what the time of the year, and by what techniques. These patterns undoubtedly vary by agro-climatic region, soil type, farm size, available labor, and cash resources. A related set of questions concerns the determinants of the demand for fertilizer. How do timing, price, distance to point of sale, availability of credit, extension information, and other factors influence demand? The relationship between demand and price is of particular interest, although it would be quite difficult to get anything more than a rough estimate.

In addition to current practices, it is useful to investigate the current state of knowledge of and attitudes toward fertilizer on the part of farmers. How familiar are they with the different characteristics of each type of fertilizer? How accurate is their perception of the potential yield increases? Are the constraints to fertilizer use related to a lack of information, the inavailability of fertilizer, or a lack of liquidity?

The final set of questions concerns the actual profitability of fertilizers under different circumstances. Answering this question involves agronomic trials combined with analysis of the economic benefits and risks. Although a great deal of agricultural research has been done in Cameroon, not all of it is appropriate to the kind of question we would like to answer. We are looking for agronomic trials of fertilizer response done on-farm and followed up with a careful evaluation of the net economic benefit of alternate fertilization levels. The fertilizer response trials should involve different combinations of nutrients to estimate the "response surface"<sup>2</sup> rather than simply testing various rates of application of 20-10-10. In addition, there appears to be a need for greater use of soil testing in conjunction with agronomic trials, so that the results can be applied to other areas with similar soils.

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<sup>2</sup> A response surface is a relationship between crop yield and the application level of two or more nutrients, as contrasted with the linear relationship between yield and one type of fertilizer.

## 2.4 Sustainability of Institutions

The fourth objective of the program is to establish institutional arrangements which promote sustainability, efficiency, and adaptability to changing conditions. It is insufficient to create an "efficient" system of fertilizer distribution and use if the conditions are not in place to ensure that it continue to perform well and adapt to the environment in which it operates. The information needs to meet this objective are described here and summarized in the fourth column of Figure 1.

The sustainability of the system is a function of several variables. For banks, importers, and distributors to be interested in continuing to fulfill their respective roles, they must be making an adequate profit for the time and resources they invest (in the case of cooperatives, they probably need to at least cover their costs). In addition, the roles of the public and private sector must be well-defined and adequately fulfilled. Hence, it is useful to monitor the perceptions of participants in program, their understanding of their roles and those of others, and their level of satisfaction with their operation of the system and their rewards for participating.

For the system to continue to be efficient, there must be certain competitive conditions. A large number of competitors at each level (banks, importers, distributors, etc.) make it difficult to any one to exert monopoly power. Even with a small number of participants, competitive conditions may exist if other firms can easily enter the market without substantial investments in resources (low barriers to entry). Good information flow also contributes to efficiency in that participants are able to make informed decisions. Thus, it is useful to track the number of participants at each level, the existence of barriers to entry, and the level of information participants have about the program itself and about market conditions.

The adaptability of the system depends on the adaptability of the individual participants. They must be able to identify and take advantage of opportunities as they present themselves. In addition, adaptability is a function of the working relationships among the participants and the incentive system that regulates their interactions. The internal policies of different organizations, particularly the cooperatives, is also important and bears monitoring.

### 3. SOURCES OF INFORMATION

Having discussed the objectives of the Fertilizer Sub-sector Program and the information requirements implied by each one, we now turn our attention to the question of how each type of required information is to be collected. The collection method includes the source of information, the collaborating data collection organization, the frequency with which it is collected, and the duration of data collection activities (whether it is just for the life of the project or should be continued after the end of the project). A summary of the data needs and the proposed data collection methods is presented in Figure 4. This table is organized according to the program objective which the information serves. Figure 5 includes the summary of the organization of fertilizer supply shown in Figure 2, but adds the information sources relevant to each link in the marketing chain. Similarly, Figure 6 repeats the factors affecting the demand for fertilizer, presented in Figure 3, but adds the types of data collection activity which will shed light on each aspect.

For the purposes of clarity, we organize this section by the source of information, rather than by program objective. This is because the same source of information may serve multiple objectives, and likewise, a given objective is supported by data from different sources. We consider five types of information source: existing sources of information, periodic reporting by key participants in the fertilizer sub-sector, farm surveys, agronomic trials, and special studies. Each of these types of information sources is described in turn (sections 3.1 to 3.5).

#### 3.1 Existing Sources of Information

In line with the principle of making use of existing resources, we first consider the available secondary sources of information which will be of use in understanding the fertilizer sub-sector. Although the recent economic problems in the country have caused severe cut-backs in the number of statistical reports issued, Cameroon can still be considered relatively well-endowed with agricultural information. Several useful sources of existing information are reviewed in this sub-section.

##### 3.1.1 Ministry of Agriculture - Agricultural Census

The Directorate of Studies and Projects (DEP) of the Ministry of Agriculture, supported by USAID's Agricultural Management Project, carried out a detailed survey of the agricultural sector in 1984. It was based on an effective sample of slightly less than 5000 farm households and included a wide variety of questions concerning production, land use, sales, agricultural income, and farming practices. The survey has been repeated on an annual basis, relying on a smaller sample of about 3400 (the exact number varies from year to year).

The reports based on the 1984 survey are printed, but have not yet been officially released pending internal review. There is one summary document

FIGURE 4: RELATIONSHIP BETWEEN INFORMATION NEEDS AND DATA COLLECTION STRATEGY

INFORMATION NEEDS	SOURCE OF INFORMATION	COLLECTION FREQUENCY	DURATION OF COLLECTION
<b>Efficient import/distribution</b>			
CIF prices	Fiduciary bank	Monthly	Long term
Contract prices	Fiduciary bank	Monthly	Life of project
Union-level prices	Distributors	Semi-annual	Life of project
Farm-level prices	Distributors	Semi-annual	Long term
Transport costs	Distributors	Semi-annual	Life of project
Other costs	Distributors	Semi-annual	Life of project
Size shipment	Fiduciary bank	Monthly	Life of project
Bag/blend plant	Feasibility study	Once	- -
Coop supply mgt	Training assessment	Once	- -
<b>Supply responsive to demand</b>			
Date prog launched	Internal	Annual	Life of project
Dates of contracts	Fiduciary bank	Monthly	Life of project
Loan approval period	Fiduciary bank	Monthly	Life of project
Date of shipment	Fiduciary bank	Monthly	Life of project
Dates cleared customs	Fiduciary bank	Monthly	Life of project
Dist to unions	Fiduciary bank	Monthly	Life of project
Dist to cooperatives	Distributors	Semi-annual	Life of project
Timing of delivery	Distributors	Semi-annual	Long term
Tons distributed	Fiduciary bank	Monthly	Long term
Types delivered	Fiduciary bank	Monthly	Long term
Nbr provinces/depts	Distributors	Semi-annual	Long term
Distrib of demand	Farmer surveys	Periodically	Long term
Prefered types	Farmer surveys	Periodically	Long term
Prefered timing	Farmer surveys	Periodically	Long term
Application rates	Farmer surveys	Periodically	Long term
Crops fertilized	Farmer surveys	Periodically	Long term
Other char of demand	Farmer surveys	Periodically	Life of project
<b>Effective fertilizer use</b>			
Crop response to fert	Agronomic trials	Periodically	Long term
Impact of timing	Agronomic trials	Periodically	Long term
Impact of technique	Agronomic trials	Periodically	Long term
Profitability of fert	Econ analysis of trials	Periodically	Long term
Risk of fertilizer	Econ analysis of trials	Periodically	Long term
Farmer perceptions	Farmer surveys	Periodically	Life of project
Farmer knowledge	Farmer surveys	Periodically	Life of project
Farmer practices	Farmer surveys	Periodically	Life of project
Extension/publicity	Special study	Once	Long term
Credit constraints	Special study	Once	Life of project
Impact of price	Farmer surveys	Periodically	Life of project
Other constraints	Farmer surveys	Periodically	Life of project
<b>Adaptability/sustainability</b>			
Eval of participants	Fertilizer meetings	Annual	Long term
Intention to continue	Fertilizer meetings	Annual	Life of project
Distribution of risk	Special study	Periodically	Life of project
Eval by banks	Fertilizer meetings	Annual	Life of project
Eval by importers	Fertilizer meetings	Annual	Life of project
Eval by distributors	Fertilizer meetings	Annual	Life of project
Eval by farmers	Farm surveys	Periodically	Life of project
Nbr banks	Fiduciary bank	Monthly	Life of project
Nbr importers	Fiduciary bank	Monthly	Life of project
Nbr distributors	Fiduciary bank	Monthly	Life of project
Nbr farmers	Farm surveys	Annual	Life of project

FIGURE 5: RELATIONSHIP BETWEEN FSSRP INFORMATION SYSTEM AND THE COMPONENTS OF THE FERTILIZER SUPPLY SYSTEM

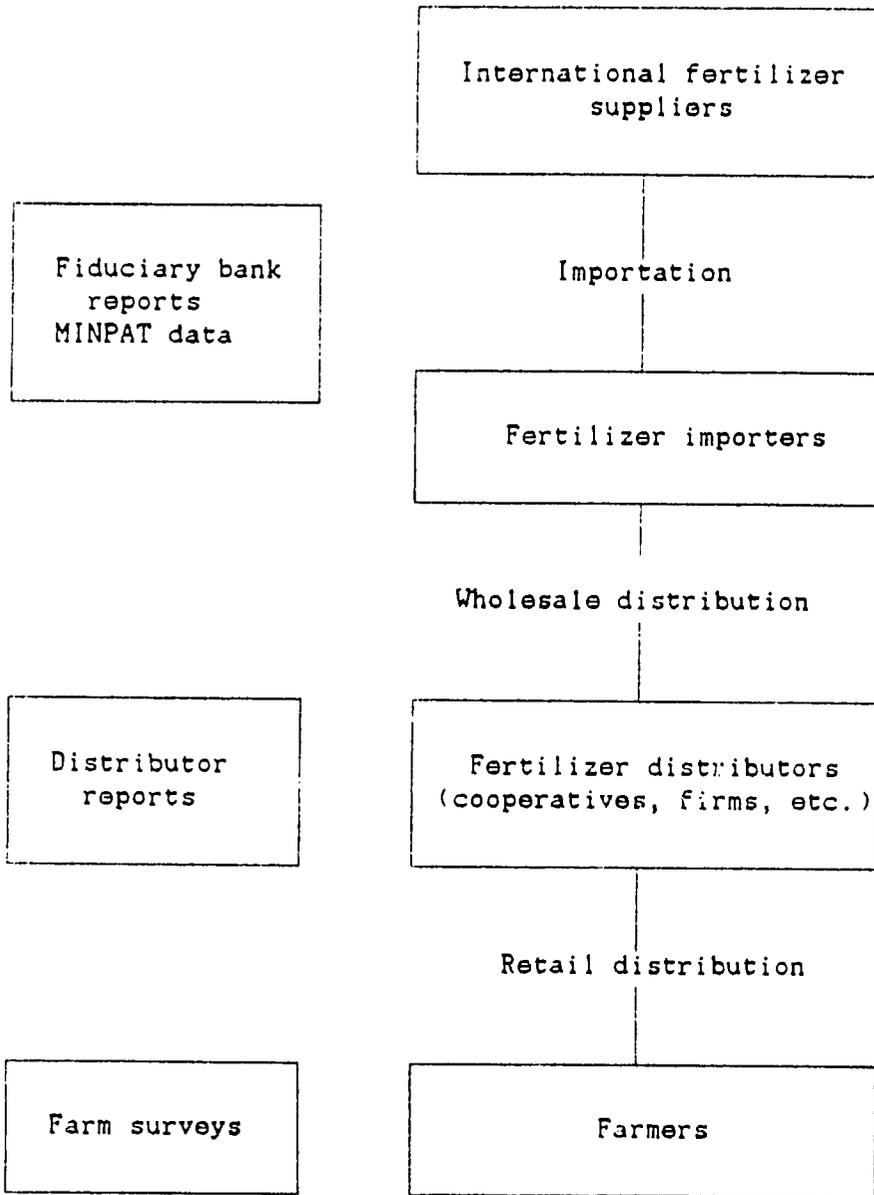
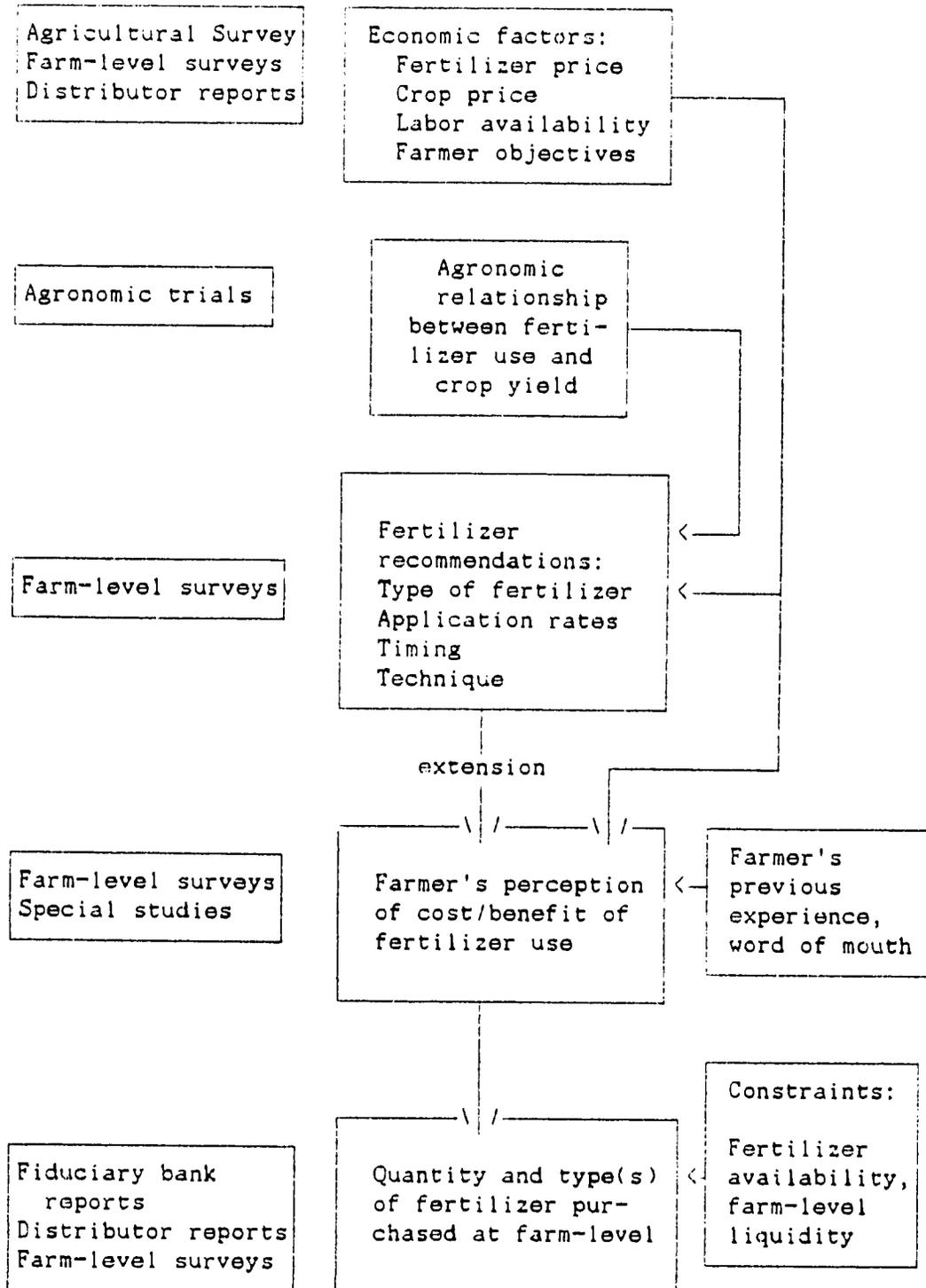


FIGURE 6: RELATIONSHIP BETWEEN FSSRP INFORMATION SYSTEM AND FACTORS AFFECTING THE DEMAND FOR FERTILIZER



with national and provincial figures, as well as individual reports for each province. The provincial reports include some figures at the level of the division, although often they are grouped together to ensure a sufficiently large number of observations.

The survey includes a number of questions concerning the use of fertilizer. For example, the 1984 summary report provides the following statistics:

- o the number of farms using organic fertilizer by province
- o the number of farms using chemical fertilizers by province
- o the number of farms using both types of fertilizer by province
- o the number of farms using fertilizer by province by crop category: coffee, cocoa, tea, cotton, rice, tobacco, and food crops
- o the number of farms using chemical fertilizer by province by fertilizer category: ammonium sulfate/urea, compound, and other
- o the quantities of chemical fertilizer used per farm by province

In addition, the report contains information concerning the area, production, and sales of the major crops for each province and for some individual divisions. This information is useful in providing baseline information about the patterns of fertilizer use by province and by crop before the FSSRP. (Some of the important statistics related to fertilizer use are presented in Annex D.)

A report based on the combined results of the 1984, 1985, and 1986 surveys is due to be delivered to the printers in early April. The format for these reports is somewhat different, but almost all the information in the 1984 report is retained in the 1984-6 report. The only significant change is that, due to the smaller sample size, estimates at the level of the division could not be included. Another change is that the list of crops on which fertilizer is used has been reduced, eliminating tea, cotton, and tobacco.

In order to make use of existing resources as much as possible, we have proposed to the Director of Statistics in MINAGRI/DEP several modifications in the questionnaire which would make it more useful for monitoring the impact of the Fertilizer Sub-sector Reform Program (see Annex A). First, we suggested that the categories of fertilizer be disaggregated to include NPK 20-10-10, NPK 12-06-20, urea, and ammonium sulfate. Even if concern about the number of observations limits the number of categories to three, it would be preferable to include the first three mentioned here, they being the most widely used types within the subsidized sector. The second proposal was to add the price information for each type of fertilizer. Although this was not a useful question under the old system of administered prices, it is an important variable in monitoring the new system. And the third proposal was to add a question concerning the organization or place from which the farmer bought his or her fertilizer. This would help us track the flows of fertilizer down to the farm-level. Although the initial

response to the proposals appears favorable, the issue is still under consideration within the Division of Studies and Projects. Any modifications adopted would be incorporated into the survey of 1990.

### 3.1.2 MINPAT - Importation Statistics

The Directorate of Statistics within the Ministry of Plan and Regional Development (MINPAT) collects statistics related to international trade, prices, industrial production, and national accounts. Two areas of possible relevance to FSSRP are fertilizer prices and fertilizer imports. Unfortunately, while MINPAT collects prices of consumer products, they do not collect them for intermediate products such as fertilizer. The Bulletin Mensuel de la Statistique has data on imports, but publication of this document is delayed by the economic crisis. The most recent issue available is that of March 1987 (most of the other publications are even further behind). An alternative is to use the computer listings from which the Bulletin is derived. This is both more timely and has more detailed information. These listings provide the quantity and value of official imports, including those of fertilizer. The fertilizer imports are broken down into the following categories:

Customs code	Type of fertilizer
31.01.00	Guano and other natural fertilizers
31.02.01	Sodium nitrate
31.02.11	Urea
31.02.90	Nitrogen fertilizers
31.03.00	Phosphorus fertilizers
31.04.01	Potassium salts
31.04.90	Other fertilizers
31.05.90	Other urea fertilizers

The listings are available on a reference basis from the documents section of the Direction of Statistics, MINPAT, or they can be ordered through a monthly subscription. We recommend a monthly subscription to the fertilizer import statistics.

### 3.1.3 Other Sources

Although it is not our intention to provide an exhaustive list, it is worth mentioning a number of other publications which have recently been published or will soon be released. The Annual Report of the National Cereals Research and Extension (NCRE) project provides an overview of the cereals research being carried out at the Institut de Recherche Agricole (IRA) with support from the project. It gives a brief summary of the methodology and results of the breeding activities, agronomic trials, and survey work carried out during the year.

The individual stations IRA stations and the Testing and Liason Units (TLUs) attached to them also publish the results of survey work. For

example, the TLU in Bambui (North West Province) recently issued the results of a farm budget and time allocation study carried out in the Ndop Plain. Similarly, the TLU in Ekona (South West Province) recently published the results of a survey on cropping systems and farming practices in the Meme Division. The results of surveys of the Ndian and Manyu Divisions are in draft form. All of these studies contain some information about the utilization of fertilizer, although it is generally not a major topic of investigation.

The North West Development Authority (MIDENO) has recently finished the first phase of the Foodcrop Programme Evaluation Study, which concentrates on the effectiveness of the extension service in the province. The report of the first phase is scheduled to be published soon, while the second and third phases of the study are to be implemented later this year. MIDENO has also just completed a study on economics of coffee production in the North West. Similarly, the results of collaborative research between IRA and the Union des Cooperatives Agricoles de l'Ouest (UCCAO) on the fertilization of coffee has recently been published. These two coffee reports should be useful in determining the status of fertilizer research on coffee and in identifying the most useful role the FSSRP can play in this sector. And finally, the analysis of the 1984 Household Budget and Consumption Survey (in both urban and rural areas) has recently been accelerated with support from Cornell through the USAID-financed Cameroon Agricultural Planning Project. While this report will not provide much information on fertilizer use per se, it will be helpful in supplying background information on the rural economy in general.

### 3.2 Regular reporting

Regular reporting by key participants in the fertilizer sub-sector can be an effective, cost-efficient way of obtaining timely information, particularly the figures related to the physical distribution of the fertilizer, the prices paid at different levels, and the timing of distribution. On the other hand, it is important not to burden the participants with excessively detailed reporting requirements. We recommend limiting regular reporting to the fiduciary bank (Bank of Credit and Commerce Cameroon) and to the distributors. Each source is described in turn.

#### 3.2.1 Fiduciary Bank

The fiduciary bank is in a key position in the flow of information concerning the subsidized fertilizer supply system. It receives information on imports and distribution from the commercial banks which, in turn, obtain the information from the importers and distributors who come to them for credit and subsidy disbursement. Thus, as manager of the revolving credit fund and the subsidy fund, the fiduciary bank has information on all importation and distribution carried out under the program.

The Bank of Credit and Commerce Cameroon (BCCC) has been named the fiduciary bank for the Fertilizer Sub-sector Reform Program through a

contract with the Technical Supervisory Committee. The contract (article 9, page 8) stipulates that the BCCC is to provide monthly reports covering the following items:

- a) Basic data
  - Number of participating banks
  - Number of borrowers
  - Volume of fertilizer imports
  - Volume of fertilizer delivery/distribution
  - Major FSSRP accounts
- b) Outstanding loans
  - Volume of loans per bank and per borrower;
  - Number and type of borrowers (retailer, wholesaler, type of activity);
  - Loan tenure, interest rates, average size of loans globally and per bank;
  - Repayment rate.
- c) Delinquent loans
  - The age of each past due loan and the reason for delinquency
- d) Subsidy payments
  - Amounts of subsidy earmarked and subsidy payments per marketing organization and per bank;
  - Amount of funds remaining in the Subsidy Fund accounts.

In the first year of the program, the BCCC was very forthcoming with information about the subsidy and loan fund accounts and the importation contracts being financed under the project. However, the format of the reports was not standardized, making comparisons somewhat difficult. Reporting is complicated by the fact that a given importation loan can be used to finance more than one shipment, each of which may contain fertilizer ordered through more than one distributor contract.

With this in mind, we have developed two forms, which, when complemented with the monthly account statements for the two funds, should provide a clear picture of the status of the various loans and shipments. The Importation Status form is organized by importer-distributor contract, containing the names of the importer and distributor, the date of the contract, the value of the contract, and the quantities of each type of fertilizer ordered. In addition, for each type of fertilizer, it provides the CIF value, the date of arrival in Douala, the date it cleared customs, and the disbursement number which financed the importation. (The form is shown in Annex B.)

The second form reports on loan status. For each loan, it shows the commercial bank, the importer, the distributor(s), the date of earmarking, the type of loan (importation or distribution), and the value of the loan. In addition, information is listed by disbursement: the value disbursed, the date of disbursement, and the date of repayment. (The form is also presented in Annex B.) A separate table is presented for details on delinquent loans, if any.

Together, these two forms should satisfy on a monthly basis a number of the information needs identified in section 2: the number of participants of

different types (commercial banks, importers, distributors), the quantities imported and distributed by type of fertilizer and destination, the timing of distribution down to the union level, the CIF and contracted price, and the status of the loan fund and the subsidy fund.

These two forms were shown to the Manager of Operations and Credit at the BCCC. He raised several points concerning the first version, and several changes were incorporated. He confirmed that the forms would be easy to submit on a monthly basis. In fact, he noted that the standardized form would simplify their work, since, under the previous system of ad hoc reporting, they received several requests from the Technical Supervisory Committee for clarification and additional tables.

### 3.2.2 Distributors

Although the fiduciary bank is a key source of information about the operation of the fertilizer sub-sector, it does not trace the fertilizer after it is transported from Douala to the distributor. For information on the farm-level distribution and prices of fertilizer, we must rely on reports from the distributors themselves.

In the first year of the FSSRP, four cooperative unions participated as distributors. Detailed information regarding distribution, prices, and costs were collected from them in the course of visits to their headquarters. It would be convenient to establish a system of regular reporting by the distributors, to be supplemented by field visits once a year. To this end, we have prepared two forms for distributors: a Price Structure form and a Distribution form. The Price Structure form provides price and cost information for each of the five types of fertilizer at various points in the marketing chain: the contract price, the transport to the cooperative union, union margin, transport to the farmer, transport to the cooperative, cooperative margin, and the farm-level price. The Distribution form shows the distribution of each type of fertilizer to the different member cooperatives, as well as the level of sales and stocks at each cooperative. (These forms are shown in Annex C.)

These two forms were reviewed with representatives of three of the four cooperatives which participated in the program last year, the Union Centrale des Cooperatives Agricoles de l'Ouest (UCCAO), the North West Cooperative Association (NWCA), and the Union des Cooperatives du Littoral (UCAL). The head of the Purchasing, Transport, and Supply Division at UCCAO said that they carried out an inventory of member cooperative stocks twice a year and that the reporting forms posed no particular problem. The General Manager of NWCA offered to provide the reports on a quarterly basis, although given their system of having prices vary across the province, he suggested having one column for the minimum price and another for the maximum price. The situation at UCAL is more problematic due to the fact that the union is new and does not have much control over its member cooperatives. The General Manager of UCAL felt that the member cooperative would under-report sales and over-report stocks, as a way of delaying the payment to the union for

the fertilizer. He did not want to visit the cooperatives to take inventory of the stocks because he tends to be the object of hostility concerning the late coffee payments by the National Produce Marketing Board. At least until the coffee payment issue is resolved, it will probably be difficult to get information on cooperative sales and stocks from the Littoral, but it should be possible to obtain data on deliveries to the cooperatives and the price structure.

Although only cooperatives acted as distributors within the subsidized fertilizer sub-sector last year, it seems likely that other entities will become involved this year. Two importers, CAMATREX and ADER, have stated intentions to move into the area of distribution. Likewise, a number of coffee processors in Haut-Nkam Division of the Western Province expressed a strong interest in distributing fertilizer. The question arises as to what extent we can expect them to provide the same information as the cooperatives. As the "price" for benefiting from the Fertilizer Sub-sector Reform Program, we can probably induce them to provide the retail price (the contract price is available from the fiduciary bank) and the quantities sold at each point of sale. For the coffee processors and other local merchants, there is likely to be only one point of sale anyway. And for CAMATREX and ADER who will probably have multiple outlets, it seems likely they would be willing to provide sales and price information by point of sale.

Although the credit arrangements in the purchase of fertilizer are an important topic, we do not recommend trying to obtain this information from the distributors. First, this information is not available at the union level and is probably not systematically tabulated even at the cooperative level. Second, impressionistic evidence seems to indicate that credit from the cooperatives is relatively rare. Coffee growers buy fertilizer at the time of the sale of the previous harvest, the value of the fertilizer being directed subtracted from the crop payment. Third, the cooperatives (or other distributors) may not be the only, or even the most important, source of credit. Thus, monitoring this source of credit may understate the true availability of credit. Instead, we propose that the issue of credit availability at the farm level be investigated through farm surveys.

### 3.3 Farm Surveys

Although existing sources can provide a general picture of the patterns of fertilizer use and reporting systems can yield up-to-date information on imports, distribution, and prices, neither can provide more detailed data on farmer knowledge and practices regarding fertilizer. Thus, the existing sources and reporting system can be supplemented in an important way by farm surveys, as illustrated in Figures 5 and 6.

#### 3.3.1 General Principles

In planning farm surveys to better understand fertilizer use in Cameroon, we have relied on four principles. First, the surveys should be done by existing institutions with experience in farm surveys. Given the

existence of a number of qualified but under-funded organizations, it would be both expensive and unwise to create yet another survey unit. Second, FSSRP should contract a number of different organizations to conduct surveys. This would allow comparison of their performance, reduce the risk of over-dependence on any one organization, and make use of regional expertise.

Third, to reduce the administrative burden of dealing with various organizations, preference should be given to entities which can be funded through existing projects of USAID in Cameroon. The projects with potential for collaboration are the the Cameroon Agricultural Policy Project with MINPAT and MINAGRI, the Agricultural Education Project with the University Center at Dschang, and the Tropsoils project and the National Cereals Research and Extension (NCRE) project with the Institute de Recherche Agricole. And finally, in planning the farm surveys, the wide variation in fertilizer use across regions must be taken into consideration. The following table gives some key indicators of current and potential demand for fertilizer in the seven provinces in which the FSSRP operates. Coffee and maize production figures are included because they account for a large part of fertilizer demand among small farmers (more detailed information for each province is shown in Annex D).

TABLE 1: INDICATORS OF FERTILIZER DEMAND BY PROVINCE

Province	1988 subsidized fert. orders (1000 MT)	1984 fertilizer consumption (1000 MT)	1984 farms using fertilizer (%)	1984 production ----- coffee      maize (1000 MT) (1000 MT)	
West	35.0	41.1	75.0	46.5	112.8
Littoral	21.0	21.0	40.0	37.4	6.9
North West	7.0	13.4	37.3	21.0	169.0
South West	0.0	3.7	10.3	12.9	11.2
East	0.0	2.2	12.3	22.8	26.4
Central	0.0	0.7	2.0	7.5	15.4
South	0.0	-	0.2	0.2	3.8

Sources: Subsidized fertilizer orders from Privatization of Fertilizer Marketing in Cameroon: A First-Year Assessment of the Fertilizer Subsector Reform Program, 1989. All others from the 1984 Agricultural Census.

Notes: (1) "Fertilizer" refers to chemical fertilizer.  
 (2) Coffee figures include both arabica and robusta

In order to maximize the return on the research investment, the level of effort must be greater in areas of current or potential demand. At the same time, we wish to get a broad understanding of the situation in all of the provinces in which FSSRP operates. This can be accomplished by carrying out a general survey of fertilizer use in the seven provinces in which FSSRP operates and supplementing it with more intensive, provincial surveys which concentrate on the areas of particular interest. A common core of questions would be included in both the general and the provincial surveys, thus providing verification of key variables. A second group of questions would be included in the intensive provincial surveys to facilitate comparison across provinces. And a third set of questions would vary among the provincial surveys, addressing issues and problems specific to each province.

In addition, to the extent that the surveys are repeated over the life of the project, they will provide longitudinal data on the impact of the FSSRP on the patterns of fertilizer use in Cameroon and feedback for improving the program. The general survey and the provincial surveys are discussed in turn below.

### 3.3.2 General Fertilizer Survey

Nation-wide data collection is carried out by two government agencies: the Direction of Statistics with the Ministry of Plan and Regional Development and the Direction of Studies and Projects in the Ministry of Agriculture. MINPAT relies on a network of provincial and division-level

delegations to collect data. It has been involved in some major data collection efforts, notably the 1971 Employment Survey, the 1978 Fertility Survey, the 1984 Household Budget and Consumption Survey, and a series of Industrial Enterprises Surveys. Unfortunately, the most recent study on the publication list is the Fertility Survey of 1978.

The Direction of Studies and Projects (DEP) in the Ministry of Agriculture, on the other hand, is actively involved in the annual agricultural surveys. Data is collected by a full-time staff of 200 enumerators plus supervisors. Unlike MINPAT, MINAGRI/DEP has experience in farm surveys on agricultural topics. Furthermore, it already has a national sampling frame of farm households which would reduce the start-up costs of implementing a fertilizer survey. Finally, the existence of the Cameroon Agricultural Planning Project (which has replaced the Agricultural Management Project) at MINAGRI/DEP provides a convenient funding mechanism. Thus, we recommend contracting MINAGRI/DEP to carry out the general seven-province survey.

The Agricultural Survey involves three rounds of interviews, one in June, the second in October-November, and the third in February. For each round, the seven southern provinces are surveyed simultaneously by teams of roughly four enumerators working in each division. For the same round, interviewing begins six weeks later in the three northern provinces where the agricultural cycle is delayed relative to the south. According to Rod Kite of the Agricultural Management Project, there is time in between the rounds to carry out smaller surveys.

A seven-province survey involving 50-70 farms per province (350-490 farms in all) should provide useful information on the general patterns of fertilizer use. Although the details of the collection methodology are best left to MINAGRI/DEP, the FSSRP should take an active role in negotiating the outline of the methodology and in defining the content of the survey. It is important to resist the temptation to overload the questionnaire. It is better to start with a short general questionnaire and to let the results guide the design of more intensive surveys to follow.

For those farmers that use fertilizer, we would like to know the following information:

- o Household characteristics
- o Quantities of each type of fertilizer used on each crop
- o Areas of fertilized crops (to calculate application rates)
- o Yields of crop often fertilized (coffee, maize, etc.)
- o Preferred dates of application
- o Preferred dates of purchase
- o Place of purchase and distance from farm
- o Availability, source, and terms of fertilizer credit, if any
- o Constraints to greater use: credit, price, timing, distance to outlet, information
- o Sources of information about fertilizer use
- o Level of knowledge about fertilizer (several "test" questions)

However, the survey should also address farmers that do not use fertilizer. In the Central and South Provinces, for example, it is quite possible that a random sample of 50-70 farmers will not include a single fertilizer user. For those not using fertilizer, we would like to know the following:

- o Household characteristics
- o Areas under different crops
- o If they have used fertilizer in the past
- o If so, on what crop(s) and what was the result
- o Would they like to buy fertilizer
- o If not, why not: price, poor results in past, no information
- o If so, what is the constraint: credit, distance to outlet, payments for coffee harvest by ONCPB, availability of fertilizer, timing of supply, etc.

It is important to recognize that the sample size will not allow us to draw any conclusions regarding the patterns of use in the South and Central, nor will there be much information about those who do not use fertilizer in the West Province. These are issues that can be addressed in later surveys, if need be.

The sample size of 350-500 households may be too large to be collected between rounds of the Agricultural Survey. One solution would be to conduct the survey in two stages, each covering three or four provinces. Another solution would be have MINAGRI/DEP hire a separate teams of enumerators, although this would be more expensive and might result in lower quality since the enumerators would be less experienced.

The FSSRP would pay for per diem, fuel, questionnaire reproduction, and the printing of the report. MINAGRI/DEP would cover salaries and data processing costs (preliminary budget estimates from MINAGRI/DEP are included in Annex E). The data entry for 200 such questionnaires should take a week or two.

If MINAGRI/DEP succeeds in producing useful information in a cost-effective manner, there is no reason it couldn't be contracted to do one or more of the more intensive surveys covering a more limited area. As mentioned below, there are some provinces (particularly the Littoral) where local institutions to conduct farm surveys may be lacking.

### 3.3.3 Provincial Fertilizer Surveys

#### West Province

The West Province is by a significant margin the largest consumer of fertilizer among the provinces and, according to the 1984 Agricultural Census, has the highest proportion of chemical fertilizer users. This is probably due to the fact that it is the most important coffee producing region and a major maize producer (second only to the North West). In addition, the level of organizational and financial capacity of the

cooperative union, UCCAO, has undoubtedly played a role. It is therefore important to gain a thorough understanding of the patterns of fertilizer use in this province.

There are two institutions with which the FSSRP could collaborate in implementing these farm surveys: the Institut de Recherche Agricole (IRA) at Dschang and the University Center at Dschang is the other. The IRA station at Dschang focuses on maize breeding, rice breeding, and rice agronomy. Four IRA stations have Testing and Liaison Units (TLUs) attached to them which carry out adaptive research, extension training, and farm surveys. Unfortunately, the Dschang station does not have a Testing and Liason Unit.

On the other hand, the University Center at Dschang has a large number of people with experience and interest in conducting farm surveys. In addition, working with the university through the Agricultural Education Project would provide somewhat more flexibility than working with IRA through the National Cereals Research and Extension project. The former could include studies of fertilization of coffee, whereas the NCRE is limited to cereals.

The departments of particular interest are Rural Education, Agricultural Economics, Agriculture, and Soil Science. The intensive surveys which could be implemented fall into two general categories: 1) knowledge and perception of fertilizer by farmers and the effectiveness of extension efforts and 2) current practices with regard to fertilizer. The former would logically involve the Rural Education department, while the latter would involve collaboration between the Agricultural Economics and Agriculture (perhaps with Soil Science). As an example of the latter, two recent studies by the Agricultural Economics department attempt to use cross-sectional data and regression analysis to evaluate the impact of fertilization on coffee yields. Although it is difficult to control for intervening factors, it might be useful to replicate these studies on a larger sample using soil testing to incorporate soil characteristics into the regression analysis.

In view of the large number of student and staff who are eager to conduct research, given the resources, it should be possible to award several research grants simultaneously to different researchers in different departments. This would also introduce an incentive for performance, with researchers who produce solid results in a reasonable period of time being rewarded with additional contracts. Funding students to do their "memoire" (senior thesis) on a fertilizer-related topic may also be a cost-effective way of obtaining useful data. First, the program is assured of full-time work by the student in question, and second, there is a built-in deadline for the completion of the work.

Whether carried out by a student or by a group of collaborating professors, there should always be one principal investigator who takes final responsibility for quality control and timely completion. This will work most effectively if the principal investigator can choose the collaborators he or she is to work with.

In order for this system of multiple research grants to function properly, it is very important for the program to retain control of the allocation of research grants. If the allocations are determined by an individual or committee within the university, the criteria used will undoubtedly be determined by the internal politics of the university or perhaps some concept of "fairness" and "balance." Rather we need to allocate the grants according to the priorities of the FSSRP and the expected performance of the investigators themselves.

In summary, we propose a system of research grants to staff and to students about to do their "memoires." The allocation of grants would be determined by the program, although the day-to-day supervision would be the responsibility of the principal investigator. If broad outlines of the types of research desired are drawn up, much of the work of defining the methodology and questionnaires could be done by the researchers in the form of proposals.

### Littoral Province

The Littoral is the second largest consumer of fertilizer, as confirmed by the 1984 Agricultural Census and the orders for subsidized fertilizer placed last year. Impressionistic evidence indicates that this demand is derived mainly from the Littoral's position as the second largest coffee producer. There appears to be less channeling of fertilizer to food crops than in the West and North West, perhaps because maize production is negligible and the main foodcrops are less responsive to fertilizer.

Unfortunately, the institutional capacity for conducting farm surveys in the Littoral is not well developed. The IRA station in Ekona (South West Province) has a Testing and Liaison Unit whose mandate covers the Littoral, but the limited staff size forces them to concentrate on the South West Province for the time being. As mentioned before, the Union des Cooperatives Agricoles du Littoral (UCAL) is a new and very loose federation of cooperatives. As it is still establishing itself in the basic functions of input delivery and coffee marketing, it is not in a position to contemplate research activities. The University Center at Dschang in the Western Province is not more than 30 km from the Littoral border, but the center of the coffee growing region in the Littoral lies further to the south. Furthermore, time and transport constraints mean that university staff cannot operate far from campus.

One solution would be to involve MINAGRI/DEP in a province-wide farm survey in the Littoral. This would allow coverage of an important region of fertilizer demand. In addition, it would serve to compare the effectiveness of MINAGRI/DEP with that of the University and the other local organizations in conducting province-level intensive surveys. In addition to the questions which are common to the other province-wide surveys, it would be useful to obtain information concerning stocks, purchases, and trade in fertilizer. This is because UCAL is currently too weak to obtain information on cooperative-level sales data. In addition, there appears to be some resale of fertilizer from the UCAL member cooperatives to the Haut-Nkam

division of the Western Province.

### North West Province

The North West Province is third in fertilizer demand, third in coffee production, and first in maize production. Reportedly, a large portion of the fertilizer purchased through the coffee cooperatives is used on maize. This tendency has been strengthened by the problems resulting from the obligation to market the coffee through the National Produce Marketing Board (ONCPB) which is undergoing severe financial problems. The problem of late coffee payments affects not only the ability of farmers to purchase fertilizer, but appears to be significantly reducing the incentive to grow coffee in the first place.

In light of these issues, farm survey work in the North West is critical. Fortunately, the institutional capacity for research in the North West is well developed. Either the Testing and Liaison Unit (TLU) at Bambui or the North West Development Authority (MIDENO) would be qualified to carry out this work. Dr. Dermot McHugh with the NCRE project and posted at the TLU in Bambui recently carried out a very thorough survey to determine farm budgets and time allocation in the Ndop Plain. Although he would be well qualified to supervise a province-wide fertilizer survey, we recommend concentrating FSSRP support for the TLU on adaptive fertilizer-response trials (see section 3.4).

The Project Evaluation and Monitoring (PEM) unit at MIDENO is also involved in a number of farm surveys. A study of the economics of coffee production based on a survey of 170 farms has recently been completed and the results are scheduled to be published in April. The preliminary results indicate that over 70% of the coffee farmers use chemical fertilizer and over 80% of the coffee fields are intercropped. A second study, the Agricultural Production Programme Evaluation Study, is being undertaken to evaluate the impact of the Training and Visit Extension System being developed in the province. The survey contains questions regarding food crop production, coffee production, the use of improved varieties and techniques, and the application of fertilizer. The report on the first phase, a rapid assessment, is in preparation. Clearly, FSSRP support for MIDENO/PEM in collecting information on fertilizer use must be defined in light of these studies and the results they yield. It may be possible to add questions to the later phases of the Agricultural Production Programme Evaluation Study. If a separate survey is deemed more convenient, perhaps the same sample could be used. This would allow the fertilizer survey to use data already collected for the same households, reducing the costs and increasing the size of the data base.

### South West Province

The Testing and Liason Unit at Ekona is already involved in a program of intensive farm surveys in several regions of the South West Province. The staff of the TLU believe that that survey activity is more constrained by available staff time than by available funds. For example, there are

only "one and a third" people available for socio-economic research: Dr. Susan Almy, a socio-economist with the NCRE project, and Manfred Besong, an agricultural economist who is only available part-time as he is working on his dissertation.

On the other hand, this current program of farm surveys being carried by the TLU will provide answers to some of the questions we are asking with regard to fertilizer use in the South West Province. The first report, covering the division of Meme, has been printed, while others on the divisions of Ndiain and Manyu are in draft form. These surveys confirm the estimate of the 1984 Agricultural Census that approximately 10% of the farmers use fertilizer. One problem is that fertilizer is often not in stock at the cooperative level. The South West Farmers' Cooperative Union did not order fertilizer through the FSSRP in 1988, although they may order 2000 MT in 1989 if the ONCPB makes the coffee payments soon. However, there is a question as to whether farmers are really interested in fertilizer. The staff at Ekona report that farmers are often uninformed about fertilizer, believing for example that applying fertilizer to foodcrops will affect their taste.

The division-level reports will have to be gleaned for information relevant to the FSSRP. Following a review of these reports, small gaps in our knowledge about fertilizer use could be addressed by adding questions to a survey scheduled for November which already includes some questions regarding fertilizer knowledge and use. Larger gaps would have to be filled by resorting to MINAGRI/DEP, but the South West Province is clearly a lower priority than the Littoral, particularly given the on-going survey program at Ekona.

#### East, Central, and South Provinces

These three provinces have the lowest levels of fertilizer use among the seven provinces in which the FSSRP operates. According to the 1984 Agricultural Census, the three together consumed less than 3% of the fertilizer used in Cameroon that year. This is in part due to the relative importance of crops which are not generally fertilized such as cocoa and root crops. In addition, there is no strong cooperative movement to facilitate input supply. Third, population density is very low in this region. This makes distribution more costly, and without land pressure, there is less incentive to increase yields.

On the other hand, the liberalization of prices may improve the supply situation. The old system of pan-territorial pricing made it difficult to profitably serve areas where distribution costs were high. This year, one private distributor is interested in opening a fertilizer outlet in the East Province. Indeed, the East Province shows the greatest promise of the three, with 12% of the farms using fertilizer and significant robusta coffee production. In fact, the division of Haut Nyong in the East Province produces 13% of the robusta in the country, although it should be noted that Haut Nyong covers a vast area, larger than several of the provinces. In the East, transport may be the largest obstacle to fertilizer use. In the South and Central Provinces, by contrast, transport costs are probably less

important than the fact that the dominant crops in these provinces, cocoa and root crops, are rarely fertilized anywhere in Cameroon.

The Teaching and Training Unit at Nkolbisson (Center Province) would be a logical candidate for carrying out a survey of this region. Once again, the survey could be contracted through the NCRE project. Although a survey of the Central Province would be simpler to carry out for the TLU, a survey in the East Province might provide more useful information. Farm surveys in either province will have to focus on the reasons why farmers do not buy fertilizer. Not only is this the relevant question in these provinces, but it would be very difficult to find enough users to interview about fertilizer use. Assuming the proportions estimated by the Agricultural Census, it would take a sample of 2500 households in the Central Province to yield 50 fertilizer users. The survey should evaluate the relative importance of various factors impeding fertilizer use: unavailability of fertilizer, poor timing of availability, distance to point of sale, lack of information concerning its use, lack of credit, or the simple fact that the yield increases do not justify the cost of the fertilizer. If the survey were carried out in the East, it might be possible to compare robusta yields as a function of the level of fertilizer application, as was done in the Dschang study cited above.

#### 3.4 Agronomic trials

The economics of fertilizer, as used here, refers to the determination of the most profitable way to fertilize, including the type of fertilizer to use, the rate of application, the timing, the technique used, and the cultural practices and varieties which complement the use of fertilizers. Profitability is measured by the economic value of the additional production resulting from fertilizer use minus the costs (both monetary and non-monetary) involved in applying the fertilizer. More sophisticated analyses will also incorporate the variability of yield, so as to take into account the risk that the yield increase will be insufficient to cover the cost of the fertilizer.

Determining the optimal rate and technique of fertilizer application requires both agronomic trials and economic analysis. The agronomic trials establish the physical relationships between fertilizer use and yield, taking into account other factors such as crop variety, weeding practices, date of planting, and so on. Ideally, a "response surface" is estimated, which describes the relationship between yield and different combinations of two or more nutrients. The economic analysis applies prices to the additional output and to the additional costs (e.g. fertilizer, labor, etc.) in order to determine the "best" fertilizer practices.

The accuracy of recommendations based on this methodology depend on 1) the similarity between the conditions under which the trials were conducted and on-farm conditions, 2) whether the criteria used to choose the "best" practices are similar to those implicitly used by the farmer. For example, if the trials are done under conditions of intensive weeding beyond that which the farmer normally does, the trial results may not be applicable to

his or her situation. Similarly, if the recommendation is based on strict profit maximization, the recommendations will not be appropriate to the farmer who is also interested in minimizing risk. As a general rule, farmers choose application rates considerably below the recommendations of researchers and extension agents.

#### 3.4.1 Research Priorities of the FSSRP

The Institut de Recherche Agricole (IRA) has a sizeable research network including 6 research centers, 16 stations, and 39 substations. It employs 190 scientists, including 130 nationals and 60 expatriates. In spite of the budget problems of the government, the agricultural research program is quite active, in part due to assistance from USAID (through the NCRE project) and other donor agencies. For example, the NCRE annual report for 1987 contains over 400 pages of results from breeding and agronomic research on maize, rice, sorghum and millet.

Given this volume of research activity, it is reasonable to ask if there aren't already enough "on-the-shelf" data on fertilizer economics for the purposes of the Fertilizer Sub-sector Reform Program. To answer this question, it is necessary to compare the needs of FSSRP with the existing research results. In general, improving the effectiveness of fertilizer use implies the need for recommendations based on on-farm trials and economic analysis. Since the choice of fertilizers will no longer be effectively limited to those that are subsidized, of which NPK 20-10-10 is the dominant one, there is a need for trials involving different combinations of nutrients to identify the best balance among them. The recommendations should be tied to soil type, or at least to "recommendation domains" determined by rainfall, altitude, cropping system, and other factors.

Since maize accounts for a large portion of the demand for fertilizer, it is worth reviewing IRA research on the yield response of maize to fertilizer. The 1987 Annual Report for NCRE/IRA describes 15 maize-fertilizer trials. They covered rates of application, timing, sources of N, sources of magnesium, sources of phosphorus, and variables. Eight of the fifteen measured the response to different levels of a single type of compound fertilizer, most frequently 20-10-10. Four more measured the effect of different applications of single nutrients. Only three evaluated the impact of different combinations of nutrients (of these, only one was a complete factorial of two major nutrients).

With regard to economic analysis on which to base recommendations, the reports of only three of the fifteen trials mentioned the results of economic analysis. It should be noted that the Rambui and Ekona TLUs also carried out "minikit" tests in which packages of seed and fertilizer are provided to farmers and their reactions sought at the end of the season. This constitutes an economic "test" of the desirability of the package, though it does not help define recommended application rates.

On the topic of soil testing, it is true that soil type was frequently mentioned, but only at Ekona (which has a soils laboratory) does testing

appear to have been done systematically. Researchers at Bambui explained that soil testing is expensive (over 10,000 FCFA per sample) and time consuming (4-5 months), so that it was done selectively. Recommendations were tied to recommendation domains, as defined by altitude, rainfall, cropping system, and other factors.

Thus, it appears that current research at IRA does not fully satisfy the needs of the fertilizer sub-sector, given the sector's transition to a privatized system without subsidies. First, there is a need for more research on the most effective combinations of N, P, and K. Current research concentrates excessively on the number of bags of NPK 20-10-10. While this was a reasonable approach when subsidized NPK 20-10-10 was virtually the only compound fertilizer available, it is no longer sufficient. Second, there is a need for more economic analysis on which to base recommendations. Third, it would be useful to conduct, on a trial basis, systematic soil testing in conjunction with agronomic trials in order to calibrate recommendations to testable soil characteristics. This latter recommendation is qualified because it is still an open question whether such a sophisticated system is sustainable under present conditions in Cameroon.

#### 3.4.2 Supporting Research on the Economics of Fertilizer Use

Although the farm survey work will provide a more complete picture of the frequency of fertilizer use on different crops, it appears that coffee and maize account for most of the demand for fertilizer in Cameroon. Vegetables and rice are often fertilized, but the production is modest. Cassava, yams, and other roots crops (with the exception of white potatoes) are very rarely fertilized. In sum, we recommend that FSSRP sponsored fertilizer response trials concentrate on coffee and maize. Given the composition of USAID projects through which assistance may be channeled, support for research on maize is considerably easier to arrange.

The methodology of doing factorial fertilizer response trials (involving different combinations of nutrients) on a large number of on-farm sites and applying economic analysis has not been frequently used in Cameroon. The idea of systematically taking soil samples and calibrating fertilizer recommendations to testable characteristics of the soil is even more experimental, given local resources and conditions. Therefore, it would be best to start these trials in one region, later replicating the methodology in other areas.

For maize research, we recommend using the North West Province as the pilot region for these trials. The IRA station at Bambui is the center for highland maize research and the Provincial Delegation of Agriculture operates a network of 10 Trials and Demonstration Centers (TDC) which could organize the on-farm trials. Discussions with the researchers at IRA/Bambui and the Provincial Delegation indicate that it would be feasible to organize trials on 50 sites, five near each of the 10 TDCs. Soil samples would be collected and sent to the soils laboratory in Ekona or the one in Dschang. The trials would involve 4x4 factorial design: four levels of nitrogen for

each of four levels of phosphorus (previous research indicates that potassium is not a constraint in the North West Province). Additional treatments might be included using mineral supplements, if soil testing reveals the presence of minor nutrient deficiencies.

The results would be used to estimate the "response surface," that is the mathematical relationship between the level of each nutrient and the yield. From this analysis, recommended levels of nitrogen and phosphorus could be determined for each region. Finally, a study of the correspondence between the nutrient recommendations and the soil type would eventually allow recommendations to be made directly from soil test results.

The FSSRP would pay for the fertilizer, soil tests, and labor on the trial site, while the Testing and Liaison Unit would provide technical advisory services and the Provincial Delegation of Agriculture would provide the staff at the Trials and Demonstration Centers and conduct the analysis of results. Preliminary budget estimates for a fifty-site, 16-treatment set of trials is presented in Annex E.

The IRA station at Ekona (South West Province) has primary responsibility for lowland maize research. It would be desirable to conduct similar trials in this region, although the task is complicated by the fact that the station does not have a network of "antennas" similar to the TDCs in the North West Province. One possibility would be to greatly reduce the number of sites at which the trials are done, perhaps limiting it to 3-4 sites on a pilot basis until resources are made available for a larger network. Alternatively, the FSSRP could provide a greater level of support allowing the posting of trial supervisors in the field, one per cluster of trial sites.

The IRA station at Nkolbisson (Center Province) also conducts fertilizer response trials on maize, both on-station and on-farm. Researchers at this station have expressed support for the idea of testing different nutrient combinations in preparation for the removal of subsidies and liberalization of the fertilizer market. However, the feasibility of conducting such trials on a large number of sites, with support from the FSSRP, has not yet been explored.

With regard to research on the fertilizer response of coffee, it is clear that the state of current knowledge is more advanced than for foodcrops. As mentioned in section 3.1, research into the economics of coffee production has recently been completed in the North West Province by MIDENO. Fertilizer response trials on robusta coffee have been carried out by IRA in Abong Mbang (East Province) and Barombi Kang (Littoral Province), while arabica fertilizer trials have been conducted in Foubot (West Province) and Santa (North West Province). In Foubot, IRA has been collaborating with UCCAO on a series of fertilizer response trials with arabica. Six zones based in part on soil type have been identified and fertilizer recommendations adapted to each. A report on coffee fertilization has recently been published based on this research. According to the Director of Agricultural Operations at UCCAO, there is already fairly good

information on the relationship between coffee yield and fertilization, but much less information on current practices with regard to fertilizer.

In summary, in spite of the widely-noted channeling of fertilizer from coffee to foodcrops, coffee is probably still the dominant source of demand for fertilizer in Cameroon (see Annex D). But given the amount of agronomic research done on coffee, it is not clear that support from FSSRP is called for in this area. A more thorough review of the literature is warranted before making any judgement on this issue.

### 3.5 Special Studies

Some of the information needs mentioned in section 2 cannot be met from existing publication, periodic report, farm surveys, or agronomic trials. In addition to understanding current fertilizer use, on-farm conditions, and the economics of fertilizer use, it is important to study specific aspects of the fertilizer sub-sector. Each of the proposed special studies addresses a particular problem identified during the course of this mission.

#### 3.5.1 Role of Credit and Risk in the Fertilizer Sub-sector

The most critical issue facing the FSSRP in early 1989 is the liquidity problem at the National Produce Marketing Board (ONCPB) which has prevented the payment of growers for a significant portion of the coffee harvest. During the field trip, this problem was consistently identified as the most serious impediment to fertilizer purchases in the North West, Littoral, and South West Provinces. (The West Province is partially immune to this problem because UCCAO has the right to export directly.) If fertilizer purchases are reduced, the production costs per kilogram of coffee will rise (operational inefficiency) and the incentive to maintain coffee trees will be diminished. The crisis at ONCPB is a very sensitive one, being related to the liquidity problems in the government as a whole, and is thus beyond the scope of FSSRP. However, there is urgent need for a study to determine the best way to adapt to the situation, at least until it is resolved at higher levels.

A key element in the financial system is the distribution of risk. Currently, the fiduciary bank extends credit to the commercial bank, which in turn extends it to the importer or distributor. However, the commercial bank is responsible for repaying the fiduciary bank whether or not it has been repaid by the importer/distributor. The fact that the commercial bank currently faces all of the risk has led them to demand strict guarantees from the importer/distributor. In some cases, the cooperatives have sought and obtained guarantees from the marketing board (ONCPB). Unfortunately, with the liquidity crisis at ONCPB, there is some question as to whether it will be able to honor those guarantees since much of the coffee harvest has not yet been exported. If the banks lose confidence in the ONCPB guarantees, the cooperatives could find it extremely difficult to obtain credit from the banks.

Even if the coffee payments were made in full immediately, there would remain a degree of uncertainty regarding the ability of ONCPB to pay for the coffee next year. The risk that this introduces into the system may result in commercial banks declining to participate in the fertilizer program. At the seminar in Dschang to discuss the first year of the program, a number of participants suggested that some mechanism for sharing the risk be developed. For example, the fiduciary bank and/or the loan fund could accept part of the loss in the event of non-payment and the commercial bank would only be responsible for repaying a certain percentage of the loan. Clearly, this is a high priority issue which needs to be addressed.

Although the problem with ONCFB is a very immediate one, there are also longer term issues in farm credit. As mentioned in section 3, it is difficult to obtain information about farm-level credit arrangements from the distributors, so we must rely on the farm surveys. The results of the surveys will help guide further investigation in this area. If credit is not a constraint (aside from the current problems with ONCPB), then perhaps no additional study is necessary. However, the surveys may indicate that credit is a limiting factor for certain categories of farmers, such as those not affiliated with a cooperative or those not producing coffee. A study might be conducted into ways of resolving this constraint at the farm-level, either separate from or as part of the broader credit study.

### 3.5.2 Training Requirements of Distributors

As mentioned in section 2.3.3, improving the input supply management of the cooperatives may reduce distribution costs, contributing to the operational efficiency of the distribution system. In addition, an effective bid-and-tender system enhances competition and promotes price efficiency. The privatized system of fertilizer importation and distribution places greater responsibilities on the distributors than did the old system. They must estimate their own demand, request bids from and negotiate contracts with importers, and negotiate with banks for credit. The first year of the program was successful in large measure due to the ability of the distributors (cooperatives) to adapt to their new roles. However, some problems did arise. The NWCA ran into difficulties dealing with one of the commercial banks. UCAL was forced to rely heavily on the assistance of the Provincial Delegate of Agriculture in the Littoral, who took responsibility for projecting demand, requesting and evaluating bids, and negotiating with importers. COOPAGRO (in the West) and the South West Farmers' Cooperative Union did not order any fertilizer, in part due to a lack of understanding of the new procedures.

Therefore, it might be useful to provide short-term technical assistance to certain cooperatives in the areas of inventory management, demand projection, and selection of a supplier through bidding procedures. The technical assistance would be furnished upon request of the cooperative union or private distributor. Although it is too late for this season, an assessment of needs could pave the way for short-term assistance before the next FSSRP campaign.

### 3.5.3 Pre-feasibility of Bulk-blending and Bagging Facilities

The privatization of fertilizer distribution has introduced strong incentives for cost-reduction into the system. However, as mentioned in section 2.3.3, the operational efficiency of the distribution system might be further increased by investments in bulk-blending and/or bagging facilities in Cameroon. In its 1986 study of the fertilizer sub-sector, the International Fertilizer Development Center (IFDC) evaluated the economics of such a facility. The study concluded that:

Installation of the bulk-blending plant is not recommended until it is demonstrated that the importation of fertilizers in bulk with local bagging (Item 5) is technically and economically viable under the Cameroon conditions ... Furthermore, bulk blending should be done only if a clear demand for a bulk-blended line of products is established. (IFDC, 1986, p. 328)

On the other hand, they were more positive about the desirability of local bagging facilities:

A fertilizer bagging plant having a capacity of at least 100,000 mtpy should be installed in the Douala area (outside the port authority's jurisdiction) as soon as possible. The proposed bagging plant complete with bulk unloading and storage facilities is expected to cost about US 1.84 million. (IFDC, 1986, p. 329)

An updated pre-feasibility study of bulk-blending and bagging facilities might provide the impetus for private investment in such a plant. However, two caveats must be made. First, an important factor in the economics of bulk blending is the composition of demand for fertilizer, as noted by the IFDC. Fertilizer demand is now in a state of transition as a result of privatization and the gradual removal of subsidies. Thus, the pre-feasibility study of the bulk-blending plant might be based on firmer ground if it was done later, as the volume and composition of demand in the unsubsidized system stabilize. On the other hand, a pre-feasibility study of local bagging operations depends less on the composition of demand and, thus, could be done sooner. Second, the sole purpose of the study would be to interest private investors into further examination of the opportunity. If investors become interested on their own, there would be no reason for the study.

### 3.5.4 Additional analysis of the Agricultural Census

Information about the patterns of demand assist us in assuring that the supply is adequate in terms of time, place, type, and quantity (allocative efficiency). The 1984 Agricultural Census report provides a large amount of valuable information concerning the current patterns of fertilizer use in Cameroon. However, even the 400-page report of national-level data and the 10 reports of provincial-level data do not exhaust the possible analyses that can be drawn from the data base. In line with the goal of

making use of existing resources, we recommend commissioning supplementary tables to be produced from the data base of the agricultural survey. MINAGRI/DEP could be contracted relatively easily through the new Cameroon Agricultural Policy and Planning (CAPP) project. Given that the 1984 report estimates that 33% of the farms in Cameroon use chemical fertilizer, the 1984 sample currently being used must contain around 1000 fertilizer users. New tables could be requested of the following cross-tabulations:

- o quantity of fertilizer used and percentage of farms using it by farm size
- o quantity of fertilizer used and the percentage of farms using it by the value of agricultural production
- o quantity of fertilizer used and the percentage of farms using it by the value of agricultural sales
- o quantity of fertilizer used and the percentage of farms using it by the volume of coffee harvested by the farm among farmers using fertilizer just for coffee
- o coffee yield by quantity of fertilizer applied per hectare of coffee among farmers using fertilizer just for coffee

It should be noted, however, that provincial level data would only be reliable for a few provinces. This is because the proportion of farmers using fertilizers varies from 75% in the West to less than 3% in the South and Central. Thus, the number of users in the sample varies greatly from province to province, with many of the provinces having an insufficient sample size for reliable estimates.

### 3.5.5 Unmet Demand for Fertilizer

The provincial-level farm surveys should provide useful information regarding the constraints to fertilizer use and the extent to which the system is matching supply to demand (allocative efficiency). Impressionistic evidence indicates that there are pockets of unmet demand for fertilizer. For example, the Moungo division of the Littoral and the Haut Nkam division of the West contain large numbers of farmers not affiliated with cooperatives. In the past, they purchased fertilizer from the coffee processors through whom they marketed their coffee. However, the coffee processors did not order fertilizer in the first year of the FSSRP due to lack of information about the provisions of the program. Similarly, the growers of COOPAGRO in Foumbot (West Province) did not participate last year. And finally, there are unaffiliated coffee growers and non-coffee growers who, according to officials at MIDENO, find it difficult to purchase fertilizer. These problems may be resolved this year with continued educational efforts. But if the farm surveys confirm that such supply problems persist, it would be useful to study the situation with an eye toward ways of facilitating fertilizer supply for farmers who are not cooperative members.

A related study might look at the constraints on demand in the East, Central, and South Provinces, with particular attention on the Haut Nyong

division in the East. This division produces 13% of the robusta coffee in the country, yet did not participate in the program last year. Naturally, any such study would be guided by and build upon the results obtained in the farm surveys.

### 3.5.6 Annual Assessment of the FSSRF

In the first year of the program, the assessment, along with the FSSRP seminar in Dschang, served to review the experience of the previous year, identify improvements to be made for the following year, and inform a wider audience about the objectives and provisions of the Fertilizer Sub-sector Reform Program. The assessment contained descriptions of 1) the operations of each of the major participants of the program (banks, importers, and cooperatives), 2) the physical distribution of fertilizer by type, by destination, and by importer, and 3) the prices and cost structure of fertilizer in different provinces and at different stages of the marketing chain. Perhaps more importantly, it reported on the perceptions and recommendations of each of the major participants in the program and highlighted a number of problems with suggestions for resolving them. It is clear that this exercise, required by the Program Agreement, is a useful one and will continue to provide important feedback on the operation of the FSSRP.

#### 4. ORGANIZATION OF DATA COLLECTION AND ANALYSIS

In this section, we provide some general recommendations concerning the division of responsibilities between the USAID mission and the Technical Supervisory Committee (TSC) representing the government of Cameroon. In addition, estimates are made of the resources required by each to fulfill these functions. The recommendations parallel those presented in the companion report "Privatization of Fertilizer Marketing in Cameroon: A First Year Assessment of the Fertilizer Sub-sector Reform Program."

##### 4.1 Division of Responsibilities Between the TSC and USAID

The TSC and USAID share the goals of improving the efficiency of fertilizer supply and use and creating sustainable institutions which will adapt to changing conditions. The differences in roles between the TSC and USAID stem not from differences in goals, but rather differences in skills and resources that each has to contribute to the operation of the program. USAID has access to greater technical resources, while the TSC is more familiar with the political, economic, and agricultural conditions in which the FSSRP must operate.

Part of the institutional objectives of the program is to help identify and promote a more limited but important role for the government in fertilizer marketing. The government would participate in the areas of 1) data collection and dissemination, 2) the organization of annual fertilizer seminars to discuss problems and solutions, and 3) diagnostic studies to facilitate the efficient operation of the private distribution system. It is these functions which we recommend be assigned to the TSC in the hope that they be continued after the end of the project, although perhaps within an established institution such as the Ministry of Agriculture.

Taking into account the above factors, we recommend that the following responsibilities be taken by the TSC:

- o Primary responsibility for assembling secondary information relevant to the fertilizer sub-sector, including the results of farm surveys carried out by IRA, MIDENO, UCCAO, and the University Center at Dschang
- o Primary responsibility for collecting and interpreting the monthly reports to be submitted by the fiduciary bank (Bank of Commerce and Credit Cameroon) and the semi-annual reports to be submitted by the distributors (principally the cooperatives)
- o Primary responsibility for the organization of the annual seminar to exchange views and recommendations concerning the functioning of the FSSRP
- o Primary responsibility for the annual assessment of the program based on the annual seminar of participants and on informational

trip(s) to discuss the operation of the program and the performance of the fertilizer sub-sector

- o Dissemination to interested parties of information about the program (the brochure, the annual assessments, etc.) and the results of recent fertilizer research, including both research funded by the FSSRP and that done by other institutions
- o Supervision of the routing of program documents requiring government approval to the relevant ministries
- o Assistance in the design of studies being supported by the project and the review of drafts of results
- o Assistance in the planning of informational field trips carried out by USAID and TSC staff, particularly with regard to scheduling and protocol arrangements

On the other hand, we recommend that the following responsibilities be adopted by the USAID mission:

- o Joint responsibility with the TSC for establishing the terms of reference for the studies supported by the project, including farm surveys, agronomic trials, and special studies
- o Joint responsibility with the TSC for monitoring the progress of the studies supported by the project
- o Joint responsibility with the TSC for reviewing drafts of the results of studies supported by the project
- o Assistance to the TSC in collecting secondary information related to the fertilizer sub-sector

#### 4.2 Resources Required to Carry out These Activities

We recommend the establishment of a small secretariat for the TSC. The responsibilities we recommend be given to the TSC require more time than can be expected of the Committee members. At the same time, the activities are important ones which need to be carried out. We recommend the following personnel:

- 1 full-time Research Coordinator, a relatively junior person but someone with a strong technical background and self-motivation who can assemble materials, interpret findings, and develop contacts with researchers, cooperative, banks, and so on
- 1 full-time Administrative Assistant with experience in government service who can handle the routing of approvals, travel arrangements, organization of bibliographic information, and so on

1 part-time or full-time Secretary/Clerk to do typing, filing, scheduling appointments, etc.

It is important to keep the initial investment in the Secretariat modest to evaluate its effectiveness before making additional investments.

With regard to the human resources required at USAID, it is more difficult to make recommendations. The supervision of a series of farm surveys and agronomic trials will require significant administrative resources. These studies will involve buying into as many as four AID projects: the Agricultural Education Project, the Cameroon Agricultural Planning Project, the Tropsoils project, and the National Cereals Research and Extension project. It may also involve contracting institutions without an AID project-affiliation, such as MIDENO. Field supervision will be complicated by the fact that, even excluding the general survey by MINAGRI/DEP, research will be conducted in at least three provinces and possibly as many as six or seven. The additional personnel requirements will depend greatly on the degree to which short-term consultancies are used to design trials and surveys and to carry out the special studies. At the very least, project will require one and a half full-time professional equivalents.

With regard to computer facilities, it might be thought that an "information system" would involve a large data-base which would store all the information collected for rapid retrieval. In fact, a computerized data-base is not useful unless it contains a large number of records (say 100 to 100,000), each of which contains the same variables, examples being payroll records and survey data. However, the information to be assembled by the monitoring and data collection system of the FSSRP contains a wide variety of types of information with no common variable.

Although it is not possible to "computerize" all the information collected, it would probably be convenient to have an IBM-compatible computer for selected analyses. It could be used to keep track of the various components of the project, to generate budget projections, and to analyse survey or agronomic trial results. IBM-compatibility is necessary to have access to the wide variety of software, including packages designed for project management, for budgeting (spreadsheet software), and statistical analysis. An additional advantage of IBM-compatibility is that most, if not all, of the implementing institutions use IBM-compatible computers. Thus, an IBM-compatible computer at USAID would allow the editing of texts drafted in the field. Furthermore, if the software were standardized among surveys (by no means a simple task), additional analyses of survey data could be carried out in Yaounde.

## 5. SCHEDULING OF ACTIVITIES

In this section, we provide a tentative schedule of activities proposed for the FSSRP information system. The accompanying Figures 7A and 7B present work plans for the 1989 and 1990/1991 activities respectively. The first category of information refers to the timing of the principal activities during the annual cycle of the program. It is worth noting that the timing of the annual review, fertilizer seminar, and the start of the new campaign have been scheduled earlier than they were carried out during the first year of the program. This change is intended to improve the timing of fertilizer availability at the farm level. As mentioned above, the late start of the campaign in 1988 meant that the fertilizer was not available in February and March when farmers are ready to apply it. Although the schedule was accelerated by two months in 1988, further shift is necessary. This proposal is discussed more fully in the companion study "Privatization of Fertilizer Marketing: An Assessment of the First Year of the FSSRP."

### 5.1 Schedule of Publications and Periodic Reports

The second category of information describes the timing of the release of a number of studies of relevance to the Fertilizer Sub-sector Reform Program, as described in section 3.1. The next Agricultural Survey report, covering 1984-86, is due within a few weeks by some reports, although there is some question as to whether this deadline will be met. The MINPAT data on fertilizer imports will be available monthly as soon as the subscription is arranged. The results of two MIDENO studies are to be released with four to six weeks, one reporting on the first phase of the Foodcrop Program Evaluation Study, the other on the economics of coffee production. And finally, the results of two surveys carried out by IRA/Ekona are now in draft stage. They cover the divisions of Ndian and Manyu and complement the recently released study of the Meme division.

As discussed in section 3.2, the proposed system of periodic reporting involves 1) monthly reports from the fiduciary bank concerning fertilizer imports and the status of the loan and subsidy funds and 2) semi-annual reports from the distributors concerning the price structure and the status of deliveries and stocks. This schedule is reflected in the third category of information in Figures 7a and 7b.

### 5.2 Schedule of Farm Surveys

The timing of the farm surveys is considerably more complex, and thus the proposed schedule more tentative. The surveys to be carried out by MINAGRI/DEP are the seven-province general survey, as well as a more intensive province-wide survey in the Littoral (see the description in section 3.3). The general survey is more urgent, since ideally we would like the design of the more intensive localized surveys to respond to issues raised by the results of the general survey. On the other hand, MINAGRI is constrained by the timing of the collection of the annual Agricultural

FIGURE 7a: 1989 SCHEDULE FOR MONITORING AND DATA COLLECTION FOR THE FERTILIZER SUBSECTOR REFORM PROGRAM

	January	February	March	April	May	June	July	August	September	October	November	December
<b>FSSRP annual cycle</b>												
Fertilizer seminar											X	
Launch new campaign												
Period of ordering			-----									
Period of delivery				-----								
Periods of application									-----			
<b>Publications</b>												
Ag Survey 84-86				X								
Ag Survey 85-87					X							
MINPAT import data	X	X	X	X	X	X	X	X	X	X	X	X
MIDENO Coffee report				X								
MIDENO Food reports				Phase 1			Phase 2				Phase 3	
Ekona survey reports			X			X?						
<b>Periodic reports</b>												
Fiduciary bank				X	X	X	X	X	X	X	X	X
Distributors					X					X		
<b>Survey work</b>												
Minagri Ag Surveys						---Round 0---				---Round 1---		
Minagri 7-province				TOR		Quest. design		---Pilot---				--Collect
Minagri Littoral				TOR		Quest. design		---Pilot---				
UCD West				TOR		Quest. design						---Pilot---
MIDENO Northwest				TOR		Quest. design						---
IRA/Nkol East?				TOR		Quest. design						---
IRA/Ekona SW					Add Q's?				Pilot			--Collect
									Collect			
<b>Agronomic trials</b>												
IRA/Bambui				TOR		Soil test						
IRA/Ekona						TOR			Soil test			
IRA/Nkolbisson						TOR			Soil test			
Calibration of recom. to soil type												
<b>Special studies</b>												
Credit and risk							Study	Report				
Coop mgt training						Assessment				Training		
Feasibility of plant												
Ag Survey analysis					TOR			Analysis/Report				
Demand study												
Annual review										-----		

FIGURE 7b: 1990-1991 SCHEDULE FOR MONITORING AND DATA COLLECTION FOR THE FERTILIZER SUBSECTOR REFORM PROGRAM

	1990												1991										
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.
<b>FSSRP annual cycle</b>																							
Fertilizer seminar												X											X
Launch new campaign	X												X										
Period of ordering	-----												-----										
Period of delivery		-----												-----									
Periods of application			-----						-----						-----						-----		
<b>Publications</b>																							
MINPAT import data	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Periodic reports</b>																							
Fiduciary bank	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Distributors					X					X							X				X		X
<b>Survey work</b>																							
Minagri Ag Surveys		Round 2				Round 0				Round 1			Round 2				Round 0					Round 1	
Minagri 7-province						Report																	
Minagri Littoral				Collect				Report															
UCD West					Collect				Report														
MIDENO Northwest	Pilot		Collect					Report															
IRA/Nkol East?				Report																			
IRA/Ekona SW		Report																					
<b>Agronomic trials</b>																							
IRA/Bambui			---Agronomic trials---				---Analysis---		Report					---Agronomic trials---		---Analysis---		Report					
IRA/Ekona			---Agronomic trials---				---Analysis---		Report					---Agronomic trials---		---Analysis---		Report					
IRA/Nkolbisson			---Agronomic trials---				---Analysis---		Report					---Agronomic trials---		---Analysis---		Report					
Calibration of recom. to soil type																							
<b>Special studies</b>																							
Credit and risk																							
Coop mgt training																							
Feasibility of plant																							
Ag Survey analysis																							
Demand study		---Study---			Report																		
Annual review																							

Survey. As shown in the figure, the Agricultural Survey involves three rounds per year. One possibility would be to attach the fertilizer questions to the normal third-round questionnaire (the smallest of the three) to be administered in February-March 1990. The second option (displayed in schedule) would be to run a separate data collection effort between the second and third rounds at the end of 1989. Although it would be more expensive, we recommend the second option because of the above-mentioned urgency of the survey. If the MINAGRI/DEP unit carries out the general seven-province survey in December-January, it could conduct the province-wide survey of the Littoral between the third and first rounds in April-May.

The survey to be conducted by the University Center at Dschang (West Province) is somewhat less well-defined. For the purpose of this schedule, we have assumed that the data collection can only be carried out during the summer months when students are available. Nonetheless, a pilot survey could be implemented during the December break. It should be noted that the resources at the university lend themselves better to a number of smaller studies, rather than one large one. For example, smaller, more focused surveys could be carried out any time of the year by students doing their "memoires." Thus, the schedule provided in the work plan is probably a simplification.

The MIDENO survey of the North West is scheduled for early 1990 for two reasons. First, this would allow the questionnaire to be modified in light of the results of the general seven-province survey. Second, it is about this time that MIDENO should have completed the third and last phase of the Foodcrop Program Evaluation Study. Thus, it is expected that resources would be available for the fertilizer survey. The scheduling, and even the feasibility, of an IRA/Nkolbisson run survey in the East or Central Province is still uncertain pending further discussions with the staff there.

And finally, as mentioned in section 3.3, the constraints on staff time at IRA/Ekona preclude conducting a fertilizer survey in the South West at least for the rest of this year. However, there is already a survey with questions on fertilizer use scheduled for November 1989. It might be possible to add a few questions to this survey. If not, another possibility would be to explore the feasibility of supporting a province-wide fertilizer survey for 1990.

### 5.3 Schedule of Agronomic Trials

The next set of activities on the work plan includes the agronomic trials to examine the economics of fertilizer use (see the description in section 3.4). These trials are naturally tied to the agricultural cycle. Since the main season is just beginning now, it would not be possible to start main-season trials until this time next year. This is not as inconvenient as it may seem for two reasons. First, the methodology of these experiments is relatively complex, involving cooperating farmers, a large number of treatments, and a large number of sites. Thus, the timing allows careful planning of the experiments. Second, it is useful to have

the results of the soil tests before starting the trials in order to identify any severe deficiencies which might bias the results. Starting the trials in February-March 1990 would allow the results of the soil test to be known beforehand, in spite of the fact that the tests require three to five months to do. The work to calibrate fertilizer recommendations to soil type could begin as the trial results become available, although the results would be tentative after only one year of results.

#### 5.4 Schedule of special studies

Finally, the approximate timing of the special studies is provided at the end of Figures 7a and 7b. The most urgent study is on the topic of credit and risk sharing (see section 3.5.1). Given the seriousness of the liquidity crisis and the repercussions of the late coffee payments, this study should be commissioned as soon as possible. This study will require the services of a credit and banking specialist on a short-term basis. Given the time required to locate a francophone credit and banking specialist, it is probably necessary to think in terms of a June-July consultancy.

The assessment of technical assistance needs of the distributors (described in section 3.5.2) is less urgent, but it would be desirable to arrange for the technical assistance to be provided before the next "ordering" season which is expected to take place in January-February. The assessment itself could probably be done with existing USAID staff if necessary, although the technical assistance itself will have to involve outside help.

The pre-feasibility study of the bagging and blending plant would not be done in the near term due to continuing uncertainty regarding the impact of the FSSRP on the composition of demand for fertilizer (see section 3.5.3). In addition, the need for the study would be eliminated if a private investor started examining the feasibility of such a plant on his own. For these reasons, we would recommend delaying this study until 1990 or even 1991.

The supplementary analysis of the data base of the Agricultural Survey, described in section 3.5.4, is a relatively simple task which can be done without outside assistance. It could be initiated almost immediately except for the fact that there is a change of project staff occurring at MINAGRI/DEP. With the departure of the Agricultural Management Project personnel, there will be a gap before the new team is installed under the Cameroon Agricultural Planning Project. Even after their arrival, it will undoubtedly take time for them to become familiar with the data base and software. Thus, as shown in Figure 7a, we estimate that this study will be done in July or August of this year.

And lastly, the design of the study of unmet demand for fertilizer should be based on the information collected during the assessment of the second year of the FSSRP. The two field trips made in connection with the first assessment identified a number of pockets of farmers who wanted to purchase fertilizer, but had not been able to for a variety of reasons. To some extent, increased knowledge and understanding of the program will deal

with this problem. If the second assessment does not find the problem to be serious, there may be no need for the demand study. If, on the other hand, such problems persist, it will be worth a special study, probably in March of 1990 to coincide with one of the periods of fertilizer application. Ideally, the study would also be able to take advantage of preliminary results from the seven-province survey to be conducted in December-January.

### 5.5 Tasks Requiring Immediate Action

The first order of priority is to investigate the mechanisms for buying into other USAID contracts and initiate the process. Since the FSSRP monitoring and data collection system is relying heavily on existing organizations and projects, little can be done until the contracting mechanisms are in place.

Almost as important is to begin collecting budget estimates from IRA, MINAGRI, the University Center at Dschang, and others for the studies. Even if the estimates are for "reference studies" rather than concrete already-designed studies, this would assist in the development of a global budget for the monitoring and data collection activities.

Next in importance is to begin the process of identifying and contracting a credit and banking specialist to do the credit and risk study discussed in section 3.5.1. Similarly, short-term technical assistance for the design of farm surveys and agronomic trials may be needed soon, so arrangements must be started. Of lower priority are a number of information gathering activities: discussing possibilities for collaboration with the staff of IRA/Nkolbisson on both a farm survey and agronomic trials, examining the type and amount of fertilizer research that has been done on coffee and roots and tubers to evaluate the usefulness of supporting this kind of research, subscribing to the MINPAT importation statistics, and following up on the questions to be added to the Agricultural Survey.

## APPENDICES

APPENDIX A

PROPOSED MODIFICATIONS OF THE AGRICULTURAL SURVEY QUESTIONNAIRE

Explanation

Until 1987, approximately 60% of the fertilizer used in Cameroon was imported by FONADER and sold at subsidized prices to coffee growers. The price was uniform throughout the country and for all types of fertilizer imported by FONADER. In 1988, the government, with support from USAID, launched a program to privatize the distribution of fertilizer and to progressively reduce the level of subsidy. According to the plan, the subsidies will be completely eliminated by 1991. Given these changes in the fertilizer sub-sector, it is even more important to be able to monitor closely the distribution and use of fertilizer. With the goal of monitoring the evolution of the distribution and use of fertilizer, we would like to propose several small modifications in the questionnaire.

1. Modification of a question

Given the liberalization of fertilizer prices, it would be useful to ask the price paid for fertilizer. In addition, it would be helpful change the list of the types of fertilizer in order to better reflect the most frequently purchased types, that is 20-10-10, 12-06-20, and urea.

Current version:

What quantities of chemical fertilizer did you use this year (indicate the type)?

	Quantity	
a. Ammonium sulfate	_____	bags
b. Urea	_____	bags
c. Composite fertilizers	_____	bags
d. Others	_____	bags

Proposed version:

What quantities of chemical fertilizer did you use this year and at what price did you purchase them (indicate by type)?

	Quantity	Price
a. 20-10-10	_____ bags	_____ FCFA/bag
b. 12-06-20	_____ bags	_____ FCFA/bag
c. Urea	_____ bags	_____ FCFA/bag
d. Ammonium sulfate	_____ bags	_____ FCFA/bag
e. Other	_____ bags	_____ FCFA/bag

2. Add a question

Although most of the fertilizer is currently distributed by the cooperatives, a diversification in the channels of distribution is expected. As a result, it would be useful to know the source of the fertilizer

purchased in the rural areas.

New question:

Where did you purchase your fertilizer this year?

- a. Cooperative \_\_\_\_\_
- b. Store \_\_\_\_\_
- c. Market \_\_\_\_\_
- d. Other \_\_\_\_\_

**APPENDIX B**  
**REPORTING FORMS FOR THE FIDUCIARY BANK**

**B-1: Importation Status by Contract**

**B-2: Loan Status**

**B-3: Delinquent Loan Status**

APPENDIX B-1

IMPORTATION STATUS BY CONTRACT

As of 31 July 1989

IMPORTER	DISTRIBUTOR	DATE OF CONTRACT	CONTRACT VALUE (FCFA)	TYPE OF FERTILIZER	QUANTITY (MT)	CIF VALUE	DATE OF ARRIVAL	DATE CLRD CUSTOMS	DISBSMT NUMBER
CAMATREX	UCCAO	24 May 89	650,000,000	20-10-10	8,000	560,000,000	10 July	25 July	89-1-1
				12-06-20	2,500	160,000,000	15 July	--	89-1-2
				Urea	4,000	--	--	--	89-3
Aminou	UCAL	31 May 89	345,000,000	20-10-10	5,000	350,000,000	20 July	--	89-2-2
				Am sulfate	1,500	105,000,000	10 July	30 July	89-2-1
Aminou	UCCAO	2 June 89	150,000,000	Am sulfate	4,500	325,000,000	10 July	30 July	89-2-1
ADER	NWCA	10 June 89	250,000,000	20-10-10	4,000	295,000,000	--	--	89-4
				Urea	1,500	120,000,000	--	--	89-4

APPENDIX B-2

LOAN STATUS

As of: 31 July 1989

LOAN NUMBER	COMMERCIAL BANK	IMPORTER	DISTRIBUTOR(S)	DATE OF EARMKNG	LOAN TYPE	VALUE OF LOAN	DISBRSMT NUMBER	VALUE DISBURSED	DATE OF DISBRSMT	DATE OF REPAYMENT	STATUS
Y 89-1	BICIC	CAMATREX	UCCAO	25 May	Imp	325,000,000	89-1-1	350,000,000	10 July	28 July	Closed
Y							89-1-2	300,000,000	15 July	- -	Open
Y 89-2	Meridien	Aminou	UCAL, UCCAO	10 June	Imp	275,000,000	89-2-1	100,000,000	17 July	- -	Open
Y							89-2-2	175,000,000	25 July	- -	Open
Y 89-3	BICIC	CAMATREX	UCCAO	25 June	Imp	125,000,000	- -	- -	- -	- -	Earmarked
Y 89-4	BIAO	ADER	NWCA	19 July	Imp	150,000,000	- -	- -	- -	- -	Earmarked
Y											
Y											
Y											
Y											

APPENDIX B-3

DELINQUENT LOAN STATUS

LOAN NUMBER	DAYS PAST DUE	EXPLANATION
-----	None -----	

APPENDIX C

REPORTING FORMS FOR DISTRIBUTORS

C-1: Status of Fertilizer Distribution

C-2: Fertilizer Price Structure

APPENDIX C-1  
FERTILIZER DISTRIBUTION STATUS

Name of Cooperative Union \_\_\_\_\_

Status as of \_\_\_\_\_

Type of Fertilizer

	I 20-10-10	I 12-06-20	I 12-06-20	I Urea	I Ammon Sulf	TOTAL	I
1. Quantity contracted (tons)	I	I	I	I	I	I	I
2. Quantity recv'd (tons)	I	I	I	I	I	I	I
3. Percentage recv'd (as of 1 Feb.)	I	I	I	I	I	I	I
4. Stocks (tons)	I	I	I	I	I	I	I
3. Quantity distributed (tons)	I	I	I	I	I	I	I
4. Percentage distributed (10 March)	I	I	I	I	I	I	I

Distribution by cooperative (tons)

a. _____	I	I	I	I	I	I	I
b. _____	I	I	I	I	I	I	I
c. _____	I	I	I	I	I	I	I
d. _____	I	I	I	I	I	I	I
e. _____	I	I	I	I	I	I	I
f. _____	I	I	I	I	I	I	I
g. _____	I	I	I	I	I	I	I

APPENDIX C-2

FERTILIZER PRICE STRUCTURE

Name of Cooperative Union \_\_\_\_\_

Status as of \_\_\_\_\_

Fertilizer Type

	Fertilizer Type							TOTAL
	20-10-10	12-06-20	10-30-10	Urea	Ammon Sulfi			
1. Value CIF Douala (FCFA/ton)								
2. Transportation to cooperative union (FCFA/ton)								
3. Union margin (FCFA/ton)								
4. Transportation to cooperative (FCFA/ton)								
5. Cooperative margin (FCFA/ton)								
6. Transportation to the farmer (FCFA/ton)								
7. Price to the farmer (FCFA/ton)								
(FCFA/sack)								

ANNEX D: FERTILIZER STATISTICS IN CAMEROON BY PROVINCE

	Extreme North	North	Adamoua	East	Central	South	Littoral	South-west	North-west	West	Cameroon
Nbr crop farms	268500	36700	53300	66700	162000	55000	64000	73500	131200	158700	1130200
Nbr using fertilizer	182900	61100	13400	17700	4700	400	29300	17400	52400	126700	512000
% farms using fertilizer	68.1	63.2	24.9	26.5	2.9	0.7	45.8	23.7	44.5	79.9	45.3
% of users in Cameroon	35.7	11.9	2.6	3.5	0.9	0.1	5.7	3.4	11.4	24.7	100.0
Nbr using chem fert	37100	57200	3700	3200	3200	100	25600	7600	48900	119000	375600
% farms using chem fert	36.2	53.2	16.1	12.3	2.0	0.2	40.0	10.3	37.3	75.0	23.2
% of users in Cameroon	25.3	15.2	2.3	2.2	0.9	0.0	6.3	2.0	13.0	21.7	100.0
Chemical fertilizer (MT)	12940	13070	1450	2250	660	0	21050	3700	13350	41090	109560
% of national total	11.8	11.9	1.3	2.1	0.6	0.0	19.2	3.4	12.2	37.5	100.0
kg/crop farm	48.2	135.2	26.9	33.7	4.1	0.0	328.9	50.3	101.8	258.9	96.9
kg/user	133.3	228.5	166.7	274.4	206.3	0.0	822.3	486.9	273.0	345.3	291.7
Nbr arabica producers	0	0	0	0	0	0	0	0	35900	97400	193300
% farms producing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	61.4	17.1
% of producers in Cam	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.6	50.4	100.0
Nbr robusta producers	0	0	3700	39500	22400	3300	37200	38200	21000	53600	218900
% farms producing	0.0	0.0	6.9	59.2	13.8	6.0	58.1	52.0	16.0	33.8	19.4
% of producers in Cam	0.0	0.0	1.7	18.0	10.2	1.5	17.0	17.5	9.6	24.5	100.0
Nbr coffee producers	0	0	3700	39500	22400	3300	37200	38200	116900	151000	412200
% farms producing	0.0	0.0	6.9	59.2	13.8	6.0	58.1	52.0	89.1	95.1	36.5
% of producers in Cam	0.0	0.0	0.9	9.6	5.4	0.8	9.0	9.3	28.4	36.6	100.0
Nbr coffee farms fert	0	0	1100	12700	600	0	23700	7200	41600	114000	200900
% coffee farms fert	-	-	29.7	32.2	2.7	0.0	63.7	18.8	35.6	75.5	48.7
Nbr food producers	240500	96400	52000	64800	160300	51900	63800	73500	130600	158500	1092300
% farms producing	89.6	99.7	96.5	97.2	99.0	94.4	99.7	100.0	99.5	99.9	96.6
% of producers in Cam	22.0	8.8	4.8	5.9	14.7	4.8	5.8	6.7	12.0	14.5	100.0
Nbr food farms fert	118800	32400	12000	5300	3100	200	5200	8600	25100	53300	264000
% food farms fert	49.4	33.6	23.1	8.2	1.9	0.4	8.2	11.7	19.2	33.6	24.2

APPENDIX E: FERTILIZER SUB-SECTOR REFORM: PROJECT COMPONENT BUDGET, 1989 - 1992

			1989		1990		1991		1992		Row Total
	Cost per	Unit	No. of Units	Cost							
<b>MONITORING NETWORK AND EVALUATIONS</b>											
<b>Existing Sources</b>											
Agricultural Census/Survey	5000 / analysis		3	15000	1	5250	1	5513	1	5788	31551
MINPAT Import. Stats.	100 / month		7	700	12	1260	12	1323	9	1042	4325
Other Sources	5000 / analysis		2	10000	2	10500	2	11025	1	5788	37313
Existing Sources Subtotal				25700		17010		17861		12618	73189
<b>Regular Reporting</b>											
Fiduciary Bank	500 / year		0.58	292	1	525	1	551	0.75	434	1802
Distributors	500 / year		0.58	292	1	525	1	551	0.75	434	1802
Regular Report Subtotal				583		1050		1103		868	3604
<b>Farm-Level Surveys</b>											
Provincial-Level	9000 / province		7	63000	10	94500	10	99225	10	104186	360911
Detailed Sub-provincial	12000 / province		2	24000	2	25200	3	39690	2	27783	116673
Specific studies	1000 / study		5	5000	5	5000	5	5000	5	5000	20000
Farm-Level Survey Subtotal				92000		124700		143915		136969	497584
Agronomic Trials	12000 / trial		0	0	2	25200	3	39690	5	69458	134348
<b>Special Studies</b>											
Credit and Risk Sharing	75000 / study		1	75000	0	0	0	0	0	0	75000
Fertilizer Demand Potential	75000 / study		0	0	1	78750	0	0	0	0	78750
Pricing Policy	75000 / study		0	0	1	78750	0	0	1	86822	165572
Bulk Blending											
Pre-Feasibility	62000 / study		0	0	0	0	1	68355	0	0	68355
Others	75000 / study		1	75000	1	78750	1	82688	1	86822	323259
Special Studies Subtotal				150000		236250		151043		173644	710936
<b>Annual Review</b>											
Review Mission	30000 / mission		1	30000	1	31500	1	33075	1	34729	129304
Workshop	5000 / workshop		1	5000	1	5250	1	5513	1	5788	21551
Annual Review Subtotal				35000		36750		38588		40517	150854
Outside Evaluation	100000 / evaluation		1	100000	0	0	0	0	1	115763	215763
Contingency	10 percent			40328		44096		39220		54984	178628
<b>TOTAL MONITORING NETWORK AND EVALAUTION</b>				<b>443612</b>		<b>485056</b>		<b>431418</b>		<b>604820</b>	<b>1964905</b>

## APPENDIX F

### LIST OF PERSONS CONTACTED

#### Technical Supervisory Committee

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