

**A Field Study of Fertilizer Distribution and  
Use in Senegal, 1984: Summary Report**

by

**Eric Crawford and Valerie Kelly**

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## **SPECIAL NOTE FOR ISRA-MSU REPRINTS**

In 1982 the faculty and staff of the Department of Agricultural Economics at Michigan State University (MSU) began the first phase of a planned 10 to 15 year project to collaborate with the Senegal Agricultural Research Institute (ISRA, Institut Sénégalais de Recherches Agricoles) in the reorganization and reorientation of its research programs. The Senegal Agricultural Research and Planning Project (Contract 685-0223-C-00-1064-00), has been financed by the U.S. Agency for International Development, Dakar, Senegal.

As part of this project MSU managed the Master's degree programs for 21 ISRA scientists at 10 U.S. universities in 10 different fields, including agricultural economics, agricultural engineering, soil science, animal science, rural sociology, biometrics and computer science. Ten MSU researchers, on long-term assignment with ISRA's Department of Production Systems Research (PSR, Département de Recherches sur les Systèmes de Production et le Transfert de Technologies en Milieu Rural) or with the Macro-Economic Analysis Bureau (BAME, Bureau d'Analyses Macro-Economiques) have undertaken research in collaboration with ISRA scientists on the distribution of agricultural inputs, cereals marketing, food security, farm-level production strategies and agricultural research and extension. MSU faculty have also advised junior ISRA scientists on research in the areas of animal traction, livestock systems and farmer groups.

Additional MSU faculty members from the Department of Agricultural Economics, Sociology, Animal Science and the College of Veterinary Medicine have served as short-term consultants and professional advisors to several ISRA research programs.

The project has organized several short-term, in-country training programs in farming systems research, agronomic research at the farm-level and field-level livestock research. Special training and assistance has also been provided to expand the use of micro-computers in agricultural research, to improve English language skills, and to establish a documentation and publications program for PSR Department and BAME researchers.

Research publications from this collaborative project have been available only in French. Consequently, their distribution has been limited principally to West Africa.

In order to make relevant information available to a broader international audience, MSU and ISRA agreed in 1986 to publish selected reports as joint ISRA-MSU International Development Paper Reprints. These reports provide data and insights on critical issues in agricultural development which are common throughout Africa and the Third World. Most of the reprints in this series have been professionally edited for clarity; maps, figures and tables have been redrawn according to a standard format. All reprints are available in both French and English. A list of available reprints is provided at the end of this report. Readers interested in topics covered in the reports are encouraged to submit comments directly to the respective authors, or to Dr. R. James Bingen, Associate Director, Senegal Agricultural Research and Planning Project, Department of Agricultural Economics, Michigan State University, East Lansing, MI 48824-1039.

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A FIELD STUDY OF FERTILIZER DISTRIBUTION AND  
USE IN SENEGAL, 1984: SUMMARY REPORT

by

Eric Crawford and Valerie Kelly

1987

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## TABLE OF CONTENTS

	PAGE
I. BACKGROUND	1
II. SCOPE AND OBJECTIVES OF THE STUDY	2
A. Scope	2
B. Objectives	2
III. METHODOLOGY	3
IV. IMPLEMENTATION OF THE STUDY	5
V. MAJOR FINDINGS AND RECOMMENDATIONS	6
A. Organization of Fertilizer Distribution	6
1. Casamance	6
2. Sine-Saloum	7
3. Fleuve	10
B. Major Findings	12
1. Late delivery	13
2. Fertilizer sales	14
3. Fertilizer/peanut sales ratio	14
4. Average quantities received	15
5. Non-reteneu sources of fertilizer	15
6. Fertilizer utilization	15
7. Transport costs borne by farmers	15
8. Fertilizer losses	16
9. Inadequate financing and records	16
10. Inadequate planning of the reteneu system	18
11. Delays observed at the regional level	19
12. Weaknesses in regional organization	20
13. Attitudes and opinions	21
C. Policy Implications	25
1. Objectives and policy constraints	25
2. Organization of the distribution system	27
3. The reteneu system	29
4. Cash sales	30
5. Fertilizer price	31
6. Timing	31
7. Summary of major recommendations	31
D. Topics for Further Study	32

**A Field Study of Fertilizer Distribution and Use  
in Senegal, 1984: Summary Report a/**

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**I. BACKGROUND**

The Government of Senegal is currently in the process of restructuring the fertilizer distribution system, and discussing alternative price and credit policies. There is considerable interest in evaluating the performance of the current transitional system, in order to identify needed improvements. Such an evaluation should be based on a thorough understanding of the structure and economics of the fertilizer distribution system at all levels, and of factors affecting farmers' use of fertilizer.

Recently, the Bureau of Macroeconomic Analysis (BAME) in ISRA (Institut Sénégalais de Recherches Agricoles) has initiated research on the distribution and use of agricultural inputs. While this research program was being prepared in early 1984, the BAME was asked by USAID to undertake a fertilizer marketing study. Such a study was a covenant of the USAID fertilizer import program (AID Project No. 685-0249 dated August 11, 1983), which called for a study to be undertaken by the GOS to: "present a plan for reorganizing the fertilizer marketing system including a study of the respective roles of the private and public sectors. This plan will recommend methods of reorganization for maximizing efficiency, minimizing costs and responding to local farmers needs."

In April, 1984, ISRA and USAID agreed that the study be divided in two parts: (1) a field study implemented by the BAME in the regions of Sine-Saloum, Casamance, and Fleuve; and (2) a national-level study, carried out independently but incorporating the results of the field study, which would analyze the organizational and financial aspects of the overall fertilizer distribution system, and develop concrete proposals for improving the performance and cost-effectiveness of the system. In July, the Ministry

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**a/ Note:** This is a **substantially condensed** version of the detailed preliminary report, which was presented on 22 October 1984. The material in this report is **provisional**, since analysis of the survey is still underway. The detailed final report is expected to be available by 30 December. The contributions to this summary made by the other authors of the preliminary report (Curtis Jolly, Philippe Lambrecht, Matar Gaye, and Makhona Mbaye) are gratefully acknowledged.



of Plan and Cooperation officially requested USAID to provide technical assistance to carry out this study, with a deadline of 30 October, 1984. USAID agreed to carry out part (2) of the overall study.

This report concerns only the field study. The design of the field study began in May, 1984, in anticipation of formal approval and funding by USAID. Under the direction of the Interim Head of the BAME, the field study was carried out by a team of six economists including two senior economists, along with two research assistants and 16 field survey interviewers. Very helpful comments on survey design and organization of the report were received from Lamine Thiam and Jean-François Damon of USAID.

## II. SCOPE AND OBJECTIVES OF THE STUDY

### A. Scope.

The study encompassed the following areas:

1. **The Fleuve:** the perimeters of Lampsar, Boundoum, Colonat, and Ndombo/Thiago, as well as irrigated village perimeters in Podor and Matam departments.

2. **The Sine-Saloum:** the Departments of Fatick, Gossas, and Foundiougne in the newly created region of Fatick, and the Departments of Kaolack, Nioro, and Kaffrine in the newly created region of Kaolack. (Prior to July 1, 1984, these six departments were grouped into the single region of the Sine-Saloum.)

3. **The Casamance:** three study zones were selected in the region of Ziguinchor, and three in the region of Kolda (Department of Sédhiou).

### B. Objectives.

The original objectives of the study were the following:

1. To describe the structure, participants, and operating procedures of the fertilizer distribution system in three regions--Casamance, Sine-Saloum, and Fleuve.

2. To monitor the distribution of fertilizer during the 1984/85 season, including collection of information on the quantity and type of fertilizer distributed in each region, the costs involved, and to whom the fertilizer is distributed.

3. To identify constraints and bottlenecks within the system, such as lack of transport, financing, information, etc., which adversely affect the quantity, quality, and timeliness of fertilizer deliveries to farmers.

4. To identify the major factors affecting farmer decisions regarding the purchase and use of fertilizer, and ways in which the current distribution system acts to encourage or discourage the appropriate use of fertilizer by farmers. Among other aspects, this would include: (1) an examination of the "retenue à la source"; and (2) a summary of the available evidence on the profitability of fertilizer use under farmer conditions.

5. Given the conditions within each region, to propose alternative forms of organization and policies for distributing fertilizer, and to evaluate their advantages and disadvantages from the standpoint of the major participants in the system (suppliers, distributors, cooperatives, government agencies, and farmers). This would serve as an input to the national-level study to be carried out by USAID.a/

### III. METHODOLOGY

In general, the methodology consisted of an annotated bibliography, informal discussions with relevant parties, collection of official data from SONAR and SAED, and a formal survey of SONAR and SAED distributing agents, leaders of village sections and producers groups, and farmers. Initial planning visits were made to each region to finalize the research plan and budget. (The main report contains complete details on the methodology.)

During the formal survey, questionnaires were administered at four levels: (1) major distribution points (perimeters in the Fleuve and Centres d'Eclatement de Produits Agricoles, CEPA, in the Sine-Saloum and Casamance); (2) smaller, local distribution points, seccos (in Sine-Saloum and Casamance only), (3) farmer organizations (village sections or producers groups), and (4) individual farmers. For each study zone within each region, distribution points were selected first, followed by a sample of farmer organizations

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a/During the course of survey design, it became apparent that certain of the original objectives could not be addressed satisfactorily in the time available. Specifically, the study did not include any systematic interviews of transporters or traders, nor any assessment of the profitability of farm-level fertilizer use under either current or projected conditions. In the first case, USAID was expected to take primary responsibility for addressing the transport and commerce aspects. In the second case, it was considered impossible in the time available to collect the necessary primary data.

dependent on these distribution points, followed by a sample of farmers belonging to each organization sampled. Portions of the sample were randomly selected, including all farmers and, in some areas, the village sections and seccos. The total sample is shown below.

**Summary of total sample.**

	Casamance	Sine-Saloum	Fleuve	TOTAL
CEPA's/perimeters	N.A.	5	6	11
seccos	18	20	N.A.	38
village sections	51	48	6	105
producers groups	N.A.	N.A.	37	37
farmers	239	191 <u>a/</u>	145	575

a/Note: Although 192 farmers were interviewed in the Sine-Saloum, only 191 cases were analyzed. One case was dropped.

The content of the questionnaires was a function of the objectives of the study, namely to monitor the distribution campaign, assess its performance and the perception of those involved in the system concerning its performance, and determine the level of fertilizer use by farmers. A set of performance criteria was developed, including: (1) timeliness, (2) ability to disseminate fertilizer in the desired quantity and quality, (3) conformance of the distribution procedures to those originally established for the retenue system, and (4) the degree to which the distribution procedures were understood by various participants in the system.

In general, the categories of questions included the following:

**1. Distribution point questionnaire (perimeter, CEPA, secco).**

- Personal characteristics of the manager
- Personnel, equipment, and storage facilities at the distribution point
- Quantity and timing of fertilizer delivered to the distribution point
- Quantity and timing of fertilizer delivered from the distribution point to the village section (SV), producers group (GP), or farmer
- Distribution procedures
- Problems encountered during the distribution
- Opinions of the manager regarding reform of the system

**2. Village section and producers group questionnaire.**

- Background information: membership, resources, etc.
- Information on groundnut marketing and the reteneue (Sine-Saloum and Casamance only)
- Quantities and timing of inputs received in 1984/85
- Opinions on the desirable dates for fertilizer distribution
- Quantities and timing of fertilizer distributed to members
- Problems encountered in the distribution
- Financial resources and management of the organization
- Opinions on possible reform of the distribution system

**3. Farmer questionnaire.**

- Characteristics of the farmer and the farm
- Area planted to different crops this year
- Farmer's understanding of the reteneue system (Sine-Saloum and Casamance only)
- Questions concerning fertilizer distribution this year
- Acquisition and use of fertilizer by the farmer this year, by type and source of fertilizer
- Factors affecting fertilizer use
- Opinions on possible reform of the distribution system

Copies of these questionnaires are available from the BAME on request.

**IV. IMPLEMENTATION OF THE STUDY**

The planned and actual dates for the major activities of the study are shown below.

<b>Activity</b>	<b>Planned</b>	<b>Actual</b>
Initial planning visits	May-June	May-June
Survey design	June-July	July-early August
Field surveys	July-August	August-September
Data analysis	September	September-October
Preliminary report	15 October	22 October
Final report	15 November	30 November

The important difference between planned and actual timing is that the field surveys started over one month late, due to delay in approval of funding for the study, and delay in obtaining molyettes for the field interviewers. In general, activities began a week or two earlier in the Casamance, where interviewers, molyettes, and operating funds were already available.

## V. MAJOR FINDINGS AND RECOMMENDATIONS

This section is organized in four parts. First, the organization of fertilizer distribution is described for each of the three regions studied. Second, the major findings of the study are presented briefly. Third, the policy implications of these findings are discussed. Lastly, suggestions are made for topics meriting further study in order to facilitate the design of an improved fertilizer distribution system, as part of a review of fertilizer policy in general.

### A. Organization of Fertilizer Distribution.

1. **Casamance.** Since the dissolution of ONCAD (Office Nationale de Coopération et d'Assistance pour le Développement) in 1980/81, input distribution in the Lower and Middle Casamance has been handled either by the regional development agency SOMIVAC or its extension arm PIDAC (Société pour la Mise en Valeur Agricole de la Casamance and Projet Intégré pour le Développement Agricole de la Casamance, respectively), by SONAR (Société Nationale d'Approvisionnement du Monde Rural), by special projects such as the PRS (Projet Rural de Sédhiou), or by private groups such as AJAC (Association de Jeunesse Agricole de la Casamance).

SONAR was the most important of these organizations in terms of fertilizer distribution this year; the farmers in our sample received between 65 percent (Ziguinchor Region) and 99 percent (Kolda Region) of their fertilizer from SONAR. (The PIDAC and AJAC programs are discussed in the full report.) SONAR has four sub-regional distribution points (Centres d'Eclatement de Produits Agricoles, CEPA) located at Ziguinchor, Bignona, Sédhiou, and Kolda. There are 240 seccos (small distribution points) managed by 141 part-time gérants (warehouse managers).

SONAR's program in 1984 was based on the "retenue à la source," in which 5 CFA was withheld from each kilo of peanuts sold by farmers to SONAR or SONACOS. SONAR used this money to buy fertilizer from SSEPC (Société Sénégalaise d'Engrais et de Produits Chimiques), which markets imported urea and NPK manufactured by ICS (Industries Chimiques du Sénégal). The type of fertilizer ordered was based on recommendations from the CRD (Comité Regional de Développement). Using rented private trucks and a few of its own trucks, SONAR transported the fertilizer to the CEPA's (occasionally directly to the secco), from which it was then distributed in smaller trucks to the seccos. Each gérant was given a list of fertilizer quantities allotted to each SV.

Representatives of the village sections (SV's) then picked up the fertilizer from the seccos, and distributed it among their members. Farmers were responsible for transporting the fertilizer to their farms. The distribution was organized by a commission consisting of the president and three other officers of the SV, and the SONACOS weigher who was involved in peanut sales. Although each SV was supposed to have a list of farmers who sold peanuts through the SV, this was not true in all cases.

Certain procedural problems arose. Some farmers did not receive fertilizer because they were not members of the SV through which they had sold peanuts. In some cases, farmers who sold less than one ton of peanuts did not receive fertilizer. In most cases when the amount due was less than one sack (50 kg), the bag was opened and the correct amount weighed out; in some cases, a bag was given to several farmers to share among themselves.

The amount of fertilizer distributed at each level was determined by SONAR as a function of the amount of peanuts sold, based on the records of SONAR, SONACOS, and the SV's. In 1983/84, Casamance was responsible for approximately 28 percent of total peanut sales. Based on this, the Casamance was allotted 4,006 tons of 6-20-10 and 1,704 tons of urea. This represented about 40 kg of NPK and 15 kg of urea per ton of peanuts sold. Given a total of 55 kg of fertilizer per ton of peanuts sold, and a total retenuer of 5,000 CFA/ton, the implied average price of fertilizer paid by the farmer was 91 CFA/kg.

Table 1 shows that 99.7 percent of the allotment was received at the CEPA's, and 97.6 percent of the allotment was distributed to SV's. For the Casamance sample overall, farmers actually received 36.9 kg of NPK and 14.8 kg of urea per ton of peanuts sold. The figures were lower in Ziguinchor Region (29.5 kg NPK and 13.3 kg urea) than in Kolda Region (38.6 kg NPK and 15.3 kg urea). The average amount of "retenuer" fertilizer received per farmer for the Casamance overall was 69.9 kg of NPK and 28.5 kg of urea, a total of 98.4 kg. Farmers surveyed in Ziguinchor Region received much less on average (29.3 kg NPK and 13.2 kg urea) compared to those in Kolda Region (103.2 kg NPK and 40.9 kg urea). Of the 31.8 tons received by farmers in the sample, 90.9 percent came from the retenuer, 8.6 percent from PIDAC and other development agencies, 0.4 percent from the Gambia, and the rest from miscellaneous other sources.

2. **Sine-Saloum.** Since the dissolution of ONCAD in 1980/81, fertilizer distribution in the Sine-Saloum has been handled much the same as

**Table 1. Summary of the 1984 Retenue Fertilizer Distribution Campaign, Casamance.**

	Ziguinchor	Kolda	Total Casamance
Allotment (tons) <u>a/</u>	1,071.95	4,637.55	5,709.50
Received (tons)	1,071.95	4,617.97	5,689.92
Distribution to SV's (tons)	1,003.80	4,569.87	5,573.67
Received as % allotment	100.0	99.58	99.66
Distribution to SV's (%) <u>b/</u>	93.64	98.54	97.62
Regional share (%) <u>c/</u>	18.8	81.2	100.0
NPK received/farmer (kg) <u>d/</u>	29.3	103.2	69.9
Urea received/farmer (kg)	13.2	40.9	28.5
<b>Total received/farmer (kg)</b>	<b>42.5</b>	<b>144.1</b>	<b>98.4</b>
NPK received per farmer per ton of peanut sales (kg)	29.5	38.6	36.9
Urea received per farmer per ton of peanut sales (kg)	13.3	15.3	14.8
<b>Total received per farmer per ton of peanut sales (kg)</b>	<b>42.8</b>	<b>53.9</b>	<b>51.7</b>

Source: Field surveys, 1984, and SONAR/Ziguinchor. A sample of 239 farmers was studied in the regions of Ziguinchor and Kolda (Department of Sédhiou).

a/ NPK plus urea.

b/ Amount distributed as percent of amount allotted.

c/ Amount received by region as percent of total received in the Casamance.

d/ Amount of "retenue" fertilizer received per farmer sampled. In principle, each farmer was to receive roughly 40 kg of NPK and 15 kg of urea.

in the Casamance. The Sine-Saloum, however, benefitted from fewer special projects than the Casamance. SODEVA (Société de Développement et de Vulgarisation Agricole) and SODEFITEX (Société de Développement des Fibres Textiles) have been the only rural development agencies offering fertilizer on credit, working with a limited number of farmers who sign contracts to produce maize or cotton. In addition, farmers could make cash purchases at SONAR in 1981/82 and 1982/83. In 1983/84 SODEVA took over this marketing responsibility, establishing 39 sales points. During the 1981-84 period, fertilizer use declined radically, causing the government to institute the "retenue à la source" system as the first attempt since 1980/81 to distribute fertilizer systematically to a large number of farmers.

The fertilizer distribution system in the Sine-Saloum in 1984 was essentially the same as that in the Casamance. The two primary actors were SONAR and the village sections. Fertilizer was shipped from Dakar to the five CEPA's (Gossas, Kaffrine, Kaolack, Kougheul, and Nioro) which were in turn to ship it to the 184 SONAR seccos where representatives of SV's would take delivery. For a variety of reasons, SONAR was unable to ship fertilizer rapidly from CEPA's to seccos, hence the SV's were initially told to collect their allotments at the CEPA's. This proved to be very unpopular given the distances some SV's had to travel. By late July, SONAR began systematically to ship fertilizer out to the seccos from all but the CEPA in Kougheul; of the 184 existing seccos, however, only 88 were actually used to distribute fertilizer. SONAR used its own limited fleet of trucks as well as those belonging to private transporters and to URCASS (Union Régionale des Coopératives Arachidières du Sine-Saloum) for distribution to seccos.

The six SONAR CO.D.'s ("Coordinateurs Départementaux") in the Sine-Saloum were responsible for calculating quantities to be distributed from the CEPA's to seccos and SV's in their departments. This delegation of authority to the departmental level led to substantial differences in the procedures followed from one department to another.

For the SV's, fertilizer distribution was frequently the first group activity in which they had participated since their creation in 1983. Because of their newness, SV's have rudimentary--if any--record keeping systems. Many have no membership lists and no records of peanut sales by members. Physical infrastructure such as meeting rooms, warehouses, scales, etc. are rarely found. Nevertheless, the SV's were required to collect their



fertilizer allotment from SONAR, organize and pay for transportation back to the SV, and then calculate and weigh quantities due to each member. The same procedural problems described above for SV's in the Casamance were experienced by SV's in the Sine-Saloum.

A total of 10,136 tons of fertilizer was allocated to the Sine-Saloum under the retenue system. Fifty-five kilos of fertilizer was to be distributed per ton of groundnuts sold, made up of 23 kg of 14-7-7, 17 kg of urea, and 15 kg of 6-20-10.

The 48 SV's sampled received 697,348 kg (7 percent of the total Sine-Saloum allotment). Of the 191 farmers sampled, 150 sold some groundnuts through official channels last year and were therefore eligible for "retenue" fertilizer. Together these farmers received 15,837 kg of "retenue" fertilizer; the average amount per farmer was 105 kg. There was high variability among departments with the Kaolack average by farmer being only 25 kg and the Kaffrine average being 148 kg. The amount received per ton of peanuts sold averaged 36 kg, ranging from 26 kg in Nioro to 44 kg in Fatick. (Adjusting for cash received by farmers from SV sales of fertilizer, the average is higher (39 kg) and the range smaller (37 to 44 kg). See Table 2 for more details.) Farmers in the sample also purchased Gambian fertilizer (4,780 kg for the entire sample), and obtained fertilizer from maize or cotton contracts (800 kg for the entire sample).

3. Fleuve. Fertilizer distribution in the Fleuve differed in several respects from that in the other regions studied. First, it is the regional development organization in the Fleuve, SAED (Société d'Aménagement et d'Exploitation des Terres au Delta du Fleuve Sénégal), which controls fertilizer distribution to the irrigated perimeters. The distribution system varies somewhat as a function of differences in perimeter management. The other important actor is the producers group (GP), which is SAED's main point of contact with farmers. The GP is a sub-unit of the village section (SV). The median size of the GP's surveyed was 17 members in the Delta and 79 in the Middle Valley. Creation of SV's began only recently, especially in the Middle Valley where they are often either non-existent or non-operational. The SV's therefore did not play a significant role in fertilizer acquisition or distribution this year.

Second, fertilizer is provided to farmers on an interest-free credit basis, to be repaid at the time of harvest. There is no retenue. Third, the

**Table 2. Average Peanut Sales, Fertilizer Received, and Fertilizer/Peanut Sales Ratios per Farmer by Department for Farmers Participating in the Retenue, Sine-Saloum, 1984.**

	D E P A R T M E N T S <sup>a/</sup>						TOTAL
	FAT	FOU	GOS	KAF	KAO	NIO	
Average kg peanuts sold per farmer <sup>b/</sup>	1149	3789	1848	3506	842	4574	2913
Average kg fert received per farmer <sup>c/</sup>	51	141	75	148	25	119	105
Adjusted average kg fert received <sup>d/</sup>	51	141	75	150	31	168	115
Average kg fert received per ton peanut sales	44	37	41	42	30	26	36
Adjusted average kg fert received per ton of sales	44	37	41	43	37	37	39
No. of farmers	24	21	17	45	15	28	150

Source: Field surveys, 1984. A sample of 191 farmers was studied in 6 departments of the Sine-Saloum. Of this sample, 150 sold peanuts in 1983/84.

<sup>a/</sup> Departments of Fatick, Foundiougne, Gossas, Kaffrine, Kaolack, and Nioro.

<sup>b/</sup> Standard deviations of the Departmental averages shown in this table were consistently greater than the averages.

<sup>c/</sup> These figures do not represent the total fertilizer distributed by SONAR to SV's. They exclude amounts of fertilizer sold by SV's who then distributed cash to their members. SV's sold fertilizer only in the departments of Kaffrine, Kaolack, and Nioro.

<sup>d/</sup> These figures include the fertilizer equivalent of the cash received by farmers, converted at the departmental average price per kg received by SV's who sold fertilizer.

amount and type of fertilizer distributed is based on orders formulated by the perimeter directors, as a function of the perimeter area, SAED HQ's recommended dose per hectare (often adjusted by the perimeter director), and existing stocks. This year, because of farmers' objections to the significant price increases (from 45 to 91 CFA/kg for urea, and from 56 to 149 CFA/kg for 18-46-0), SAED often allowed farmers to decide themselves what amount of fertilizer to take.

SAED also obtains its fertilizers from SSEPC. This year, SAED was unable to obtain bank credit to purchase fertilizer, and was therefore obliged to pay cash from its own resources. Private truckers then transported the fertilizer to central storage facilities at the perimeter (Delta) or zone (Podor and Matam), from which it was made available to the GP's. GP's maintained regular contact with SAED officials to obtain information on dates of fertilizer delivery or availability at SAED warehouses. The GP's generally arranged their own transport from the zone to their village, depending on distance, degree of autonomy, and availability of transport. SAED sometimes transported fertilizer to the SV or GP level, if storage facilities were available there. (In the Casamance and Sine-Saloum, SONAR rarely if ever transported fertilizer beyond the secco level.)

The GP presidents received the entire quantity for their group and were responsible for distributing it to members, based either on the amount they had requested or on their irrigated area times the perimeter-level fertilizer recommendation per hectare. In general, the amounts requested by farmers were rounded to the nearest bag (50 kg). At the SAED level, quantities inferior to one bag were not distributed. Where area cultivated per farmer was small (e.g., the irrigated village perimeters, PIV), farmers sometimes decided to share bags, or to make one request for the entire year's fertilizer (in case of double-cropping), enabling them to store part of a bag for the dry season crop. Because of high price levels, some GP's disagreed on how much fertilizer to take, and farmers had to obtain their fertilizer individually at the SAED warehouse. This also applied to members of GP's who did not have access to credit (due to non-repayment of credit by the GP) and who had to pay cash.

#### **B. Major Findings.**

The first eight paragraphs of this section summarize the major findings concerning the conduct of the fertilizer distribution campaign. Paragraphs

9-12 discuss the major problems and constraints. Paragraph 13 summarizes survey findings concerning respondents' opinions and attitudes about this year's distribution campaign and alternative methods of organizing fertilizer distribution.

1. **Late delivery.** The most significant and negative feature of fertilizer distribution this year was late deliveries. Both NPK and urea arrived later than planned, and, except for urea in the Fleuve region, arrived late with respect to crop needs. In the Casamance, significant rain fell in June, but by the end of June only 37 and 12 percent of the NPK had been distributed to SV's in Ziguinchor and Kolda regions, respectively. (See Figures 1 and 2.) In Kolda, NPK distribution did not exceed 50 percent until the third week in July. Urea distribution did not start until mid-July, and distribution to SV's did not reach 50 percent until the first week of August for Ziguinchor, and the third week of August for Kolda. By mid-August, farmers were already harvesting maize and early peanuts. Rough estimates by ISRA agronomists at Djibélor suggest that while fertilizer could have been used with full effectiveness on transplanted rice, it was probably only 70 percent effective on peanuts and direct-seeded rice, and 30 percent effective on maize and millet.

In the Sine-Saloum, only 30 percent of the fertilizer had been received at the CEPA's by mid-June; by 27 July only 82 percent had arrived. The CEPA's did not start distributing NPK to seccos and SV's until the first week in July when 50 percent of stocks had been received from Dakar. Urea distribution began the last week in July once 35 percent of stocks were received at the CEPA's. By July 28, 65 percent of NPK had been turned over to SV's, but it took 8 more weeks to terminate NPK distribution. Sixty-five percent of urea was distributed in the first two weeks after receipt at the CEPA's, but the last 35 percent took an additional 7 weeks. Based on planting dates reported by SV's, 90 percent of farmers had completed millet planting and 38 percent had finished peanut planting by the time of the first fertilizer deliveries to SV's (3 July). (See Figure 3.) (The agronomic impact of late deliveries will be discussed further in the final report.)

In the Fleuve, fertilizer distribution also began later than planned. In June, fertilizer was distributed to Podor and Matam, using stocks existing in the Delta. Fertilizer arrived at perimeters in the Delta between 5 and 13 August, which was 3-7 weeks later than planned. NPK arrived late with respect to the rainfall pattern, but this was not the case with urea. In

some areas, late distribution of NPK to farmers was due to farmers' attempts to renegotiate the price with SAED before taking delivery.

**2. Fertilizer sales.** In response to late deliveries, SV's in the Sine-Saloum frequently sold fertilizer rather than distributing it to members. Sales were less frequent in the Casamance and practically non-existent in the Fleuve. Ten percent of all fertilizer received by SV's surveyed in the Sine-Saloum was sold--mostly to private traders, but occasionally to other farmers. The average sale price was 23 CFA/kg. Eighty-one percent of the fertilizer sold was urea. As a result, members of these sections received on average only 71 percent of their intended urea allotment.

Fertilizer sales by farmers were much less common than those by sections. In the Sine-Saloum, only 1.4 percent of "retenu" fertilizer actually distributed to farmers was subsequently sold by them. The farmers' response to late delivery was more one of storage, accounting for 18 percent of "retenu" fertilizer arriving at the farm level. On average farmers received 10 percent less than the anticipated allotment due to SV sales, reduced the 90 percent they did receive a further 1.4 percent by individual sales, and stored a further 18 percent. In other words, **only 72.5 percent of "retenu" fertilizer was actually used by sample farmers in the Sine-Saloum during this season.** In the Casamance, 1 percent of fertilizer received by farmers was sold by them, and an additional 11 percent stored. Thus, **88 percent of "retenu" fertilizer was used by Casamance farmers.**

**3. Fertilizer/groundnut sales ratio.** There appears to have been considerable variability in the amount of fertilizer received per ton of peanuts sold by the SV's as well as by farmers participating in the "retenu" system. For the Sine-Saloum, the amounts which SV's claimed to have distributed ranged from 22-60 kg of fertilizer per ton of peanuts sold, compared to the 55 kg/ton which they should have received and distributed. Individual farmers surveyed reported receiving anywhere from zero to 120 kg per ton. Eighty-nine percent of farmers received less than 55 kg/ton. Even adjusting for cases where farmers received cash in lieu of fertilizer due to SV sales, the average amount received per ton for the six departments was 39 kg--substantially below the 55 kg planned. (See Table 2.) Part but not all of this difference is explained by amounts sold by the SV's to finance transport of fertilizer back from the distribution point.

The ratio of fertilizer received to peanuts sold also varied in the 6 study zones of the Casamance, from 31 to 60 kg per ton (NPK plus urea). The survey averages were 43 kg/ton in Ziguinchor Region, 54 kg/ton in Kolda Region, and 52 kg/ton for the Casamance as a whole. (See Table 1.)

**4. Average quantities received.** Overall, the amounts of fertilizer delivered under the retenue system were small, averaging 105 kg per farmer surveyed in the Sine-Saloum, and 98 in the Casamance. This is explained by (a) the size of the original retenue (5 CFA/kg of peanuts sold), (b) the doubling of the price of fertilizer this year, and (c) the generally poor harvest (and thus sales) last year. (See Tables 1 and 2.)

**5. Non-retenué sources of fertilizer.** Even smaller amounts were obtained from other sources. For farmers surveyed in the Casamance, only 9.1 percent of their fertilizer came from non-retenué sources--8.6 percent from PIDAC, and the rest from traders, the Gambia, or gifts. Of the total amount of fertilizer used by farmers sampled in the Sine-Saloum, 73 percent came from the retenue, 22 percent from cash purchases (usually of Gambian fertilizer), 4 percent from maize and cotton contracts, and the rest from gifts. Farmers sampled in the Fleuve obtained virtually no fertilizer from non-SAED sources.

**6. Fertilizer utilization.** Except for the Fleuve, farmer use of fertilizer was also very low. In the Casamance, farmers sampled used an average of 24 kg/ha in Ziguinchor Region, and 26 kg/ha in Kolda Region. For the six study zones, the range was from 16 kg/ha in Oussouye to 41 kg/ha in Simbandi-Brassou. In the Sine-Saloum, farmers who participated in the retenue system used an average of less than 15 kg per hectare of peanuts and millet cultivated. Those who did not obtain fertilizer through the retenue used even less. In the Fleuve region, for the Delta and Podor/Matam, respectively, fertilizer use (exclusively on irrigated parcels) was about 100 and 150 kg/ha of 18-46-0, and 165 and 225 kg/ha of urea.

**7. Transport costs borne by farmers.** In the Sine-Saloum, some village sections had to travel significant distances and/or make several trips to obtain their fertilizer. For the SV's in the Sine-Saloum sample the average roundtrip was 15 km (the range was from zero to 120 km). For all SV's surveyed, 46 percent made 1-2 trips, 44 percent made 3-5 trips and the remaining SV's made 6-10 trips. For the 19 SV's obtaining fertilizer directly from CEPA's, cash transport costs ranged from zero to 5.6 CFA/kg;

their average roundtrip was 54 km. For the SV's obtaining fertilizer from the seccos, these costs were lower--from zero (in 14 cases) to 3.3 CFA/kg. Costs per kilometer/ton also varied substantially (13 to 960 CFA) and in all but one case were greater than the 23-25 CFA which SONAR pays private transporters who haul fertilizer. SONAR is now in the process of trying to reimburse SV's for transport costs incurred when delivery was taken at CEPA's; given the high prices paid by many sections, it is unlikely that they will receive reimbursement to cover the full amounts paid. In the Casamance, most SV's took possession of their fertilizer at the seccos. Half the time, the SV transported the fertilizer to members; in other cases, members were asked to transport their own allotments. This reduced the cash transportation costs incurred by the SV's. Transport costs averaged 0.9 CFA/kg, ranging from 0.2 to 1.6 CFA/kg. The fact that SONAR in the Casamance, unlike in the Sine-Saloum, managed to get fertilizer out to most of its seccos made it possible for SV's to avoid the high transport costs associated with taking delivery at CEPA's. In the Fleuve, the regional average transport and handling cost from Dakar (14.72 CFA/kg ) was added to each kilo of fertilizer, with the result that transport to the Middle and Upper Valley was subsidized while transport to the Delta was surcharged.

**8. Fertilizer losses.** There were relatively minor problems with fertilizer losses during shipment, or poor quality. In the Sine-Saloum two tons were either never sent from Dakar or were lost en route to the CEPA's; another ton was reported as lost during shipment within the region. In the Casamance, 19.6 tons were not received. Urea bags were often poorly sealed, and compaction due to water damage was not uncommon. An estimated 4-10 percent of urea bags were torn in the Fleuve. Torn NPK bags were less often observed. In the Sine-Saloum, 36 tons of fertilizer had to be rebagged at the Kaolack CEPA before onward shipment to Foundiougne because bags had been torn during shipment from Dakar and unloading in Kaolack.

**9. Inadequate financing and records.** The major weaknesses of the distribution campaign were late deliveries and variability in amounts of fertilizer received relative to peanuts sold. The major cause of the delays appears to have been shortage of financing and/or delayed payment at the top of the system (We say "appears" since our study focussed at the regional level and below, hence we do not have direct information about what happened at the national level. This question is expected to be elaborated

in the USAID report.) **Variability in the fertilizer/peanut sales ratio occurred mainly because the peanut sales records did not provide the information necessary for accurate calculation of fertilizer entitlements.**

a. **Financial constraints.** Financial problems seem to have delayed delivery from the manufacturer to SONAR, as well as transport from Dakar to the regions. (In brief, there appear to have been difficulties in mobilizing the funds represented by the retenue, delays in payment of these funds to the fertilizer manufacturer, and underestimation of the cost of transport.) Lack of financial resources also delayed the hiring of transport for distribution within the regions, and (perhaps) the extension of the contracts of the SONAR secco managers. In the Fleuve, SAED was unexpectedly unable to obtain bank credit to finance this year's fertilizer order. SAED's need to mobilize its own resources to pay for fertilizer resulted in delay and smaller initial deliveries. As of mid-September, about one-half of the requested amount of NPK had been received by SAED.

b. **Inadequate records for the "retenue".** Peanut sales records were not always sufficiently detailed to permit accurate determination of fertilizer quantities due each SV and farmer. Such information, however, was necessary in order to implement the retenue system properly. A basic problem here was that the structure of peanut marketing (based on the SONACOS collection points established at selected SV's and on SONAR seccos) was not the same as the structure of fertilizer distribution (based on the SONAR secco and all SV's). Not all SV's were peanut marketing collection points, and farmers were allowed to sell at more than one collection point. The lack of sales records based on SV membership made it frequently impossible for SONAR agents to know how much fertilizer to allocate to each SV, and for SV leaders to know whether the amounts they received were only for their members or included amounts due to non-members who had sold peanuts through their SV. Thirty-four percent of SV's surveyed in the Casamance and 46 percent of those in the Sine-Saloum thought the quantities received were not correct.

In addition, there were several sources of records, those kept by SONAR, by SONACOS, by the Cooperative Service, and by some SV's. The reported peanut sales figures were not always consistent from one source of records to another. The situation was further complicated by differences between the weights recorded at the sales point and those recorded on arrival at SONACOS



(the latter become the official SONACOS weights). These conflicting records posed a problem for SONAR's field agents when attempting to allocate fertilizer by SV and farmer.

SV membership and sales records were also inadequate, which is not surprising given the relatively recent formation of most SV's. Of the 48 SV's sampled in the Sine-Saloum, 11 had no membership records, and another 10 had no list on hand although they claimed that one was maintained by the cooperative service or the administration. In a few SV's surveyed, the administrative bureau was not even sure which villages were affiliated with their section. Due to village rivalries and personality conflicts, some villages have unilaterally changed their SV affiliation several times since the creation of the sections. Only 52 percent of Sine-Saloum SV's had records of members' peanut sales in their possession; another 31 percent claimed that the list existed but was kept by some other service while 17 percent claimed that no such list existed. In the Casamance, 67 percent of SV's had a list which they had prepared and an additional 16 percent had access to one prepared by SONAR or SONACOS; only 4 percent had no list at all.

**10. Inadequate planning of the retenue system.** Although certain organizational problems were observed at the regional level, often their basic cause seems to have been a failure at the national level to foresee implementation problems and to plan accordingly. The nature of the problems observed during the field study suggests that those involved in the design of the retenue system (presumably including the BNDS (Banque Nationale pour le Développement du Sénégal), Ministry of Plan, Ministry of Rural Development, SONAR, SONACOS, the Cooperative Service, and the local administration) did not give enough thought to implementation procedures. The two most problematic procedural issues were:

a. The procedures for converting the retenue from a paper transaction to a real transaction and for transferring this money to the fertilizer manufacturer/distributor in a timely fashion do not appear to have been clearly defined and/or administered.

b. The original plans for the retenue system do not seem to have taken into account the reality of the peanut marketing process and the difficulties of using the peanut sales records as the basis for fertilizer distribution at the SV level. It seems fair to expect that planners should

have foreseen the problems of distribution which would inevitably arise, and should have formulated clear procedures (before the 1983/84 peanut marketing campaign began) for dealing with these problems.

As a result of inadequate planning, SONAR was given the implementation responsibility without clear guidelines. This had the following effects:

a. Those procedures which were formulated were communicated to field offices too late to allow regional officers to prepare adequately for the distribution campaign (e.g., to calculate entitlements and to mobilize personnel and transport).

b. The instructions disseminated were not sufficiently clear or comprehensive with respect to availability of funding for transport and personnel for distribution within the region. The instructions seem to have been interpreted differently in the Sine-Saloum and Casamance, at least at the outset of the campaign.

Given the complexity of the tasks involved in switching to a retenué system, some of these problems may have been unavoidable. However, attention is drawn to these problems because they did have a negative impact on the performance of SONAR and SV distribution personnel at the regional level, and because they represent issues which must be resolved if the retenué is to be continued.

11. **Delays observed at the regional level.** In general the survey indicated that SONAR and SV staff at the regional level managed to distribute fertilizer rapidly once they had received it from Dakar. However, some significant delays did occur within the regions, often as a result of lack of instructions or other factors outside the control of regional personnel. In the Sine-Saloum, for example, two CEPA's began receiving fertilizer in May but distribution to seccos and SV's did not really start until the beginning of July. SONAR officials claim that they were awaiting instructions from Dakar and could not begin distribution until they were assured that the full Sine-Saloum allotment would be delivered. In the Casamance, there was less delay between receipt of fertilizer at the CEPA's and distribution to seccos, except for urea in Kolda Region.

Other significant delays experienced by SONAR in both the Casamance and Sine-Saloum resulted from: (a) impassable roads (due to early rains); (b) unstaffed seccos (due to late arrival of supplies from Dakar, and legal and

financial problems in extending the contracts of the secco managers beyond six months); (c) a general shortage of diesel fuel; and (d) lack of transport (a reflection of SONAR's inadequate finances and SONAR-Dakar's poor record of paying transporters). In general, delays were greatest in the larger zones with numerous and geographically dispersed seccos.

With respect to SV's, many in the Sine-Saloum managed to take delivery and distribute fertilizer within 2-3 days of notification of its availability at the secco or CEPA. When delays occurred, they were usually because SV's disagreed with SONAR on the amount of fertilizer, or because SV's had trouble arranging transportation. The former problem is related to the overall lack of planning for use of peanut sales records; the latter problem would not have arisen if SONAR had had the resources to deliver fertilizer to all seccos as originally planned. In the Fleuve, distribution to GP's was delayed by discussions resulting from farmer attempts to persuade SAED to lower the price prior to delivery.

In both the Sine-Saloum and Casamance, farmers often were not well-informed and did not understand the retenue system, which led to some delays in organizing the distribution. In the Casamance, it sometimes took 2-3 weeks to organize the SV commissions responsible for the distribution.

**12. Weaknesses in regional organization.** Although many of the difficulties experienced at the regional level were beyond the control of regional personnel, a number of problems could perhaps have been avoided or diminished. SONAR in the Sine-Saloum in particular did not have a consistent policy from one department to another with respect to calculating SV entitlements. Different sources of peanut sales figures were used, as well as different distribution points (individual SV versus the collection point). The lack of a consistent policy undoubtedly contributed to the variability in fertilizer/peanut sales ratios observed throughout the region, and also caused delays at the SV level because the SV's often did not know for which farmers they had received fertilizer. In the Casamance, SONAR stated that SV's were always given fertilizer for members only, including amounts for members having sold at several locations. Better management of personnel (e.g., not allowing SONAR drivers in the Sine-Saloum to go on vacation just when fertilizer began to arrive) and forward planning for ordering supplies (e.g., sacks for rebagging) could also have alleviated some of the delays.

13. **Attitudes and opinions.** Based on interviews conducted at different levels, attitudes and opinions toward the current distribution system and alternative systems can be summarized as follows:

a. **Farmers were relatively happy with the SAED distribution system.** Overall, 48 percent of farmers and 46 percent of GP presidents interviewed stated that they were satisfied. (Twelve percent of farmers and 5 percent of GP's expressed no opinion.) However, compared to farmers in Podor and Matam, farmers in Delta were much less pleased. They were especially unhappy when fertilizer stored in the Delta was shipped early to Podor and Matam, and they tended to complain in general that SAED had not consulted them sufficiently. NPK also arrived in the Delta 3-7 weeks later than planned. Delay as the major problem was cited by 15 percent of GP's and 18 percent of farmers in the Delta, but by only 3 percent of farmers and none of the GP's in the Middle Valley (where in fact there had been no problem with late deliveries).

b. **Farmers were relatively unhappy with the SONAR system.** When asked to identify those aspects of this year's distribution system which should be retained, 24 percent of farmers in the Casamance and 30 percent in the Sine-Saloum stated that the system was so bad that nothing should be retained. When asked to identify the major problem with this year's distribution system, 61 percent of Casamance farmers said the delay, 10 percent mentioned high prices, and 5 percent mentioned that farmers had to travel too far to obtain their fertilizer. In the Sine-Saloum, 60 percent of farmers and 71 percent of SV's said delay was the biggest problem, 9 percent cited the government's failure to honor its commitments (a reference to the fact that the retenue system had been presented in terms of the old prices which were subsequently doubled), and 7 percent said the major problem was that quantities received were too small. In the Sine-Saloum, 75 percent of SONAR employees interviewed said that the "timing of distribution" should be changed, a reference to the problem of delays.

c. **Opinions on the retenue system itself were divided.** In the Sine-Saloum, 42 percent of SONAR employees thought the system was good, versus 33 percent bad; for SV's, the responses were 23 percent good, 27 percent bad; and for farmers, the responses were 22 percent good, 35 percent bad. Not surprisingly, those farmers who did not participate in the retenue system this year (generally because they did not produce enough peanuts to

sell last year) objected to the retenu system on the grounds that it reinforced their misfortune by denying them fertilizer after a bad year. SV presidents in the Casamance thought that the present system worked poorly, and that it would be better to have fertilizer available at the time of peanut marketing.

d. All farmers complained about the substantial increase in fertilizer prices under the retenu system. However, except in the Fleuve, farmers tended to rate high prices as a substantially less important problem than late deliveries. Only 10 percent of farmers in the Casamance and 6 percent of farmers and SV's in the Sine-Saloum cited high prices as the major problem. In the Sine-Saloum, however, 33 percent of SV's and 26 percent of farmers said that the prices should be lowered. In the Fleuve, on the other hand, 55 percent of GP presidents and 44 percent of farmers in the Delta said that high prices were the major problem with the distribution this year. This opinion was expressed even more strongly in the Middle Valley, cited by 100 percent of GP presidents and 90 percent of farmers. Over 60 percent of farmers in the Fleuve cited high prices as the reason they did not use more fertilizer this year.

e. The opinions expressed by farmers suggest a need for some degree of credit. In explaining why they had not acquired more fertilizer this year, 71 percent of farmers in the Sine-Saloum cited lack of financial resources, and 12 percent of farmers in the Casamance cited lack of credit. In the Sine-Saloum, 44 percent of farmers claimed that lack of financial resources also prevented them from purchasing more fertilizer in 1982/83 when it was available for cash purchase at 45-52 CFA/kg. (Note: it goes without saying that establishing the need for fertilizer credit requires information on farmers' costs and returns as well as on their expressed desires.)

f. Other opinions were obtained regarding the type of credit system preferred. Farmers and SV's in the Casamance and Sine-Saloum were asked several questions about whether they thought SV's could administer a credit system (i.e., obtain credit, manage it, and assure reimbursement). In the Sine-Saloum, over 92 percent of farmers and over 95 percent of SV's responded affirmatively to these questions. Responses were also generally affirmative in the Casamance: 50 percent of farmers said they felt the SV's were ready to administer credit now, and 76 percent said SV's would be ready to do so in the future. When asked about their preference for group versus

individual credit, 81 percent of farmers in the Sine-Saloum and 76 percent of those in the Casamance preferred group credit while 18 percent of Sine-Saloum and 11 percent of Casamance farmers preferred individual credit. Eighty-five percent of SV's in the Sine-Saloum also preferred group credit. When asked to describe the ideal distribution system, eighty-nine percent of farmers in the Fleuve said they would prefer a credit system, either the current SAED credit system (28 percent) or a credit system managed by the village section or producers group (61 percent).

g. When farmers were asked at what time of the year fertilizer should be available, their answers varied depending on the type of distribution system. Assuming that fertilizer were available only for cash purchase, most farmers would like to be able to buy it at the time of harvest and crop sales. This opinion was expressed by 82 percent of farmers in the Casamance, 94 percent of farmers in the Sine-Saloum, and 37 percent of farmers in the Fleuve (52 percent in the Delta versus 21 percent in Podor and Matam). In the Fleuve, 53 percent of farmers would prefer fertilizer to be available at the beginning of each agricultural season. Assuming a retenue system, 68 percent of farmers in the Sine-Saloum said that they would prefer fertilizer to be available at the beginning of the rainy season.

h. Information and accessibility are two other important factors affecting fertilizer acquisition. Thirty-nine percent of farmers surveyed in the Sine-Saloum said they did not buy fertilizer in 1982/83 either because it was not available in their area or because they had no information about it. (Note that during this period, fertilizer was distributed by SODEVA using a network of only 39 distribution points.)

i. In terms of alternatives to SONAR or SAED as organizations to handle fertilizer distribution, most farmers said they would like the village section or cooperative to take this responsibility. This opinion was expressed by 84 percent of farmers in the Fleuve, where it was assumed that credit would be available. (Note that the village section or cooperative was favored by 75 percent of GP presidents in the Delta, where SV's have been functioning for at least one year, as opposed to only 12 percent of GP presidents in Podor and Matam, where SV's are still non-operational.) In the Sine-Saloum, 35 percent of SV's and 34 percent of farmers said that the SV could handle fertilizer distribution. The cooperative ("coopérative mère") was cited by 17 percent of SV's and 12 percent of farmers, and SONACOS

was cited by 17 percent of SV's and 10 percent of farmers. Seventeen percent of both SV's and farmers suggested that some combination of the above organizations (along with SODEVA) would provide the best fertilizer distribution system. In response to a more specific question about an increased role for the cooperatives, 48 percent of SV's and 34 percent of farmers were favorable while 21 percent of both SV's and farmers were opposed. (Others had no opinion.) Of those favoring an expanded role for the cooperatives, most thought that cooperatives would have to collaborate with the SV's and regional development agencies to develop an effective system. In the Casamance, 46 percent of farmers preferred the "communauté rural" as the alternative to SONAR (perhaps because cooperatives are less well developed in this region), although 81 percent said that the fertilizer distribution point should be either the SV or the cooperative. SOMIVAC was cited by 9 percent of farmers, and SONADIS by 11 percent.

j. Most farmers were not in favor of the involvement of private traders in fertilizer distribution. (The question referred to "commerçants privés." This was doubtless interpreted as referring to wholesale or retail traders, not to the "private sector" as such.) Thirty-two percent of farmers in the Sine-Saloum said they "lacked confidence" in private traders on the grounds that traders did not understand the problems of farmers. In the Sine-Saloum, opposition to the involvement of private traders was expressed by 75 percent of SONAR employees, 81 percent of SV's, and 62 percent of farmers interviewed. Of those opposed, 46 percent of SONAR personnel, 31 percent of SV's, and 32 percent of farmers said they felt traders would charge excessively high prices; 17 percent of SONAR personnel, 10 percent of SV's, and 2 percent of farmers said private traders would not reach all farmers. In the Casamance, 37 percent of farmers said that traders should have no role, but 31 percent said traders should sell from SONAR seccos, and 21 percent said traders should provide fertilizer on credit. In the Fleuve, only 4 of 145 farmers suggested that private traders should play a role in fertilizer distribution.

k. Given the limited time available for the survey, it was not possible to collect significant information on farmer attitudes regarding an "acceptable" price for fertilizer. In the Sine-Saloum, only 7 percent of farmers said they had bought fertilizer in 1982/83, when it was available for cash purchase at 45-52 CFA/kg. Forty-eight percent said they would have

bought "some" fertilizer at 45 CFA/kg if it had been available at the time of peanut marketing in 1983/84. (Specifically, 91 farmers said they would have bought a total of 26,460 kg of fertilizer, an average of 290 kg per farmer.) Fifty-two percent said they would not have bought any fertilizer under these circumstances. The implications of this are discussed below.

### **C. Policy Implications.**

**1. Objectives and policy constraints.** In evaluating the current fertilizer distribution system, or in considering changes that might be made in the system, it is important to take into account what the system is intended to do (its objectives) and also other existing governmental policies which affect what can or cannot be done in reorganizing the fertilizer distribution system. Listed below are some of the key areas where the government is likely to have specific objectives or expectations for the fertilizer distribution system.

**a. Amount and type.** One would like the distribution system to provide the appropriate amount and type of fertilizer. What is "appropriate" depends on whose point of view is considered, e.g., the farmer, the development agent, the agronomist, the economist, etc.

**b. Timing.** Fertilizer should be provided at the appropriate time, in terms of when farmers want to acquire it and when it should be applied if utilization is to be effective.

**c. Coverage.** The distribution system is typically expected to cover a certain geographical area, or to meet the needs of certain farmers.

**d. Costs.** Two major aspects are involved here:

-- cost-effectiveness: the system should provide the desired benefits at minimum cost. This saves resources and thus potentially benefits everyone.

-- distribution of costs: the system involves many types of costs, of which some are borne by the government, others by manufacturers, transporters, and retailers (if any), and others by farmers or farmer groups. There is generally an objective of reducing the budgetary cost of the system to the government, and/or of reducing the financial cost of fertilizer to farmers. (Of course the two are not necessarily compatible.)



e. **Production priorities.** The system is typically expected to support production of key crops, e.g., peanuts, millet/sorghum, rice, maize, and cotton. A given system may tend to favor some crops more than others.

f. **Participants.** As a matter of political philosophy, the government may expect the system to be structured around certain actors, e.g., farmer groups such as the village section, or private traders, etc. The Senegalese government's interest in expanding the role of village sections and of the private sector in fertilizer distribution is probably based partly on the expectation that this will allow a reduction in the activity (and hence budgetary costs) of government organizations. However, participation of village sections is probably also considered desirable in terms of socialist principles.

It is not difficult to see that a fertilizer policy which gives priority to one objective could easily hamper the attainment of others. Such conflicts among objectives might include the following:

a. Distribution of the amount and type of fertilizer which farmers regard as appropriate (often lower than recommended quantities) would call for a different system from one which provides the amount and type consistent with agronomic or production policy objectives. For example, the pattern of distribution resulting from a cash sales system would be quite different from that associated with a "retenue" or credit system.

b. Which regions and farmers are covered by the system depends on other policies established. Distribution of fertilizer only to areas where its use is consistently economic would increase the rate of return from investment in fertilizer, but might exclude certain regions, e.g., the northern peanut basin. Charging the full cost of transport, rather than having a uniform price of fertilizer, would disfavor the more remote northern, eastern, and southern regions. A system based on private traders, unless heavily controlled by the government, might also result in neglect of remote areas.

c. Reducing the cost of fertilizer to farmers through subsidies might increase fertilizer use and thus contribute to production objectives. However, using government budgetary resources (or even foreign aid) for such a program would reduce funds available for other development programs. The value of the subsidy would therefore have to outweigh the potential reduction in the benefits received by farmers from other programs.

d. Promoting the participation of certain groups automatically limits how the system can be structured. For example, village sections and the private sector have certain preferences and capabilities with respect to the amount, timing, and procedures of fertilizer distribution.

These issues are perhaps obvious. The point is two-fold: (a) the objectives of the fertilizer distribution system must be clearly established, and priorities set; and (b) the impact of alternative distribution systems on these objectives must be carefully analyzed. In this discussion of policy implications we do not recommend a system of priorities but attempt to illustrate how various policy options will favor the attainment of different objectives. The discussion is centered around several major issues: organization of the distribution system; the retenué system; the cash sales alternative; price of fertilizer to farmers; and timing of fertilizer deliveries.

2. **Organization of the distribution system.** Farmers in the Fleuve region seem relatively satisfied with SAED's role in fertilizer distribution. This relative success results in part from the length of time SAED has operated in the region, and from the integration of input supply and other services in one organization. Whether SAED was better financed than SONAR this year (e.g., for transport) is not known; SAED may have been more effective but also more costly than SONAR. Other important factors include those which would be difficult to duplicate in other areas of Senegal. SAED's control over key production inputs (water, services, chemical inputs) gives them unusual leverage over farmers; without this, the credit system would not be as effective. The credit system is probably one of the key elements in farmers' current satisfaction with the fertilizer distribution system. However, elsewhere in Senegal, the government is reducing the role of rural development agencies, hence the "RDA-dominated" model is no longer acceptable. SAED itself is expected to reduce the subsidies on the services it provides farmers, and to gradually turn over to farmer groups the responsibility for provision of inputs, credit, and other services. By 1987, farmer groups are expected to organize these services themselves, and to finance them with credit from the CNCA (Caisse Nationale de Crédit Agricole) or commercial banks.

In the Sine-Saloum and Casamance, the survey results suggest that farmers would like to replace the government-run system with one involving a

major role for the village section and cooperative. There was limited interest in involvement of the regional development agencies, and practically no interest in the involvement of private traders. While these preferences are clear, it is not clear how realistic an assessment farmers have made of the capacity of the village section and cooperative to distribute fertilizer on time and at an acceptable cost. There is a long history of cooperatives in the Sine-Saloum, but the idea of the "coopérative mère" (mother cooperative) is a new one to farmers in both the Sine-Saloum and Casamance.

The question is what role the SV's and cooperatives are capable of fulfilling, and what assistance they need to do so? The results of the field study suggest that, at least in the next 2-3 years, it would be realistic to expect them to take responsibility only for distribution of fertilizer at the SV and farmer level, perhaps with the cooperatives collecting fertilizer from major distribution points within the region for onward distribution to SV's. A broader role would not be consistent with their current financial and physical resources, training, and organizational experience. Producers groups in the villages of Ndombo/Thiago in the Fleuve are successfully operating a cash fund for purchase of inputs. This is a model which SAED hopes to extend. However, these farmers have relatively large off-farm incomes, which makes it easier for them to mobilize the necessary cash.

Training in financial management for cooperative and SV staff would facilitate their successful involvement in input distribution. Two other weaknesses would need to be remedied: (a) **inadequate resources** at both the SV and cooperative level to assure transport of fertilizer; and (b) **lack of solidarity** among members of those SV's which were formed without due attention to the desires of member villages to associate with each other.

With respect to (a), although cooperatives in the Sine-Saloum own some trucks, if they wished to provide their own transport for input distribution they would probably need to find some means of financing additions to the truck fleet. Use of private transporters is a possibility, but the survey results indicated that when SV's arranged for transport on a piecemeal basis the costs were relatively high. Better rates might be obtained if the cooperative negotiated all transport contracts.

With respect to (b), in cases where solidarity does not exist within the SV, mistrust among members might rule out any input distribution system which required advance payment and hence collection of money which would be handled

by SV and/or cooperative staff. This seems to be an important issue for the cooperative service to resolve, given the frequency with which SV's in the sample reported that their member villages were unhappy with their SV affiliation.

3. **The retenue system.** The intended role of the retenue was to (a) prefinance the acquisition of fertilizer, and (b) provide farmers with a basic minimum amount of fertilizer. The retenue was to have been accompanied by credit and cash sales programs. In fact, this year the prefinancing does not seem to have worked, the quantities provided to farmers were very small (and often too late), and there were no accompanying credit or cash sales programs.

The drawbacks of the retenue system include: (a) farmers have no flexibility with respect to the type, price, amount, or timing of fertilizer obtained; (b) an effective system appears to depend on adequate financing, good records, and well-planned procedures--which have not yet been assured; (c) the amount of fertilizer available through the system for a given agricultural season is heavily determined by the previous year's harvest; and (d) the system provides fertilizer where peanuts are grown, which does not necessarily coincide with where it is needed for production of cereal crops.

One advantage of the retenue system is that in principle the government thereby assures minimum supplies of critical inputs. The question is at what cost? A costly government system puts as much burden on farmers as a system relying on private traders who might charge farmers high prices.

Regarding the amount of the retenue, the 5 CFA/kg retenue financed about 55 kg of fertilizer (NPK and urea combined) per ton of peanuts sold. Assuming yields of one ton/ha of peanuts, this means that only about one-third of the recommended amount of fertilizer for peanuts (150 kg/ha) and nothing for cereals is financed through the retenue, given current prices. Using some of this fertilizer on cereals (which is what was encouraged this year) means an even smaller fraction of the recommended amount available for peanuts. (Note that only 14 percent of farmers in the Sine-Saloum said that a higher retenue would be a good way of increasing the amount of fertilizer provided. However, this may have reflected general dissatisfaction with the retenue. If farmers could be confident of receiving the correct amounts of fertilizer on time, they might accept an increase in the retenue.)

Assuming that the retenué system is to be continued for at least one more year, the following measures must be given priority attention.

a. Fertilizer must be delivered to farmers on time.

Otherwise, the credibility of the retenué system, and perhaps of other future distribution systems, may be irreparably damaged.

b. To ensure timely delivery, proper financing and payment are also essential.

c. To ensure that farmers receive the amounts to which they are entitled, steps must be taken to improve peanut sales and SV membership records, and to formulate easy-to-implement distribution procedures.

d. To make available more significant quantities of fertilizer, the amount of the retenué may need to be increased, or the price of fertilizer lowered if the retenué remains the same.

4. **Cash sales.** The farmers' perception that they lack financial resources would limit the demand for fertilizer on a cash sale basis. This year, 22 percent of the fertilizer obtained by farmers sampled in the Sine-Saloum and less than 1 percent of that obtained by farmers sampled in the Casamance was purchased for cash--mostly parallel market Gambian fertilizer at about 25 CFA/kg. If a system of cash sales were implemented, many farmers indicated that they would prefer having fertilizer available for purchase at the time of peanut or rice sales. Farmers would clearly have more cash available to spend at this time of the year.

Thus, there appear to be several prerequisites to a successful cash sales program:

a. Fertilizer should be made available at the time of commercialization.

b. The government would have to finance the full peanut price at the time of marketing. This would be 55 CFA/kg instead of the current 50 CFA/kg, assuming that the 15 CFA/kg retenué for seed is maintained. If the seed retenué is dropped too, 70 CFA/kg would be required.

c. Information about the price and location of sales outlets should be widely disseminated.

d. It may be desirable to coordinate fertilizer price policy with the Gambia; availability of cheap Gambian fertilizer will reduce the demand for Senegalese fertilizer in border areas.

**5. Fertilizer price.** This question merits more careful study, yet the limited data obtained, as well as other impressions gained through the survey, suggest that the demand for fertilizer would (at least initially) be quite limited at prices close to the existing real cost of fertilizer (90-100 CFA/kg).<sup>a/</sup> (The Fleuve may be an exception; even if prices increase, there is a strong possibility that farmers will increase fertilizer doses at least to their 1982/83 levels, if they see a negative effect on yields from this year's reduction in fertilizer application.) In the Sine-Saloum and Casamance, farmers have not bought much fertilizer for cash at 45 CFA/kg; as noted, 52 percent of farmers surveyed in the Sine-Saloum said they would not have bought any fertilizer this year at 45 CFA/kg.

**6. Timing.** The vital importance of timely deliveries has already been emphasized. The impact of late deliveries on agriculture this year was perhaps aggravated by the earliness of the rains in some areas. However, it would be prudent to initiate the entire process (other than peanut sales, of course) two months earlier than this year's schedule, to ensure that fertilizer is in the field in April or May. (Based on informal information from ICS, the current schedule calls for estimates of fertilizer needs by 15 December, a firm order with 30 percent down payment by 15 February, and delivery of fertilizer in May/June.) Obviously, switching to a cash sales system with fertilizer available at the time of peanut marketing (e.g., November) would require an even earlier schedule.

**7. Summary of major recommendations.**

a. The highest priority must be given to ensuring timely delivery of fertilizer to farmers. This is absolutely essential if the benefits of fertilizer are to be realized.

b. Adequate financing and prompt payment are necessary to achieve timely delivery of fertilizer. These elements must be assured by the central authorities concerned.

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<sup>a/</sup>It should be noted that the results of this study and of other research show that factors other than price affect farmers' decisions to use fertilizer. These include: timing and place of availability; information on how to use fertilizer properly; the magnitude of yield response to fertilizer, and its variability in response to rainfall; the sale price of crop output; the supply and cost of complementary inputs (e.g., herbicides); cash flow constraints and the farmer's ability to bear risk; and the returns from fertilizer investment relative to returns from other investments open to the farmer.

c. No matter what new distribution system is adopted, improved record keeping will be necessary for efficient performance. If the retenu system is continued, records of peanut sales and village section membership must be improved to permit distribution of the correct quantities to each SV and farmer.

d. Support must be given to SV's and cooperatives to enable them to play a broader role in fertilizer distribution, as well as in other development activities. Training in financial management would be one important way of strengthening the capacity of SV's and cooperatives. Reviewing the village composition of the SV's may help improve solidarity among SV members, and thus improve the basis for successful group action.

#### D. Topics for Further Study.

1. First, it should be noted that additional data analysis is being done for inclusion in the final report.

2. The nature of financial and administrative constraints experienced at the national level this year should be identified, with a view to alleviating them next year.

3. Farmer attitudes need to be assessed in a more narrowly focussed, in-depth study. This applies to perceptions of the costs and benefits of fertilizer use, what constitutes an "acceptable" price, alternative credit and distribution procedures, and the advantages and disadvantages of involvement by private traders.

4. There should be an expanded analysis of the profitability of fertilizer use, from the farmer's point of view as well as from the national economic point of view. It is particularly important that the analysis improve on previous studies with respect to treatment of uncertainty in agricultural production, the resulting risks which the farmer faces, and the farmer's ability to bear risk. Capital constraints at the farm level, which limit the farmer's ability to acquire fertilizer even when desired, should also be assessed. The benefits obtained from a retenu-based system which provides farmers very small amounts of fertilizer should also be examined in relation to the costs of such a system.

5. The resources and attitudes of potential private sector participants in fertilizer distribution (e.g., manufacturers, distributors, private traders, and transporters) should be investigated further to ascertain the feasibility and nature of their possible involvement.

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