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The Impact of Policy Reforms on Agricultural Input Marketing and Use in NIGER

by

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AHA	*Aménagements hydro-agricoles*
ASDG	Agricultural Sector Development Grant
BCEAO	*Banque Centrale des Etats de l'Afrique Occidentale*
BDRN	*Banque de Développement Rural du Niger*
CA	*Centrale d'Approvisonnement*
CFAF	CFA franc, monetary unit of the West African Monetary Union
CNCA	*Caisse Nationale de Crédit Agricole*
CSPPN	*Caisse de Stabilisation et de Peréquation des Prix*
DAP	diammonium phosphate
DEG	Development Economics Group of Louis Berger, Inc.
DEP	*Direction des Etudes et de la Programmation*, MAG/EL
FAO	Food and Agriculture Organisation of the United Nations
FNI	*Fonds National d'Investissement*
IFDC	International Fertilizer Development Center
KCL	potassium chloride
MAG/EL	*Ministère de l'Agriculture et de l'Elevage*
NPK	compound fertilizer (nitrogen-phosphorous-potassium)
ONAHA	*Office National des Aménagements Hydro-agricoles*
PAAD	Program Assistance Approval Document
PIL	Project Implementation Letter
RINI	*Riz du Niger*
SEDES	*Société d'Etudes pour le Développement Economique et Social*
SSP	single superphosphate
TSP	triple superphosphate
UNC	*Union Nationale des Coopératives*
URC	*Union Régionale des Coopératives*
USRC	*Union Sous-Régionale des Coopératives*

Notes: In this report, "tons" means metric tons
In November 1991, $1 = 280 CFAF

I. INTRODUCTION

This report examines the impact of policy reforms on agricultural input marketing and use in Niger. The reforms were initiated in 1985 under the first USAID-funded Agricultural Sector Development Grant (ASDG-I). The Grant was intended to be a sector-targeted resource transfer of $45 million with a technical assistance component. Disbursement of funds was tied to a series of agricultural policy reforms focusing on reduction of input subsidies, internal and external trade liberalization, and strengthening of cooperative and private-sector involvement in marketing and storage activities.

ASDG-I was established with a dual purpose:

- "to promote the implementation of growth-oriented agricultural policies"; and
- "to provide additional resources to the agriculture sector in order to maintain existing investment activities and raise the level of the sector's absorptive capacity".[1]

In this paper, the use of chemical fertilizers and the performance of the government's input supply agency, the *Centrale d'Approvisionnement* (CA), are assumed to be the main targets of input policy reform. Effects of the reforms on the supply of agricultural equipment, pesticides and herbicides are treated only cursorily.

The University of Michigan technical assistance team published two earlier papers on this subject: the "Retrospective Study of Fertilizer Supply and Demand in Niger" (1986) and "Agricultural Inputs, Version 2.0" (1989). This paper takes another look at some of the issues addressed in the earlier efforts and provides data on activity through the end of 1990.

When work on this paper began, we had some hope that we could provide a two-part assessment along the lines of our earlier work on the impact of reform on millet, sorghum and cowpea production.[2] However, the lack of any reliable data on fertilizer use make it impossible to perform a quantitative analysis.

Our analysis therefore remains limited to a qualitative approach. We have divided the report into the following sections.

- A background section which also summarizes recent developments and trends.
- A brief review of the rationale for and implementation of the policy reforms;
- A proposed methodology for continued monitoring and evaluation of the effects of policy reform;
- An examination of the demand for fertilizer, including distribution patterns;
- A discussion of fertilizer supply, including examinations of import activity and the evolution of public and private sector supply;
- An institutional analysis of the CA, focusing on the effect of reform on its operation and performance; and

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[1]USAID, "Program Assistance Approval Document (PAAD)": Niger Agricultural Sector Grant, 1984, p. 3.

[2]Larry Herman and Robin Barlow, "The Impact of Agricultural Policy Reforms on the Output of Selected Crops in Niger", 1991.

- An analysis of the impact of reform on marketing and distribution as evidenced by interviews with private traders and by the results of surveys of agricultural cooperatives regarding fertilizer use.

II. BACKGROUND AND CURRENT TRENDS

In Niger, as in much of West Africa, for many years the government was expected to be the main supplier of agricultural inputs to farmers through government-organized cooperatives at government-set prices. The *Centrale d'Approvisionnement* (CA), a government agency closely tied to the agricultural credit agency (CNCA), was the chosen instrument of supply. As policy reform was implemented in the mid-1980s, the CA was transferred -- with its input inventories intact -- from the aegis of the government to that of an ostensibly private entity, the National Cooperative Union (UNC).

Today the *Centrale* provides far fewer inputs than it once did for a variety of reasons: because subsidies have been removed, because the agency is inefficient and, most importantly, because private merchants have stepped in as policy reform intended. However, it is the steady depreciation of the Nigerian naira against the CFA franc, rather than policy reform, that has had the largest impact on the supply and use of agricultural inputs and on the private sector's role therein. As relative prices of Nigerian fertilizers and tools fell, these items flowed across the long frontier, and the CA's activity contracted.

The *Centrale* mainly sells fertilizer today. There is little demand for the agency's aged inventory of farm equipment except for a handful of items: ox- and donkey-carts, plows, toolbars and motorpumps. The rest of the inventory languishes; less than ten of any one item are sold per month nationwide. The CA sells no great quantity of agricultural chemical inputs, except for a fungicide, thorial, whose value in seed treatment has been recognized by Nigerien farmers. The CA's continued existence is a consequence of substantial but diminishing donor assistance. The agency's financial situation remains precarious despite forgiveness of a very large debt to the CNCA.

The CA might have been considered in a terminal state when suddenly it doubled its fertilizer sales after the government cut prices drastically in mid-1990. But the flow of revenue can only be a temporary palliative. As 1991 ended, most of the CA fertilizer inventory had been sold, and there was no immediate prospect of replenishment. The *Centrale* exists day-to-day, apparently overstaffed for its current volume of business, losing money, and unaware of its true financial status. Unless the CA is reorganized and better managed, it is unlikely to last much longer. Whether it should survive at all as a check on the private sector is another question, discussed in section VII, which begins on page 38.

All of the fertilizer used in Niger is imported, either as donor grants or as purchases from Nigeria. The former are distributed by the CA, largely through the cooperative union, while the latter are privately marketed. The CA has supplemented grants with occasional purchases of Nigerian fertilizer from merchant importers. Tables 1 and 2 provide a breakdown of donor contributions by year, donor and type. There are no reliable data on imports from Nigeria.

In the early 1980s the CA switched from open market purchases of Nigerian fertilizer to reliance on donors. Since 1983 fully 90 percent of the CA's distributions of fertilizer have come from donated fertilizer. Donations have averaged about five metric tons annually, peaking at just under 10,000 tons in 1986 and then declining sharply in the last two years to less than 1,400 tons in 1991 (Table 1).

Table 1: Deliveries of Donor-Supplied Fertilizer, 1983-1991
(tons)

Country	Type	1983	1984	1985	1986	1987	1988	1989	1990	1991	TOTAL
Canada	urea	2,044	2,451	2,983			2,984				10,461
Japan	NPK		1,257	1,330		789	1,291	3,479	1,526	1,357	11,030
	urea								458		458
Holland	urea				3,978			2,000			5,978
	NPK				2,505	2,990					5,495
U.S.	TSP				2,000						2,000
	SSP				350						350
Other	NPK				440						440
	amm. sulf.				90						90
	KCL				20						20
	SSP				50						50
FAO	TSP			499	498				159		1,155
	urea						298				298
	NPK	254	741						20		1,015
	KCL								15		15
TOTAL		2,298	4,448	4,811	9,931	3,779	4,573	5,479	2,179	1,357	38,855

SOURCE: CA

Table 2: Fertilizer Aid by Type and Donor, 1983-1991
(tons)

	UREA	NPK	TSP	SSP	Other	Total	%
Japan	458	11,030				11,488	30%
Holland	5,978	5,495				11,473	30%
Canada	10,461					10,461	27%
FAO	457	1,015	996		15	2,483	6%
US			2,000	350		2,350	6%
Other		440		50	110	600	2%
TOTAL	17,354	17,980	2,996	400	125	38,855	100%
% By Type	45%	46%	8%	1%	0%		

SOURCE: Table 1

Several donors have contributed. Japan, Holland and Canada have been the main providers, accounting for 87 percent of 38,855 tons of fertilizer aid provided since 1982/83 (Table 2). Japan is now the sole remaining source for the CA, and the quantities coming from Japan have diminished. A request for 1,500 tons to be delivered in 1992 is in the pipeline.

Where Fertilizer is Used

In Niger the demand for fertilizer is largely but not entirely a derived demand since almost all of it is used on cash crops. Rice, cotton and vegetables are the marketed crops that dominate its use. It is often argued that the low levels of aggregate usage in Niger result from farmers' low incomes and lack of access to credit. Yet fertilizer is inexpensive by any standard in this landlocked country and the soils are generally considered to be nutrient poor. If millet farmers, the vast majority, are reluctanct to use fertilizer, their reasons are more complex than lack of ready cash.

There are three types of agricultural production where fertilizer is used. The most important consumer is the modern irrigation subsector consisting of irrigated perimeters. Most are found along the Niger River and many are double-cropped.[3] Demand for fertilizer to be applied at least once a year and often twice on approximately 12,000 ha in this subsector is relatively predictable.

The CA used to be the dominant supplier of the producer cooperatives on the AHA, but the private sector made inroads when Nigerian fertilizer became cheaper than the CA's despite the cost of transport from Nigerian sources. In the last year, however, the situation has changed. The CA cut its fertilizer prices in mid-1990 and it has made the input much more attractive by not demanding timely payment from those cooperatives which are not being paid by the government's rice milling authority (RINI). As result, the CA provided some 4,400 tons of fertilizer to the AHA cooperatives from October 1989 to March 1991 and is currently owed by them a huge amount, said by a CA official to exceed 350 million CFAF.

A second group of users are the farmers who cultivate dry-season crops (*cultures de contre saison*) on small plots that are watered by hand or animal power from shallow wells. In 1990 it was expected that 68,000 ha would be cultivated in the 1990-91 dry season. Almost half of the area (33,000 ha) was located in the Tahoua Department.[4] Plans were to devote 34 percent of the hectarage to vegetables; 32 percent to legumes, mainly cowpeas; 21 percent to roots and tubers; 11 percent to foodgrains, mainly wheat, barley and maize; and two percent to sugar cane.

Because dry-season plots tend to be small and scattered, it is more difficult to gauge fertilizer demand than on the perimeters. Even so, demand is relatively stable because rainfall is not a major factor. The private sector is believed to be the main supplier, though it cannot be documented, but the CA remains a significant source.

The third segment of the market is made up of the thousands of rainfed crop farmers who produce millet, cowpeas and other crops on about 3.5 million ha. Some 60 percent of this area lies in the administrative districts (*arrondissements)* along the Nigerian border. This source of demand for fertilizer is a "wild card," about which we have the least information.

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[3]These perimeters are known collectively as the AHA or *aménagements hydro-agricoles*. The government agency which supervises them is ONAHA (*Office National des Aménagements Hydro-agricoles*).

[4]Tillaberi came next with 10,000 ha, followed by Zinder with 8,000 ha and Diffa with 7,000 ha. *Secrétariat Permanent du Comité National du Système d'Alerte Précoce*, "Bulletin d'Information sur la Situation Alimentaire," no. 2, janvier 1991. p. 18.

The belief that the private sector was unlikely to meet the needs of this third group of farmers provided a rationale for government intervention in the form of credit, subsidized prices, and a secure delivery system. There is little evidence that the CA accomplished its mission in this regard.

Fertilizer Sales

Sales of fertilizer by the CA decreased markedly from their apogee at 14,000 tons in 1981/82[5] to only 3,600 tons in 1988/89, as shown in Tables 3 and 4. The initial decline in sales in the early 1980s predates the reforms and in fact explains the motivation for them; the drop-off was attributed at the time to the CA's inability to procure additional stocks due to the subsidy constraint.

A second drop-off in sales occurred in 1985-86 (Table 3), following a CA price increase decreed by the government as reforms were implemented. Sales continued to decline sharply through 1988-89 even though nominal prices remained constant. This was not paradoxical. Fertilizer from an alternative source -- Nigeria -- was becoming relatively cheaper as the Nigerian naira depreciated rapidly against the CFA franc (see pp. 33-38).

For this reason, the decline in government sales should not be interpreted to mean that fertilizer usage declined in Niger during this period. The private sector, which had been serving farmers close to the Nigerian border for several years, gradually expanded its market beyond the immediate border areas. The change in relative prices allowed private traders to supplant the *Centrale* as the dominant seller of fertilizer on the perimeters along the Niger River in Tillaberi Department. Private traders simply became more competitive over a wider area as the CA became less.

The pattern changed in 1990. The data for CA fertilizer sales from October 1989 through December 1990 reveal a sharp surge to almost 7,000 tons during the 15-month period. Except for Maradi and Zinder Departments, which encompass border zones where private trade flourishes, CA sales elsewhere were virtually twice the levels for 1988/89 (Table 3).

The figures demonstrate the effect of a major cut in fertilizer prices decreed by the government in mid-1990 so that the CA could compete with Nigerian imports. Clearly, the increase in "sales" also reflects the CA's willingness to provide fertilizer to the AHA cooperatives without insisting on payment.[6] The perimeter cooperatives buy directly from the CA's main depot (*siège*) in Niamey, which distributed 4,400 tons in 1989/90, compared to 2,000 tons in 1988/89.[7]

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[5]The years refer to the old fiscal years, which ran from October 1 to September 30. The 1989/90 fiscal year was extended to 31 December 1990 so that subsequent fiscal years would coincide with the calendar year.

[6]Fertilizer "sales" are supposed to be cash-and-carry except for project entities and irrigated perimeter cooperatives, which can pay after the harvest. However, sometimes individuals are allowed to take fertilizer with a promise to pay later. In such cases the quantity is usually carried as inventory although it is no longer in the local cooperative union (USRC) warehouse. Nor are losses for any reason (wastage from broken bags, storm damage, pilferage, even embezzlement) counted as sales. In any case, record keeping is highly variable from one USRC to another, and no great reliance should be placed on the figures reported.

[7]Sales figures from the main depot are for an 18-month period, October 1989 through March 1991. The CA official who verified the data in November 1991 maintained that there were few sales in the first quarter of 1991.

CA FERTILIZER SALES BY DEPARTMENT, 1982-1990

(tons)

DEPT	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	Average 1982-90
AGADEZ	143	154	166	148	120	154	151	188	308	170
DIFFA	50	43	10	43	5	5	21	8	42	25
DOSSO	4,424	1,921	2,001	590	297	179	419	468	847	1,238
MARADI	2,150	1,683	1,637	891	369	178	490	301	123	869
NIAMEY*	878	718	1,570	473	262	261	549	349	690	639
TAHOUA	1,247	1,505	624	1,085	183	332	540	199	461	686
ZINDER	2,048	312	415	185	73	15	224	77	86	382
CA SIEGE	3,050	2,481	3,159	5,675	5,124	3,658	1,554	1,990	4,384	3,453
TOTAL	13,990	8,817	9,582	9,090	6,434	4,783	3,948	3,579	6,940	7,463

(percent)

DEPT	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	Average 1982-90
AGADEZ	1%	2%	2%	2%	2%	3%	4%	5%	4%	2.8%
DIFFA	0%	0%	0%	0%	0%	0%	1%	0%	1%	0.3%
DOSSO	32%	22%	21%	6%	5%	4%	11%	13%	12%	13.9%
MARADI	15%	19%	17%	10%	6%	4%	12%	8%	2%	10.4%
NIAMEY*	6%	8%	16%	5%	4%	5%	14%	10%	10%	8.8%
TAHOUA	9%	17%	7%	12%	3%	7%	14%	6%	7%	8.9%
ZINDER	15%	4%	4%	2%	1%	0%	6%	2%	1%	3.9%
CA SIEGE	22%	28%	33%	62%	80%	76%	39%	56%	63%	51.1%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

*Now Tillaberi

SOURCE: CA DATA

Table 3: CA Fertilizer Sales by Department, 1982-1990

VENTES D'ENGRAIS 1/10/89 AU 31/12/90

PAR DEPARTEMENT

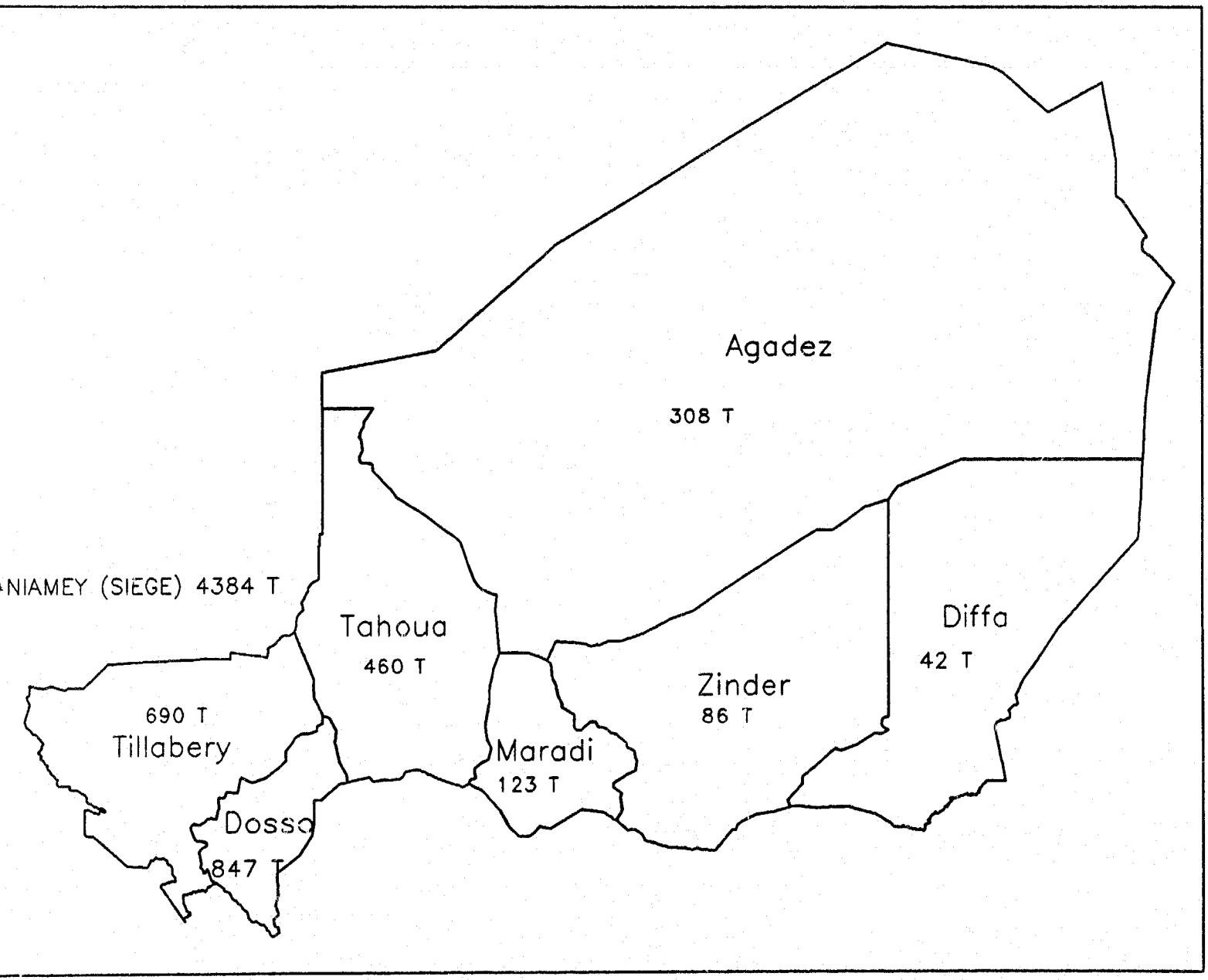

Figure 1: Departmental Fertilizer Sales, 1989/90 (tons)

Table 3 shows a striking disparity. Sales from the main depot (63%) and in the southwestern departments, Tillaberi (10%) and Dosso (12%) account for fully 85 percent of the total for 1989/90. The other five departments account for only 15 percent of sales, and half of those sales are in nearby Tahoua Department.

Table 4: Fertilizer Sales by the CA, 1980-1990
(tons)

	(1) Total Fertilizer	(2) Units of N	(3) Units of P_2O_5	(4) Units of K_2O	(5) Total Fertilizer Units	(6) Ratio of (5)/(1)
1980/81	11,114	2,119	1,393	241	3,754	0.34
1981/82	13,990	1,660	2,290	256	4,207	0.30
1982/83	8,817	1,565	1,270	211	3,045	0.35
1983/84	9,582	1,571	1,362	320	3,254	0.34
1984/85	9,090	2,131	1,107	375	3,613	0.40
1985/86	6,434	1,675	778	336	2,788	0.43
1986/87	4,783	1,232	502	270	2,004	0.42
1987/88	3,948	833	579	174	1,586	0.40
1988/89	3,579	914	397	201	1,512	0.42
1989/90	6,940	2,090	560	407	3,057	0.44

SOURCE: CA data
Notes: (a) The national sales figures in this and other tables were compiled from the CA's departmental data. They differ slightly from the aggregate numbers produced by the CA itself and cited in various studies.
(b) Fertilization units were calculated as follows: N= 45% urea + 15% NPK; P_2O_5= 15% NPK + 46% TSP + 20% SSP +35% Tahoua rock phosphate; K_2O= 15% NPK. The very small quantities of other types sold are not included.

Table 5: CA Fertilizer Stocks on 12/31/90
(tons)

	Siège	Agad.	Diffa	Dosso	Maradi	T'houa	Tilla	Zinder	TOTAL
Urea	56	83	10	96	43	144	111	74	617
NPK	1,340	19	11	260	43	68	397	23	2,161
TSP	9		6	154	8	18	224	128	547
SSP	16		6	119	203	21	14	45	424
Tahoua	7		5	87		594			693
Other						1			1
KCL	40								40
DAP	41								41
TOTAL	1,510	101	39	717	298	846	746	269	4,527

SOURCE: CA data
Note: Totals may differ from sums due to rounding.

In 1991, the CA took two deliveries of Japanese-granted fertilizer, 888 tons of NPK 15-15-15[8] in May and 469 tons of it in November. The CA also purchased 180 tons of urea from the government's seed project (*Projet Semencier*) and 190 tons of Nigerian-origin NPK from merchants. The total quantity available in 1991, according to the CA's records, was thus approximately 6,250 tons, as shown in Table 6. Of this quantity, about 4,500 tons were the types most used: urea and NPK.

The CA official who monitors stocks claimed in November 1991 that with the exception of the delivery from Japan that month, virtually all of the urea and NPK fertilizer was gone. He also stated that very little single superphosphate (SSP) was left and that there had been significant draw-downs of triple superphosphate (TSP) in the course of 1991. His most recent reports, dated September, showed minimum amounts on hand in the departments. He knew or suspected that in most cases the numbers (116 tons in Tahoua, 28 tons in Maradi) represented, not inventory but unpaid deliveries to individuals. He expected the November shipment of Japanese NPK to be quickly snatched up by the AHA cooperatives. If it occured, the CA will have disposed of fertilizer at a rate like that of 1989/90 and to start 1992 will have virtually no fertilizer left other than Tahoua rock phosphate, which moves very slowly at any price.

It is evident that the *Centrale* can compete with private traders as long as it offers good quality Japanese fertilizer at a competitive price and/or on extremely generous terms to buyers from perimeter cooperatives.

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[8]Wherever it appears in this report, "NPK" refers to NPK 15-15-15, which is by far the most common complex fertilizer and now the only one available through the CA. It is both provided by Japan and produced in Nigeria.

Table 6: Fertilizer Available from the CA in 1991
(tons)

	Inventory 12/31/90	Grants in 1991	Purchases in 1991	Total Available
Urea	617		180	797
NPK	2,161	1,357	190	3,708
TSP	547			547
SSP	424			424
Tahoua	693			693
Other	82			82
TOTAL	4,524	1,357	370	6,251

SOURCE: CA data

III. INPUT POLICY REFORMS: RATIONALE AND EXPERIENCE

What the Reforms were to Accomplish

With regard to liberalization of agricultural inputs, the underlying objectives of policy reform were budgetary relief and improved sectoral efficiency. By steadily reducing input subsidies and improving the efficiency of the input supply agency, the designers of the program hoped to cut substantially a drain on the government budget. The sectoral productivity objective was to assure that agricultural inputs, especially fertilizer, would be imported, produced, and used efficiently, so that benefits at least matched opportunity costs. This means both that the Nigerien resources spent on fertilizer should be appropriate relative to other potential uses for these resources and that fertilizer should be used where it is most effective.

One notes that the problems of stagnant growth and inefficiency in the use of chemical fertilizers are endemic throughout Africa. The World Bank's analysis of fertilizer policy in Africa[9] notes that while increased use of fertilizers is probably a necessary condition for the required improvement in agriculture productivity, it is far from a sufficient condition for growth. "A complete solution requires that chemical fertilizers be used in conjunction with a variety of policies that promote soil and farm management techniques." (MADIA/5, 5-6)

Still, fertilizer subsidies and other government interventions aimed at encouraging fertilizer use were common throughout Africa in the 1970s. By the 1980s, these programs were under considerable stress and criticism:

> ...increased budget deficits and doubts about the effectiveness of public sector interventions (*e.g.*, concern that subsidies result in high cost public sector monopoly of importation and internal

[9]Uma Lele et al., *Fertilizer Policy in Africa: Lessons from Development Programs and Adjustment Lending, 1970-87*. The World Bank, MADIA Discussion Paper 5, 1989.

distribution, that they do not reach their intended beneficiaries, and that they cause wastage and misallocation of resources) have led donors to conclude that the costs of fertilizer interventions outweigh their benefits. (MADIA/5, 7)

The system of parastatals, subsidies, and input pricing policies existing in Niger at the time ASDG was formulated follows this pattern. It had as its purpose the expansion of the use of modern agricultural inputs. The rationale for this government intervention was a combination of trying to correct for perceived market imperfections and failures, equity concerns, and the general preference for public over private institutions. Regardless, the use of modern inputs remained limited.

In fact, USAID became convinced that distortions introduced by government policies were overwhelming any market failures such as imperfect competition and producer misinformation. The distortions were of course scarcities and rents occasioned by subsidies and controls. In other words, modern input use was being restricted because of, rather than in spite of, the activities of the CA.

This is in large part due to the fact that, rather than increasing the availability and use of inputs, the subsidy policy has had the opposite effect of limiting supplies as the GON has been unable to support the funding required to subsidize the inputs in the amounts needed. (PAAD, 36)

It was the combination of the subsidies and institutional inefficiency that were presumed to prevent the CA from satisfying farmer demand at the subsidized prices. Furthermore, it was not even clear that the inputs being sold were economically beneficial:

...the higher the level of subsidy, the less certain one can be that farmers seeking to maximize their own profits will maximize the return to the country as well. This is especially true in Niger where the profitability of certain pieces of highly subsidized equipment is not at all obvious. (PAAD, 36)

By correcting for the failures of government intervention, the designers of ASDG expected to see a number of things happen.

- First, that fertilizer and other agricultural inputs would go to those who would make the best use of them.
- Second, that resources used in distributing inputs would be used more efficiently.
- Third, that private merchants would respond to an anticipated increase in demand for modern inputs and play an ever larger role in distribution.

If the efficiency objective of reform were being attained, success could be measured by:

- an increase in total fertilizer use because the reason for an artificially induced scarcity -- the subsidy -- would have been removed;
- greater efficiency of fertilizer use or in other words, applications on crops with high benefit-cost ratios rather than on crops with lower ratios; and
- input markets that function competitively, allocating scarce inputs to more efficient uses.

The conditions that might increase the demand for fertilizer are both technical and economic. Development and extension of technical packages that improve fertilizer response while reducing risk are perhaps a crucial determinant. Also, it was hoped that liberalization of agricultural commodity markets, improved access to agricultural credit, and cross-border trade liberalization would make fertilizer use more

attractive to farmers and might offset the higher costs of agricultural inputs once subsidies were removed. However, for exogenous reasons that we explore in section VI, the assumption that fertilizer prices would rise as a result of the reforms was mistaken. If it was assumed that crop prices would also rise or at least remain constant in real terms, the free-fall of the Nigerian naira (section VI) helped render that assumption mistaken as well.

The mechanisms for effecting these reforms appeared to be straightforward. The government was to reduce its level of subsidy on inputs by steps, starting with a subsidy of no more than 50 percent on any one input and ending with an average of no more than 15 percent on all inputs. The government was also required to transfer the CA to the National Cooperative Union (UNC) and was precluded from granting any sort of monopoly power to the CA.

Determination of the actual level of subsidy was an early issue because, as we describe more fully in sections VI and VII, the CA was buying much less fertilizer and receiving more as grant aid from donors. The debate concerning measurement of subsidy rates notwithstanding, the main effect of the subsidy reduction was a slight increase in official fertilizer prices in 1986 (Table 13), while private market prices remained lower.

The transfer of the CA to the cooperative sector had as its largest effect the cancellation of the agency's large debt to another government agency. But the CA is still for all intents and purposes a government entity. It is doubtful that members of cooperatives (farmers) perceive the CA as any more under their control than they did previously. The CA's market role has weakened and market penetration by private sector agents has occurred.

Though we agree that reforms in this area were essential and generally well designed, we believe that the rationale and estimate of projected benefits were seriously flawed in three ways:

- First, the assumption that the subsidy constrained total supply of fertilizer was almost certainly incorrect. Niger is not comparable to Senegal, where the government was the *only* source in the early 1980s.[10] Private trade in Nigerian fertilizer has been common in the border zone for some time.

- Second, the assumption that removal of subsidies would result in higher fertilizer prices was wrong, since the continued depreciation of the naira has kept prices down. This was something the project designers could not have foreseen.

- Third, the assumption that benefits would be widespread seems quite inconsistent with the unpromising character of the technical packages and cultural practices in use at the time of ASDG design. Little has changed since then.

Thus, the following prediction of the impact of the input reforms found in the PAAD seems to us to have oversold the benefits considerably:

> The policy changes in subsidies and input supply system should result in more inputs available to the farmers... The beneficiaries of these policy changes will be farmers whose demand the CA could not satisfy formerly because CA did not have the resources to deliver the necessary inputs due to the

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[10]See Abt Associates, Inc., *Senegal Agricultural Policy Analysis*, 1985, pp. 123-125 for a discussion of the problems encountered in Senegal when the government tried to eliminate fertilizer subsidies and the private sector was unable to step in. The amount of fertilizer available in 1984 was only 35,000 tons, one-third of what had been distributed annually in the late 1970s.

excessively high level of subsidy as well as the execution problem inherent in the present input supply system. A majority of the beneficiaries are subsistence farmers in the various productivity project zones of the five provinces and these farmers are Niger's poor majority. The number of farmers who would benefit from this is estimated at approximately 500,000. (PAAD, 62)

IV. METHODOLOGY

A desirable methodology for analyzing the effects of reforms would have two components, quantitative and qualitative. The quantitative analysis would be in the form of a model of Niger fertilizer demand that would facilitate a statistical test of the effects of reforms. The qualitative component would be more descriptive, identifying and tracking key variables, as well as focussing on the behavior of the major participants in, and beneficiaries of, input markets. Unfortunately, reliable data on major aspects of this market are lacking.

We present here an overview of the sort of monitoring and analysis that would improve our understanding of input markets and enable policy makers to track the impact of reforms. We also evaluate the current state of data and specify the kind of market information needed to conduct a comprehensive impact assessment.

Key Quantitative Indicators

The single most important variable that ought to be tracked is total fertilizer use. This measure ought to be disaggregated by region (department and *arrondissement*), by subsector (irrigated, dry-season and rainfed) and by crop. In addition, data on use by type of fertilizer are necessary both to compute application of units of nutrient and to monitor how effectively the distribution system is responding to geographic and crop-specific needs for nutrients.

Marketing data are required to show evolution in market share of public and private sector sellers. Levels and sources of imports, timing of deliveries and prices are all necessary to evaluate the effects of reforms on the distribution system.

Sadly, both types of data are difficult -- in some cases, impossible -- to obtain. The two current methods of estimating total use are stock monitoring and farm-level estimates of use. On the supply side the CA maintains comprehensive records of stocks and deliveries, broken down by fertilizer type, for their central and departmental warehouses. We believe these data to be reasonably accurate, with several caveats.

- Data refer to deliveries to, and withdrawals from, warehouses rather than actual use on crops.
- The CA maintains no records regarding buyers, making it impossible to tell where the fertilizer is being used.
- Record keeping at the *arrondissement* level is inconsistent at best and in some cases so sloppy that the data are completely unreliable.
- Data from departments and *arrondissements* are verified only once a year when an employee from Niamey makes the circuit.

Whatever the drawbacks of official data on public-sector supply, however, they can be made accessible to policy makers. The same cannot be said for data on private-sector supply. There exist no estimates of private fertilizer trade whatsoever. Occasional market surveys or farm surveys indicate activity, but no

time-series data are available. Nor can we accurately measure private-sector sales by department. This is a debilitating data deficiency. It makes measuring total use from the supply side impossible and does the same for calculations of market share.

An indirect method of monitoring supply would exist if reliable import data were available. Unfortunately, this is not the case. The University of Michigan technical assistance team devoted considerable energies to collecting data directly from border posts, assisting the *Direction des Douanes* in the computer coding of border-post data and reconciling donor deliveries of fertilizer with recorded imports.

Despite such efforts, these data are still unreliable. The inconsistencies between border-post records and official national figures cannot be reconciled.[11] Official statistics on recorded imports bear little relation either to distributions by the CA or to what we know to be the level of use in the irrigation subsector. But even if the data are taken only as crude indicators of recorded imports that pass through border posts, they say nothing about clandestine imports. The latter contribute substantially to the total supply of fertilizer in Niger.

There are several reasons for clandestine movements.

- The illegality of exporting fertilizer from Nigeria gives traders an incentive to avoid main entry points into Niger.
- Until 1989, import duties were still being levied on fertilizer, creating an incentive to avoid customs posts.
- Anecdotal evidence suggests that a substantial number of Nigerien farmers near the border smuggle small quantities in from Nigeria for their own use and for petty commerce.

Farm-level estimates of fertilizer use also tend to be occasional and local. Surveys like the one conducted by the Maradi Productivity Project in 1984[12] contribute to our understanding of how farmers use fertilizer, but the they tend to give us selected images of points in time and space that are difficult to complement in order to evaluate the pattern and evolution of use.

Some data do exist for the irrigation subsector. ONAHA, the supervisory government agency, conducted a survey of 30 cooperatives on its irrigated perimeters regarding fertilizer use and supply in 1989. The results of this survey were never tabulated, though we have now made use of them. We were able to extend the data set by reconducting the survey on a more comprehensive set of 39 cooperatives, including several whose activities are limited to off-season farming of vegetables. As a result, we have reasonably good data on fertilizer use and purchases for the irrigation subsector for recent years, almost no information about use in the other two subsectors, and no time-series data that could be used to track trends.

Since the ultimate purpose of input-policy reforms is to improve agricultural productivity, a final set of indirect indicators would focus on yields. Evidence of higher yields in each of the three subsectors would complement evidence of increased fertilizer use to support the claim that reforms stimulate greater sectoral efficiency.

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[11]In at least one case it appears that records at a border post alternated between measuring shipments in tons and kilograms. In some years it is difficult to distinguish imports from transshipments destined for Burkina Faso or Mali.

[12]Projet de Développement Rural de Maradi, *Niveau de consommation et formes d'utilisation des engrais minéraux dans la zone d'intervention du projet.* Février 1984.

Econometric Model of Fertilizer Use

If policy reforms had any effect on fertilizer use patterns, we should be able to test for it by using a relatively simple model of fertilizer use. Using a technique similar to that used for evaluating the effect of cereal marketing reforms,[13] we would have liked to estimate demand equations for fertilizer use for pre- and post-reform data. We would then apply an econometric test of the equivalency of the two equations (comparing estimated coefficients) or an analysis of residuals when the estimated pre-reform equation is used to predict post-reform demand. These results would be superior to tracking the indicators listed above since they would take directly into account the variations in other factors that affect fertilizer demand.

The estimation of such a model requires, above all, consistent and reliable data on fertilizer consumption. Since, as we explained above, such data are not available, we are frustrated in our effort to propose a rigorous but workable method for assessing the impact of reforms. Nonetheless, we present a brief overview of such a model, in the hopes that it will help guide policy makers in the monitoring of key variables.

A fully specified model of the Niger fertilizer market would include both supply and demand equations. For reasons that we discuss below, however, we believe that the effective supply of fertilizer to the Nigerien market is perfectly elastic, with relatively unlimited quantities available from Nigeria. That makes the delivered price of fertilizer the only supply-side variable. This can be computed from Nigeria price data, parallel market naira-CFAF exchange rates, and estimates of marketing margins. Only if there were reason to believe that marketing margins have changed substantially over time (e.g., reductions in the Niger import duties or increased enforcement of the Nigerian export ban) would it be necessary to include margins explicitly.

We believe that the demand for fertilizer is dominated by three factors:

- Technical factors that affect fertilizer responsiveness and increase the physical productivity of fertilizer. These include the area under irrigation, rainfall, and the availability of improved technical packages.

- Factors that affect the economic advantages of using fertilizer. These include the delivered price of fertilizer and the prices of crops to which fertilizer is intensively applied.

- Factors that influence the farmer's ability to purchase modern inputs. These include availability of credit and cash income.

This suggests a model along the lines of the following:

$$Q_{fert} = f(IR, R, QAG_{t-1}, P_f/P_{ag}, T)$$

where:

Q_{fert} = quantity of fertilizer used in Niger;

IR = index of land under irrigation and dry season farming;

R = index of rainfall, preferably showing early rains when fertilizer use decisions are made;

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[13]See Herman and Barlow, 1991, *op. cit.*

QAG_{t-1} = lagged agricultural output or revenue term;

P_f/P_{ag} = index of fertilizer to agricultural commodity prices; and

T = trend factor.

The model would be estimated for national data though it would also be desirable to do so by region so as to capture the effects of different levels of cropped land under irrigation and of rainfall on rainfed areas. The explicit test of the effects of input reforms would be if estimated coefficients for any of the determinants were significantly higher when estimated using post-reform data than when using pre-reform data.

Qualitative and Institutional Analysis

Qualitative analysis of the impact of input reforms should focus on three areas:

- o the institutional performance of the CA and producer cooperatives;
- o the impact of reforms on agricultural productivity; and
- o the competitiveness and efficiency of fertilizer marketing and distribution.

Evaluation of the institutional performance of the CA should focus primarily on the budgetary objective of reducing its deficit. Unfortunately, this is difficult to do given the poor quality of the CA's financial reports (section VII). A secondary issue is how well the CA is able to complement the private sector in supplying fertilizer and other inputs, especially in regions where private traders may be able to exploit their market power. For example, it would be useful to know the extent to which the CA serves farmers whose modest demand for fertilizer is in lots too small for private traders to supply. As noted above, however, the CA does not monitor end use.

One crude test of the impact of reforms on agricultural productivity is to look at yields to see if they have shown any changes that cannot be explained otherwise. Unfortunately, data on yields tend to be unreliable except for the rice perimeters. Yields for dryland crops are almost certainly overwhelmed by rainfall effects. In the absence of a more rigorous model which included fertilizer as a variable, it is doubtful that rainfed crop yields will tell us much.

Irrigated and dry-season crop yields are more useful, since rainfall has more effect on the total area planted, depending on water availability, than it has on yields directly. Data do exist for yields of irrigated crops such as rice, corn, cotton and market vegetables. Any sudden decrease in fertilizer supply as a result of reforms (as has been suggested by some critics of the reforms) should show up as a decrease in yields. Conversely, if, as the reform designers predicted, the reforms actually removed a supply constraint, one should see evidence of rising yields in subsectors that use fertilizer intensively.

A quick look at yields for irrigated rice (both seasons) 1980-1989 and for four major dry-season crops that are typically fertilized relatively intensively fails to show any secular decline in yields that could be attributed to shortages caused by the CA's diminished activities (Figures 2 and 3). In fact, the data seem to suggest continued increases in yields during the post-reform period. This is corroborated by respondents to our cooperative survey who continue to report fertilizer use that is generally consistent with the recommendations of technicians.

With regard to market efficiency, one would like to measure concentration ratios, marketing margins, and price correlation between regions. All of these require more knowledge of the private sector than we now possess. Several sources of information are available and useful. The previously mentioned 1988 ONAHA

survey of fertilizer use on irrigated perimeters provides good data on the buying behavior of cooperatives. Such surveys could easily and cheaply be continued. They should also be expanded to cooperatives that farm dry-season plots and to a sample of farmers who grow only rainfed crops, especially those near the Nigerian border.

A number of trader surveys have been carried out with the assistance of the University of Michigan technical assistance team. Recently the International Fertilizer Development Center (IFDC) has undertaken an extensive study of Nigerian exports of fertilizer to Niger, including an attempt to contact as many private traders as possible. Regular monitoring of major traders and a sample of smaller merchants, using a short questionnaire, will give policy analysts useful information regarding changes in the level of activity, marketing margins, and at least a qualitative indication of competitiveness.

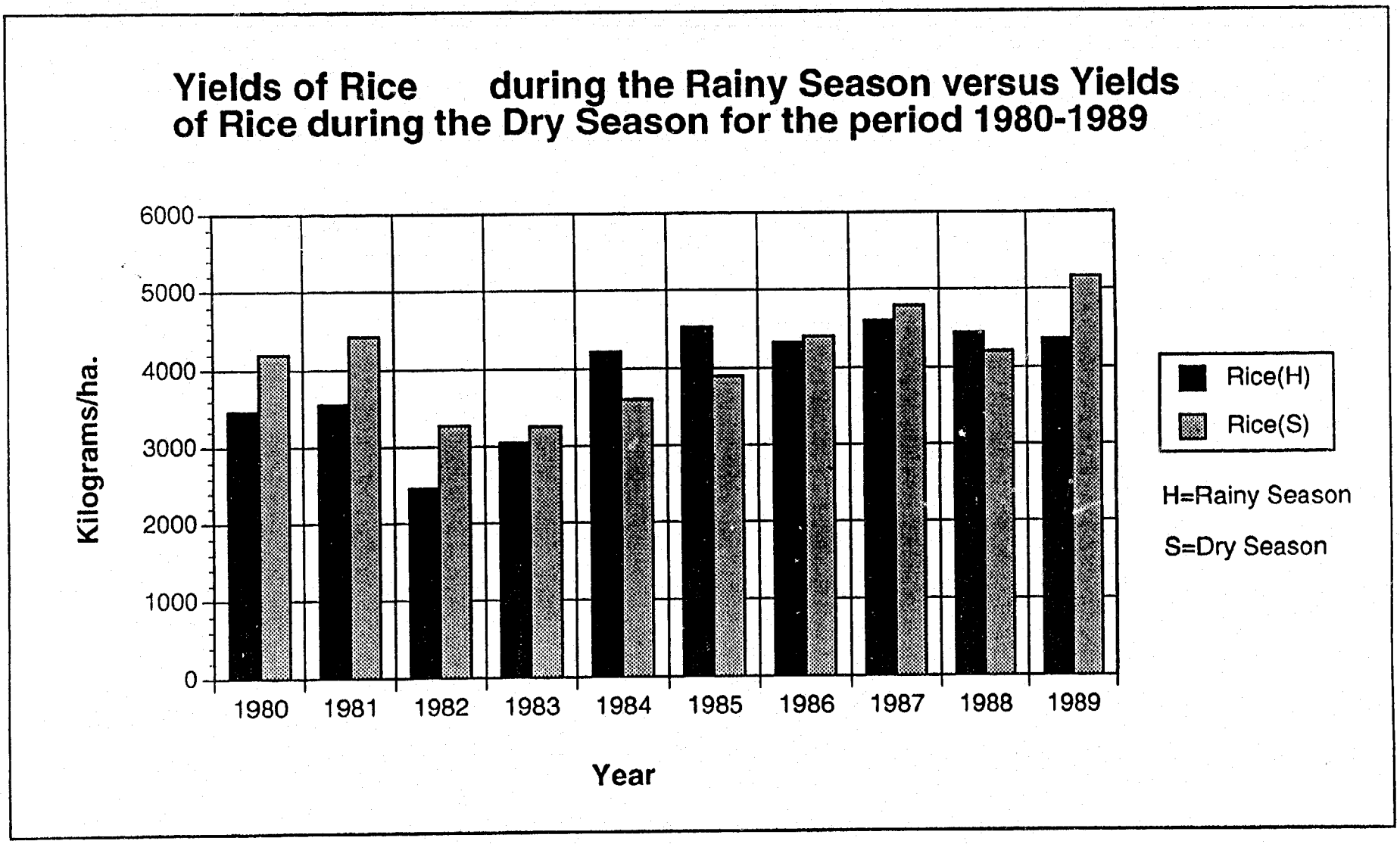
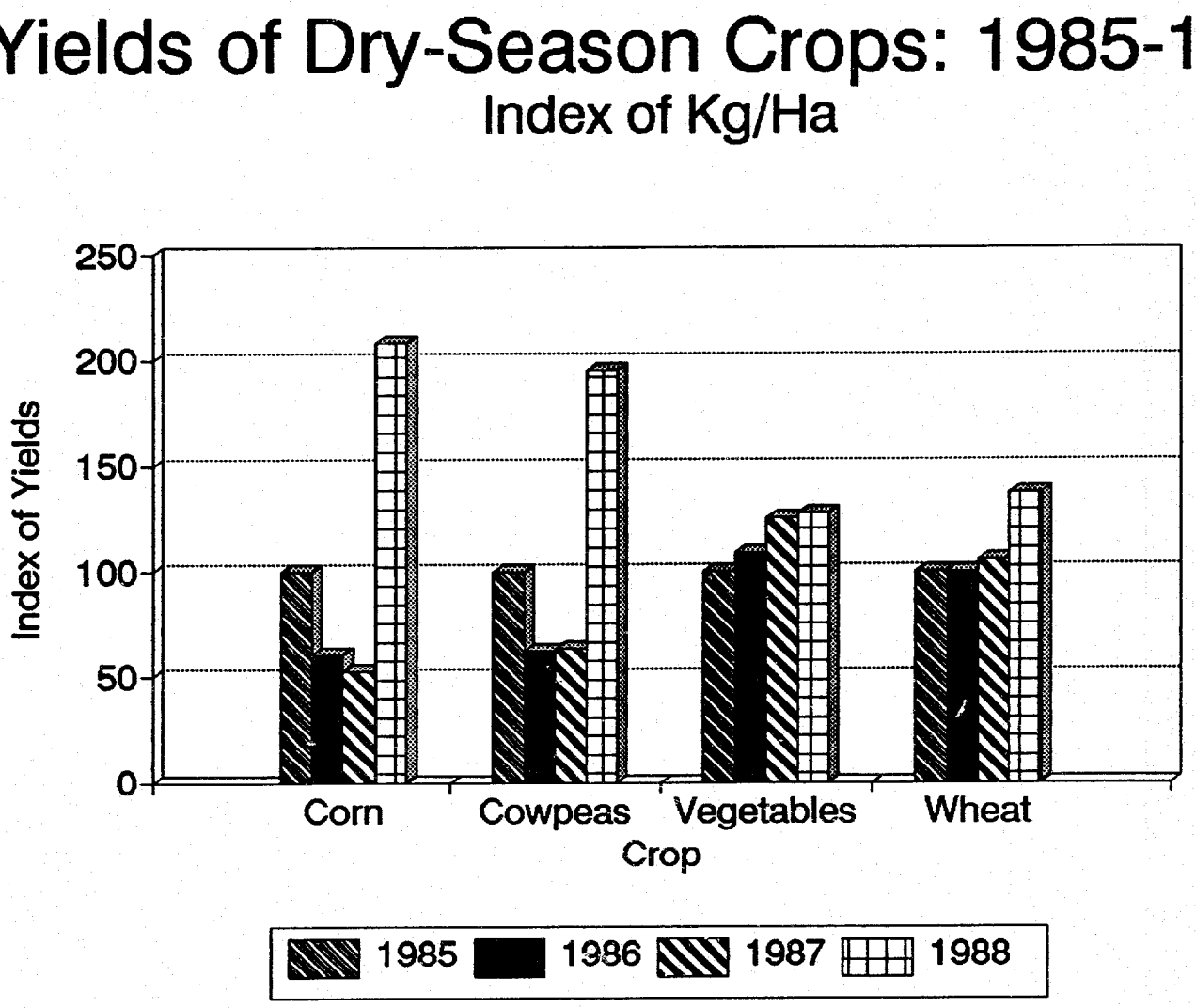


Figure 2: Rice Yields

Source: CRED/DEP/MAG/EL, 1991

Figure 3


Yields of Dry-Season Crops: 1985-1988
Index of Kg/Ha
Index of Yields
250
200
150
100
50
0
Corn
Cowpeas
Vegetables
Wheat
Crop
1985
1986
1987
1988

V. DEMAND FOR FERTILIZER

Demand for fertilizer on irrigated perimeters and for dry-season crop production has been relatively predictable both with regard to quantity and with regard to type in recent years. This is not to say that the most appropriate or cost-effective fertilizers are being used.

Demand for fertilizer to be used on rainfed crops is another story entirely. Producers of the staple foodgrains -- millet and sorghum -- not only must contend with highly variable rainfall patterns. They also sell little of what they grow and hence must be assured of a high benefit/cost ratio before they actually purchase any inputs.

The conventional wisdom holds that Nigerien millet producers avoid risks with fertilizer. Farmer interviews often reveal a concern that fertilizer can "burn" emergent plants if there is insufficient moisture. If applied on the surface, urea can also be lost easily through volatilization before it has any effect. In actuality farmers are reluctant to use *any* fertilizer when the rains begin poorly because they fear that they will both lose their investment and harm their crop. They wait until it is clear that rainfall will be adequate before they take a chance. Researchers from the University of Auvergne (Clermont I) provided a recent restatement of this hypothesis when they noted that in Niger:

> The use of chemical fertilizer and manure on rainfed crops gives better yields if rains are adequate but conversely increases the risk of catastrophe by burning plants when rainfall is insufficient. As a result the already low level of fertilizer use is declining further because of the deterioration of climatic conditions.[14]

A recent study of fertilizer use in Western Niger picked up the same theme in interviews with 60 farmers in seven villages of Tillaberi and Dosso Departments.

> Based on informal interviews of farmers by the authors, it may be confidently suggested that the perception of rainfall is the factor that guides agricultural decisions among farmers in Western Niger....The typical strategy is to wait until the season is clearly underway and the crops established before input decisions are made.[15]

For these reasons demand for fertilizer in rainfed crop areas is unreliable, likely to be manifest only after early rainfall predicts a good season, very sensitive to price and translated into purchases in relatively small quantities.

Estimating Total Demand

On the AHA perimeters, rice fields are the heaviest consumers of fertilizer. Five years ago the University of Michigan team found that the dosage was highest in ONAHA's northwestern (Tillaberi) sector, where 440 kg of urea and NPK were applied per hectare on average to perimeters surveyed in the 1986 dry season.[16]

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[14]Centre d'Etudes et de Recherches sur le Développement International, *Politique macro-économique et pauvreté au Niger*, version provisoire, juin 1990, p. 59.

[15]John P.A. Lamers et al., "Agricultural Input Expenditures and Fertilizer Use Among Farmers in Western Niger." Jan. 1989. p. 8.

[16]"Retrospective Study," p. 65. Chapter IV of the study discusses fertilizer use on irrigated perimeters.

The average was slightly lower in the southwestern (Niamey) sector at 394 kg/ha applied to about 2,900 ha in the 1985 dry season. Lower amounts are habitually used in the rainy season. On the Niamey perimeters, for example, the average was 361 kg/ha in the 1985 rainy season.

Even higher dosages are now being used on this crop. Data were collected in 1989 and 1991 in surveys of 43 cooperatives located at all of ONAHA's irrigated perimeters except those in Diffa Department (Table 7). On rice average fertilizer use was reported to be from 433 to 445 kg/ha. This is slightly higher than the reported recommended dose of 421 kg/ha.[17]

In Tahoua Department, which had 4,050 ha of irrigated perimeters in 1986, rice gives way to cotton, sorghum and wheat. Fertilizer dosages were lower than for rice in the mid-1980s but have increased. At Birni N'Konni, the largest perimeter in the region with 2,600 ha, farmers applied only 40 to 60 kg/ha in the mid-1980s. (*Retrospective*, 69) However, in the later surveys, cotton reportedly received an average of 207 kg/ha, ranging from 249 kg/ha in 1988 to 178 kg/ha in 1990. Sorghum received somewhat less at 167 kg/ha, though still substantially higher than reported in 1986.

Overall, the survey results indicate that on a total of almost 19,000 irrigated hectares planted to all crops (including seedbeds for rice) over a three-year period, an average of slightly over 400 kg of fertilizer was applied per hectare.

The dominant types are urea and NPK. The 1988-89 and 1990-91 surveys indicate that farmers use almost equal quantities of urea and NPK on rice, 223 and 204 kg/ha respectively. A few cooperatives substitute the more suitable triple and single superphosphate for the NPK composite, avoiding the inappropriate potassium NPK contains. It is often argued that Nigerian farmers are accustomed to using urea and NPK and that this explains why the CA (and private traders) sell far more of these types than of any other. However, the heavy concentration of fertilizer supplies on rice would suggest to agronomists a formulation other than NPK 15-15-15 along with urea. Phosphorous is clearly deficient in Nigerien soils; in fact it is probably the key to greater fertility since nitrogen is not as effective without its presence. Application of 100 kg of TSP per hectare with its 46 kg of P_2O_5 would provide 50 percent more of the nutrient and be more cost effective than 204 kg of NPK 15-15-15.

On both cotton and sorghum, farmers seem to use NPK more intensively than urea. In fact, almost three-quarters of fertilizer applied to cotton is NPK 15-15-15, the so-called cotton fertilizer.

If we apply these averages to the total number of hectares cropped in a year, we can obtain a very rough estimate of annual demand from the AHA perimeters. ONAHA reports total irrigated area under its control at 11,246 ha in 37 installations (Table 7). Of that total, just over 7,000 hectares are located in the Niger River basin and are for the most part dedicated to rice production. With double cropping the total area planted to rice annually is around 12,750 ha. The remaining 4,000 ha are located in Tahoua and Maradi Departments and planted to cotton, sorghum, and wheat. Those installations are less effectively double cropped; so the total number of hectares cultivated annually is just under 5,000.

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[17]It needs to be noted that the "reported recommended dose" is the amount that cooperative representatives claimed had been recommended by extension agents. We observed a high correlation between this figure and reports of actual use.

TABLE 7: ONAHA Cooperatives Surveyed, 1988-1991

Cooperative Name	Sector	ONAHA area (a)	ONAHA cultiv. (b)	1988-89 Area cultiv. (c)	1990-91 Area cultiv. (d)	1990-91 Number farmers (e)
Tara	Gaya	120	61		101	256
Djiratawa	Maradi	512	571		512	716
Karaigourou	Niamey	144	271	143	136	454
Kirkissoye	Niamey	100	189	97	97	444
Koutoukale	Niamey	340	553	339	298	700
Libore	Niamey	272	495	257	250	930
N'Dounga 1	Niamey	286	528	270	278	865
N'Dounga 2	Niamey	285	536	277	278	1040
Namarde Goungo	Niamey	246	466	245	233	424
Saadia Amont	Niamey	111	332	115	107	276
Saadia Aval	Niamey	27	47		26	56
Saga	Niamey	431	761	390	380	1101
Seberi	Niamey	397	683	348	345	1100
Tiaguirire	Niamey	180	329	175		
Galmi	Tahoua	250	390	242	245	850
Ibohamane	Tahoua	750	660	622	660	927
Kawara	Tahoua	52	52	52	53	72
B. N'Konni	Tahoua	2447	3068		2500	3000
Moulela	Tahoua	65	70	63	63	116
Tounfafi	Tahoua	28	31	27	39	65
Daiberi	Tillaberi	350	594	310	309	602
Daikaina	Tillaberi	120	208	105	119	365
Djambala	Tillaberi	662	1201	355	633	1522
Firgoune	Tillaberi	182	310	107	180	513
Karma	Tillaberi	133	252		133	452
Kourani Baria 1	Tillaberi	425	810	477	426	946
Kourani Baria 2	Tillaberi	268	502		266	633
Kokomani	Tillaberi	54	98	51	52	158
Lossa	Tillaberi	173	283	103	176	433
Namari Goungou	Tillaberi	728	1293	218	728	1792
Say 1	Tillaberi	250	467		240	354
Say 2	Tillaberi	195	373		203	347
Sona Cuvette	Tillaberi	162	294	136	156	427
Sona Terrasse	Tillaberi	39	38	39		
Tillakeina	Tillaberi	86	68	86	82	214
Toula	Tillaberi	256	486	255	256	632
Yelewani	Tillaberi	120	227	120		
Number of co-ops		37	37	29	34	
Total ha cultivated		11,246	17,597	6,024	10,560	
Average per co-op		304	476	208	311	

a. Total area under irrigation: All operating ONAHA irrigated perimters excluding those in Diffa.
b. Total area under cultivation 1990 (2 seasons)
c. Total area under cultivation 1988-89 survey (1988 rainy, 1989 dry)
d. Total area under cultivation 1990-91 survey (1990 rainy, 1991 dry)
e. Number of farmers according to 1991 survey.

If on average rice producers use 400 kg/ha and grain and cotton producers use 200 kg/ha, demand for fertilizer on irrigated perimeters can be estimated as follows:

Table 8. Estimated Demand, Irrigation Subsector

Crop	Area Cultivated (ha)	Average Dose (kg/ha)	Total Demand (tons)
Rice	12,755	400	5,100
Cereals and cotton	4,842	200	950
Total estimated demand:			6,000

As total land under irrigation has remained relatively stable, with rehabilitations and new construction just about offsetting area taken out of service, this source of demand is should remain fairly constant.

Estimating demand for fertilizer in the dry-season subsector is much more problematic. We were unable to locate any systematic source of data on use, nor were we able to implement a survey, though that should be a high priority for further studies. Interviews with farmers and experts suggest that 300 kg/ha is generally accepted as the desirable application of fertilizer on vegetable gardens, with about half that for grains and cowpeas. It is unlikely that much fertilizer is applied to roots and tubers.

Given the estimate cited above of 68,000 ha for total area under dry-season cultivation and these dosages, we can compute a very crude estimate of dry season demand for fertilizer as follows:

Table 9. Estimated Demand, Dry-Season Subsector

Crop	Area Cultivated (ha)	Average Dose (kg/ha)	Total Demand (tons)
Vegetables	23,000	300	6,900
Cowpeas	22,000	150	3,300
Foodgrains	7,500	150	1,100
Roots and tubers	14,000	0	0
Total estimated demand:			11,300

This figure should be taken as an absolute upper limit for fertilizer demand for this sector. It is unlikely that actual use reaches half this level.

Other Determinants of Demand

Use in rainfed farming, mainly millet production, is almost impossible to estimate. Though actual use is low, the potential for this subsector to influence total demand is great because of its size. Although it is unlikely to occur for some time, a change in demand could be dramatic once fertilizer became profitable for rainfed crop production. As an order of magnitude, if a new technical package induced farmers to apply only 50 kg/ha on only one-tenth of Niger's 3.5 million rainfed hectares, demand for the subsector would increase to 17,500 tons. This would more than double annual consumption.

In theory, then, rainfed demand could dwarf demand from the other two sectors. This will not occur before more appropriate technological packages are developed for rainfed agriculture, productivity increases greatly and demand for foodgrains grows appreciably with population growth. It now appears unlikely to occur until the CFA franc is devalued to stem the inflow of cheaper cereals from Nigeria, which are depressing crop prices in real terms.

The World Bank's study of fertilizer policy in Africa identifies three price factors and seven nonprice factors that constrain the use of fertilizer. (MADIA/5, 5) In the context of Niger the factors that are most likely to increase demand are development and extension of improved packages that increase crop response (and reduce variance), expansion of agricultural credit, and stable and attractive prices in output markets. The latter two were themselves the target of other ASDG reforms.

VI. SUPPLY OF FERTILIZER TO NIGER

Imports

Donor fertilizer grants are in decline (Table 1). If Niger could no longer obtain grants and Nigerian imports, the country would pay world-market prices adjusted for high transportation costs inland for fertilizer. The delivered cost of non-Nigerian fertilizer appears to be as high as 200 to 250 CFAF per kilogram. This may be contrasted with the 40 CFAF per kilogram which the *Centrale* paid in October 1991 to merchants who had imported NPK 15-15-15 from Nigeria.

The continued availability of Nigerian supplies is not assured. The Nigerian government's policy, unevenly enforced, of one preventing "leakage" of its heavily subsidized fertilizer. While illegal exports to Niger constitute a small fraction of Nigeria's total fertilizer market (estimated at more than 250,000 metric tons of nutrient in 1987)[18] the Federal government would have no desire to subsidize farmers (and the government) across the border. For some years a question have been raised about the propriety of an official or semi-official agency like the CA buying fertilizer that has been clandestinely exported from Nigeria. Large donor grants rendered the point moot for a time but the purchases of the Nigerian product in 1990 and again in 1991 have revived it.

However, if the illegality hurdle could be overcome, Nigeria is really the best source for the private and public sectors alike. Even without the subsidy, whose impact is mitigated anyway once the fertilizer is on the open market in Nigeria, the cost differential is such that it would make sense for the Nigerien government as well as private traders to import from Nigeria. Cost aside, importing from non-Nigerian sources can pose practical difficulties for Nigerien traders, as some who were interviewed have stated.

The question of legitimate, non-subsidized sales to Niger might be a fruitful topic for bilateral negotiations. As long as it survives, the CA could play a useful role competing with the private sector if it were able to

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[18]MADIA Discussion Paper 5, p. 30.

purchase directly from Nigerian fertilizer plants, possibly at a discount for bulk sales, and then import legally into Niger.

Nigeria can provide the types of fertilizer most used under current conditions. Only triple superphosphate (TSP), provided by the US in 1986, is not readily available in Nigeria. Ninety-two percent of the fertilizer grants from donors in the period 1983 to 1991 were formulations found in Nigeria: urea (45%), NPK 15-15-15 (46%) and SSP (1%) (Table 2).

Private-sector imports are impossible to quantify because of the preponderance of smuggling and the poor quality of customs data. Official data suggest total recorded imports on the order of 10,000 tons annually during the 1980s, though these figures show a marked decline in 1989 and 1990 (Table 10). It is difficult to try to match recorded imports with donor grants, but it is almost certain that the drop-off in recorded imports corresponds to the slowdown in aid shipments and not to a decline in trade with Nigeria.

Table 10: Recorded Fertilizer Supplies, 1982-1991
(tons)

	CA Sales	Donor Grants	Declared Imports	Non-donor Imports*
1982	13,990		14,505	14,505
1983	8,817	2,298	8,836	6,538
1984	9,582	4,448	8,631	4,183
1985	9,090	4,811	5,479	668
1986	6,434	9,931	13,038	3,107
1987	4,783	3,779	11,859	8,080
1988	3,948	4,573	14,803	10,230
1989	3,579	5,479	3,290	(2,189)
1990	6,940	2,179	**1,408	(771)
1991		1,357		
Average	7,463	4,317	9,094	4,928

SOURCE: Customs, Tables 1 and 3
* Declared imports less donor grants
** Estimate from an IFDC survey

The wide variability in the "non-donor imports" column in Table 10 probably says more about the unreliability of official data on declared imports than about private sector imports. The average figure of 3,731 metric tons is probably indicative of the level of declared imports during the 1980s. Our surveys of cooperatives suggest that total imports have probably remained above the 10,000 ton level, though we have no easy explanation as to why a growing share of private-sector imports now go unrecorded.

Public Sector Channels

The steady decline in public sector sales prior to 1990 has been evoked above. The sharp upturn in 1990 resulted from lowered prices, easy terms for perimeter cooperatives and a 15-month year. This trend reversal does not erase the fact that the private sector had picked up many new customers from the *Centrale* as our survey tends to confirm. Nor does it change the fact that the southeastern part of the country now relies almost exclusively on the private sector.

When examined by department, the CA distribution figures suggest a significant change in distribution patterns (Table 3). Substantial deliveries to Dosso, Maradi, Tahoua, Tillaberi (formerly Niamey), and Zinder Departments were once common as were distributions from the CA's main depot (*siege*). Since the reform period began, however, only distributions from the CA's main depot have remained sizable (over 1,000 tons).

The eastern departments along the border (Maradi, Zinder and Diffa) now account for a negligible share of sales. These three departments combined took 19 percent of the CA's sales as recently as 1987/88. In 1989/90 they took a mere four percent (Table 3). Deliveries to Zinder have declined to only 86 tons in 1989/90.

Figure 4, which stratifies CA sales by *arrondissement*, shows how sales are clustered in the southwestern corner of the country. The four leading *arrondissements* in 1989/90 were Kollo (267 tons), Boboye (235), Dosso (234) and Konni (224). All are in the southwest. Konni's primary consumers are irrigated perimeter cooperatives, who are said to prefer CA fertilizer for its quality, having had a bad experience with Nigerian products. In Dosso Department's Boboye *arrondissement*, however, the primary consumers are rainfed crop farmers. Three *arrondissements* took between 100 and 200 tons in 1989/90. Two are in the southwest: Gaya (192) and Say (151). The third is Tchirozerine (137) in Agadez Department, where potatoes, garlic and wheat are produced on irrigated bottom land (*cuvettes*) in the dry season. All other *arrondissements* consumed less than 90 tons in 1989/90; all but two less than 50. Tillaberi *arrondissement* appears in Figure 4 to have had no sales only because the perimeter cooperatives in the district obtain all their fertilizer directly from the CA central depot.

Examining sales by type of fertilizer (Tables 11 and 12), one notes that urea, NPK and single superphosphate (SSP) have accounted for 90% of CA sales in the ten-year period 1981-1990. The only notable change in the pattern in this regard is a substantial decrease in the amount of SSP sold, accompanied by increases in the proportion of urea and NPK. This change has modestly improved the ratio of fertilizer units to total fertilizer delivered since SSP has a lower total coefficient than either urea or NPK (Table 4). On the other hand, the potassium content in NPK is almost completely worthless applied on Nigerien soils.

As noted above, most of the CA's distributions have come from donor shipments. The agency has purchased fertilizer only three times -- a total of 870 tons -- in the last four years. As Figure 5 shows, sales in 1990 exceeded donor grants. There are as yet no sales figures for 1991 but it appears that sales will exceed grants and purchases by a wide margin.

The CA's inventory is thus almost exclusively determined by donor grants. Though the Ministry of Agriculture is said to have some input into the type of fertilizer requested of donors, it is far from clear that there is a conscious effort to obtain the most appropriate or cost effective types of fertilizer (section V).

Ventes Engrais du 1/10/89 au 31/12/90

Par USRC (ARRONDISSEMENT)

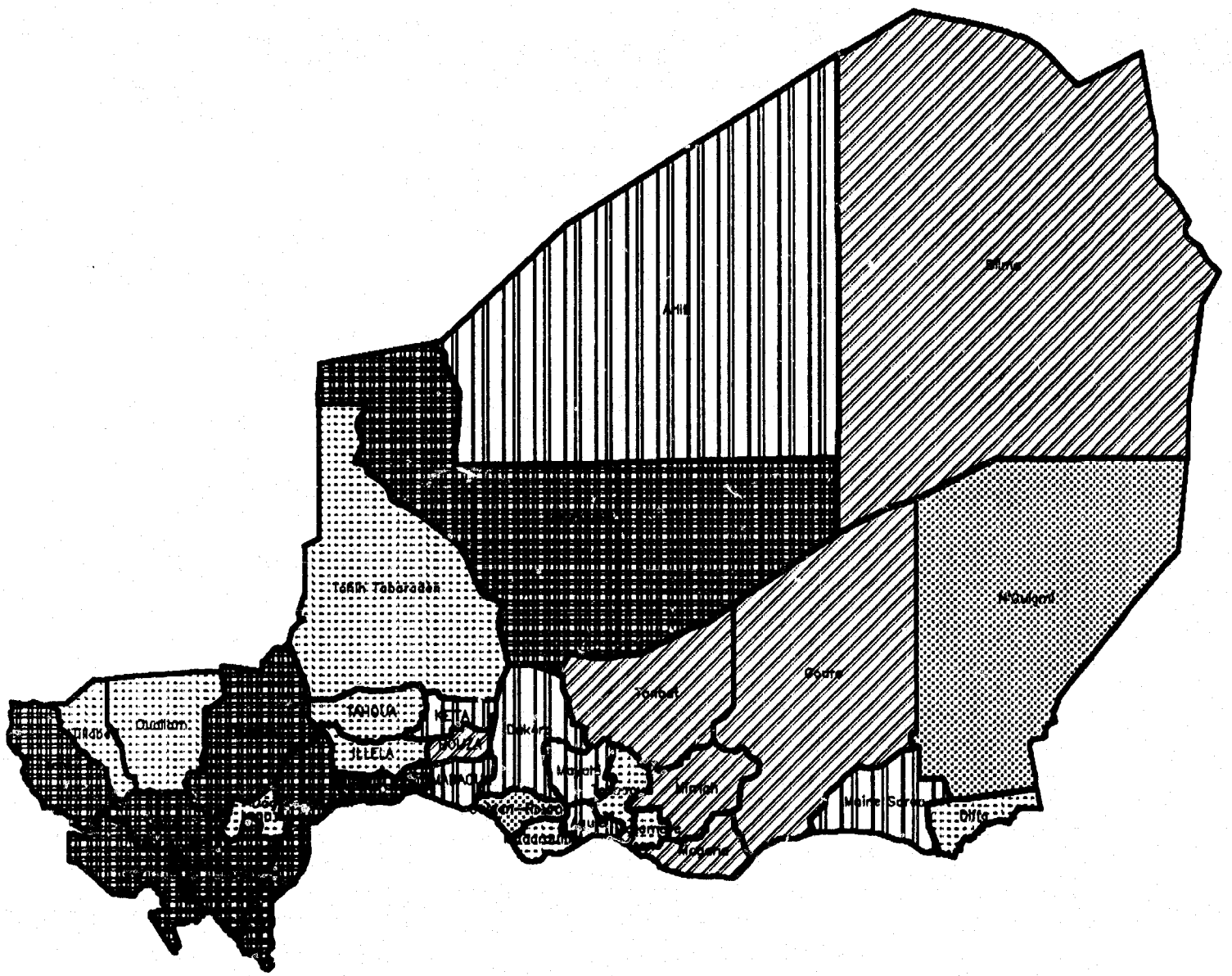


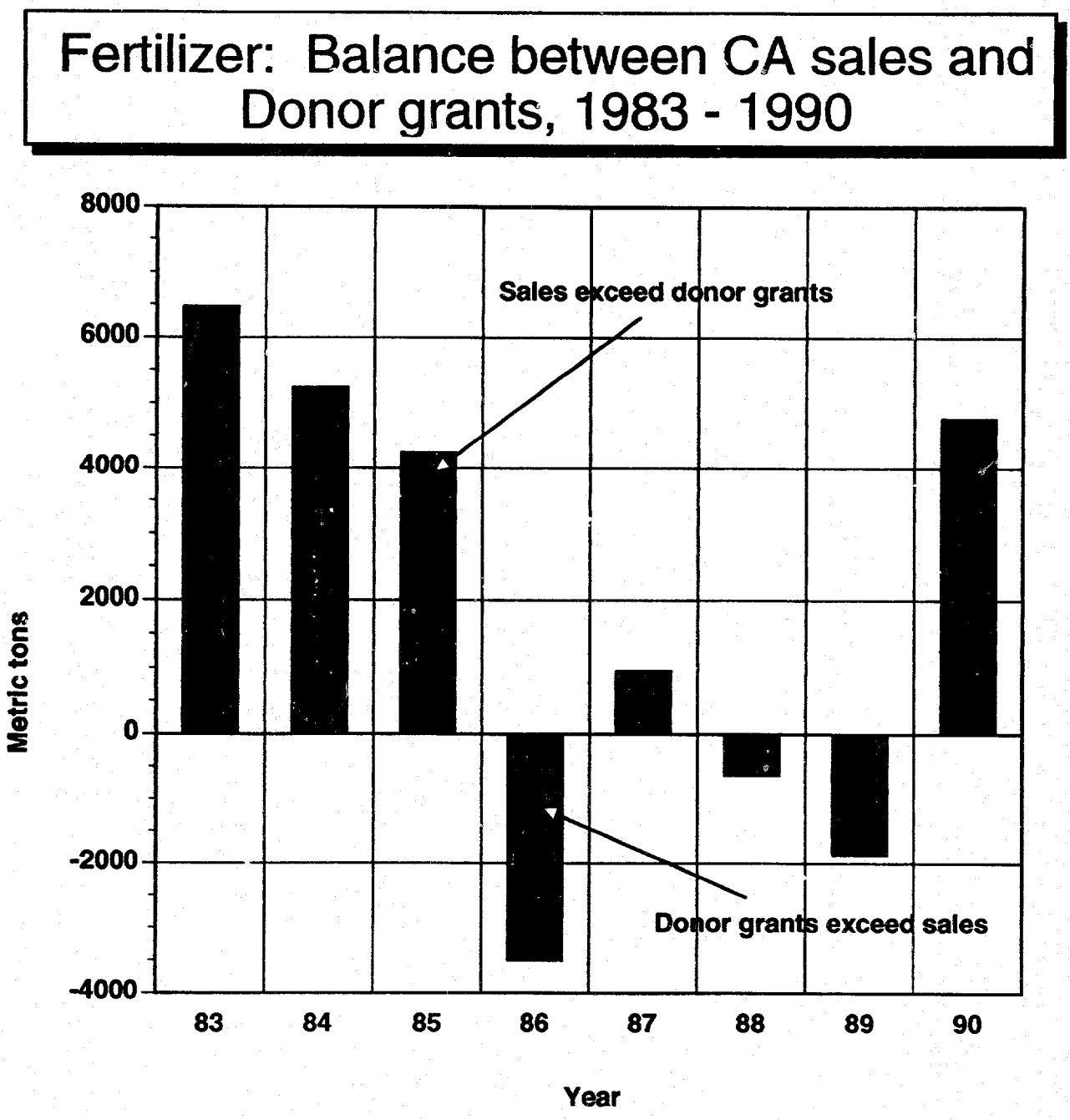
Figure 4: CA Fertilizer Sales
By *Arrondissement*, 1989/90

0 tonne
0 à 2 tonnes
2 à 6 tonnes
6 à 25 tonnes
25 à 151 tonnes
151 à 267 tonnes

Km
0 200 400

Source: C.A et CRED/DEP/MAG/EL

Figure 5



Source: CA, 1991

Table 11: CA Fertilizer Sales By Year and Type, 1981-90
(tons)

Year	Urea	NPK	TSP	SSP	Tahoua	Other	TOTAL
1980/81	4,093	1,609	353	4,786	92	181	11,114
1981/82	3,093	1,709	353	7,999	775	61	13,990
1982/83	2,968	1,404	265	3,285	800	95	8,817
1983/84	2,726	2,136	47	3,824	730	119	9,582
1984/85	3,835	2,503	530	1,584	487	151	9,090
1985/86	2,966	2,237	765	431	11	24	6,434
1986/87	2,121	1,801	246	562	18	35	4,783
1987/88	1,456	1,157	396	648	268	24	3,948
1988/89	1,581	1,342	235	386	30	5	3,579
1989/90	3,740	2,716	189	203	70	22	6,940
Average	2,858	1,861	338	2,371	328	72	7,828

(percent)

Year	Urea	NPK	TSP	SSP	Tahoua	Other	TOTAL
1980/81	37%	14%	3%	43%	1%	2%	100%
1981/82	22%	12%	3%	57%	6%	0%	100%
1982/83	34%	16%	3%	37%	9%	1%	100%
1983/84	28%	22%	0%	40%	8%	1%	100%
1984/85	42%	28%	6%	17%	5%	2%	100%
1985/86	46%	35%	12%	7%	0%	0%	100%
1986/87	44%	38%	5%	12%	0%	1%	100%
1987/88	37%	29%	10%	16%	7%	1%	100%
1988/89	44%	37%	7%	11%	1%	0%	100%
1989/90	54%	39%	3%	3%	1%	0%	100%
Average	37%	24%	4%	30%	4%	1%	100%

Table 12: CA Fertilizer Sales By Department and Type, 1981-90
(tons)

Department	Urea	NPK	TSP	SSP	Tahoua	Other	TOTAL
AGADEZ	1,437	231	0	11	0	21	1,700
DIFFA	215	42	8	22	0	0	287
DOSSO	1,102	1,250	476	9,434	357	66	12,685
MARADI	3,339	501	27	6,814	137	11	10,829
TAHOUA	1,919	1,533	228	716	2,333	176	6,905
TILLABERI	2,858	1,709	1,022	1,307	150	97	7,143
ZINDER	1,260	167	92	3,897	0	28	5,444
CA SIEGE	16,448	13,181	1,526	1,507	305	316	33,283
Total Niger	28,578	18,614	3,379	23,708	3,282	715	78,276

(percent)

Department	Urea	NPK	TSP	SSP	Tahoua	Other	TOTAL
AGADEZ	85%	14%	0%	1%	0%	1%	100%
DIFFA	75%	15%	3%	8%	0%	0%	100%
DOSSO	9%	10%	4%	74%	3%	1%	100%
MARADI	31%	5%	0%	63%	1%	0%	100%
TAHOUA	28%	22%	3%	10%	34%	3%	100%
TILLABERI	40%	24%	14%	18%	2%	1%	100%
ZINDER	23%	3%	2%	72%	0%	1%	100%
CA SIEGE	49%	40%	5%	5%	1%	1%	100%
Total Niger	37%	24%	4%	30%	4%	1%	100%

The CA has had little success marketing the inexpensive rock phosphate from Tahoua. In no department other than Tahoua itself have sales of Tahoua rock phosphate amounted to more than three percent of total sales (Table 12). Attempts to address phosphate deficiencies with this material in the early eighties and once again in 1987 were largely ineffective because of its insolubility and difficulty of application. It is doubtful that much of the rock phosphate delivered was actually applied, as farmers recount stories of using it as a building material rather than applying on their fields.

The superphosphate fertilizers, on the other hand, have in the past accounted for an appreciable portion of CA sales in the three southern departments where rainfed production is important. In Dosso Department, 77 percent of CA sales over the ten-year period 1981-90 were for SSP and TSP (Table 12). Zinder followed with 74 percent and Maradi with 63 percent. As the Table shows, SSP was more widely used than any type but urea during the period. Such is no longer the case, however. The insignificant amount of SSP and TSP sold by the *Centrale* in 1989/90, only 392 tons or six percent of the total (Table 11), demonstrates clearly that rainfed farmers have turned to private sources.

Private Sector Supply

For some time farmers in the border zones of the Maradi and Zinder Departments have had access to fertilizer of Nigerian origin sold by private merchants. As a general rule, the closer they are to the border and the higher the price of fertilizer provided by the CA, the more they have purchased from traders.

Furthermore, as the Nigerian naira has depreciated against the CFA franc, the zone where private purchases are common has expanded to the west through the Dosso Department to the Tillaberi Department. Both movements -- to private sources when the CA price rises and to the western departments as the naira depreciates -- can be demonstrated by comparing reports from the early 1980s with what is known about current conditions.

Heavy Reliance on Private Sources in 1983

Back in 1983 there was ample evidence of private trade in fertilizer from Nigeria. To cite one example, the staff of the Maradi Rural Development Project, one of the donor-supported "productivity projects" then in vogue, conducted a survey of fertilizer use by the members of eight cooperatives in 69 villages. A total of 940 farmers were surveyed. As background, the official price of fertilizer had been raised substantially by the Nigerien Government just two years earlier. The price of single superphosphate (SSP), the most heavily used in the area, almost doubled, from 20 to 35 CFAF per kg. Those who conducted the survey noticed a clear turn toward private suppliers in 1983. In that year 80 percent of the fertilizer purchased by the sample came from private sources.

The survey found that SSP fertilizer was purchased from traders at 3 to 7 CFAF per kg below the CA price. Even greater savings were realized by farmers who crossed the border, sold cowpeas in Nigeria and bought SSP fertilizer there at the equivalent of 13 CFAF per kg.

As would be expected, only a minority of the farmers in the project zone -- 20 to 25 percent -- actually used chemical fertilizer in 1983, but it was clear that those located closer to the border used more fertilizer and used higher doses per cultivated area than did farmers at a greater distance. This phenomenon is still being observed. Jess Lowenberg-Deboer, an INRAN advisor, has noted what he calls "relatively low" usage along the border, diminishing as one moves north to the east-west highway, beyond which virtually no fertilizer is used.

It is obvious that two different effects are at work. As one moves north from the border, increasing costs of transporting fertilizer from Nigerian sources make it more expensive. At the same time, average rainfall is diminishing and the use of fertilizer, especially urea, becomes riskier on rainfed crops.

Further evidence of an active private fertilizer trade in 1982 and 1983 can be found in the lengthy discussion of inputs in a Ronco Consulting Corporation report.[19] Much of the detail in the report was supplied by Ian Pattinson, who was then serving as an agricultural input supply advisor to the CA.[20] Pattinson had found two distinct levels of trade in Nigerian fertilizer. At the top were larger merchants who dealt in quantity and sold either to the CA or to the productivity projects. The Maradi Project, for example, preferred to use the private sector because it had experienced excessive delay in obtaining supplies from the CA.

The larger merchants were able to procure readily from the Nigerian Agricultural Centers and bring shipments across the border with little difficulty until 1983, when stricter controls were enforced by Nigerian border authorities. There have been periodic attempts to clamp down at the frontier but despite the alleged publication of dire threats -- to shoot traffickers on sight in 1990 -- they have succeeded in little more than raising the cost of transporting fertilizer across the border.

Since the larger merchants were reluctant to deliver directly to villages, coops or retailers, small traders, many of them Nigerian, filled the gap. The Ronco report speaks of small traders buying a few sacks from Nigerian farmers for as little as the equivalent of 8 CFAF per kg and selling them in villages on the Niger side for 20 CFAF per kg. Then as now, small merchants relied on private transporters. When a crackdown is in effect they run greater risks at the border than do larger merchants with their own trucks.

As Real Prices Increase, Sales Decline Sharply

The Nigerien Government raised the CA's fertilizer prices again in 1985, at the start of the ASDG project, by about 10 CFAF per kg (Table 13). A final increase, this time of only 5 CFAF per kg, occurred in 1986. Official prices then remained unchanged for four years until they were reduced in 1990.

Table 13: Official Fertilizer Prices, 1981-1991
(CFAF/kg)

Fertilizer Type	1981-83	1984-85	1986-89	1990-91
Urea	50	60	65	40
NPK 15-15-15	45	60	65	45
TSP	-	70	75	45
SSP	35/40	45	50	30
Tahoua Phosphate	28	35	35	25

SOURCE: *Arreté* no. 19/MDR/CA (12 juil. 1985); *Arreté* no. 0065/MAG/EL/UNC/CA (12 juil. 1990); CA

[19]Ronco, *Assessment of Agricultural Inputs and Input Delivery: Niger.* November 1983.

[20]See also Pattinson's trip report of August 1983.

In real terms it may be said that official fertilizer prices actually increased on the order of 10 percent from 1986 to 1990 if the consumer price index for Niamey, which declined by 11 percent in that period, is any guide.[21] It was in 1985/86 that fertilizer purchases from the CA dipped sharply and began a steady decline (Table 3).

The drop in sales being much steeper than the apparent increase in real prices, is its magnitude to be explained by elasticity of demand, poor rainfall, or other causes? In fact, it is reasonable to believe that demand for CA fertilizer declined so markedly because another phenomenon was also at work. The Nigerian naira was depreciating so rapidly against the CFA franc (Tables 14 and 15; Figures 6 and 7) that Nigerian fertilizer, already heavily subsidized, gained a clear price advantage over CA fertilizer.

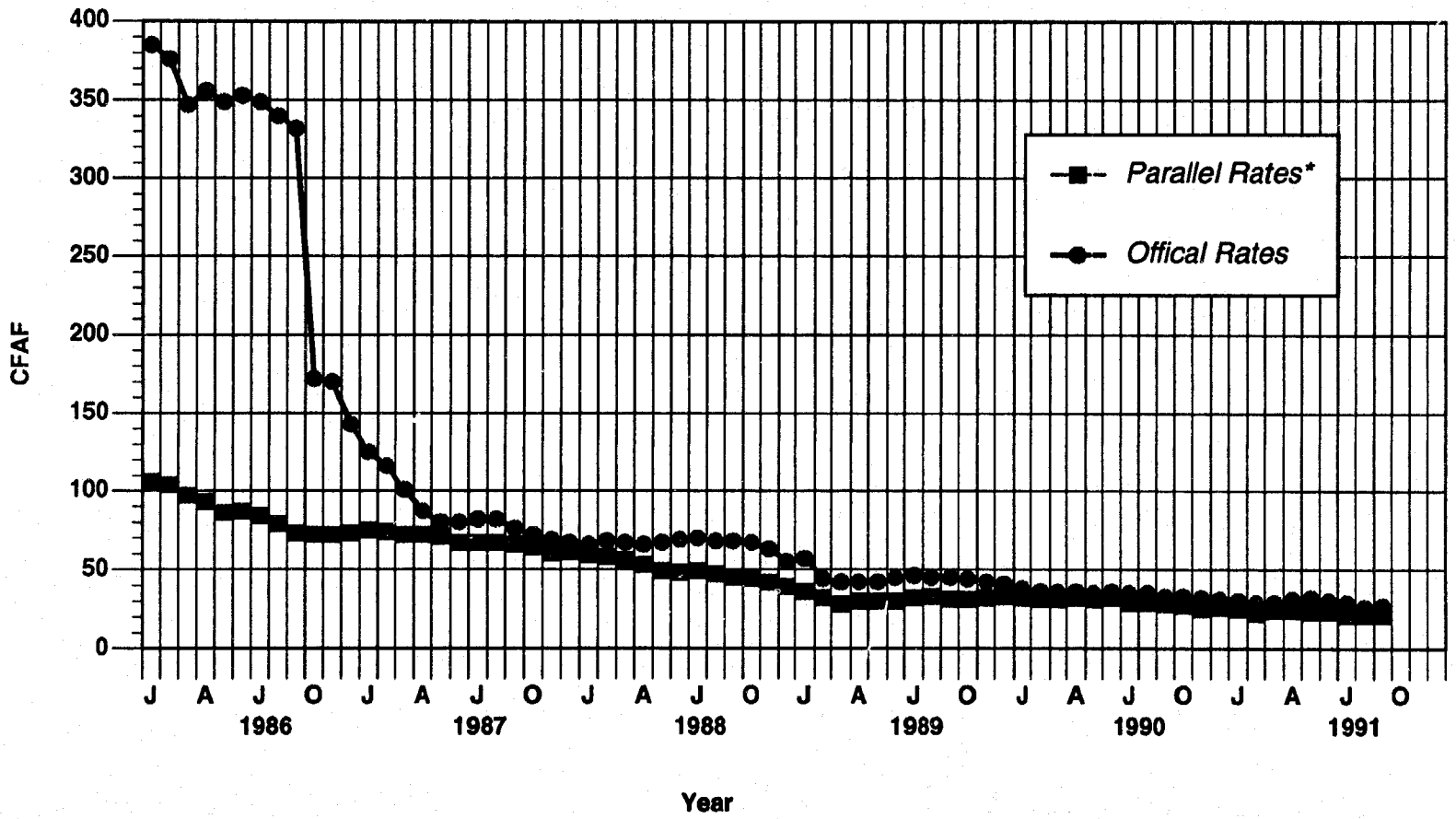
Table 14: Parallel Market Exchange Rates, 1986-1990
(CFAF per naira)

	1986	1987	1988	1989	1990	1991
January	106	75	59	36	32	25
February	104	74	58	32	31	22
March	97	72	56	28	31	24
April	93	72	53	30	32	24
May	86	71	49	30	31	23
June	87	67	48	30	32	23
July	84	67	49	32	29	21
August	79	67	47	33	29	21
September	73	66	45	31	28	21
October	72	64	44	31	27	
November	72	60	42	32	25	
December	73	61	39	33	26	

SOURCE: BCEAO via Ministry of Plan/DAEP
Note: 1991 figures are the average of buying and selling rates.

[21]Based on the *indices annuels moyens des prix à la consommation africaine à Niamey.* Direction de la Statistique et de la Demographie, *Annuaire Statistique: "Series Longues"*, 1991. p. 179. An agricultural price index would be more suitable but none is available.

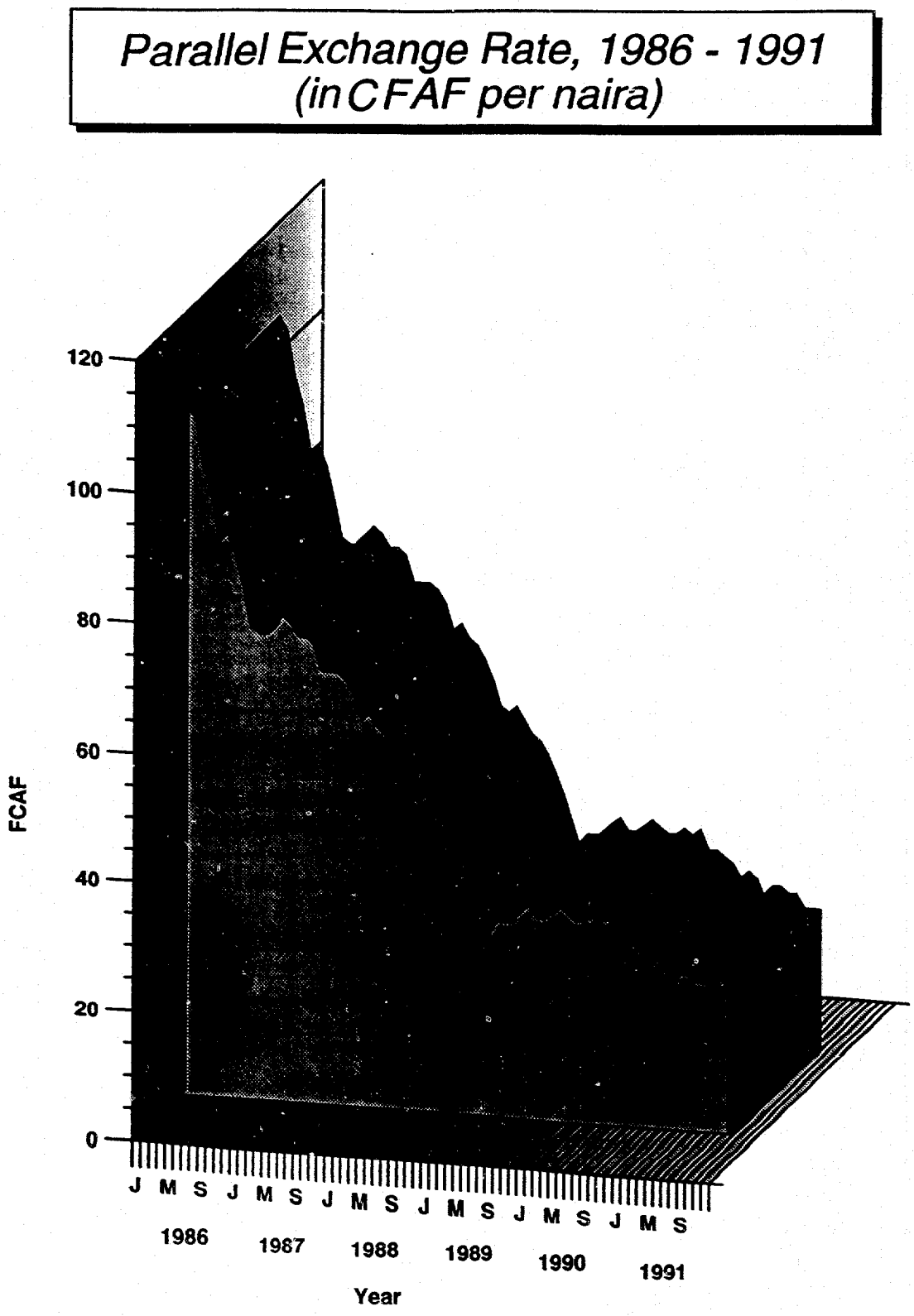
Official versus Parallel Market Exchange Rates, 1986 - 1991 (CFAF per naira)



Source: BCEAO, Niamey 1991
* Parallel rates taken in Zinder

Figure 6

Figure 7



Source: BCEAO, Niamey

Nigerian Fertilizer: Subsidies and Naira Depreciation

The heyday of Nigeria's subsidization began in 1976 during the first oil boom. At that time the Federal Government began to subsidize 75 percent of the delivered cost. State Governments later became responsible for one-third of this amount. By 1984 the overall subsidy had been reduced to 35 percent Federal and 15 percent State, a total of 50 Percent.[22] But as the Nigerian economy turned down, the naira depreciated against the franc faster than withdrawal of subsidies caused Nigerian fertilizer prices to rise.

Early in the decade, fertilizer prices expressed in both naira and CFAF were very low compared to world prices. In July 1983 while visiting Gaya, the agricultural input supply advisor of the CA observed that the "purchase price of [SSP] in Nigeria was said to be 3 naira/sack 50 kg."[23] It is unclear whether this was the official, subsidized price or an open market price, but it was probably the former. At the time the official exchange rate transformed one naira into 365 CFAF and on the black market the naira was worth less than half that amount, 175 CFAF (Figure 6).

Table 15: Official Exchange Rates, 1986-1991
(CFAF per naira)

	1986	1987	1988	1989	1990	1991
January	385	125	66	57	38	30
February	376	116	68	44	36	29
March	347	101	67	42	36	29
April	356	87	66	42	36	31
May	349	80	67	42	35	32
June	353	80	69	45	36	30
July	349	82	70	46	35	29
August	340	82	68	45	35	26
September	332	76	68	45	33	27
October	172	72	67	44	33	
November	170	69	63	42	32	
December	143	67	55	41	31	

SOURCE: BCEAO via Ministry of Plan/DAEP.

[22]S.O. Olayide and Francis S. Idachaba, "Input and Output Marketing Systems: A Nigerian Case" in J.W. Mellor et al., eds., *Accelerating Food Production in Sub-Saharan Africa.* Baltimore: Johns Hopkins University Press, 1987. p. 174.

[23]Ian Pattinson, "Trip report (20 July - 2 August) (Zinder, Maradi, Tahoua Dosso Departments.)" August 1983. p. 26.

Niger Lowers Prices

No doubt mindful of the inroads being made by Nigerian fertilizer, in mid-1987 the Nigerien government tried a sale of fertilizer more than one year old. Prices were cut drastically (Table 16) but sales did not pick up. The late announcement of the sale in some locales, *e.g.* the end of July in Tahoua Department, probably lessened its impact considerably. By then it was clear that the rains were poor, and this outcome clearly depresses fertilizer use on rainfed crops, as we have mentioned.

Table 16: Special Sale Prices of Old Fertilizer, 1987 (CFAF/kg)

Fertilizer Type	Regular Price	Sale Price Dosso Dept.	Sale Price Tahoua Dept.
Urea	65	30	25
NPK 15-15-15	65	30	25
TSP	75	40	40
SSP	50	20	30
Tahoua phosphate	35	10	10

SOURCE: CA

Fertilizer prices were nonetheless much higher in naira terms than they had been in 1983. An American researcher working in 1988 in Kaduna State, Nigeria, found the official price to be N11 per 50 kilogram bag while on the open market a bag was selling for from N14 to N32 depending on the period of the year.[24] At first glance it would seem that subsidy reduction across the border should have made imported Nigerian fertilizer more expensive when compared to CA fertilizer. In the five intervening years, however, the official exchange rate of the naira had fallen to 68 CFAF and the parallel market rate to 48 CFAF.

In CFAF franc terms, therefore, the official Nigerian price for a bag had at the worst stayed constant at about 525 CFAF (parallel market rate) or had in fact dropped from 1,095 to 750 CFAF (official rate) *despite* the subsidy reduction. Even purchases on the open market at the maximum naira price of N32 per bag cost only about 1,500 CFAF or 30 CFAF per kilo if currency was converted on the parallel market. On the Niger side of the border the price of CA fertilizer in 1988 was considerably higher at 50 CFAF per kg for SSP and 65 CFAF for urea (Table 13).

By May 1990, the start of the rainfed crop season, prices remained very attractive in CFAF terms. A 50 kg bag was selling for 40 naira on the open market in Kaduna.[25] By then the parallel market exchange rate had fallen to 31 CFAF. In CFAF terms, a bag cost only 1,250 CFAF or 25 CFAF per kilogram. Six

[24]Private communications from Chris Udry, PhD candidate, Department of Economics, Northwestern University. Udry observed fertilizer transactions in Zaria and neighboring villages from May through December 1988.

[25]Information provided to USAID Niger by the Kaduna Consulate (Kaduna 00611 of May 10, 1990).

months later the exchange rate on the parallel market had declined further to 25 CFAF so that a bag cost only 1,000 CFAF.[26]

Purchased in Kaduna at this low rice, a bag of fertilizer could be delivered to the Nigerien side of the border for little more than 2,000 CFAF, payoffs included, according to URC officials in Dosso who were interviewed in December 1990. The Dosso URC director estimated 500 to 1,000 CFAF as the cost of transportation plus under-the-table payments to Nigerian authorities to allow the fertilizer out of the country. Others gave slightly higher estimates.

In mid-1990 CA prices were lowered 30 to 40 percent across the board on fertilizer (Table 13). The reasoning behind this move was set forth in a letter from the Minister of Agriculture to the Minister of Planning in May 1990. Noting that the CA's sales figures had been slipping for a decade, the former stated that the basic cause for the decline was an increase in official prices to the point where farmers, deprived of rural credit facilities, could no longer afford to buy fertilizer. In fact, as we have seen, real prices had risen slightly since 1986, even though nominal prices were unchanged. It was also true that the dissolution of the government's agricultural credit agency (CNCA) had removed a source of credit, but most CNCA credit had been used for the purchase of animal traction implements, not for fertilizer.

In his letter, the Agriculture Minister revealed the real culprit, almost as an aside: CA prices were considerably higher than those prevailing in the private sector. Since most of the CA's fertilizer was donated gratis by donors, he reasoned, this was an abnormal state of affairs. An official price reduction would not cost the government anything. It might have a negative impact only on the amount deposited in the Planning Ministry's counterpart fund after the CA's expenses had been deducted. Yet if the CA sold a lot more fertilizer, the Minister might further have reasoned, the counterpart fund would not suffer at all. Accordingly, in July 1990 -- late in the season once again -- a price-reducing decree was issued.

VII. INSTITUTIONAL ANALYSIS OF THE CA

Evolution of the CA

The *Centrale d'Approvisionnement* was badly organized at the outset and nearly disappeared under unmanageable debt in the latter half of the 1980s. Never endowed with any working capital, the CA got into deep trouble because it had to rely on the unreliable, the national agricultural credit bank (CNCA). This institution, now defunct, was for a period both the CA's source of credit and its collection agent at the local level, bizarre as this may appear.

The CNCA loaned operating funds to the CA, which otherwise had only a variable government subsidy that invariably arrived late.[27] Since there were no CA agents outside of Niamey except warehousemen,

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[26]Parallel and official exchange rates provided by the BCEAO both directly (1990-91) and via the Ministry of Plan (1986-90). Data were collected in Zinder. See Tables 14 and 15 for monthly data since 1986.

[27]The SEDES sector study, *Etude du Secteur Agricole du Niger: Bilan Diagnostic -- Phase 1*, 1988, points out that the subsidy often arrived in April or May instead of October as was desirable and intended. (p. 213)

The CNCA had little incentive to pass the payments promptly to the CA since the longer the cash was held, the more the CA would have to borrow to function and the more interest it would have to pay to the CNCA. Payments habitually sat for months at the department level before being transferred to Niamey, where they could finally be credited to the CA.

When a Ronco Consulting Corporation team attempted to calculate the CA's delivery costs in 1982, it found that almost two-thirds of the total represented interest payments to the CNCA. This raised the average delivery cost of a kg of fertilizer to 18 CFAF in 1982. If there had been no interest charges the cost of delivery would have been only 6.5 CFAF per kg, according to Ronco's calculations. By 1983 the burden of finance charges owed to the CNCA was even heavier. For the fiscal year the charges had increased from 278 to 379 million CFAF and represented 72 percent of delivery costs.

Subsidization of the CA

The seriousness of the CA's debt problem could remain hidden while the organization received substantial subsidies from the government. Between 1974 and 1986 the CA received almost 4.4 billion CFAF in subsidy (Table 17).

Table 17: Government Subsidies to the CA (millions of CFAF)

	CSPPN	FNI	TOTAL
1973-74	-	-	35
1974-75	-	-	40
1975-76	-	-	81
1976-77	-	-	338
1977-78	-	-	370
1978-79	*420	*270	*480
1979-80	200	250	450
1980-81	300	300	600
1981-82	300	300	600
1982-83	300	-	300
1983-84	-	-	550
1984-85	-	-	0
1985-86	-	-	250

SOURCES: MAG/MTEP-SEM/CA, "Rapport de Mission Conjointe," 1986, p. 4. Ronco Consulting Corp., *Assessment of Agricultural Inputs and Input Delivery*, November 1983, p. 25.
Note: *The Joint Mission report shows a total of 480 million in 1978-79 but the Ronco report shows 420 million from CSPPN and 270 million from FNI.

Part of the subsidy came from the government's price stabilization fund (CSPPN), which obtained revenues from taxes on petroleum products, according to the Ronco report. The other part came from the National Investment Budget (FNI). There appears to have been a hiatus in the subsidy in 1985[29], but there was no direct subsidy at all in 1987 and has been none in subsequent years.

It is worth remembering here that the two primary motives for the subsidy-reduction element of the ASDG agreement were (i) to reduce government outlays and thus reduce budget deficits, and (ii) to improve the efficiency of fertilizer use. The first objective was achieved to a large extent almost immediately: by the third year of the ASDG agreement, the direct subsidy payment to the CA had been eliminated.

It may be argued that some forms of indirect subsidy of agricultural inputs remained. For example, to the extent that ONAHA has paid for fertilizer used by farmers on irrigated perimeters and sought less than full reimbursement, ONAHA would incur a corresponding budgetary deficit. One way of providing such an indirect subsidy would be to include a fertilizer line item at less than cost in farmers' seasonal payments for services (the *redevance*). The *Retrospective Study* pointed out that in 1986 ONAHA included fertilizer for some perimeters but not for others. The policy at the time was to remove fertilizer from the *redevance* on all perimeters. From all indications, the policy has been successfully implemented and this source of indirect subsidy eliminated.

Government salary payments for CA employees would be another form of indirect subsidy, but it appears that of the 28 employees working for the *Centrale* in November 1991 only one was being paid by the government. The others are the responsibility of UNC and the *Centrale*.

Levels of Subsidy

To permit the sixth resource transfer under the ASDG Grant Agreement, it is required that the subsidy level on inputs be no more than 15% now that the Grant period is ending.[30] Yet, despite the fact that no direct subsidy has been paid since 1986 and that the only identifiable indirect subsidy is one individual's salary, the question of the "level of subsidy on fertilizer" and other inputs has not been entirely laid to rest.

Even as late as the evaluation of ASDG in 1989 by Louis Berger International, there was still discussion of whether fertilizer should not be valued at world market levels translated into border prices. If that were the case, the level of subsidy would remain well in excess of 15%. For example, the local merchant who imported Japan's fertilizer grant in February/March 1990 stated in an interview that the full cost of the urea shipment delivered to CA warehouses in Niamey was 180-190 CFAF/kg and that of NPK 15-15-15 even higher at 230 CFAF/kg.[31] The border price would be somewhat but not much less. By contrast, in July 1990 the CA's asking price for urea was only 40 CFAF/kg and for NPK was only 45 CFAF/kg.

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[29]The Louis Berger International evaluation of the ASDG project in 1989 contained tables (2-4 and 2-10) which show a subsidy of 389 million CFAF in 1984-85. The Joint Mission report and the Ronco report show no subsidy in that fiscal year.

[30]The SEDES study remarks that even prior to 1986 the subsidy on inputs was so modest in terms of agriculture's share of GDP (less than 0.4 percent) and in terms of value per farm unit (355 CFAF or half a day's labor) that it seemed paradoxical to question it on financial or budgetary grounds. The authors felt strongly that it was more important to focus on the fact that Nigerien farmers used distressingly low levels of inputs because benefit-cost ratios were too low. As a consequence they were mining the soil of nutrients. SEDES, *op. cit.*, p. 211.

[31]From an interview with Maazou Aboubacar in December 1990.

In the context of the ASDG agreement, however, the world price is irrelevant. The issue was settled early. Project Implementation Letter (PIL) no. 9 of 12 December 1985 specified that the rate of subsidy would be based on the difference between the price which the government pays to commercial suppliers and the price which farmers pay. PIL no. 11 of 25 June 1987 stated that when fertilizer is donated at no cost to the government, the shadow price to be used is the CIF price of fertilizer imported from Nigeria. With the exception of some 870 tons purchased in 1990 and 1991[32], all of the CA's fertilizer in recent years has been granted by donors. As we elaborate elsewhere, with the continued depreciation of the Nigerian naira, the shadow price remains below the CA price and therefore under the terms of PIL 11 there is no "subsidy" on donated fertilizer.[33]

With regard to the open market purchases, they were made for 5 CFAF/kg less than the official retail price. Even though distribution costs will have exceeded 5 CFAF/kg, the wording of PIL 9 is such that no subsidy would be involved. However, the purchase of 500 tons of SSP in February and March 1990 was concluded for 45 CFAF/kg at a time when the retail price was 50 CFAF/kg. In July 1990 the price of SSP was lowered to 30 CFAF/kg (Table 13). Any of the purchased SSP sold at the new price would have been inadvertently subsidized since it was sold for less than the purchase price. There is no record, however, of how much was sold before and how much after the price change.

Budgetary Savings

Elimination of the direct subsidy from the Price Stabilization Board (CSPPN) and the Investment Budget (FNI) have clearly resulted in measurable savings to the Nigerien government. The Louis Berger International evaluation (DEG) attempted to estimate the total amount of savings in government outlays that can be attributed to the ASDG reforms. Their calculations showed cumulative savings of over 1.7 billion CFAF in the three year period 1984-85 through 1986-87. Close examination of their figures (DEG, 39) reveals computational errors, however. Using their method, one finds the correct estimate of budgetary saving to be just under one billion CFAF. We would maintain, nonetheless, that it is almost impossible to determine an accurate budgetary impact of subsidy removals given the poor quality of the CA's financial reports for the period in question.

How the CA Coped: Donor Grants

When the CA lost its direct subsidy, was burdened with debt and had no operating capital, how did it manage? The debt problem was resolved with a stroke of the pen in June 1987 when the UNC assumed control of the CA and in return the government absorbed all the input agency's liabilities, including its 982 million CFAF debt to the CNCA.[34] Not long afterward, the agricultural credit agency itself went out of business.

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[32]Open market purchases: 500 tons in 1990 and 370 tons in 1991 (Table 6).

[33]In its 1989 evaluation, Louis Berger International agreed that "using the Nigerian price as a benchmark, the target levels for the reduction of subsidy have been well exceeded." (p. 15) The evaluation used 45,000 CFAF/ton as the landed price of Nigerian fertilizer. This is the equivalent of 2,250 CFAF per 50-kg bag. Current estimates are lower in CFAF terms.

[34]*Rapport de Mission Conjointe, op. cit.*, p. 5. The CA also owed 105 million to Nigerien suppliers and 291 million to Japanese and Canadian suppliers as of 5/31/86. In a letter to the President of the UNC, the Minister of Agriculture proposed to absorb the debts and cede the CA's buildings and equipment to the UNC. (No. 01715/CAB/MA dated 20 August 1986).

Even when relieved of its debt burden, the *Centrale* was hardly in a position to purchase much fertilizer. In fact, as the *Retrospective Study* pointed out, by 1983 the CA had already stopped relying on large purchases of Nigerian fertilizer from private merchants. The CA was looking for grants from donors, principally Canada, Japan, the Netherlands and the FAO. By 1986, 90 percent of the CA's fertilizer came from donors.

The Counterpart Fund

The donors paid not only for the fertilizer but also for delivery to warehouses in Niamey leased by the CA. The input agency paid only for distribution from its central depot to the interior. After deducting a fixed amount to cover these distribution costs, the CA was required to send the remainder of fertilizer sale proceeds to a counterpart fund account in the rural development bank (BDRN) managed by the Planning Ministry. From the inception of the account until 31 January 1990, the Ministry spent 410 million CFAF on a wide variety of projects including the transportation of emergency food aid. When the BDRN collapsed in early 1990, the account was frozen. The *Centrale* has made no deposits in this or any other counterpart fund since then.

In preparing this report, we discovered that the government-to-government agreements under which Japan provided fertilizer, agricultural chemicals and vehicles to Niger called for deposits in the counterpart fund of the CFA franc equivalent of two-thirds of the f.o.b. value of the donated commodities. The f.o.b. value of Japanese NPK, for example, may be as high as 230 CFAF/kg, and this would require a counterpart fund contribution in excess of 150 CFAF/kg.

Even if the CA were making deposits today, which it is not, the amount deposited for a NPK sale would not exceed 30 CFAF/kg. Has some other entity in the Nigerien government been making up the difference? If so, a case could perhaps be made that the fertilizer subsidy had returned with a vengeance since the government was paying into the fund so much more than it was receiving in sales revenues.[35] The *Service des Fonds Exterieurs*, however, a unit of what has been the Planning Ministry's DFI, maintained in November 1991 that no counterpart fund deposits had been made in addition to those of the *Centrale*. The agreements with Japan have not been respected to the letter, and it appears that the issue has been raised in government councils.

Distribution Costs

Back in 1985 the amount to be deducted to cover the CA's distribution costs was set at 15.658 CFAF per kg.[36] Inflation or no, price changes or no, the amount has remained precisely the same ever since. As the Ronco team's analysis showed, this amount was too low if CNCA debt had to be paid, and it was too high if there were no debt.

There is some confusion in the *Centrale* today about what is included in the figure of 15.658. One official believes it covers only transportation and handling (*manutention*). But if it does not also cover the CA's other operating costs such as salaries and storage at the central depot, which may be substantial, how is

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[35]It would probably be necessary to show, however, that the counterpart fund was being used for incremental activities or projects, ones which the government would not otherwise have funded out of some other budget.

[36]The figure is from "Programme d'Approvisionnement en Intrants Agricoles et Proposition de Prix de Cession, Campagne 1985/1986." A study by Boubacar Bah and Associates/BECIS for USAID in the same year used 15.553 CFAF/kg. Eighteen percent of this amount was for maintenance, repair and amortization of vehicles. "Etude sur la subvention aux intrants agricoles." 1985. p. 7.

the CA to survive? Despite a smaller volume of business, there are still 27 staff on the CA's payroll and until canceled recently because of depleted stocks, leases for the CA's Niamey warehouses were each costing 200,000 CFAF per month.

Variable distribution costs actually may not have risen much since 1985, the Niamey consumer price index having declined in the interim. In January 1989, the University of Michigan team advanced a figure of 25 CFAF/kg for "handling and transportation costs,"[37] but this may be more of a gross estimate than a reflection of actual cost increases. It is difficult to tell because the CA admits it has made no attempt to recalculate its distribution costs since 1985. This oversight is just one example of the atmosphere prevailing in the agency.

The Centrale's Accounts

We have alluded to the poor quality of the CA's accounts. In November 1991 the agency had produced no annual statement for the three previous fiscal years as it approached the end of the current year. The 1987-88 and 1988-89 statements were said to be almost ready but lacking in commentary, while the 1989-90 statement was still in preparation. We were nonetheless allowed to look at the aggregate figures for the two earlier years. We obtained little elucidation of the numbers because the chief accountant had spent four years in training in Côte d'Ivoire and lacked familiarity with details.

As reflected in Table 18 below, the bottom line is that despite donor grants the *Centrale* operates at a loss. It manages for the moment:

- by drawing down inventories of equipment, fertilizer and other resources that it inherited when transferred to the UNC;
- by relying on Japanese grants of fertilizer, equipment (motorpumps to be sold) and trucks (two 10-ton and two 25-ton trucks delivered in 1990);
- by postponing deposits into the counterpart fund on the grounds that the BDRN account is frozen and no agreement has yet been reached with the former Planning Ministry on setting up a new account in the BCEAO or elsewhere; and
- by postponing payment of other bills such as those for animal traction equipment purchased from the Zinder workshop (UCOMA).

This method of coping is seriously undermined by the failure of some AHA cooperatives to pay for fertilizer, as previously mentioned. An official of the CA stated in November 1991 that while the agency owed 350 million CFAF to the counterpart fund, the arrears owed by AHA cooperatives to the CA exceeded that amount.

When it evaluated ASDG in 1989, Louis Berger International (DEG) estimated in one part of its report that "the CA was actually running a substantial operating surplus" (DEG, 11). The report is undoubtedly more accurate in another section where it showed an "actual operating deficit" of considerable proportions, declining from 2.8 billion CFAF in 1983-84 just before the reforms to 957 million CFAF in 1986-87 (DEG, 39).

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[37]Michigan Team, "Agricultural Inputs, Version 2.0," p. 11.

Table 18. Unofficial CA Financial Statement, 1988-89 (in millions of CFAF)

Sales revenues	381
Grants	126
Other earnings	96
Total revenues	603
Less: value of goods sold	332
	271
Less: personnel and other costs	347
Net operating gain (loss)	(76)

SOURCE: CA accounting data

We have found it difficult to clarify either these DEG estimates for earlier years or the murky presentation of the CA's 1987-88 and 1988-89 accounting data which we received. The *Centrale* clearly operates at a loss and cannot continue to do so much longer. The agency appears to have incurred costs of 347 million CFAF in storing and distributing inputs that fetched only 381 million CFAF in sales revenues. Without donor assistance, the *Centrale* would not have survived.

The Centrale: A Bilan

In a few small ways the CA did improve its operations since the start of the ASDG agreement, but for the most part it has remained the same. A balance sheet would show that on the positive side, the CA has:

- o divested itself of the four farm equipment workshops (*ateliers*), whose sales have diminished in the face of competition from entrepreneurial blacksmiths;[38]
- o reduced its farm equipment activity while operating in a somewhat more businesslike fashion, requiring the workshops to bid against each other and buying from the lowest bidder;
- o kept fertilizer losses to less than two percent of sales (120 tons lost for various reasons in 1989/90, of which 80 tons were the object of an embezzlement in one *arrondissement*).
- o escaped a burden of debt;
- o made an attempt to improve internal management, stock monitoring and accounting[39]; and
- o renewed its fleet of trucks with help from Japan.

In sum, on the positive side the CA has gently ceded market share in both equipment and fertilizer to the private sector while continuing to serve those cooperatives that wish to use the official input agency for one

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[38]The UCOMA workshop in Zinder is probably an exception. A CA official who deals with UCOMA maintains that it is able to keep prices lower than those of the others because it obtains much of its raw material from Nigeria. Nonetheless, several independent blacksmiths who once worked at UCOMA are even more competitive in selling equipment to farmers in the area. The CA's equipment sales in Zinder Department are minuscule (Appendix Table B).

[39]"Agricultural Inputs, Version 2.0," *op. cit.*, pp. 5-6.

reason or another. As the *Centrale*'s director puts it, the CA is able to compete with the private sector on the irrigated perimeters and in other zones at a distance from the Nigerian border for three reasons: quality, price and terms.

- o First, CA fertilizer is considered by some to be superior to private merchants' Nigerian urea which is said to arrive in Niger in bags adulterated with ash and short in weight;
- o second, CA prices have been competitive since July 1990; and
- o third, farmers in AHA cooperatives know that they can successfully delay making payment for several months, despite the CA's official policy to the contrary, a gambit which private merchants would probably not tolerate.

On the negative side, the CA has:

- o experienced a sharp drop in the quantities it handles so that fixed costs are spread much more thinly;
- o continued to live hand-to-mouth without operating capital;
- o become almost totally dependent on donor contributions;
- o continued to carry the inventory burden of old farm equipment and chemicals for which, except for carts, plows, toolbars, motorpumps and one fungicide, there is very little demand (see Appendix Tables B and C);
- o remained in limbo -- absorbed on paper by the cooperatives (UNC) yet acting like a government agency; and
- o despite use of a computerization, been unable to track the disposal of inputs or to maintain financial accounts with timeliness or much accuracy.

In sum, with its apparent ineptitude the CA gives off the classic appearance of a government agency that has lost its reason for being. Officially, it is in a transitional stage leading to new, independent status as a supplier cooperative with its own capital, raised by contribution from producer cooperatives. This idea has been bandied about for years but is no closer to reality now than it was when ASDG began.

In fact, viable independent status is probably no more than wishful thinking for two reasons: the recessionary state of the economy and the collapse of the BDRN. The rural development bank's demise has had severe repercussions on all its depositors. The cooperatives were among them. With their savings blocked and in all likelihood lost, the co-ops, like the CA and RINI, try to stay afloat by holding cash, whether it belongs to them or not. Thus, the cooperatives delay passing sales proceeds to the CA, just as RINI does not pay rice farmers and they in turn do not pay the CA.

How long can the current, uneasy "transitory" stage last? It is quite likely that the CA will disappear before it ever becomes a viable supplier cooperative. Unless it is soon reorganized, slimmed down, re-targeted and made more efficient, the fate is probably deserved.

VIII. IMPACT OF REFORMS ON FERTILIZER USE, MARKETING, AND DISTRIBUTION

The best direct source of information that we have regarding the impact of reforms on fertilizer marketing and use is a set of surveys of cooperatives and traders. The co-op surveys give us detailed information regarding the pattern of fertilizer purchase and use on irrigated perimeters, the most intensive and dependable source of fertilizer demand. They suggest that these farmers have had little difficulty satisfying their demand for fertilizer in the face of CA contraction, and to the contrary, that these farmers benefit from competition between private traders and the CA. The surveys with traders provide less substantive data regarding private sector activity, but they do present an interesting picture of a reasonably large group of merchants with experience in the trade, many of whom appear poised to fill market opportunities where demand exists.

Analysis of Surveys of Cooperatives

In 1989 ONAHA attempted to monitor fertilizer use on irrigated perimeters that it managed. The technical consultant to ONAHA believed that actual purchases and use of fertilizer might be quite different from the level of recommended applications. A questionnaire was designed and sent to 43 cooperatives representing farmers on ONAHA perimeters. The questionnaire was self-administered, leading to some inconsistencies and delays in responses. Nonetheless, 30 cooperatives provided reasonably complete responses on fertilizer purchases, use, method of payment, and stocks. In principle, this questionnaire covered purchases and use for two campaigns, rainy season 1988 and dry season 1989.

By February 1991 the data from the completed questionnaires had not been entered or analyzed by ONAHA. The University of Michigan technical assistance team was given access to the questionnaires, and with the cooperation of ONAHA, extended the survey to cover 39 cooperatives (including 5 non-ONAHA cooperatives), with data through the dry-season 1991 campaign (Tables 7 and 19). The 1988-89 survey covered almost 80 percent of the ONAHA perimeters though only about half of the irrigated area. By 1990-91 coverage had expanded to over 90 percent of cooperatives and area. Though the data collected in these surveys are insufficient to enable us to conduct time series analysis on purchases and use, they do give a good picture of the fertilizer market for the irrigation subsector.

Table 20 shows the crops and fertilizer applications reported in the surveys. The major portion of irrigated land is planted to rice, with about 5 percent each to cotton and sorghum. In all, we have data on almost 20,000 hectares planted between 1988 and 1990. Table 20 includes recommended doses of fertilizer by crop. For rice, cooperatives report that the recommended doses of urea and NPK are about equal. Only a few of the cooperatives report single or triple superphosphate or DAP as recommended, almost always in 100 kg/ha doses and as a substitute for the NPK composite fertilizer. Total reported recommended doses were just over 400 kg/ha for rice and about half that for other crops.

TABLE 19: Data on ONAHA Cooperatives in Surveys (area in ha)

Sector	Number of Cooperatives: ONAHA	Number of Cooperatives: 1988-89 Survey	Number of Cooperatives: 1990-91 Survey	Total Area Available	Area Cultivated 1988-89 Survey	Area Cultivated 1990-91 Survey	Number of Farmers 1990-91 Survey
Niamey	12	11	11	2,819	2,656	2,428	7,390
Tillaberi	17	13	15	4,203	2,362	3,959	9,390
Tahoua	6	5	6	3,592	1,006	3,560	5,030
Maradi	1	1	1	512	0	512	716
Gaya	1	1	1	120	0	101	256
TOTAL	37	29	34	11,246	6,024	10,560	22,782

Table 20 also shows actual use as reported by cooperatives. It is interesting to note how close reported use is to reported recommendations for both survey periods. This suggests that farmers on irrigated perimeters have not been constrained in acquiring he amount of fertilizer they desire as a result of the policy reforms.

Examination of total fertilizer purchases by cooperatives reveals that urea and NPK were purchased in about the same proportions as respondents claimed to have used them (Table 21). A total of just over eleven thousand tons of fertilizer were purchased, 53 percent of it urea, 44 percent NPK, and only 3 percent other forms. There was no discernable change in type of fertilizer purchased between the two survey periods.

When we look at the source of purchases, we find that the CA accounted for one-third of the fertilizer used on irrigated perimeters over the entire period (Table 22). In 1988 the CA market share was only one-quarter, though it rose to almost 40 percent by 1990, when CA prices fell. Interestingly, the amount of fertilizer sold to these cooperatives by private traders during 1988 -- almost 3,400 tons -- about equals total national sales by the CA that year. The CA sold only 1,200 tons to our reporting cooperatives.

Since the 1988-89 survey covered only one half of the area irrigated, it is possible that total CA sales to ONAHA perimeters amounted to about 2,400 metric tons, which would mean that another 1,200 tons went elsewhere, to farmers growing either dry-season crops or rainfed crops. The more complete data for 1990-91 also support the observation that about one-third of CA sales go to farmers other than those on ONAHA perimeters.

Broken down both by type of fertilizer and supplier (Table 23) there appears to be little difference in what the CA and private merchants sell. Slightly more of the CA sales were of urea than NPK, while the opposite was true for merchants. On the other hand, almost the totality of other fertilizer types (TSP, SSP and DAP) were sold by the CA, though total quantities of these were quite small. While this might indicate a greater ability of the CA to deliver specialized formulations, there is no reason to believe that this represents anything more than the CA's disposing of stocks delivered to it by donors.

TABLE 20
Area Planted by Crop and by Survey Year

	Area Planted by Crop & Survey (ha)				Area Planted by Crop and Survey (percent)		
Crop	Surv #1	Surv #2	Total		Surv #1	Surv #2	Total
Cotton	351	530	881		6%	4%	5%
Mil-Sor	501	513	1,014		9%	4%	5%
Rice	4,740	11,370	16,109		81%	88%	86%
Seedbed	276	484	760		5%	4%	4%
Other	0	48	48		0%	0%	0%
Total	5,868	12,944	18,812		100%	100%	100%

Theroretical Use as Reported by Cooperatives (Kg/ha):

Crop	Urea	NPK	TSP	DAP	SSP	Total	Surv #1	Surv #2
Cotton	83	162	200			215	250	194
Mil-Sor	73	124	200			161	175	150
Rice	214	188	102	90	70	421	378	439
Seedbed	177	175	100			295	259	314
Other	102	173				132		132
Average	181	178	116	90	70	334	301	349

Note: Totals show average of total fertilizer recommeded and do not equal sums by fertilizer type

Actual Use as Reported by Cooperatives (kg/ha):

Crop	Urea	NPK	TSP	DAP	SSP	Total	Surv #1	Surv #2
Cotton	57	149	0	0	0	207	249	178
Mil-Sor	63	104	0	0	0	167	164	171
Rice	223	204	5	4	1	436	445	433
Seedbed	185	150	2	0	0	337	321	346
Other	427	518	0	0	0	945		945
Average	206	194	5	3	0	408	403	411

Note: Totals show average of total fertilizer used and do not equal sums by fertilizer type

Table 21

Fertilizer Purchases by Type (tons)

	Urea	NPK	TSP	DAP	SSP	Total
Survey #	2,567	1,968	63	135	0	4,732
Survey #2	3,396	2,934	60	34	10	6,434
Total	5,963	4,902	123	168	10	11,166

Fertilizer Purchases by Type (percent)

	Urea	NPK	TSP	DAP	SSP	Total
Survey #1	54%	42%	1%	3%	0%	100%
Survey #2	53%	46%	1%	1%	0%	100%
Total	53%	44%	1%	2%	0%	100%

Table 22
Fertilizer Purchases by Supplier (tons)

	CA	Traders	Bot	Total
Survey #1	1,199	3,368	0	4,732
Survey #2	2,502	2,818	115	6,434
Total	3,700	7,186	115	11,166

Fertilizer Purchases by Supplier (percent)

	CA	Traders	Both	Total
Survey #1	25%	71%	0%	100%
Survey #2	39%	59%	2%	100%
Total	33%	64%	1%	100%

Table 23
Fertilizer Purchases by Type and Supplier (percent)

	Urea	NPK	TSP	DAP	SSP	Total
CA	36%	27%	100%	59%	100%	33%
Traders	62%	70%	0%	41%	0%	64%
Both	0%	2%	0%	0%	0%	1%

Percent of Fertilizer Purchases by Type Before and After CA Price Cut

	Urea	NPK	TSP	DAP	SSP	Total
Before July '90	54%	44%	0%	1%	0%	100%
After July '90	52%	46%	2%	0%	0%	100%

Fertilizer Prices by Type Before and After CA Price Cut (CFAF/ton)

	Urea	NPK	TSP	DAP	SSP	Total
Before July '90	58,494	58,645	75,000	68,109		58,711
After July '90	44,706	47,727	45,000	30,000	50,000	46,101
Average for 89-91	51,775	53,318	49,979	66,976	50,000	52,539

Percent of Fertilizer Purchases by Supplier Before and After CA Price Cut

	CA	Traders	Both	Total
Before July '90	10%	90%	0%	100%
After July '90	69%	27%	4%	100%

The reader will recall that in July 1990 the CA reduced its fertilizer prices from 65 to 40 CFAF/kg for urea and from 65 to 45 CFAF/kg for NPK. The result on the CA's market share was dramatic, as shown in Table 23, which breaks down sales by date for the second survey period. Prior to the price cut the CA's market share had declined to only 10 percent, down from 25 percent during the period covered by the first survey. However, after the price cut the CA's market share rose to 69 percent (Figure 8). Even though the price cut was slightly greater for urea than for the NPK composite, there was no discernible change in the proportions of the two sold.

The change in prices were clearly reflected in the average price of fertilizer purchased by the cooperatives as it fell from 58,711 CFAF/ton down to 46,101 CFAF/ton. What is interesting is that this decline in average prices is almost entirely the result of shifting market share rather than matching cuts by private sector merchants. Following the CA's price cut, the private sector price for urea fell only slightly, from almost 59,000 CFAF/ton to 57,000 CFAF/ton (Table 24). Trader prices for NPK declined a bit more, from 58,500 CFAF/ton to 53,500 CFAF/ton. Nonetheless, the price at which cooperatives resold fertilizer to their members declined in direct relation to the price at which it was purchased as shown in Table 24. Members of the cooperatives that responded to the CA price cut by switching suppliers benefitted directly.

We draw three conclusions from this experience:

- First, it provides evidence that cooperatives are very responsive to price, at least with respect to source of supply. Their willingness to switch from private to public-sector channels (reversing the earlier trend) suggests a strongly pro-competitive tendency from the demand side, which itself can contribute to a competitive supply response.

- Second, the flip side of demand response is that the CA's market share is sensitive to the price it charges, something that seems not to have been taken into account prior to July 1990. The contraction of the CA throughout the second half of the 1980s is directly related to the fact that its prices were rising relative to those of its private-sector competitors. This indicates that even if a scaled-down CA survives, it has the capacity to complement the private sector and to encourage competition.

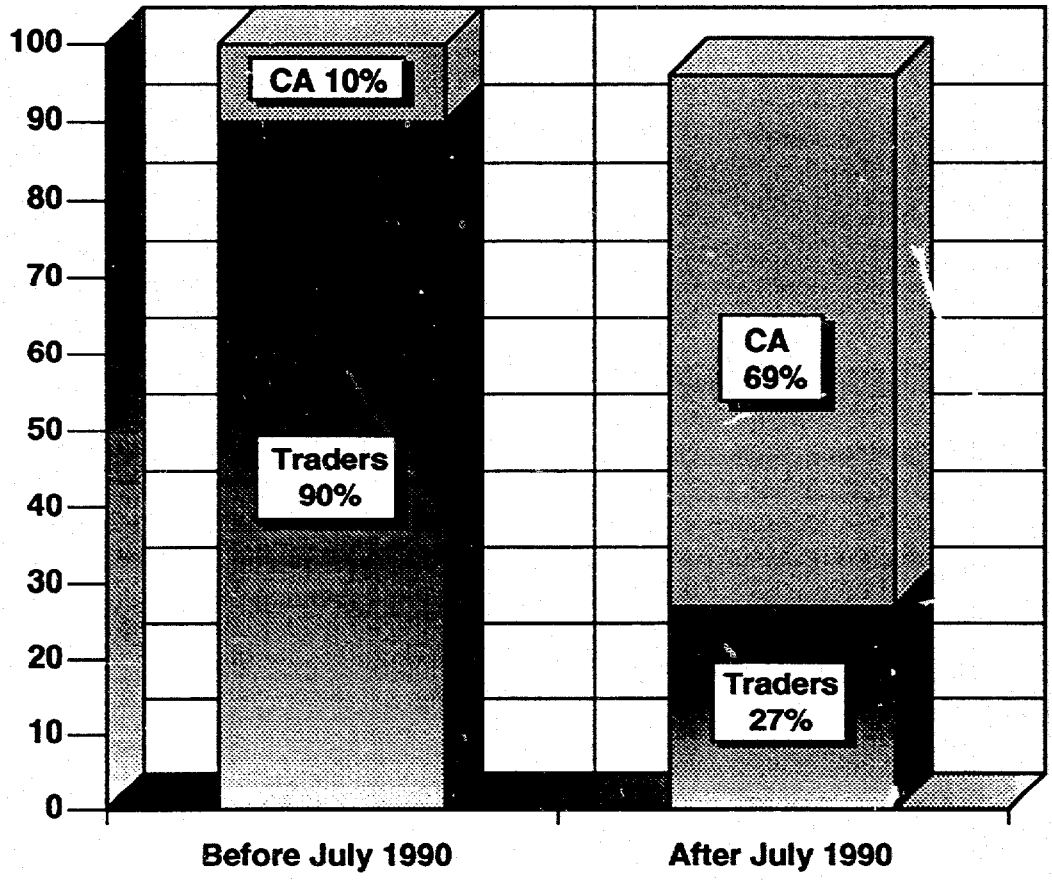
- Finally, the modest decline in private-sector prices following the CA's price cut could be taken as a sign of market power, with traders resisting matching cuts. But their drastically reduced market share argues against such a conclusion. An alternative hypothesis is better supported by the evidence and corroborated by trader surveys: that in the absence of monopoly rents in a workably competitive private sector, traders had no choice but to watch their market share fall in the hope that the CA would not for long be able to maintain such low prices before their stocks ran out. In such a case, traders had only a little room to reduce their prices, which they did. Our interviews with traders support this, both in terms of the costs of imported fertilizer and with regard to traders' willingness to enter and leave the market as conditions change.

Survey of Traders

From February through April 1991 interviews were conducted with 15 merchants who currently are or had been active in private fertilizer trade. (An additional 30 traders were identified and interviewed as part of a more comprehensive study of fertilizer trade carried out by the IFDC. Results of that study should be available soon.) Most of those interviewed were general traders and importers, specializing in cereals, livestock, spare parts and other commodities; none identified fertilizer as his principle trade commodity. Many traders reported that they move in and out of the trade according to their sense of its profitability. There is every indication that both entry and exit barriers are extremely low. No capital goods in the form of trucks or warehouses, nor professional contacts, seem necessary in order to engage in trade.

Figure 8

Percent of Fertilizer Purchases by Supplier before and after the CA price cut in 1990



Source: Survey of fertilizer use on irrigated perimeters, April 1991, CRED, Niamey, Niger

Table 24

Purchase Price of Urea Before and After Price Cut (CFAF/ton)

	CA	Traders	Total
Before July '90	55,520	58,825	58,494
After July '90	41,152	57,034	44,706
Average Urea	42,867	58,483	51,775

Purchase Price of NPK Before and After Price Cut (CFAF/ton)

	CA	Traders	Total
Before July '90	60,000	58,510	58,645
After July '90	44,810	53,445	47,727
Average NPK	46,831	57,244	53,318

Resale Price of Urea by Coops Before and After Price Cut (CFAF/50 kg sack)

	CA	Traders	Total
Before July '90	2,979	2,987	2,986
After July '90	2,245	2,825	2,359
Average Urea	2,362	2,960	2,691

Resale Price of NPK by Coops Before and After Price Cut (CFAF/50 kg sack)

	CA	Traders	Total
Before July '90	3,083	3,047	3,050
After July '90	2,388	2,636	2,474
Average NPK	2,443	2,911	2,723

Annual reported quantities imported range from under five tons to several hundred tons for most merchants interviewed. Only one reported ever having imported as much as a thousand tons in any year, though several claimed that such large-scale traders used to operate during the days when CA procured its stocks through private-sector purchase of Nigerian fertilizer.

All merchants bought their fertilizer in Nigeria, most importing predominantly urea and NPK. Only a few claimed to handle single or triple superphosphate or other types. Fertilizer is purchased from Nigerian traders, either at the border or within 100 kilometers. Transportation costs to Niger are reported to range between 5 and 10 CFAF/kg, but most traders purchase fertilizer c.i.f. the Nigerian frontier, assuming only internal transportation costs.

Purchase price in Nigeria ranged from 20 to 27 CFAF/kg in the late eighties to between 37 and 53 CFAF/kg in 1990. Price quotes seem to be in Nigerian currency, but paid in CFAF at the current parallel rate of exchange. The higher prices for 1990 appear to reflect the Nigerian government's stepped-up interdiction of fertilizer exports rather than any strengthening of the naira, which in fact weakened against the CFA franc. Internal (Niger) transportation costs are reported to vary between one and three CFAF/kg.

Most traders resell fertilizer to cooperatives operating on irrigated perimeters, though about half also reported selling to other farmers, and a few claimed to resell to other merchants as well. Most sales are for cash, though almost all acknowledge credit sales. Interestingly, some reported offering credit only to cooperatives while dealing with individual farmers in cash, while others say that the opposite is true for them. Resale prices in 1990 were reported to be between 40,000 and 55,000 CFAF/ton for cash sales, with a 5,000 CFAF/ton premium charged for credit sales.

Without exception, merchants bought and sold fertilizer for short-term sale, timing trade with periods of peak demand just prior to and during the early weeks of the cropping season. Only one family of traders interviewed maintains significant stocks between growing seasons. Most others had only informal arrangements to store stocks for several weeks before they could liquidate them. Those who sell to farmers growing rainfed crops tend to confirm the conventional wisdom by saying that these sales depend upon the timing and quality of early rains and that such sales have diminished in recent years.

Appendix Table A:
CA Fertilizer Sales by the Main Depot (Siège),
by Department and by *Arrondissement*, 1989/90

CENTRALE D'APPROVISONNEMENT
(Tons)

	Siege	Agadez	Dosso	Diffa	Maradi	Tahoua	Tillaberi	Zinder	TOTAL
Urea	2,330	271	211	24	106	349	395	54	3,740
NPK	1,918	37	416	16	4	38	281	5	2,715
TSP	87	0	76	0	2	21	0	4	190
SSP	26	0	128	2	11	3	10	23	203
DAP	7	0	0	0	0	0	3	0	10
KCL	11	0	0	0	0	0	0	0	11
Ammon.S	1	0	0	0	0	0	0	0	1
Tahoua	4	0	16	0	0	50	0	0	70
TOTAL	4,384	308	847	42	123	461	690	86	6,940

Source: CA Data

Appendix Table A (continued)
(kilograms)

TILLABERI DEPARTMENT

	Depot	Filingue	Kollo	Tera	Say	Total
Urea	34,600	2,200	169,292	55,850	133,500	395,442
NPK	95,000	47,750	97,554	23,343	17,750	281,397
TSP						0
SSP				10,000		10,000
DAP	2,800					2,800
KCL	100					100
Tahoua						0
TOTAL	132,500	49,950	266,846	89,193	151,250	689,739

DIFFA DEPARTMENT

	Depot	N'Guigmi	Maine			Total
Urea	16,450	1000	6500			23,950
NPK	13,750	700	1200			15,650
TSP	100					100
SSP	1,700					1,700
Tahoua	100					100
TOTAL	32,100	1,700	7,700			41,500

ZINDER DEPARTMENT

	Depot	Goure	Magaria	Mirriah	Tanout	Total
Urea	48,150		2,000	2,200	1,500	53,850
NPK	2,550		350	1,050	1,499	5,449
TSP	1,300	2,400				3,700
SSP	17,350	3,150	1,000	1,550		23,050
Tahoua						0
TOTAL	69,350	5,550	3,350	4,800	2,999	86,049

AGADEZ DEPARTMENT

	Depot	Tchiroz.	Arlit	Bilma		Total
Urea	130,700	119,776	17,700	2,900		271,076
NPK	11,700	17,409	7,600			36,709
TSP						0
SSP						0
Tahoua						0
TOTAL	142,400	137,185	25,300	2,900		307,785

Appendix Table A (continued)
(kilograms)

MARADI DEPARTMENT

	Depot	Aguie	Dakoro	Guidan R.	Mayahi	Total
Urea	72,950	11,700	8,200	1,000	12,150	106,000
NPK	3,900					3,900
TSP	1,700					1,700
SSP	4,950				6,200	11,150
Ammon.Sul.	450					450
Tahoua						0
TOTAL	83,950	11,700	8,200	1,000	18,350	123,200

DOSSO DEPARTMENT

	Depot	Boboye	Dosso	Doutchi	Gaya	Total
Urea	6,200	42,950	24,600	31,950	105,011	210,711
NPK	63,750	90,550	171,325	39,427	51,250	416,302
TSP	7,500	41550	5,150	5,750	16,078	76,028
SSP	29,550	50,918	33,250	1,900	12,550	128,168
Tahoua	150	9,000			6,650	15,800
TOTAL	107,150	234,968	234,325	79,027	191,539	847,009

TAHOUA DEPARTMENT

	Depot	Bouza	Illela	Keita	Konni	Madaoua	Total
Urea	91,350	4,250	150	25,000	206,800	21,500	349,050
NPK	20,750				15,500	1,850	38,100
TSP	20,250				250		20,500
SSP	100				1,000	1,450	2,550
Tahoua	50,300						50,300
TOTAL	182,750	4,250	150	25,000	223,550	24,800	460,500

Appendix Table B:
CA Sales of Farm Equipment by Department, 1989/90

	Agadez	Dosso	Diffa	Maradi	Tillaberi	Tahoua	Zinder	Siege	Total
Bati de base		2	15	118	27	20		83	265
Charrue 10"		2	2	15	23	41		176	259
Charrue 8"						4			4
Canadien 5 dents		1	5	2	1	3		9	21
Canadien 3 dents		8	9	9		9		35	70
Buttoir				19		2		12	33
Houe asine		1		7	1	4		1	14
Charrette bovine		11	23	53	40	37	2	82	248
Charrette asine		26	1	3	150	56	1	77	314
Bricole ane					3				3
joug long			1		2			1	4
joug court		3			1			15	19
houe algerienne	3								3
Motopompe Th.	29	33	45	10	2	10		111	240
Rateau	10								10
Motopompe Hda.			7			10		67	84
Soul/sarcleuse			1	20		1		53	75
Pulverisateur	11	25	22	3		2	25	31	119
Poudreuse	29	23	45	22		3	24		146
Thorial (25 gr)	99	123,537	1,802	44,045	104,229	213,244	53,211	50,831	590,998
Permetrine (25 gr)						1,266	254	620	2,140
Lindane poudre (kg)	784	954		1,575		3,052	1,938	4,150	12,453
K'othrine (25 gr)							405	50	455

Appendix Table C:
Value of CA Inventories on 12/31/90 by Department and by *Arrondissement*
(in thousands of CFAF)

Centrale D'Approvisonnement

	Agadez	Dosso	Diffa	Maradi	Tahoua	Tillaberi	Zinder	Siege	TOTAL
Equipment	1,670	47,592	19,244	51,584	32,917	29,004	9,898	n/a	191,909
Spare Parts	0	1,763	1,936	1,770	4,745	5,460	238	n/a	15,912
Fertilizer	4,438	28,706	1,501	10,157	25,120	21,124	10,575	67,500	169,121
Chemicals	4,738	12,374	6,594	25,154	13,347	14,599	24,216	n/a	101,022
Total	10,846	90,435	29,275	88,665	76,129	70,187	44,927	67,500	477,964

Dosso Department

	Depot	Boboye	Dosso	Doutchi	Gaya	Loga	Total
Equipment	17,786	3,336	2,848	10,704	8,391	4,527	47,592
Spare Parts	598	354	41	94	157	519	1,763
Fertilizer	6,225	6,153	4,340	7,011	4,458	519	28,706
Chemicals	5,766	1,634	838	2,751	1,329	56	12,374
Total	30,375	11,477	8,067	20,560	14,335	5,621	90,435

Tahoua Department

	Depot	Comm'ne	Bouza	Illela	Keita	Konni	Madaoua	Tahoua	Tchintab.	Total
Equipment	25,651	0	773	246	690	2,430	2,777	150	200	32,917
Spare Parts	4,154	0	0	161	76	339	15	0	0	4,745
Fertilizer	14,838	0	273	0	4,035	4,454	1,520	0	0	25,120
Chemicals	6,353	30	1,126	344	767	1,741	597	1,986	403	13,347
Total	50,996	30	2,172	751	5,568	8,964	4,909	2,136	603	76,129

Tillaberi Department

	Depot	Comm'ne	Filingue	Kollo	Ouallam	Tera	Tillaberi	Say	Total
Equipment	2,434	0	1,802	194	3,498	17,083	2,117	4,310	31,438
Spare Parts	1,288	0	865	1,208	271	2,934	14	168	6,748
Fertilizer	11,421	0	5,217	3,641	851	1,056	0	10,359	32,545
Chemicals	1,459	288	2,970	676	2,245	5,332	736	2,352	16,058
Total	16,602	288	10,854	5,719	6,865	26,405	2,867	17,189	86,789

Diffa Department

	Depot	Comm'ne	Diffa	N'Guigmi	Maine	Total
Equipment	15,693	60	140	966	2,385	19,244
Spare Parts	1,720	0	0	5	211	1,936
Fertilizer	971	0	0	182	348	1,501
Chemicals	3,797	126	410	878	1,383	6,594
Total	22,181	186	550	2031	4,327	29,275

Zinder Department

	Depot	Comm'ne	Goure	Magaria	Matamey	Mirriah	Tanout	Total
Equipment	6,158	67	665	494	181	572	1,761	9,898
Spare Parts	238	0	0	0	0	0	0	238
Fertilizer	3,842	0	143	1,271	1,284	4,035	0	10,575
Chemicals	22,484	0	31	1,510	191	0	0	24,216
Total	32,722	67	839	3,275	1,656	4,607	1,761	44,927

Agadez Department

	Depot	Tchiroz.	Arlit	Bilma	Total
Equipment	1,254	107	309	0	1,670
Spare Parts	0	0	0	0	0
Fertilizer	334	2,951	1,079	74	4,438
Chemicals	23	3,870	845	0	4,738
Total	1,611	6,928	2,233	74	10,846

Maradi Department

	Depot	Aguie	Dakoro	Guidan R.	Mayahi	Radaroun	Tessaoua	Total
Equipment	46,952	251	2,685	249	1,048	225	174	51,584
Spare Parts	1,727	0	43	0	0	0	0	1,770
Fertilizer	9,131	0	304	360	362	0	0	10,157
Chemicals	25,154	0	0	0	0	0	0	25,154
Total	82,964	251	3,032	609	1,410	225	174	88,665