BIBLIOGRAPHIC DATA SHEET

PN-AAG-167

AN ANALYSIS OF GRAIN STORAGE IN THREE INTERIOR SAHEL COUNTRIES

PERSONAL AUTHORS - PINCKNEY, ANNETTE

CORPORATE AUTHORS -

1978, 78P

ARC NUMBER -
CONTRACT NUMBER AID/AFR-C-1143
PROJECT NUMBERS -
SUBJECT CLASS - AE100000G190

DESCRIPTORS - GRAIN CROPS
MARKETING
SAHEL
UPPER VOLTA
MALI
NIGER
STORAGE

AFR
338.1731
P655

PN-AAG-167

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by

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Discussion Paper 75

January 1979

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Prepared for Africa Bureau, Agency for International Development, under Work Order 12, AID/afr-c-1143.

AN ANALYSIS OF GRAIN STORAGE IN THREE INTERIOR SAHEL COUNTRIES

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CHAPTER I

INTRODUCTION AND SUMMARY

In each Sahel country several groups and organizations are responsible for grain storage: farmers, traders, cooperative organizations, regional development organizations (ORDs in Upper Volta), specialized development agencies (les Opérations) and state marketing authorities. The distribution of existing physical capacity and volume of stocks among these groups depends on such factors as: (1) the marketed share of domestic grain output; (2) the structure of marketing institutions (relative importance of the public to the private sector in grain trade) and (3) the degree of development of the rural cooperative. By far the most important group, measured by volume and duration of storage, are farmers. At the farm level, impetus for cereals storage derives from the necessity of providing, for a local population, carryover stocks until the next harvest or for a longer term in the event of a shortfall in production. In this context, stocks are mainly held to meet the consumption demand of farm/village units between harvests, with some margin for seed. Given underlying cereal production conditions as well as consumption patterns, the marketed share of locally-produced grains is, in general, small relative to total production. Moreover, only a modest amount of grains is traded in bulk. This is especially true of the coarse cereals, millet and sorghum, which tend to be traded in small quantities in an atomistic market.

The concern with grain storage in the Sahel countries has grown

out of interest in foodgrain marketing strategies and price policies. If, in coming years, there is a trend toward increasing monetization of the agricultural sector through increasing purchases of grain by producing and non-producing populations, the resource costs of maintaining and managing substantial stocks of perishable commodities on both a short and long-term basis must be taken into account in defining a marketing strategy. In the long run, improved technology in domestic foodgrain production and increased productivity (yields) should lead to surpluses over the immediate needs of local producers. Where this is accompanied by growing urban populations, with increased specialization within the rural sector and expanded rural markets, there will be an increase in the effective internal demand for marketed cereals. Exports, of course, should increase also. The primary function of grain inventories in a widening and deepening market for foodgrains is to enhance the efficiency of grain markets; stockholding is a mechanism to smooth out temporary excesses in supply and demand in time and space, and hence serves to modulate price swings.

As marketing institutions develop, some shift will occur in the distribution of grain stocks between on-farm populations and other stockholding groups. Such shifts will raise the question as to what extent storage costs can be absorbed by the private sector, and more generally, the respective use of public and private resources for the acquisition and maintenance of grain stocks. The resource costs of grain storage include: a) investment in warehouse infrastructure; b) investment in grain stocks; c) preservation and conservation costs, such as supplies, equipment maintenance, and personnel; d) management-related inputs.

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production remains relatively stable for several years, but major harvests occur once a year, grain stocks are drawn down to relatively low levels before harvest (farm and off-farm supplies). The problem of low stock levels prior to harvest (the so-called soudure) is expected to be reduced through the build-up of inventories for release at critical periods during the year. Further, existing impediments to marketing such as widely dispersed markets and poor transport (which gives rise to large intra-country price differentials) would be reduced by holding of grain inventories and the interregional redistribution of grains.

These views of the role of grain storage explain policies and programs currently under consideration in the three countries. For example, there is a tendency to create specialized storage organizations, such as the Sous Comité in Upper Volta, which are concerned solely with the redistribution of grain output. Likewise, normal pipeline grain stocks handled by the public grain agencies are officially designated as "les stocks régulateurs" to emphasize their intended role as price regulators. Mali, Niger and Upper Volta have adopted in recent years the so-called grain reserve concept, where governments plan investments in long-term stock reserves to compensate for cyclical swings in production. Strategic grain stock programs would protect a country against the potential disruption to production caused by chronic rainfall insufficiency and would reduce the need for large-scale, short-term grain imports. National grain reserves pose complex issues of economic efficiency and welfare as well as questions of distributional tradeoffs between various affected groups. Economic theory suggests that a country can achieve a higher level of welfare by exporting grain production surpluses. However, for

the interior countries there may be some relative advantage in financing and maintaining some level of national cereal reserves, since transport costs add significantly to costs of imported grains.

This report is divided into two main parts. In Chapter II, the current grain storage systems of Mali, Niger and Upper Volta are presented in detail. That chapter provides information on in-transit storage facilities for use during the grain collection season, public sector storage capacity, and levels of estimated stockholdings.

Chapter III takes up current issues in the grain storage area. The first section looks at on-farm storage and the prospects for investments in low-technology improvements in this type of storage. The next section takes up community/village level storage, which has come to be viewed in some countries as a substitute for on-farm storage. Finally, some issues of long-term grain reserve programs are examined.

CHAPTER II

GRAIN MARKETING AND STORAGE INSTITUTIONS

INTRODUCTION

This section describes storage arrangements within the framework of the characteristics of the cereals economies and marketing organizations of the interior states. It is concerned with stocks held in the normal pipeline for grain milling and distribution. The general characteristics of the cereals of the three interior states are typical of the Sahel. Millet and sorghum are the main staples, supplemented by lesser production of rice and maize (production). The farming sector is overwhelmingly subsistence-oriented, with some cash cropping (groundnuts, cotton, sheanuts, cowpeas and sesame) and some sales of grains.

Two types of marketing organizations for food crops coexist in each of the three countries: a state structure and a private structure. In each country there is a public agency with responsibility for grain trade,[1] and laws exist which prohibit private trade in grains except as specified by the authority. In reality these legal monopolies are not implemented, so extensive and active private marketing systems exist. The private sector handles at least half of the total volume of the trade in grains. However, although private marketing structures are large measured in terms of the total volume of grain traded, they are small and non-specialized. In private trade, grains tend to move in units

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[1] Office des Produits Alimentaires du Mali (OPAM); Office des Produits Viviers du Niger (OPVN); Office National des Céréales, Upper Volta (OFNACER).

of relatively small magnitudes. Grains are stored, therefore, in units of similar magnitudes. In general, private grain stocks are scattered and decentralized. This is underlined in the 1977 CILSS report titled Marketing, Price Policy and Storage of Foodgrains in the Sahel, which observes:

> " Very limited amounts of grains are stored by traders. It is rare in most of the region to find private traders with a storage capacity of as much as 50 tons. Most storage, like most trading activity, is mixed; i.e., grains and other commodities, frequently sugar, will be stored in the same place, generally a room or two in a rather rudimentary building." (Vol.I, p. 73).

Thus, when speaking of foodgrain storage systems and storage infrastructure in the context of marketing, the focus is on the public sector and the activities of the various agencies which make up this sector. In each of the three countries there is, to be sure, considerable discrepancy between reality and intent in the official marketing of foodgrains; grain agencies have never played a major role in the market in any country. Nevertheless, storage systems are described within the framework of official marketing objectives for the reason that governments tend to assess grain storage capacity and needs with reference to these objectives.

This chapter outlines for each country the public agencies responsible for grain storage and provides data on stock levels and storage capacity of the public agencies. This provides a picture of the movement of grains through the marketing system and serves to indicate the extent to which grain agencies are able to meet storage requirements and maintain stocks in accordance with their official mandates. The data presented in this section are descriptive. Estimates of stock levels and information on storage capacity have been gathered from various sources. Although

such "official" information provides a general picture of the current situation, there is a lack of precision in the data both with respect to stockholding and storage facilities. Storage capacity is an illusive concept. Total storage capacity for a given country cannot be defined with rigor since the quality and condition of all structures is not known. Further, some facilities may be temporary or provisional. There is a lack of uniformity in construction and design, and even in the basic purpose of structures defined as grain storage facilities.[1] In all three countries there are older public sector storage facilities in need of renovation or replacement by structures built to more appropriate specifications for storing grains.

Two problems which plague national storage programs are 1) the dearth of management-related inputs and 2) high physical losses of grain stocks. There has been no attempt to quantify losses. Accounting data made available by public grain agencies include in "losses" reductions in grain stocks due to theft, illegal contracts, and the like; there is no measurement of physical disappearance of stocks due to lack of quality control. Technical experts observing the handling and management of grain stocks report the presence of rodent and insect damage, the general absence of appropriate loss control measures, and have concluded that overall losses are high relative to the quantity of stocks handled by national grain agencies.

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[1] Donors providing food assistance to the interior countries do maintain staffs which periodically survey and assess the conditions of facilities in which donor grains are stored. This ongoing surveillance should be reflected to some extent in official capacity estimates.

CHAPTER III

MALI

Among the interior countries, Mali is distinguished by the intervention of the state in the economy. There is an effort to impose a state monopoly on the purchase and sale of foodgrains to local consumers through the state marketing agency, OPAM. OPAM buys stocks through the intermediary of the groupment rural, an association of village-level producer cooperatives. A second source of domestic grain stocks are the Millet and Rice Opérations. The latter are development organizations which concentrate on a particular crop. The Opérations are responsible for supplying producers with technical services and inputs. They are responsible within their production zones for the primary collection of the crop for which extension services are provides. Although OPAM is authorized to commercialize the major grains during designated marketing seasons, and is responsible for the distribution of grain stocks to urbanized areas and deficit production regions, the structure of the official marketing system has tended to place the grain agency in a secondary position with respect to the formulation of marketing policy, and has denied the agency financing autonomy. Moreover, from the standpoint of the marketing process and marketing strategy, there have been certain limitations on the agency's operating procedures and its role in decision-making. These limitations have implications for the national grain storage and distribution systems.

The Collecte Primaire and Redistribution Systems

The policy-making process behing OPAM collection operations has evolved as the responsibility of a group of agencies collectively designated as the Administration within the Government of Mali, and a Cereals Committee. The functions of the Administration and Committee have been to forecast production levels and set marketing quotas by arrondissement, cercle and région; decide upon the details of the marketing season (dates, allocation of funds for bagging and transport); establish a program for the interregional distribution of grains; and finally, to determine producer prices, price schedules (barêmes) and retail prices to consumers.

As this system has developed, while OPAM was granted the virtual monopoly of grain marketing during the annual campaign, in actual practice the primary collection of cereal production has fallen to the producer cooperatives and their federation; the grain agency is not placed in direct contact with its suppliers or suppliers' associations. Under the cooperative-collection system, until grain stocks have reached the level of the cercle, the grain agency is not responsible for warehousing; in-transit storage is handled by the villages themselves and the federation of producer cooperatives.

In general what occurs is that individual producer (chef de famille) will bag the grain which he has contracted to sell, and will deliver the sacks to a village-level collection point.[1] In some instances there

[1] Note that the system requires a degree of accuracy in forecasting on the part of the Malian farmer. If he underestimates the amount which he intends to sell, funds for grains and/or sacks may be fully distributed by the time his grains are harvested. However, if he overestimates, he can draw down his grain stocks from a previous season. The latter does not appear to be an uncommon practice. (AID Project Evaluation Report, Opération Mil Mopti, 1977).

are rudimentary storage facilities at the village level; "banco structures" or bags are stored in open air. Banco structures are semi-permanent, requiring rebuilding after one or more seasons or rainfall. The efficient movement of grains (realization of minimum losses) from production points to chef lieux depends upon the timely movement of grains out of open-air storage into warehouses. This requires, in turn, a relatively well-developed transport infrastructure and a sufficient number of vehicles. Transport is particularly significant in view of the concentration of OPAM storage facilities in the capitals of the cercles; this practice increases the distance grains must be hauled.

The cooperative federation provides transport for bagged grain from village depots to the level of the arrondissements. Transport costs between these points are estimated on the basis of a weighted average of fifty kilomenters, and under current price schedules 52 MF per metric ton are allocated to village-arrondissement transport costs. In the barême, or price schedule, for millet and sorghum shown in Table III-1, this is included under the frais de collecte in Item 2. Bagging and administration (weighing, inspection) represent the remainder of the collection costs shown.

At the arrondissement level, storage facilities are found in banco, "en dur" (concrete) and "semi-dur" (banco reinforced with concrete). There is, on the average, a reported maximum of 500 metric tons of storage capacity per arrondissement, which are under the control of the cooperative federation. OPAM provides the transport from the arrondissement to the cercle, using either its own vehicle fleets or depending upon private sector transport facilities. The cost of transport between these points is

Table III-1

EFFECTIVE PRICE SCHEDULE (BARÊME) FOR MILLET AND SORGHUM, IN MALIAN FRANCS, 1977
(based on one metric ton)

1.	Prix au Producteur	36,000
2.	Frais de Collecte	3,386
3.	Prix de session (chef lieux arrondissement)	39,386
4.	Frais de ramassage	3,900
5.	Prix de revient (cercle)	43,286
6.	Taxe OPAM	47,500
7.	Frais de Transport (pondere)	48,000
8.	Frais de bancaire (5-15%)	52,700
9.	Soutien ORSP	1,800
10.	Marge de detail des cooperatives	3,000
11.	Prix à la consommation	56,500

Source: Malian Authorities

estimated on the basis of a weighted average of 75 kilometers, and is included in the barême under cost Item 4. OPAM allocates 3,000 MF per metric ton for transport to the cercle.

Once grain stocks have been assembled at the level of the cercle, the program for redistribution between zones is carried out. Given the estimated level of consumption for each cercle relative to the volume of cereal output, a certain volume of stocks may remain at the cercle. The excess marketed stocks are transported to deficit cercles within the same region or will be moved to other deficit regions. Such movements are based on GOM estimates of consumption requirements relative to production forecasts.[1] Any surpluses remaining after these distributions are placed in the Bamako area. If a global deficit is anticipated, import requirements are estimated and a schedule of grain imports is planned, including grains requested under international assistance programs.

National Grain Storage Capacity

As indicated in the discussion above, the temporary storage of grains in transit does not come under the auspicies of the grain agency. OPAM's storage services begin at the level of the cercle, where it functions to take on stocks and to organize the dispatching of supply between zones. It maintains regional grain warehouses in the primary porduction zones and in deficit areas. Most of this storage is to provide warehousing for what

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[1]The sophistication of the analysis underlying these steps should not be overestimated. Production and sales results of previous seasons from the basis of such estimates, linked undoubtedly to some intuitive adjustments for the effects of current rainfall patterns.

TABLE III-2

Published Estimates of Public Sector Grain Storage Capacity

A. IBRD Estimate of OPAM Grain Storage Capacity, by Region

Region	(in metric tons)
Segou	45,000
Mopti	30,000
Sakasso	7,000
Bamako	30,000
Gao	20,000
Kayes	6,000
TOTAL	138,000

Source: IBRD, Mali Report, January 1978.

B. CILSS Estimate of OPAM Grain Storage Capacity, by Region, 1976.

Region	Warehouses		Silos		Total Capacity
	number	capacity	number	capacity	
Kayes	7	7,300	6	3,000	10,000
Bamako	27	27,900	22	12,100	40,000
Sikasso	4	8,800	-	-	8,800
Segou	5	27,600	-	-	27,600
Mopti	29	27,600	16	8,800	36,400
Gao	15	18,070	6	3,300	21,370
Total	90	130,722	50	27,500	131,222

Source. CILSS Report, Marketing, Price Policy and Storage of Food Grain Storage in the Sahel, 1977.

TABLE III-3

REGIONAL DISTRIBUTION OF OPAM STORAGE CAPACITY, 1978
(in metric tons)

	Warehouses	Silos[a]	Total
1. District of Bamako	12,460	7,150	19,610
2. Kayes	2,800	2,200	5,000
3. Koulikoro	4,200	-	4,200
4. Sikasso	6,160	-	6,160
5. Segou	30,130	5,500	35,630
6. Mopti	15,960	11,000	26,960
7. Tombouctou	5,495	-	5,495
8. Gao	6,965	6,600	13,565
TOTAL:	84,170	32,450	116,620

[a]550 metric ton units.

Source. OPAM, March 1978.

are called consumption stocks, i.e., stocks drawn down in the course of normal demand over the year.

Recent information published on OPAM grain storage capacity indicates levels in excess of 130,000 metric tons distributed among the six regions. Two such recent estimates are shown in Table III-2. For example, the IBRD, in its latest Report on Mali, shows total capacity at 138,000 metric tons. The 1977 CILSS marketing study indicated a total capacity of 131,000 metric tons. The accuracy of these estimates is questionable. Some recent data on OPAM storage facilities are shown in Table III-3. According to these data the capacity in warehouse structures is 84,170 metric tons, with an additional capacity in silos of 32,450 metric tons. This brings the total estimated capacity to 166,620 metric tons. The revised figures may not reflect a reduction in the total number of units included in the count, but instead may reflect the estimated maximum amount of space available for a given number of sacks. The number of sacks of grain that can be stored at a given location is not measured by the total square meters of a given structure; room must be allowed for ventilation in stacking.

Approximately two-thirds of conventional storage capacity is located in the productive regions of Segou, Mopti and Sekasso. About one-third is distributed among the foodgrain importing regions of Bamako, Gao and Kayes. Overall capacity has been more equally distributed between productive and importing regions through the build-up of silo units. About one-half of new silos have been located in the importing regions.

Table III-4 shows the regional breakdown of OPAM storage infrastructure. In practically all instances, the bulk of storage facilities are

TABLE III-4

REGIONAL STORAGE CAPACITY OF OPAM: ESTIMATED UTILIZABLE CAPACITY, JANUARY 1978

Location	Stores-Warehouses		Silos	
	Number	Tonnage	Number (550mt each)	Tonnage
Bamako		12,460	13	7,150
Kayes				
Kayes		2,800	-	-
Bafoulabe		-	-	-
Kenieba		-	-	-
Kita		-	-	-
Koulikoro				
Banamba		-	-	-
Dioila		-	-	-
Kangaba		-	-	-
Kolokani		-	-	-
Koulikoro		3,500	-	-
Kati		-	-	-
Nara		700	-	-
Sikasso				
Sikasso		2,660	-	-
Bougouni		2,800	-	-
Kadiolo		-	-	-
Kolondieba		-	-	-
Koutiala		700	-	-
Yanfolila		-	-	-
Segou				
Segou		21,380	-	-
Macina		1,400	-	-
Niono		-	-	-
San		7,350	10	5,500
Tominian		-	-	-
Bla		-	-	-
Baroueli		-	-	-

Table III-4 continued

Location	Stores-Warehouses Number	Stores-Warehouses Tonnage	Silos Number (550 mt each)	Silos Tonnage
Mopti				
Mopti		10,360	20	11,000
Bandiagara		—		
Bankass		700		
Djenne		700		
Douentza		—		
Koro		700		
Tenenkou		3,500		
Youwarou		—		
Tombouctou				
Tombouctou		455	—	—
Dire		2,800		
Goundam		840		
G. Rharous		1,400		
Niafunke		—		
Gao				
Gao		4,410	12	6,600
Bourem		1,750		
Ansongo		—		
Menaka		350		
Kidal		455		

SOURCE: OPAM, March 1978.

situated in capitals. While there may be economies to be derived from the centralization of storage facilities (lower inspection and treatment costs) the absence of the dispersion of warehousing intra-regionnally imposes additional transport burdens on some foodgrain suppliers. In principle, when Opérations are suppliers, OPAM is to receive grains at the chef lieux of the arrondissements. However, since the grain agency does not maintain sufficient administrative infrastructure or physical facilities at these locations, as a general rule it receives the merchandise in the capitals of the cercles. The cereals Opérations, which are responsible for the transport from the collection points to the chef lieux, are experiencing increasingly higher costs due to transport. The Opérations, for example Opération Mil Mopti, receive 2,786 MF per metric ton for all activities involved in the collection process. Since the Operations bear the costs of losses involved in collection operations, they bring what ever warehouse structures are available into use for grain storage during the period of collection in order to minimize the risks of loss on grains in transit. Such structures, however, are intended primarily for housing production inputs. Opérations do not maintain physical facilities specifically for housing grain stocks.

Stock Levels

OPAM, through its official monopoly, picks up approximately 8 percent of millet and corn production and perhaps 30 percent of rice output. Trade in the "parallel market" by private traders equals or exceeds OPAM in the care of coarse grains, in most areas of the country. In Table III-5 an estimate of the evolution of the official commercialization of

TABLE III-5

COMMERCIALIZATION OF MILLET AND CORN, 1972-1977
(in metric tons)

Year	5th Region Mopti	All Regions	Direct OMM[a]
1972	6,120	28,700	-
1973	1,030	10.910	-
1974	3,810	9,860	-
1975	11,360	49,740	8,705
1976	10,960	42,890	8,440
1977	12,740	40,900	5,400

Source: AID, Project Evaluation Report, Opération Mil Mopti., 1977.

[1]Opération Mil Mopti. in the 1976/77 campaign, it was decided that in the Bankaes and Djenné Cercles, existing cooperatives would take over grain collection, delivering directly to OPAM. Thus the data for 1977 excluded Bankaes and Djenné.

the coarse grains is given. According to this source, in the last three years, with near normal rainfall, the marketed share of coarse grains has averaged about 45,000 metric tons per annum.[1] Official marketing of rice output has run about 50-60,000 metric tons over the period if a factor of 30 percent is applied to production estimates. Given these magnitudes of the net additions to grain stocks, the overall volume of stocks controlled by OPAM implies fairly high-use rates of existing storage infrastructure.

In addition to stocks acquired through domestic grain purchases, imports are a second source of grain stocks. Mali maintains a substantial grain trade with neighboring countries. Because of significant intercountry price differentials (low official producer prices at home relative to consumer prices abroad), there is a large volume of unofficial trade in grains which is unrecorded in published data. It is not unrealistic to suppose that a substantial percentage of the grains which are acquired in the parallel market are not stored for domestic sale, but are moved out of the country. On the basis of official trade statistics provided by the Central Bank and shown in Table III-6, over the past two years Mali has been a net exporter of grains. Imports, at least until the recent rainfall deficiency, had declined substantially from immediate post-drought levels.

In the two years of good rainfall after the drought, the GOM had built up almost 18,000 metric tons of grains under its Reserve Stock Program. Table III-7 shows the reserve stock position as it existed in the

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[1] The figures conform to those shown in OPAM, Rapport d'Activite, 1974-1976.

fall of 1976. Since that time, these stocks have been drawn down, and as of the first quarter of 1978 the GOM had no balance of reserve stocks.

TABLE III-6

VALUE AND QUANTITY OF OFFICIAL EXTERNAL TRADE IN CEREALS 1975-1977

		Imports		Exports	
Year	Commodity	Quantity	Value	Quantity[1]	Value
1975	Rice	Purchases: 15,000	3.0	-	none
		Food Aid: 8,000			
1976		Purchases: None	-	18,000	2.4
		Food Aid: None			
1977		n.a.	n.a.	n.a.	2.4 (estimated)

Source: Banque Centrale de Mali, March 1978.

[1]OPAM, Rapport d'Activité, 1976.

TABLE III-7

SITUATION OF RESERVE STOCKS, AUGUST 31, 1976
(in metric tons)

Location (Region)	Type of Structure	Tonnage
Mopti	n.a.	11,500
Bamako	conventional warehouse	497
Sogoniko	conventional warehouse	2,857
Sogoniko	metalic warehouse	484
n a.	in silos	2,308
Total		17,646

Source OPAM, Rapport D'Activité, Sept. 1975-1976.

CHAPTER IV

NIGER

On the basis of expressed policy objectives, the GOM has made a serious effort to intervene in the market for foodgrains through price policies, cereal distribution and storage networks. The public sector cereals marketing and storage systems are represented by the grain agency OPVN and the Union Nigerienne de Credit et de Cooperation (UNCC).[1] OPVN is the executing agent for a cereals marketing policy which is formulated in the Ministry of Economic Affairs and guided by the National Committee for Cereals. The UNCC is responsible for the annual collecte primaire from primary producers in rural markets in areas in which producer cooperatives have been established, buying from both cooperative and non-cooperative producers who trade in the market. It is estimated that OPVN picks up about 6 percent of domestic production of coarse grains, millet and sorghum. Some 15 percent of grain production is handled by private traders. Roughly 80 percent of millet and sorghum production remains at the farm level. A current judgement is that stocks equivalent to perhaps 70-75 kilograms per inhabitant are stored on-farm.

Collection and Redistribution Systems

The primary role of the grain agency has been to take on stocks from productive regions and redistribute grain throughout the country. As Table IV-1 shows, OPVN acquires grain stocks in surplus production areas

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[1] The UNCC is a national agency primarily in charge of the formation of rural cooperatives and the provision of technical assistance and inputs to cooperatives. Grain marketing is a subsidiary activity.

TABLE IV-1

OPVN MILLET AND SORGHUM PURCHASES, BY REGION AND PRIMARY AGENT, 1977
(in metric tons)

Region	Millet				Sorghum			
	UNCC	Traders	Direct Purchase	Total	UNCC	Traders	Direct Purchase	Total
Niamey	532	905	-	1,437	5	-	-	5
Dosso	-	120	11	131	-	-	-	-
Touahoua	112	519	-	631	17	-	-	17
Maradi	1,200	99	-	1,299	125	-	-	125
Zinder	919	-	-	919	27	-	-	27
Diffa	-	-	-	-	232	126	411	769
Totals:								
All Grains	5,363	-	-	-	-	-	-	-
UNCC Share	2,762	-	-	-	407	-	-	407
Traders	-	1,643	-	-	-	126	-	126
Direct Purchase	-	-	11	-	-	-	411	411

Source: Office of the Entente Fund, Niamey.

by three means. UNCC purchases, private (licensed) traders, and to some extent, through direct purchases by the grain agency. The latter are primarily sorghum purchases, and if the figures in Table IV-1 are representative, the direct purchases of sorghum are about equal to UNCC collections. Under the structure of the official marketing system, the UNCC is supposed to serve as the primary contact with the agency's grain suppliers. It finances its primary collection activities through a 6.5 percent loan from the CNCA (Agricultural Credit Bank). During the period of the campaign, on market days the UNCC exercises a monopoly on producer grain sales in rural markets. Agents may rent some type of temporary warehousing near primary marketing locations until stocks are moved to permanent facilities. Most often, however, sacks are stacked in the open air. The movement of foodgrains from these collection points is the responsibility of OPVN, which, in principle, moves the grain within one week of collection. OPVN in-transit costs, from market to warehouses, are shown in the barême in Table IV-2 under item four as 1,700 CFA F per metric ton.

In some regions traders supply OPVN with a greater proportion of its stock acquisitions than does the cooperative federation. Traders contract to deliver grains directly to OPVN warehouses so that the agency does not incur a transport cost on trader deliveries. However, the total stock acquisition cost to OPVN on grain supplied by traders is higher than of UNCC. The barême in Table IV-2 shows that this arises from the higher commission paid to private traders. The differential amounts to 2,500 CFA F as shown under item two of the schedule.

Following the collection process, OPVN redistributes grain stocks among departments in accordance with estimates of consumption requirements.

TABLE IV-2

PRICE SCHEDULE (BARÊME) FOR MILLET AND SORGHUM, PER KILOGRAM, ESTABLISHED FOR OPVN BY TYPE OF AGENT, 1977 (in CFAF)

	Millet and White Sorghum		Red Sorghum	
	Traders	UNCC	Traders	UNCC
Price paid to producers	30.00	30.00	25.00	25.00
Commission	4.00	1.50	4.00	1.50
Stock preparation, tagging operations, etc.	2.05	2.05	2.05	2.05
Transport (from markets to stores)	—	1.70	—	1.70
OPVN administrative and overhead costs	4.30	4.30	4.30	4.30
Provision for debt	2.00	2.00	2.00	2.00
Treatment of stocks	.10	.10	.10	.10
SUBSTOTAL of OPVN costs:	42.45	41.65	37.45	36.65
ADD:				
Estimated costs of interregional transfers	6.00	6.00	6.00	6.00
Total cost to OPVN	48.45	47.65	43.45	42.65
OPVN sale price	40.00	40.00	30.00	30.00
Estimated loss to OPVN per kilogram	8.45	7.65	13.45	12.65

SOURCE: OPVN, Niamey

The second element in the barême shows an estimated redistribution cost of 6,000 CFA F per metric ton to OPVN on grains transferred between regions. At current levels of official cereal prices, consumers are subsidized by between 8 and 13.50 CFA F per kilogram through the agency's stock and redistribution operations.

Stockholdings

National grain stocks are held at two levels. First, under the arrangements between the UNCC and local cooperatives, 10 percent of the primary collection is turned over to local cooperatives and stored at the local level. As discussed below, the UNCC and cooperatives maintain local grain storage facilities. The second group of stockholdings are those of OPVN which are composed of domestic stock purchases and official imports. The latter include grains purchased from neighboring countries directly by the grain agency as well as cereals coming in under foreign assistance programs. The levels of stocks shown in Table IV-3 probably do not take account of cereals coming in under recent international assistance agreements. In recent years, OPVN has imported substantial amounts of grains under direct purchase contracts from neighboring-country grain producers. These include OPAM in Mali, OFNACER in Upper Volta, and foodgrains from Nigeria.[1] These sources make up the so-called "stocks regulateurs", stocks to be drawn down with the objective of making incremental adjustments to local supply as demand conditions change over the course of the year.

[1]Imports of millet, sorghum and rice are reported as follows for the year 1976/77: Mali· 5,000 MT; Upper Volta: 5,574; Nigeria: 4,600 MT.

TABLE IV-3

OPVN STOCKS AVAILABLE FOR COMMERCIALIZATION, BY DEPARTMENT, AS OF JANUARY, 1978
(in metric tons)

Department	Millet	Sorghum	Corn	Rice	Wheat	Total
Niamey	1,610	3,310	500	179		5,599
Tahoua	1,022	1,100		47		2,169
Maradi	2,261	1,788	100	59	21	4,208
Zinder	758	428	173	23		1,382
Diffa	226	10		57		293
Agadez	668	617		358		1,643
Dosso	675	1,075		419		2,169
Totals:	7,220	8,328	673	1,142	21	17,384

SOURCE: Office of the Entente Fund, Niamey

In addition to these stocks, OPVN at present is holding stocks for the government under the Emergency Reserve Stock program. Table IV-4 indicates that the agency holds approximately 15,000 metric tons of millet and sorghum. These stocks are located in the three departments of Maradi, Tahoua and Zinder.

Storage Capacity

There are in Niger three general categories of public sector storage facilities: warehouses in arrondissements controlled by the UNCC and its cooperatives; conventional warehouses and stores owned by OPVN; and special silos constructed for long-term grain storage which are under the direction of OPVN.

1. UNCC-Cooperative Storage.-- The UNCC controls its own network of stores and also manages facilities belonging to the cooperatives. In all cases these stores serve multiple uses and are not solely available for grain storage. Space in local warehouses is used for storing of fertilizers, seed, and equipment. Local warehouses are used as well in the commercialization of cash crops and other foodstuffs. It is roughly estimated that these competing uses reduce the area specifically allocatable to grain storage to between one-quarter and one third of total capacity. Both the FED and the IBRD were active in the construction of local storage facilities between 1968 and 1975. As a result of this financing of facilities to augment UNCC and cooperative stores, it is estimated that about 9,000 metric tons of capacity are available which meet minimum conditions for storing grains for other than very short periods.

TABLE IV-4

OPVN: RESERVE STOCK POSITION, JANUARY 1978
(in metric tons)

Department	Millet	Sorghum	Wheat
Dosso	--	--	--
Tahoua	800	--	--
Maradi	8,116[1]	--	--
Zinder	6,574	510	--
Diffa	--	--	--
Agadez	--	--	--
Niamey	--	--	--
Total:	14,770	510	

SOURCE: Office of the Entente Fund, Niamey

[1]A source within OPVN reports reserve stocks located at Maradi as 7,339 metric tons.

2. OPVN Storage.-- Official estimates of OPVN grain storage capacity demonstrate considerable variability. Table IV-5 provides two different estimates of the number of OPVN warehouses and their capacity, broken down by department. The figures under Roman numeral I are based on public documents made available by the Office of the Director at OPVN. The figures in parentheses under Roman numeral II are derived from Table IV-6. This table shows a breakdown of storage facilities by district in the seven departments. These data were drawn from other documents issued within the grain agency and show an overall reduction in estimated capacity

The variance in the estimates of the number of structures owned by OPVN and corresponding capacity suggests that additions to capacity and the withdrawal of some older facilities are in process. Such shifts make difficult a precise accounting of total capacity at a point in time. Investments are currently being planned, and as the financing of these investments is assured, the capacity represented by planned investments may be included in published totals before actual construction is realized. Another source of discrepancy between the estimates may be due to a revision of construction standards which leads to the elimination of facilities of low quality. It is reported that in the Niamey Department, particularly, there are a number of relatively small storage structures (each having a capacity of 100 metric tons) which are, in fact, unsuitable for storage of grains for any period of time A more rigorous assessment of the quality and condition of structures, and the gradual subtraction from totals of small banco structures, for example, gives a more realistic picture of storage infrastructure.

TABLE IV-5

OPVN GRAIN STORAGE CAPACITY, 1978
(in metric tons)

Department	Number of Warehouses		Capacity[1]	
	I	II	I	II
Niamey	15	(15)	14,500	(13,500)
Dosso	11	(10)	9,000	(5,000)
Touhoua	11	(13)	13,500	(11,500)
Agadez	4	(3)	4,000	(4,000)
Diffa	9	(7)	7,500	(5,500)
Maradi	13	(14)	11,000	(11,500)
Zinder	16	(18)	13,500	(16,500)
Total:	79	(80)	73,000	(67,500)

SOURCE: Office of the Director, OPVN, Niamey.

[1]Figures in parentheses derived from Table IV-7.

TABLE IV-6

OPVN GRAIN STORAGE AND PLANNED CAPACITY BY LOCATION OF STORAGE STRUCTURES, DECEMBER 1977
(in metric tons)

Location	Number of Structures	Capacity
Department - Niamey		
Niamey	8	9,500
Balleyara	1	500
Say	1	500
Tera	1	500
Tillaberry	1	500
Ouallam	1	1,000
Filingue	2	1,000
Department - Dosso		
Dosso	5	1,000
Kare Mairoua	1	500
Gaya	1	1,000
Degondoutchi	1	1,500
Loga	1	500
Birni-N'Gaoure	1	500
Department - Tahoua		
Tahoua	2	2,500
Bouza	1	500
Illela	1	500
Keita	1	500
Birni N'konni	5	5,000
Tchintabaraden	1	500
Madaoua	2	2,000
Department - Maradi		
Maradi	2	3,000
Guidan-Roumdji	1	500
Aguie	1	500
Dakoro	1	500
Tessaoua	6	4,500
Mayahi	1	500
Gazaoua	1	500
Tchadaoua	1	1,500
Department - Zinder		
Zinder	4	4,000
Goure	1	500
Magaria	2	2,500
Matameye	1	1,000
Mirriah	1	500
Tanout	3	3,000
Bakin-Birgi	4	2,000
Mainasoroa	2	2,000

Table IV-6 continued

Location	Number of Structures	Capacity
Department - Diffa		
Diffa	2	2,000
N'Guimi	5	3,500
Department - Agadez		
Agadez	2	2,500
Arlit	1	1,500

SOURCE: OPVN, R.F.A. Storage Consulting Team.

TABLE IV-7

NIGER. SUMMARY OF STORAGE CAPACITY ESTIMATES
DETAIL OF EXISTING AND PLANNED CAPACITY BY TYPE OF STRUCTURE
AND SOURCE OF FINANCING, 1978
(in metric tons)

I.	Conventional Structures			
	A. Realized:	Number	Capacity	
	Before 1974:	46	34,500	
	Loans & Grant-financed	34	36,000	(includes 7,500 financed under long term storage program)
		80	70,500	
	B. Under construction	8	4,000	
II.	Silos (Sealed Long-term Structures)			
	A. Realized:	Number	Capacity	
	Loan & Grant-financed	11	7,500	
	B. Financed and under construction	20	10,000	

SOURCE: OPVN, RFA Storage Consultancy Team.

Table IV-7 summarizes the overall situation with respect to OPVN storage infrastructure on the basis of the type of structure and the source of financing. The term "conventional structures" covers various types of storage units, ranging from banco stores to corrugated and concrete structures. The term excludes "silos" which are covered and sealed with butyl substance and used for long-term grain storage. In general, it may be assumed that conventional structures erected since 1974 are more likely to reflect basic minimum standards of construction and quality. In any event, however "official" the estimates, a present total grain storage capacity figure of 70,000 metric tons or more undoubtedly overstates the grain agency's utilizable grain storage infrastructure. This figure becomes more realistic if it is interpreted to include planned investment and construction.

CHAPTER V

UPPER VOLTA

In Upper Volta, several public agencies are directly or peripherally concerned with grain marketing and storage. These include the national grain agency, OFNACER, established in 1970; the Organismes Regionaux du Developpement (ORDs); the Ministry of Rural Development; and the Sous Comité de Lutte contre les Effets de la Secheresse. The Agricultural Services and the Ministry of the Interior also have some responsibility in the grain storage area.

In the eight years since the creation of OFNACER -- which introduced state intervention into grain marketing -- efforts to establish a dual marketing structure and to increase the state's share of the domestic foodgrain market have met with mixed success. At present, Upper Volta's public policy with respect to its official marketing system for domestic grain output and the related question of grain storage are in an unsettled state. In 1974, when OFNACER was granted a monopoly for the sale of cereals to consumers, the ORDs were simultaneously granted a monopoly over the purchase of food crops from producers. For a variety of reasons this official monopoly has not worked out.[1] It is widely known and can-

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[1]The recent CILSS report summarizes the ORD experience in 1974 as follows:

> "The ORDs lacked the staff, the knowledge, and the experience required for foodgrain marketing...Many had no marketing infrastructure at all and, therefore, had to rely on private traders and truckers. All the ORDs were forced to allocate workers, working capital and other resources away from the developmental or productionist role of the organization to the marketing function."

op. cit. Vol. 2 p. 18.

ibid., Vol. II

didly admitted that at present, the role of the ORDs in grain marketing is little more than a legal fiction. Moreover, since the primary function of the ORDs is to promote agricultural and social development, the burdensome and poorly implemented additional responsibility for grain marketing and storage impose high social and economic costs.

Under the (theoretical) operation of the official marketing system, the ORDs are authorized to acquire, through purchase, the marketed share of the nation's grain output. As such, the ORDs at the time of the collecte primaire have been designated as the original repositories of the marketed portion of grain output. Stocks acquired through the purchase of domestic output are, in turn, placed at the disposition of OFNACER for distribution and sale. In addition to domestic stocks, OFNACER receives official imports of grain. A great proportion of imports represent food assistance financed under foreign aid programs. The public marketing authority, however, does not have a unique responsibility for the distribution of grain stocks. The Sous Comité contre les Effects de la Sécheresse oversees the placement of grain stocks in deficit production regions and distressed areas. In the Sahel context, such conditions are chronic and the Sous Comités' role is a continuing one; and is not limited to periods of production declines such as the ones which occured between 1971-1974. The broad role of the Sous Comité is to improve the equalization of cereal supply and demand between surplus and deficit regions.

Storage Capacity

The total amount of storage infrastructure owned by each of these organizations can only be roughly estimated. A summary of these estimates

is presented in Table V-1. An accurate account of grain storage capacity by sector is hampered by several factors. First, at present, total storage availability at the ORD level is not known, and a census of ORD storage has been authorized. Until this census is completed, ORD grain storage estimates are subject to large error. A second complicating factor is the practice of the exchange of facilities between public agencies and between the public and private sectors. For example, leasing arrangements take place between the Sous Comité and OFNACER. The latter also rents facilities from time to time from private commercants on a short-term basis.

1. ORD Storage.-- An unofficial estimate of the storage capacity owned by the eleven ORDs at the beginning of 1978 is 20,800 metric tons. As indicated above, this figure is only approximate since a census of ORD storage facilities is still in progress. The distribution of the estimated total among ORDs is not available. In any event, the existence of a certain volume of storage capacity at the ORD level does not necessarily mean that space in such structures is allocated totally to foodgrain storage. ORD storage facilities serve mulitple purposes, and are used for such items as insecticides, fertilizers, equipment etc. These competing uses emphasize that the primary responsibility of the ORDs is not grain marketing and storage, but general agricultural development.

2. OFNACER Storage.--- OFNACER estimated total storage capacity, distributed in eight of the ORDs, is shown in Table V-2. The total capacity figure of 25,500 metric tons differs slightly from data prepared in response to a CILSS questionnaire issued in the fall of 1976 which indicated a total of 27,500 metric tons. The 2,000 metric tons difference applies to Ouaga-

TABLE V-1

SUMMARY OF ESTIMATES OF GRAIN STORAGE CAPACITY, 1976 AND (FEBRUARY) 1978

	1976[1]	1978[2]
Public Sector		
1. ORDs	20,800	20,800
2. OFNACER	27,500	25,500
3. Sous Comité	8,200	11,500
4. Potential Emergency Reserve	11,000	11,000 (approx.)
Storage Facilities (Silos)		
Private Sector		
5. Farmers	1,600,000	—
6. Traders	33,000	—

[1]SOURCE: 1976, C.R.E.D., University of Michigan, CILSS, Club du Sahel, Marketing Price Policy and Storage of Food Grains in the Sahel, Vol. II.

[2]OF NACER.

TABLE V-2

UPPER VOLTA: ESTIMATED PUBLIC SECTOR STORAGE INFRASTRUCTURE

A. OFNACER: Grain Storage Facilities by District, February 1978[1]
(capacity in metric tons)

ORD	Department	Capacity	Type of Structure
Centre	Ouagadougou	13,000	concrete; prefabricated
Haut-Bassins	Bobo-Dioulasso	3,000	concrete; prefabricated
Volta Noire	Dedougou	1,500[2]	concrete
Pl. Nord Mossi	Kaya	1,500	concrete
Sahel	Dori	500	concrete
Centre-Est	Koupela	1,500	concrete
Yatenga	Ouahigouya	1,500	concrete
Centre Ouest	Fada N'Gourma	3,000	concrete
	TOTAL:	25,500	

[1]Most of these facilities have been financed by foreign loans and grants. OFNACER's own resources were used to finance facilities in Koupela and Dedougou.

[2]Under construction.

B. Sous Comité: Grain Storage Capacity, February 1978
(in metric tons)

Northern ORDs	11,500
Non-Sahel	3,000[1]
TOTAL	14,500

[1]Estimated. Facilities are located near Ouagadougou.

SOURCE: OFNACER, Office of the Director.

dougou, where capacity has been reduced from 15,000 to 13,000 metric tons.[1]

More than one half of the grain agency's total infrastructure is located in Ouagadougou. OFNACER maintains facilities with a capacity of 3,000 metric tons each in the departments of Bobo-Dialousso and Fada N'Gourma. Six thousand metric tons are distributed equally between the four Departments of Dedougou, Kaya, Koupela and Ouahigouya. Previously there had been no public sector capacity in the major grain-exporting ORD of Volta Noire, but 1,500 metric tons is reported to be under construction.

At the beginning of 1978, OFNACER was reported to have access to some facilities under lease arrangements with commercants in the private sector. The scale of facilities available for rental on an ad hoc basis consisted of one warehouse of 1,000 metric tons, one warehouse of 500 metric tons, and assorted structures of 20-50 metric ton capacity. Although no data have been gathered on lease-cost financing, an opinion was expressed that OFNACER pays a fairly high price when required to lease private sector facilities.

Table V-3, which shows OFNACER cereal sales by locality for the period April 1, 1975 to March 31, 1976, indicated that 70 percent of the grain agency's stocks were sold in the Department where its facilities are located. However, one observes from the tables that large grain sales occur in areas where warehousing facilities do not appear to exist. For example, in the department of Gorom-Gorom, where OFNACER maintains no

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[1] See paper prepared by A. Pinckney, 1977

TABLE V-3

OFNACER CEREAL SALES, BY LOCALITY,
APRIL 1, 1975 TO MARCH 31, 1976
(in metric tons)

District	Cereals				
	Rice	Millet	Sorghum	Corn	
Ouagadougou	3,540	681	1,985	786	6,992
Ziniare					
Kokologo	4				
Dassouri	2				
Bousse	4				
Manga	1				
Sapone	-				
Po	1				
Koudougou	89		8	21	
Manoro	2		3	4	
Yako	21				
Kindi	-				
Sabou	4				
Samba	2				
Tenado	3				
Reo	1				
Bobo	835		525	213	1,573
Banjora	364		2	13	379
Diebougou	2	33			
Boroma	10				
Debougou	132				
Tougan	55				
Nouna	88				
Kassoum	2				
Toma	31				
Safane	9				
Salenzo	6				
Gassan	120				
Ouahigouya	468	11	14		493
Seguenega	9				

Table V-3 continued

District	Rice	Millet	Sorghum	Corn	
Gourcy	11				
Thiou	1				
Koumbri	-				
Djiko	10	44		7	
Arbinda	11	1	8		
Dori	64	35	10	188	
Gorom	9	1,408	488	64	1,969
Markoye	2	259	31		
Kaya	56		2	165	
Boulsa	-				
Mane	-				
Fada N'Gourma	45	6	8	6	
Tembende	-	155	235	4	394
Bogande	9				
Kantchari	17	3			
Koupela	76		1		
Tenkodogo	70				
Zorgho	45				
Boutenga	59				
TOTAL:[1]	6,400	2,635	3,319	1,471	13,825

[1]Excludes 2,855 metric tons of grains provided under foreign aid programs, mainly sorghum.

SOURCE: Office of the Entente Fund, Niamey.

storage infrastructure, approximately 2,000 metric tons of foodgrains were sold. On the other hand, the Sous Comité has built up regional storage capacity, and its storage structures are located in some areas where OFNACER does not maintain warehouses.

3. Sous Comité Storage.-- The Sous Comité owns about 11,500 metric tons of capacity in the northern region and about 3,000 metric tons near Ouagadougou. It is possible that in the case of storage facilities located in Ouagadougou, some temporary shifts tend to take place between the two public agencies, OFNACER and the Sous Comité. As shown in Table V-4, the bulk of the Sous Comité's storage facilities are located in the northern ORDs of Yatenga and the Sahel. Both ORDs are traditionally net importers of cereals. The corrugated and concrete structures, 200-300 square meters in area with a total capacity of 11,500 metric tons, were initially used as warehousing for stocks acquired under the Comité's National Grain Stock Reserve Program. The Sous Comité's storage capacity in the northern ORDs has been replaced by the acquisition of materials for the construction of sealed silos. As indicated below, a build-up of stocks occurred under this program between 1974 and 1977. Since that time, these stocks have been drawn down and the structures in the northern ORDs represent, for the present, unused capacity.

4. Private Sector (off-farm) Storage.-- The major characteristic of private sector grain storage is decentralization. It is believed that the private commercant stocks small quantities of 10-40 tons on the average, in any given location. Some informed judgements place the average stock quantity closer to 100 metric tons. The differential may be ex-

TABLE V-4

SOUS COMITE: CONVENTIONAL STORAGE INFRASTRUCTURE IN THE NORTHERN ZONE
(in metric tons)

ORD	District	I. Corrugated Structures[1]		II. Concrete Structures[2]		Total
		Number	Surface	Number	Surface	
Yatenga	Ouahigouya	5	1,000	-	-	1,000
	Sougo	1	200	-	-	200
Yatenga	Titao	2	400	3	900	1,300
Sahel	Djibo	-	-	6	1,800	1,800
Sahel	Arbinda	2	400	3	900	1,300
-	Gorgadji	1	200	-	-	200
Sahel	Dori	2	400	9	2,700	3,100
Sahel	Sebba	2	400	3	900	1,300
Sahel	Gorom	2	400	3	900	1,300
TOTAL:		17	3,400	27	8,100	11,500

[1]Surface of each unit measures 200 square meters.

[2]Surface of each unit measures 300 square meters.

SOURCE: OFNACER

plained by seasonal adjustments in stockholdings. It has been suggested that after harvest, commercants buy with a view to storage, and then release grain gradually over the course of the year. Where this holds true, stocks at any point in time reflect the trader's view of price trends, and the average level of stocks held may be subject to sizeable fluctuations.

Current Stock Levels

At the beginning of 1978, public sector foodgrain warehouses had considerable excess capacity. A fall in domestic grain output in 1976/77 brought, as is the normal Sahel pattern, an even greater decline in the marketed volume of grain. Table V-5 gives the evolution of local grain market purchases, imports, and stock positions since 1971. The table shows that grain purchases from the domestic market fell by more than 70 percent between 1975/76 and 1976/77. The grain agency's 1976/77 sales of 22.4 thousand metric tons of millet, sorghum and rice were composed largely of imported grains (foreign aid imports rose by more than 100 percent) and the drawing-down of existing stocks.

The so-called Reserve Stocks held by the Comité National were drawn down in 1976/77 In 1974 and 1975, 5,802 metric tons of grains had been purchased under the first phase of the Reserve Stock program. An additional 3,128 metric tons were purchased under the second and third phases in 1976 and 1977 The initial stock acquisitions were turned over to OFNACER for export to Niger in November and December of 1976. Stocks acquired under the second and third phases of the program were used to

TABLE V-5

OFNACER GRAIN PURCHASES, IMPORTS, SALES AND STOCK POSITION 1971/72-1976/77[a]
(in thousands of tons)

	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77
1. Local Market Grain Purchases	1.54	0.76	2.77	15.40	25.70	6.21
2. Imports of Grain (foreign aid)	35.29	27.41	29.54	24.75	3.00	7.36
3. Local Market Grain Sales	30.75	24.93	33.02	28.01	13.00	22.36
4. Changes in Grain Stocks (1. + 2. minus 3.)	+6.08	+3.24	-0.71	12.14	15.70	-8.79

[a]Estimated by OFNACER as of February 1978

SOURCE: IMF Report on Upper Volta, 1977

meet OFNACER's sales requirements in Ouagadougou in 1977.[1]

In February 1978 OFNACER was reported as holding no stocks from local market grain purchases. Local market sales were reported as being made solely from cereals imported under food aid programs. The Agency's stocks were estimated to be equivalent to approximately one and one-half month's normal grain sales. At this time, the ORDs were also reported to be carrying some amount of grain stocks.[2] The exact level of these holdings has not been determined; however, it may be equivalent to balances indicated in line 4 of Table V-5, less amounts allocated to reserve stocks over the periods shown.

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[1]Ministere du Developpement Rural, Comité National pour la Constitution des Stocks de Cereales de Reserve, Rapport d'Information des Activités du Project, Campagne 76/77 - 77/78, December 1977.

[2]Based on information received from Office of the Entente Fund, Niamey.

CHAPTER VI

GRAIN STORAGE: ISSUES AND INVESTMENT PRIORITIES

In the context of the Sahel economies, there are two levels of grain stocks: 1) on-farm stocks held as reserves by cereal producers; 2) stocks which have been accumulated at the regional levels through the intervention of national grain agencies in cereals markets. The transfer of stocks from production points to centralized warehousing has produced a system, of sorts, for the holdover of stocks in the process of collection and transport.

On-Farm Storage

The quantity of cereals stored on farms, though not known with any degree of certainty, undoubtedly represents for each of the three countries the major proportion of its national cereal stocks and represents equally an established volume of storage capacity which imposes no lien on the public sector. Since investment decisions concerning on-farm storage infrastructure are made by individuals and/or family groups, such investments are costless from the standpoint of national budgetary resources. In the two to three relatively improved harvests since the drought, Sahelian producers have begun to rebuild stocks drawn down in the early 1970. Some observers believe this will continue for several more harvests, and for the immediate future, the distribution, at the

margin, of any increasing cereals output among sale, consumption and storage will be reflected in a general increase in on-farm stocks.[1]

Storage Costs

Often in discussions of grain storage, and especially when issues of donor intervention arise, there is a tendency to treat on-farm storage and public sector storage as though they were mutually exclusive elements. Grain stocks stored by subsistence producers, or, in a few cases, by a relatively small number of higher-income, large-scale producers, and stocks which are collected to move in trade, are not mutually exclusive. There is a flow of stocks from farms to off-farm stockholders. All stocks are for some period of time before marketing the responsibility of farmers. Moreover, farmers sometimes draw upon old grain to meet marketing quotas. It may well be that long-term, on-farm holders of stocks practice a policy of stock turnover just as grain agencies plan under their reserve programs. In any event, producers sell grains at periods of the year other than immediately following harvests, drawing upon stocks to meet cash requirements, gifts, etc.

On-farm storage as such imposes a cost on the national economy only to the extent that poor storage practices or inadequately constructed storage facilities reduce the total supply of national stocks; or deterioration in quality (infestation) of grains stored at the farm level causes

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[1]This view of the rebuilding of stocks, at least in those areas within countries which have traditionally maintained high levels of on-farm storage is put forward in IDET-CEGOS, Etude des Structures des Prix et des Mecanismes de la Commercialisation des Mils et des Sorghos, May 1976; and, Conseil de l'Entente, Etude Relative a la Constitution d'un Stock de Reserve en Cereales pour le Niger, January, 1975.

losses when grains stored on farms for a period of time move in trade. Losses in absolute volume of grains reduce the national stock of wealth represented by the value of the grain, and the deterioration in quality might be viewed as a negative production externality, which carries a social cost when grains enter the marketing system.[1]

There is no empirical study which establishes a statistical basis for judging outright losses, or losses in weight or quality of grains stored at the farm level in the Sahel. On the one hand, it is held that within the range of avialable technology, traditional graneries using local construction and fastening materials minimize fixed investment costs, and serve reasonably well in relation to such costs. This sanguine view does not extend, however, to on-farm storage conditions related to pre-storage handling, absence of the chemical treatment of grain, and the like, which is said to impose a high risk burden on primary producers storing grains. Given the magnitude of the loss potential, there are technical experts who hold that substantial returns may be realizable through introduction at the farm level, through technical improvements

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[1] It sometimes used to be argued that stocks held by subsistence producers are destabilizing and accentuate fluctuations in the volume of grains reaching the national market. The argument affected the reactions of farmers to price (income) changes. At low prices, farmers would increase the quantity of supplied in order to maintain a given income, thus further lowering prices. At higher prices, farmers tended to decrease the quantity supplied, taking part of the increased income in the form of increased consumption of the higher-priced product. (FAO, Commodity Policy Price Studies, National Food Reserve Policies in Underdeveloped Countries, Rome 1958.) Such arguments, based on the assumption that the farmer seeks to hold money income constant, are no longer fashionable. In the Sahel, it is accepted that marketed output, at least, is positively responsive to an increase in price. Moreover, the large volume of grains moving as a result of interstate Price differentials weighs heavily in favor of the responsiveness of marketed supply to price.

in pre-storage handling, grain treatment, and perhaps some technological innovation in infrastructure. If the present cost of on-farm storage infrastructure is low relative to other possible techniques, this limits the scope for technological innovation in infrastructure. Opportunities may be wider for improvements in storage methods, insecticide treatment, etc.[1]

Traditional graneries, constructed at minimum cost with local materials, facilitate, at their best level of construction, the maximum amount of storage in relation to the individual farm unit's production level, and the maximum duration of storage. Small money outlays are required per ton of grain stored at the farm level. No actual cost estimates have been made for construction of traditional storage infrastructure in the Sahel countries, but there are estimates of on-farm storage construction costs for other West African countries where similar materials are used in construction. Applying these estimates to a fairly

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[1] In Niger, for example, technicians have found that a particularly injurious species of beetle has infiltrated national grain agency stocks. It is possible that given the predominant type of on-farm storage structure -- typically a construction employing a straw matting amenable to the breeding of this insect -- infestation may have reached on-farm stocks. This remains a conjecture, since no surveys of farmer stocks have been carried out, but suggests there are returns to be derived from pest control measures.

A recent survey taken by a short-term FAO field team in Mali confirms findings in some other West African countries of an absence of a correlation between losses and the length of the storage period, implying that traditional storage technology is not in itself a cause of storage losses. It is at the field level that substantial grain losses occur. Here, possible measures for improvement include pest control systems, more rapid drying techniques, and improved rack and platform storage. In addition to the technical factors which account for field losses, a second factor is involved, namely, a labor constraint. This is because women are largely responsible for field collection and there are competing uses for labor time. If grains survive the predators, bacteria and fungi to which they are prone during field storage, the traditional ganeries -- if maintained in good repair -- minimize losses. There are two major ways in which traditional graneries could be improved; these are the elevation level of bins and floor reinforcement. (FAO, Rome, 1978.)

typical on-farm storage unit found in Mali permits a simulated cost schedule to be constructed.[1]

The estimates shown in Table VI-1 are based on labor time of one man-day per metric ton of capacity. This coincides with figures which have been cited in Upper Volta. Often, family labor is utilized in the in the construction of graneries, which lowers the cash outlay. But since family labor time has value in alternative uses, it is not inappropriate to value all labor included in construction. In addition to the total cost of 2,420 CFAF shown in the schedule, certain monetary costs such as interest and depreciation charges might be added. For any new storage construction techniques to be effectively introduced as the farm level, the cost cannot exceed the relatively low present cost of on-farm storage infrastructure. Any higher cost must bring about a reduction in storage losses significantly greater than the increase in total costs of new construction methods and materials.

Community-Village Level Storage

There are two factors which place a limit on the scale of stored output located on-farm. The first concerns the scale of production of the

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[1]Estimated costs are based on a classical bin raised off the ground on wooden stilts or stones, made of clay and reinforced with straw. The roof is of straw matting. In such structures access is either through the top or through a wooden door. On the average, bins are about two and one half meters in diameter, sometimes compartmentalized to store different products such as millet panicles, maize cobs, etc. Such bins when found in the Dogon area are built on a slab of rock and raised on a rock footing. This firm base and elevation contributes to the relatively greater efficiency of Dogon storage.

TABLE VI-1

EXEMPLARY CONSTRUCTION COST SCHEDULE FOR ON-FARM STORAGE STRUCTURE

1. Size: 5 Metric Ton Capacity
2. Estimated 4-5 days total labor time

Type of Charge	Cost (CFAF)
1. Mason charges	920
2. Labor costs Includes: a) Soil mixing and preparation b) Transport of clay, water, etc.	1,200
3. Roofing	300
TOTAL:	2,420

SOURCE: Based on data of estimated traditional storage cost in V.K. Nyanteng, The Storage of Foodstuffs in Ghana, 1974.

farm unit itself. Given the average production of farms, taking into account the distribution between the marketed share of output and the amount to be stored for home consumption, and/or release over time, the farm has an optimum level of needed storage capacity. In general, grain storage units of 1-10 metric tons provide sufficient storage space for on-farm needs. This implies, parenthetically, that any modernization of facilities to be introduced at the farm level must take account of the optimum scale of on-farm storage requirements. The second point concerns technological or engineering limitations of traditional graneries. The type of construction materials used in the traditional sector place an upper limit on the storage capacity of a given unit. The design quality of a traditional storage unit is determined by the strength of the flooring and the height above the ground. Weight beyond a certain limit narrows the distance between the structure and the ground. The technology of traditional grain storage structures limits carrying capacity to about ten metric tons.

Collective or cooperative storage systems at the village level have come under discussion partly because of the economies to be derived from storing on an organized basis in a central store or silo (e.g., to spread the overhead costs of supervision, maintenance, insecticide treatment, and to benefit from longer occupancy rates), where individual farm unit structures would be too small in scale to efficiently administer a program. In part, the discussion concerns the introduction of innovations in relatively small-scale storage infrastructure, which would not be economically feasible where the volume to be stored is as low as ten metric tons per unit of storage. The minimum volume of grain required to justify the

employment of more costly construction techniques would be secured by amassing the stocks of individual farmers.[1] The concept of village-level stores is linked as well to official marketing objectives. Cooperative or village storage depots are viewed as a means of drawing on farm stocks, making them accessible to trading. Such a scheme has been put forward in Upper Volta, and while the scheme does not propose to introduce innovations in storage infrastructure, it is examined below in some detail because it raises issues of what the true benefits to the farmer are in collective storage.[2]

The village-level storage scheme in Upper Volta is linked to current proposals to strengthen the rural cooperative in order to use the organization as the primary collection agent for the official marketing system. This is, as discussed above, because the ORDs have paid little more than lip service to their assigned role as grain collection agents. A project to be financed under the Fund du Développement Communautaire involves the creation of what is called a Village Cereals Bank. The local cooperative or groupement villageois would construct a number of small, traditional graneries in each village, and bear the responsibility for maintenance and overall supervision of stocks. At harvest, the cooperative would buy grains from individual members at an official producer price of 25 CFA F per kilogram, to consitute the stock. It is during the period of the soudure that the banking element enters the scheme. Members would be entitled to draw grains on credit, equal to a stated percentage of the amount

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[1] The argument is also made that village stocks are subject to better loss control than stocks maintained by government at a higher level supervised by a disinterested bureaucracy.

[2] GOUV, Ministry of Rural Development, Information Report on Project Activities, December, 1977.

the farmer had originally sold, with repayment due at the next harvest. Repayment would be in kind, i.e., in cereals, and would be increased to include an amount equal to a pro-rated share of storage costs and interest on the loan from the FDC. It will be noted that such a scheme requires that farmers use the credit facilities during the soudure in order to generate sufficient earnings to pay off the loan.[1]

Whether farmers could be induced to participate in the storage scheme would depend on the benefits they could expect to receive. Its proponents argue that farmers would benefit from the differential between the cooperative producer price of 25 CFA F kilogram for millet and sorghum (set at 4-5 CFA F over the prevailing official price) and the price that could be obtained from any private trader. Yet the scheme as it is conceived has overtones of a "company store" arrangement. Some hypothetical transactions set out below show why this is so.

Example 1 shows the transactions of a single farmer who, in the first year, markets 500 kg of cereals to the local cooperative. He earns 12,500 CFA F on the marketed share of his output. At the beginning of the soudure, he draws out 250 kg from the cooperative. If, in the following year, his production remains constant, and his share available for marketing remains the same, a portion of his 500 kg must be used to repay his debt of the previous season, plus interest charges. This reduces his cash earnings by something more than one-half over the previous year.

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[1] Implicit assumptions are that the farmer's production remains constant and his "marketed" input includes some shift between off-farm and village collective storage.

EXAMPLE 1

HYPOTHETICAL TRANSACTIONS OF A FARMER UNDER A VILLAGE STORAGE SCHEME
Interest rate = 5 percent

Year I.	(Debt owed) Repayment	Sold	Borrowed	Price per kg.	Earnings from Grain Sales
Harvest	-	500 kg	-	25 CFAF	12,500
Soudure			250 kg		
Year II.					
Harvest	262.50 kg	237.50	-	25 CFAF	5,937
Soudure			250 kg		
Year III.					
Harvest	262.50	237.50	-	25 CFAF	5,937
Soudure			250 kg		
Year IV.					
Harvest	(262.50 kg)	-		-	0
Soudure			250 kg		

Debt outstanding at beginning of 5th year = 525.00 kg.

On the assumption that production remains constant, these transactions are repeated in the third year. But, suppose the farmer's production would fall, and the share of output available for marketing declines. If this occurs, the farmer ends up in debt to the cooperative. In the fourth year it is assumed that production declines to the point where his home consumption requirements leave him no output for marketing. His cash earnings fall to zero. If he is required to pay his outstanding grain debt of 262.50 kg to the cereals bank, his own-consumption balance may be negative. If his indebtedness is forgiven, and he is allowed to again borrow against the soudure, his outstanding loan balance will amount to 525 kg. If, in the next year, production returns to the same level as in the years preceding its fall, and if the farmer is required to pay the full value of his loan, his cash earnings again will be zero. Whatever arrangements are made for repayment, the farmer could remain in a state of continued indebtedness at the village cereals bank, and might well end up in a situation where he "owes his soul to the company store".

Another question related to the disposition of the bank's assets, i.e., the grain stocks purchased from farmers. The project document suggests that "once farmers gain confidence in the scheme" sales of grain stocks will be carried out under ORD supervision. Local cooperatives will transfer stocks to warehouses located in the chef lieux of the departemnts for sale by the cooperative association. Thus, when local production falls, there is no assurance that the farmer can expect to have current consumption needs covered by grain stocks placed in cooperative storage. The hypothesis underlying the village bank grain stock position in Example 2 is that the bank will only hold stocks at a level sufficient

EXAMPLE 2

VILLAGE BANK GRAIN STOCK POSITION, 4-YEAR PERIOD
in kg

	(A) Receipts: i=Purchases ii=Repayment iii=Loans due	(B) Disbursements during soudure	(C) Sales	(D) Balances [1]
Year 1.	i=500	-250	--	250
2.	i=237.50 ii=262.50	-250	250	250
3.	i=237.50 ii=262.50	-250	250	250
4.	iii=262.50	-250	--	0

Real balances (f) (receipts minus disbursements and sales).

to cover the farmers cereal requirements during the soudure. If local storage is to be encouraged, schemes must be structured to insure that the farmer gains under a collective storage system, not only in its initial phase, but taking into account the possibility of variation in his level of production. Moreover, sales from collective storage schemes should be deferred until some minimum level of stocks are acquired. It is unlikely that farmers will participate in collective storage unless there is a grain reserve element built into the program, since the reserve element is a primary motivation for on-farm stockholding.

National Storage Objectives

National storage objectives in the three interior countries fall roughly into three categories: 1) a grain stock to meet consumption demands of off-farm populations and deficit areas; 2) a grain supply to stabilize prices over the soudure and between successive years as production fluctuates; 3) a long-term reserve of grain to meet secular shortfalls in production. The first and second objectives, insofar as grain storage facilities and stocks are concerned, are intermingled. The major issues relating to intra-annual price stabilization and the feasibility of buffer stocks for inter-annual price stabilization fall into the area of price and marketing policies. This section takes up issues relating to the first and third objectives.

Location of Storage Infrastructure

If a storage network is to contribute to the global flow of cereals, attention must be given to the optimum location of facilities, as well as

to marketing and price policies. Grain agencies, charged with the responsibility of meeting consumption requirements of non-cereal producers, and rural consumers in deficit areas have the problem of reaching consumers at minimum selling and transport costs. In the case of grains, where the product is low in value per unit of weight, shipments — except for short distances — result in transportation costs which form a substantial amount of the delivered price.

The general features of the consumption and production maps of the interior countries are well known. In each country, agricultural production tends to be concentrated in a few regions, with substantial distances between major grain-exporting and grain-importing regions, imposing heavy transport and collection costs on grain purchasers. National grain agencies, buying in all regions, first move stocks from production points to central collection locations. In Mali, for example, grain stocks move, on the average, 125 kilometers from villages to the chef lieux of the cercles. These stocks are again transferred on the basis of geographical consumption and production patterns. In Niger, the grain agency pays, on the average, 6,000 CFA F per metric ton on interregional grain transfers. In general, it can be assumed that true selling and transport costs are not borne by cereal consumers. In part these costs may get shifted backward to cereal producers (to the extent that producer prices are reduced in order to maintain a given consumer price, especially in the case of lower-cost producers), or in part, shifted to the general taxpayer to the extent that the grain agency's overall deficit is covered by budgetary transfers.

Should public grain agencies ever pick up a significant proportion of the grain trade and become primary buyers and sellers in the market, warehousing and distribution systems will be critical to their efficient operation; an accounting must be made of the relative costs which prevail under differing warehousing and storage locations. Such an analysis requires a concept, for example, of "market area." Except for national capitals and large towns in regions, the geographic boundaries of market areas is difficult to define. Markets are spread over large distances, dispersed and isolated. They are characterized by a lack of uniformity in the distribution of consumers over distance and by low population densities. Further characteristics of these markets are the lack of comsumer mobility, and the fact that transport costs are probably linear, i.e., transport cost increases at an equal rate from production locations to selling locations. At present, there is an imperfect and generally unplanned distribution of national warehousing. In particular there is a lack of storage facilities in chronic deficit-production areas; a better geographic location of grain inventories is a priority requirement under a comprehensive storage strategy. A rational price policy could contribute to an optimum location of grain stores as well. A differential in producer prices, which would take into account higher collection and transport costs in less accessible production areas, might serve to promote private grain storage in higher supply-cost regions.

The Long-Term Grain Reserve Program

Post-drought planning in the Sahel has included planned investments in grain stocks and facilities in order to provide a floor under cereal

consumption in the event of a series of poor harvests. As the country surveys have indicated, immediately after the drought governments began to build up long term reserve stocks. Between 1974 and 1977 Upper Volta had built up 8,900 metric tons of millet and sorghum; Mali had a total of 18,000 metric tons; Niger, a total of 15,000 metric tons. Except in the latter case, these stocks were drawn down within three years of their accumulation, so that as of the beginning of 1978 there were no security stocks in Mali or Upper Volta.

In all three countries security stock programs were initiated as soon as agricultural production rebounded in 1974, and in no instance has detailed, long-term grain reserve planning been carried out. Reserve levels have been set on the basis of some general objectives which include providing for the consumption needs of certain populations for a period of time in the event of a shortfall in production. What has been lacking is a detailed examination of the marketing and price policy issues implicit in such programs, and the institutional and structural strategies required to support reserve programs. An a priori assumption has been made that national welfare would be best served through a country's accumulation of long-term reserves, and that the strategy would be an efficient means of balancing a rainfall-dependent grain production sector. Thus, numerous questions have remained unaddressed in formulating grain reserve policy, among which are these:

i) Price Policy Coordination.— What are the inter-relationships between stocks acquired and sold under the reserve programs and price stabilization stocks? How responsive is the sup-

ply of marketed output at prevailing producer prices?[1] Are present producers of cereals expected to subsidize future cereal consumers -- as a result of the current price structure -- when supply and demand conditions will have changed?

ii) Institutional Structure.-- What are to be the institutional arrangements for control and authority over reserve stocks?[2] What structural changes are envisioned if public grain agencies are to manage reserve stocks? At present these agencies are understaffed, underequipped, and possess limited management-related inputs. To date grain reserve programs have been largely dependent upon foreign technical, as well as financial, assistance.

iii) Storage Technology.-- The appropriate long-term storage technology for foodgrains under Sahel climatic conditions is not known. The butyl silo has been adopted as an intermediate or stop-gap technology in all countries, and is assumed to be the most economical form of storage technology under current conditions. The assumption is that coarse grains can be stored in such structures for three to five years, but there has not

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[1] E.g., in Upper Volta the Comité National pour la Constitution des Stocks de Reserve reported a liquidity position at the beginning of 1978 of 41.0 million CFAF. But under present grain marketing arrangements and price policies it is questionable whether the Comité will be able to replace stocks which have been sold off.

[2] It is of interest to note that in Niger, where no reserve stocks have been released -- despite recurring production deficits and continued claims on international food assistance -- only the President has the power to draw upon grain reserves.

yet been a test of this length of storage, and the technology remains unproven.

iv) Locating Reserve Stocks.-- What studies have been undertaken to determine the optimum location of stored reserves?

Such fundamental questions as these indicate that there is much planning and policy-decision making to be carried out if reserve programs are to serve as a drought defense mechanism in the Sahel countries. Moreover, the financial and capital investments involved in this type of venture are not negligible. Some indication of capital and operating costs are indicated in Tables VI-2 and VI-3. These estimates were drawn up for Upper Volta but adequately reflect general magnitudes of costs for the two other countries when applied to a given quantity of stocks.

Levels of Grain Reserves

Table VI-4 shows reported planned reserve targets and stock positions for the three countries at the beginning of 1978. There is no firm basis for judging how reserve targets have been derived. For example, a statistical exercise prepared for the interna_ use of the grain agency in Mali suggests that the reserve target should be limited to coarse grains, and to a maximum of 70,000 metric tons.[1] The estimated optimum level is arrived at by taking the differential between a so-called normal production year and the level of production realized in any one drought year, in this case 1973; this calculation yields a gross maximum defici.. f 333,000.

[1] OPAM, Determination de la Quantitité Necessaire pour le Stock de Sécurité de Mali, undated.

TABLE VI-2

EXISTING AND PLANNED INVESTMENT IN STORAGE INFRASTRUCTURE FOR LONG-TERM GRAIN STOCKS
(in metric tons)

A.	Realized:	11,000 MT (Sealed silo capacity)
	Estimated Construction Cost.	35,000 CFA per square meter
B.	Planned:	
	(i) 1977/78	9,000 (includes proposal to build 1,500 MT for bulk storage)
	(ii) 1980/81	11,000 (construction to represent replacement of existing capacity of 11,000 sealed silos)
	Total planned capacity:	20,000
	Total estimated costs (includes equipment)	113.0 million FCFA on 7,500 (sealed silo capacity)
		42.0 million FCFA on 1,500 (in bulk)

SOURCE: Ministere du Developpement Rural, Upper Volta, Comité National pour la Constitution des Stocks de Cereales de Reserve, Rapport d'Information des Activites du Projet, December 1977.

TABLE VI-3

BREAKDOWN OE ESTIMATED FINANCIAL COSTS: 9,000 METRIC TONS OF RESERVE STOCKS (245 FCFA=$1)

	Cost in Millions of FCFA
1. Investment in facilities:	
7,500 MT (conventional storage in sacks)	113.0
1,500 (bulk storage plus equipment)	42.0
2. Operating expenses	
Includes machinery, stock protection equipment	12.0
Transport equipment	60.0
3 Administrative personnel	9.0
4. Training costs	15.0

SOURCE: Ibid.

TABLE VI-4

PLANNED GRAIN RESERVE TARGETS. FIRST QUARTER 1978
(metric tons)

Country	Tonnage	Type of Grains: Rice	Type of Grains: Coarse Grains	Realized
Mali	80-100,000	60,000	20-40,000[1]	-
Niger	25,000	-	25,000	15,000
Upper Volta	20,500	-	20,500	-

[1]Includes 2,000-3,000 tons of maize.

SOURCE: Ibid.

metric tons. The observed deficit is assumed to provide a measure of future production shortfalls, implicitly assuming that no changes in production technology will have occurred between past and future droughts. It is next assumed that on-farm storage will cover approximately 80 percent of the projected deficit of 333,000, i.e., storage on farm is equal to about 30 percent of a normal year's production. The remaining 20 percent of the deficit, which represents the 70,000 metric tons, would be met by the national Plan objectives had originally projected a reserve stock target of 95,000 metric tons, which included an allocation of 25,000 metric tons to the private sector, presumably meant to reflect on-farm stocks. Three-fourths of total national reserve stocks, or 70,000 metric tons, were to be held in the form of coarse grains, with the remaining one-fourth in rice. As Table VI-3 indicates, the composition of the reserve stock has been revised to make rice the leading reserve cereal. Among the interior countries, Mali is unique in the proportion of rice in cereal reserve targets.

Stock Composition: Supply

Upper Volta.— All countries plan to constitute grain reserves from local production. One of the problems facing national grain reserve programs — and one which will effectively limit their scale — is the grain agency's ability to purchase a sufficient volume of grains. Table VI-4 shows a planned schedule of millet and sorghum acquisitions, drawn up for OFNACER for the harvest years 1978-82. According to this schedule, OFNACER will be authorized to purchase three-fourths of the reserve target of 20,500 metric tons in a single collection season. These projections are

probably not realistic. Table V-5 on page 48 supra showed the level of OFNACER's local grain purchases since the drought. In only one year the series have local market purchases substantially exceeded sales. A marked improvement in grain production and a substantial increase in the marketed supply of output must occur in Upper Volta in order to realize the purchasing schedule shown in Table VI-5 for Upper Volta, the feasibility of establishing a long-term grain reserve program is largely dependent upon a revision of its grain marketing system. Until such time as marketing arrangements are better constructed, a grain reserve program will remain largely a paper exercise. Imports of grains, of course, or not ruled out. But it would be more rational to look at the grain reserve program in the context of a comprehensive agricultural production and marketing strategy, and to use a grain storage program as a vehicle to achieve improvements in both spheres.

Mali.-- In Mali, the long-term grain reserve program is in reality two programs: the first is a long-term grain reserve program in rice, and the second is a reserve program composed of the coarse grains, millet and sorghum. The projected build-up of a rice reserve stock of 60,000 metric tons, which in real terms means the purchase of 100,000 tons of paddy, is linked to a rice productivity scheme. In fact, it is probably not incorrect to suggest that for Mali, long-term grain storage in rice provides a vehicle for investment in infrastructure and associated activities in order to develop domestic rice production. In short, investment in rice production, rather than storage infrastructure, is the cornerstone of the policy. The reserve stock is to come from the incremental production produced through rice investment programs.

TABLE VI-5

PLANNED EVOLUTION OF GRAIN RESERVE STOCKS, UPPER VOLTA

	YEAR									
	1977/1978		1978/1979		1979/1980		1980/1981		1981/1982	
	Nov.-Apr	May-Oct	Nov -Apr	May-Oct	Nov -Apr	May-Oct	Nov -Apr	May-Oct	Nov -Apr.	May-Oct
1. Beginning stocks	-	15,500	8,000	20,500	12,000	20,500	15,000	20,000	14,400	20,000
2. Additions to stock during year	15,500	-	12,500	-	7,500	-	5,000	-	6,600	-
Of Which: Local Purchase Imports	15,500	-	12,500	-	7,500	-	5,000	-	6,600	-
3. Distribution during year	-	7,500	-	7,500	-	5,500	-	6,000	-	6,600
4. Changes in stocks end fo period	15,500	8,000	20,500	13,000	20,500	15,000	20,000	13,400	20,000	13,400

Source: Ministère du Developpement Rural, Secrétariat Permanent du Comité de Coordination du Developpement Rural, Projet Stock de Reserve Ouagadougou, Rapport d'Information des Activites du Projet, Dec. 1977.

With this grain storage policy, there is now joined to the controversy concerning the economic costs of rice production and the relative costs of encouraging rice consumption over that of millet and sorghum, a controversy over the economic costs of rice storage. Long-term grain reserves in rice impose greater storage costs than do equivalent amounts of reserves in coarse grains. Rice requires, as well, a different kind of storage technology.

For technical reasons, both capital and operating costs of storage of rice stocks exceed the costs of storage of millet and sorghum. Capital costs are higher because of the higher capacity requirements for rice. It is estimated that for a given physical capacity, two tons of millet and sorghum may be stored to one ton of rice. Thus, rice storage portends a 100 percent increase in capital investment in storage infrastructure in comparison to the storage investment required for an equal amount of the coarse grains.

The differential in capital investment required between grain types arises not only from differing capacity requirements; rice storage requires a different type of storage infrastructure. Within the range of available technology, and given the climatic conditions of the Sahel, the type of structure considered to be the most efficient for long term grain storage is the butyl silo. This structure can be filled with a given capacity of treated grains, then permanently sealed for the occupancy of the stock. The engineering design of such silos and the source of their cost advantage over other forms of storage technology is that they permit the storage of cereals for a period of up to five years (in principle) without continuing maintenance and disturbance of the grain. However, this technology

was developed for, and is only applicable to, the storage of coarse grains. Rice is not amenable to such long-term storage. Even under the best conditions, rice stocks require rotation within a period of less than twelve months. This implies that there are greater operating costs associated with rice stocks, since stocks must be turned over more frequently and require continuing maintenance, supervision, and treatment.

A quantative estimate comparing actual costs of rice stocks and stocks of coarse grains made by the grain agency in Mali is as follows:

Quantity	Type of Grain	Est. Cost (MF)
1 metric ton	Rice RN40	135,000
1 metric ton	Coarse grains	60,000

The relative costs of storage as well as considerations of production economics and consumption patterns, suggest that the more rational policy would be to limit long-term reserve programs to the coarse grains. If targets for reserves in the form of rice stocks are realized, the array of marketing and price issues raised in the recent CILSS report will no longer be academic but will take on real world significance.