



## List of Abbreviations

GOS	Government of Senegal
ONCAD	Office National de Coopération et d'Assistance pour le Développement - (National Cooperative and Development Assistance Office)
ITA	Institut de Technologie Alimentaire - (Institute of Food Technology)
SODEVA	Société de Développement et de Vulgarisation Agricole (Agricultural Development and Extension Company)
C.N.R.A.	Centre National de Recherche Agricole (National Agricultural Research Center)
FAC	Assistance and Cooperation Funds (French Assistance)
FED	European Development Funds
IRAT	Tropical Agronomy Research Institute
S.D.R.S.	(Company for Rice Development in Senegal)
I.B.R.D.	International Bank for Reconstruction and Development
I.D.R.C.	International Development Research Center (Canada)
SEAC	Societe d'Etudes et d'Applications Chimiques (Company for Studying and Applying Chemicals)

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## Project Review Paper

Title: Senegal Grain Storage Construction; Cereals  
Preservation Training

Fiscal Year Proposed for Financing: FY 76 (5th quarter)

Appropriation Category: Food and Nutrition

Date of Submission to Bureau: December, 1975

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### I. Priority and Relevance:

The recent, severe drought has impressed the Senegalese with the need for a wide range of measures to promote increased cereals production and to provide adequate storage facilities to assure the commercialization of the increased production and to store buffer stocks. The principal cereal crops of Senegal are millet and rice with lesser amounts of sorghum and corn being produced. With the full implementation of current production programs, Senegal will be self-sufficient in respect to millet and sorghum in years of normal rainfall. This will require an annual production of 600,000 MT to 700,000 MT. Rice consumption averages about 300,000 MT per year and domestic production varies from 75,000 MT to 150,000 metric tons.

The GOS has responded to these needs by enacting the Food Law-program (see Annex A) which provides for measures to increase the commercialization of millet and sorghum (the basic subsistence crops in the rural areas of Senegal) including the expansion of storage capacity to be reserved explicitly for buffer stocks of millet and sorghum.

The implementing institution of this program is ONCAD. In the past ONCAD has been responsible for marketing groundnuts and minor purchases of cereals. Because of the recent priority emphasis placed upon commercialization of food grains to be implemented by ONCAD, they are currently required by law to purchase any amount of millet and sorghum offered for sale by the farmer. Currently ONCAD has 45,000 MT

in storage from the previous years harvests. It is estimated that this year ONCAD will purchase 100,000 MT of cereals. If this is to be realized then additional storage must be located or constructed.

All existing warehouse space is being utilized either for the 45,000 MT of grain in storage or being readied for peanut seed which is already drying in the fields. ONCAD is expected to commence purchases of peanuts on December 15. While the majority of the peanut purchases can be stored outside, the seed must be protected and thus requires warehouse space.

In order to maintain the momentum in the commercialization of food grains ONCAD has proposed the construction of an additional 120,000 MT of storage capacity. This construction is to be in 1,000 and 2,000 MT units located throughout Senegal with the exception of Dakar. The first tranche is to be for 60,000 MT capacity of which the GOS plans to construct 30,000 MT by May, 1976. The plans of the units have been approved, sites located and bids received. AID proposes to finance 30,000 MT of the remainder on a fixed amount reimbursement method.

In order to insure ONCAD has sufficient trained manpower to implement the expanding program of commercialization the grant portion of this program includes technical assistance and training both in Senegal and the United States for managing and protection of grain stored.

Without the additional storage and trained manpower to manage the stocks, ONCAD will have to store the grain outside under marginal conditions which will result in increased losses hence making the commercialization of cereals a very costly operation. ONCAD has assured USAID that they will continue to purchase from the farmer all millet and sorghum offered for sale to them regardless of storage capacity. However, it is doubtful if the commercialization program can withstand the probable heavy losses over several years. Hence, the economic feasibility of the commercialization program would be questionable without expansion of storage capacity despite the obvious policy commitment to this activity.

Since the commercialization program with the resulting buffer stocks would benefit in general the total population in the event of drought and the small farmer in particular by offering a ready market and an alternative commercial crop already familiar to him, this loan/grant proposal provides AID with an opportunity to respond to both the production and equity issues in the Congressional mandate. The marginal impact of the proposed loan/grant would appear to be critical to success of ONCAD's implementation of the commercialization of crops that in the past have been considered and treated basically as subsistence food crops.

II. Borrower/Grantee/Administrating Agency:

The grantee/borrower will be the GOS Ministry of Rural Development and Hydrology, GOS Administration will be ONCAD in close cooperation with ITA and CNRA for training under the grant portion of the proposed activity. The loan will be for 40 years, the last 30 years at 3% interest with a 10 year grace period at 2%. The first tranche of the grant of \$100,000 will be supplied under AIA funding.

III. Description of Project:

A. Loan (\$3,500,000)

This loan will be disbursed under the fixed amount reimbursement method with total disbursement estimated over two years and to be completed by end of FY 1978. The 'GOS' contribution will be \$3,000,000.00, including 500,000,000 CFA (\$2.3 million) already budgeted for the construction of 30,000 MT of storage capacity to be completed by June, 1976, donation of land for the 30,000 MT to be financed by USAID and financing the costs of local training for 715 Senegalese.

BACKGROUND SENEGAL 1975: GENERAL AGRICULTURAL SUMMARY RELATED TO GRAINS

Senegal's economy is tied very closely to its Agricultural sector. Peanuts account for about 50 percent of the total agricultural production and account for 60 percent of total export income.

Years prior to the drought of 1972-73, there appeared to be a lack of interest in encouraging the domestic food production of rice, millet and sorghum. Rice has been grown, but in much smaller volumes than internal consumption. Rice appears to be a popular and fast-growing staple of the Senegalese diet especially in urban areas. Rice constitutes a major import and substantial negative factor for Senegal's balance of trade.

Since 1973, the Senegalese Government has displayed an interest in developing self-sufficiency in grain production as exemplified by the Government of Senegal's current agricultural policy. Its current policy is to promote domestic agricultural production to cope with a population growth about 2.2 percent most of which is in urban areas.

To date much of the Senegalese grain production has not been commercialized. Most of the rice, millet and sorghum is consumed in the villages where it is produced. The Government is now making an effort to encourage commercializing millet and sorghum with a price support and purchasing policy.

Storage facilities in the GOS buying program appear to be one of its limiting factors. Adequate grain storage facilities are limited as well as trained qualified personnel to implement a buying and storage program.

An announced goal of the GOS is to establish a reserve of millet and sorghum of 200,000 to 300,000 MT as a contingency for drought over the next three to five years.

Land holding patterns are mostly traditional. There is no private land ownership outside urban areas, and the right to assign land for cultivation is vested in the village chiefs who are appointed by the GOS. With the exception of the overcrowded groundnut basin, rural production is not limited by land availability. Output is primarily limited by production techniques. While these have gradually improved, they remain predominantly traditional. Low productivity reflects the absence of formal education and practical training (the literacy rate outside urban areas probably is no more than three percent to four percent) and the limited amount of capital available for investments. Traditional techniques keep

an active adult from cultivating more than about four to five acres (one and a half to two hectares) of groundnuts or millet and somewhat less of rice. With the help of a draft animal, this figure might be doubled. Depending on the size of the family and on the use of animals, farms average seventeen to twenty-one acres (seven to eight hectares) and rarely exceed 35 acres (15 hectares).

Population:

The estimated population of Senegal for 1974 is 4,222,803 persons with an estimated average yearly increase of 2.2 percent.

Unemployment is considered serious in the cities, particularly in Dakar.

Seventy percent of the working force are estimated to be directly engaged in agriculture.

Figure 1:

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Demographic Statistics - Senegal - 1974

<u>Regions</u>	<u>Total Population</u>
Cape Vert	804,657
Sine-Saloum	844,771
Thies	584,296
Diourbel	667,365
Fleuve	408,871
Senegal Oriental	261,942
Casamance	650,901
Total	<u>4,222,803</u>

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Figure 2:

<u>Senegal - Population of the Major Urban Centers, by City</u>	
Estimate as of 1974	
<u>City</u>	<u>Population (in thousands)</u>
Dakar (Metropolitan area)	714
Diourbel	39
Kaolack	106
Saint Louis	87
Tambacounda	23
Thies	98
Ziguinchor	49
<b>Total</b>	<b>1,116</b>

Millet and Sorghum Production:

Millet and sorghum are the basic food grain crops of Senegal. In 1973-74 production was 570,000 metric tons. The production for 1975 is estimated to be 610,000 - 640,000 MT by ONCAD. Millet and sorghum production figures are usually composite figures with millet normally representing three fourths of the composite figure.

Figure 3: Food Grain Production-Senegal-1973-74

<u>Region and Department</u>	<u>Millet and Sorghum</u>	<u>Paddy Rice</u>	<u>Cowpeas</u>	<u>Corn</u>	<u>Fonio</u>
(metric tons)					
Sine-Saloum					
Region Total	160,400	200	1	900	40
Thies					
Region Total	103,300	400	4,100	-	-
Diourbel					
Region Total	161,700	-	8,600	-	-
Fleuve					
Region Total	27,400	9,800	1,900	14,200	-
Senegal Oriental					
Region Total	32,500	4,700	-	16,200	2,040
Casamance					
Region Total	84,300	49,100	500	13,900	400
Cap Vert					
Region Total	<u>1,100</u>	<u>-</u>	<u>40</u>	<u>-</u>	<u>-</u>
<b>NATIONAL TOTAL</b>	<b>570,700</b>	<b>64,200</b>	<b>15,141</b>	<b>45,200</b>	<b>2,480</b>

Source of Date: Rapport Annuel, Direction des Services Agricoles, Ministere du Developement Rural, Senegal 1974.

Millet and sorghum production in Senegal has been increasing in recent years. Much of this increase can be attributed to normal or above growing conditions as well as the introduction of improved inputs which includes heavier fertilizers, better seed varieties and the increased use of animal traction.

As a part of the overall GOS policy with regard to cereals, concerted efforts have been underway for four years to stimulate production within the country. These special efforts have been carried out by SODEVA (Societe de Developpement et de Vulgarisation Agricole) first in Sine Saloum region with assistance from the CCCE (Caisse Centrale) from 1972 to 1975. A similar project was initiated by AID in March, 1975, with SODEVA in the Thies and Diourbel regions whereby a package of technical practices are introduced on farms through extension-like activities to intensify local production. Emphasis is given to such things as animal traction, improved implements, fertilizers, and good seed which are factors known to increase yields of millet and sorghum grown in the area. The IBRD recently completed a study of the SODEVA/CCCE project in Sine Saloum and as a result extended a credit of \$15 million to continue and expand that effort.

The areas served by these projects constitute the groundnut basin of Senegal which is also a highly important cereals production area. Increased cereal production from these two projects will most certainly add to the already acute nature of the cereals storage problem. Those phases of these on-going projects addressing the storage problem (such as training in on-farm storage and extension of credit to build on-farm storage by the AID project) will help locally, but the broader aspects of cereal storage must be addressed by considerably larger inputs of expanded storage capacity and training proposed in the present loan/grant project.

In addition to the limited efforts to deal with storage problems of these essentially production oriented projects, AID is encouraging the GOS to develop a plan to utilize in cereal storage work 117,000,000 CFA of counterpart funds generated 3-4 years ago by sales of PL 480 grains. Current thinking going into the development of

this plan is to assist, through SODEVA, with the construction of on-farm and cooperative (village) level medium to small sizes of storage units. Therefore, this will not conflict with, but will be supplementary to the inputs of constructing larger units of storage for ONCAD envisaged in this development loan.

Because of wide fluctuations in annual rainfall crop outputs of millet and sorghum in Senegal tends to fluctuate widely. In 1965 estimated production of millet and sorghum was 554,000 metric tons, the following year production dropped to 423,000 metric tons. More recently a short crop brought on new awareness by the GOS of the country's disruptive production pattern.

Figure 4:

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Millet and Sorghum Production 1964-1974  
and 1975 Estimate in metric tons

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Year	<u>1964-65</u>	<u>1965-66</u>	<u>1966-67</u>	<u>1967-68</u>	<u>1968-69</u>	<u>1969-70</u>	
Production	531,762	553,756	423,448	654,960	449,459	486,400	
Year	<u>1970-71</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>	Est.
Production	400,800	582,700	322,000	510,000	570,700	610,000	-
						640,000	

10-Year average 1965-74  
Production figure 548,598

Source: Rapport Annuel, Direction des Services Agricoles,  
Ministere du Developpement Rural, Senegal 1964/65-74

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Consumption of Millet and Sorghum:

Consumption of millet and sorghum is higher per person than any other food grain. It is generally concluded that consumption is significantly higher in the rural areas because of lack of availability of imported rice and lower per capita incomes. A study of overall national consumption was carried out in 1973 showing a per capita consumption figure of millet and sorghum of 114.89 kg/year. This figure is generally considered to be low since the data was collected during a year of a below average crop.

Figure 5:

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Food Grain Consumption 1973

<u>Crop</u>	<u>Consumption kg/yr/person</u>
Millet and sorghum	114.89
Rice	80.85
Wheat	22.7
Corn	14.35

Source: Projet d'implantation d'une Minoterie de mil -  
April 1974 Societe Nationale d'Etudes et de  
Promotion Industrielle

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An early study made in 1969 by the Societe Nationale d'Etudes et de Promotion Industrielle indicate that a more normal consumption of millet and sorghum is 137 kg/year per person.

The Marketing of Millet and Sorghum in Senegal:

Background:

In general the Senegalese farmer considers his millet and sorghum crop a subsistence crop, however, during years of surplus production, these farmers enter the market economy.

Peanuts are generally considered by the farmers to be their cash crop, thus in response to favorable prices and guaranteed markets more land has traditionally been devoted to peanut production than to the primary food crops of millet and sorghum. Because the Senegalese farmer is now at least partially in the money economy, his needs for income to buy consumer goods have increased in more recent years. Cash to satisfy his family's needs for consumer items such as sugar, cloth, salt and grain has increased. Cash returns from peanuts are not evenly distributed throughout the year and the need for cash is just before peanut harvest. Historically it is this period just before that he must buy grain at much inflated prices. Many times he will sell or contract part of his new crop before harvest at a reduced prices below official prices.

In the past much of the marketing of food grain has been through private traders. A typical pricing pattern was to have a price of 10 to 17 CFA/kg from harvest time to December. January to the summer months prices would increase to 25-35 CFA/kg (the period when the needs were the greatest). Prices in drought years, or just following drought years, may be double prices of a normal year.

In the past decreed prices have existed and were to be enforced by the Government's official marketing agency, ONCAD, by purchasing and storing millet and sorghum for resale. Because of a lack of suitable storage, competition with its peanut programs, and other factors, ONCAD has not purchased a very high percentage of the millet and sorghum crop.

The Current Situation:

The GOS current Agricultural policy, is to obtain self-sufficiency in grain production through the commercialization of the food grains. Because storage facilities for food grains have been a limiting factor the GOS will shortly let contracts for the construction of 30,000 MT of storage. The storage structures are to be all of the 1,000 to 2,000 MT size. ONCAD is to use these storage facilities as buying stations and establish cooperatives similar to their present peanut marketing program.

ONCAD bought 30,000 MT of millet and sorghum in 1974 at a price of 30 CFA/kg which is presently placed in central locations. The 1975 harvest is being temporarily stored in its peanut seed "seccos". Storing in the seccos is currently a problem because there is not enough space for the millet and the peanut seed, consequently when the peanut seed enters the "seccos" the millet must be moved outside and stored in the open thus exposing the millet to potential losses. So far losses from storing outside have been minimal because the peanut seed has been taken out of storage just prior to the wet season with the millet returned to the "secco" before the rains. If an early rain should occur, damage could be substantial.

ONCAD's 1975 millet and sorghum policy was announced in November, 1975, and included a pricing policy to purchase 100,000 MT of sorghum and millet at 30 CFA/kg throughout the entire season. It is unclear where the additional 100,000 MT will be stored. It is also unclear exactly what part private trade will have in the new program but as it is presently stated it would be illegal for the private trade to buy directly from farmers.

The GOS has announced that it has a goal to establish a reserve of 200,000 to 300,000 MT of millet and sorghum for a drought reserve. The present reserve is about 45,000 MT.

Until November 1974, when the GOS eliminated the subsidy on imported rice, consumer prices were at an irrationally low level. Recognizing that subsidized consumer prices were taking away incentives for farmers to produce for the market economy subsidies on vegetable oils, rice and sugar were eliminated.

New marketing policies now in effect include guaranteed farm level prices 30 to 40 percent above old levels. Millet is now at 30 CFA/kg a level that is considered to be well above the variable costs of production and competitive with the 41 CFA/kg for peanuts.

Rice Consumption, Importation, and Production:

The consumption of rice has been growing rapidly in Senegal. Production has not kept up with the rapidly expanding demand requiring very large annual imports. In 1974 this amounted to 157,782 MT.

Figure 6:

<u>Source</u>	<u>Rice Imports</u>	
	<u>Calendar Year 1974</u>	
Brazil		15,645
China (PR)		27,174
Pakistan		10,963
Thailand		28,000
USSR		<u>76,000</u>
	Total	157,782 MT

The importation of rice represents a large drain on Senegal's foreign exchange.

The demand for rice is growing because of its ease of preparation compared to millet and increased urbanization. However, the demand appears to diminish during years of a poor peanut harvest when incomes are low.

Recommendations:

The recommendations made by the team in this report are done so taking into consideration the stated goals and objectives of the Government of Senegal with regard to its commitment to stable grain prices to consumers and producers, increased sorghum and millet production and a reserve for drought of 200,000 to 300,000 MT. Other unstated but implied considerations are those of increasing the efficiency of the marketing system, production system as well as adding additional income to the agricultural sector and thus the general economy.

In addition, the Project Paper Design Team should consider an additional project to determine the feasibility of locating millet threshers at cooperatives. It is believed that by locating the thresher in conjunction with the coops and ONCAD buying stations that the farmers will participate more effectively in marketing programs as well as receive the benefits from the increased efficiency of mechanical threshing. (See Annex F)

CRITIQUE OF ONCAD'S PROPOSED 1,000 AND 2,000 METRIC TON WAREHOUSES

Engineering Design of Proposed Facilities - Two alternative designs are proposed for consideration. The advantages of each are discussed below with a final decision to be made during the Project Paper stage of design. The final decision must depend upon negotiations with ONCAD comparative construction cost data as well as recommendations of the AID/W review of this Project Review Paper.

Bag Versus Bulk Storage:

The ONCAD warehouses (reference drawings numbered 75.06, February 13, 1975, and 75.07, February 13, 1975,

on file AID/W and ADO/Dakar) are designed for either bag storage, or bulk storage inside a perimeter bulk-head of bagged product. That is, the walls are not designed to withstand the lateral pressures from bulk grain.

1. Advantages of bag storages for Senegal circa 1975:
  - a. Most of the methods of transport in rural areas currently require that grain be bagged;
  - b. Equipment for bulk handling is not readily available;
  - c. Spare parts, power sources and trained personnel for operation and maintenance of mechanical equipment for bulk handling are not readily available;
  - d. Storages can be used for storing other products as grain is sold out, or when bulk handling becomes an accepted practice and other types of storages are built;
  - e. One storage unit can accommodate several kinds and grades of grain;
  - f. May facilitate operation of a warehouse on a "first in", "first out" principle.
2. Disadvantages of bag storages:
  - a. Bagged product is difficult to sample;
  - b. Aisles around stacks of bags decrease utilization of space;
  - c. High cost and short supply of bags;
  - d. High labor requirements;
  - e. More susceptible to rodent and insect damage.

At this stage in the technology and mechanization of grain handling in Senegal, the advantages of bag storages of grain may well outweigh the disadvantages. By initially building the warehouses sufficiently strong to withstand the lateral pressure from bulk grain, later conversion to bulk storage in these units would be facilitated. However, the original cost would be much greater, and unjustified unless the conversion occurred. The cost of a typical prefabricated steel building designed for bulk grain storage is approximately double the cost of the same size unit not designed for bulk storage.

Design of ONCAD Warehouses (Ref. Dwg. Nos. 75-06 and 75-07, on file AID/W and ADO/Dakar)

## 1. Dimensions

a. The 2,000 metric ton units are 20m x 50m x 4m sidewall height; 1,000 ton units are 20m x 25m x 4m sidewall height.

Using the stacking pattern proposed by ONCAD (a 1m wide aisle all around the perimeter of the building, a 2m wide center-aisle lengthwise in both the 1,000 and 2,000 ton units, a 2m wide cross-aisle in the 1,000 ton units and two cross-aisles each 2m wide in the 2,000 ton units and stack heights of 3.5m), the capacity is approximately 784 tons and 1,640 tons for the 1,000 ton and the 2,000 ton units, respectively (assuming 1.5 cubic meters per metric ton).

The height of the proposed warehouses (4m sidewall) is scarcely adequate for stacking 3.5m high. A sidewall height 2m greater than the stack height would allow a man to walk on top of the stacks, thus facilitating stacking and fumigation operations (stacks must be covered with a gas-tight cover during the fumigation operation).

By increasing the warehouse height and forming stacks 4 to 6 meters high, economy could be gained by greater utilization of floor space, suggested sidewall heights for these stacks would be 6 and 8 meters, respectively.

## 2. Materials

The sidewall construction of concrete blocks (15 cm thick) with outside sealer (stucco) has some advantages, as follows:

- a. Will withstand bumping by equipment better than corrugated steel siding;
- b. Can utilize Senegalese materials such as sand, gravel and cement;
- c. Utilizes common construction practices, the Senegalese apparently have not had much experience with erecting prefabricated metal buildings;
- d. Lower heat conduction than a galvanized steel sidewall.

Some disadvantages of concrete block wall construction are as follows:

- a. Lack of quality control on blocks, mortar joints and the plastered sealer coat (stucco);
- b. Rough, hard to clean inside surface;
- c. Most block walls observed in the field had cracks.

The 10 cm thick reinforced concrete floors appear adequate if vehicles are not driven into the warehouses. A vapor-proof plastic film under the concrete floor will help to permit the concrete to cure properly and to maintain a dry floor.

The sliding steel doors should be tight fitting and of a type not easily damaged by bumping, to keep the building rodent tight.

The asbestos-cement roofing has the following advantages:

- a. Long life;
- b. Local labor has experience with this product;
- c. Heat conduction is lower than that of galvanized steel;

d. The long overhang of the roof appears adequate to prevent rain from blowing through the ventilation openings in the upper sidewalls.

e. Produced in Senegal.

Note: A white or aluminum roof surface is desirable to reduce the heat buildup inside the building. The steel trusses and columns spaced 5m apart eliminate any necessity for any interior supports which would interfere with fumigation. All steel components, such as steel roof purlins, concrete reinforcing steel, trusses and fasteners would be imported.

### 3. Ventilation

The openings along the upper sidewalls and at the ridge of the roof appear adequate to keep the inside temperature within tolerable levels for both man and grain. Screens must be maintained to keep out birds.

### 4. Foundation

The concrete foundation should extend sufficiently deep to reach firm subsoil and to prevent rodents from under-burrowing. The strength and soil-bearing capacity of the foundation must be adequate to carry the roof load and the outward thrust from the trusses. Provisions appear adequate to prevent erosion from the roof runoff even without eave gutters.

### 5. Site Preparation

The site should be graded for proper runoff of rainfall away from the building and to assure that the floor is well above the highest expected flood level. Avoid building in a flood plain.

### 6. Fencing

The warehouse area should be fenced and guarded against unauthorized entry. The fence should be at least 20 meters beyond the storage building and the intermediate area kept closely mowed to discourage rats from the area.

### 7. Office

The present plans show no office area. Space must be provided for records, supplies, equipment such as moisture testers and grading apparatus and a working area.

The working area should be well lighted and, possibly, air-conditioned.

### Location of Grain Storage Warehouses

For long-term storage of cereal grains (one year or longer) the warehouses should be located in regions of lowest humidity, preferably inland 75 kilometers (about 50 miles) or more and in regions with annual rainfall less than 600 mm per year or north of latitude 14° North.

### Conditioning of Grain

If grain is bought at 10 percent or lower moisture content and kept under cover, no drying or aeration equipment should be required for storage in the less humid regions of Senegal (see section on location of warehouses). If drying is required, spreading grain in thin layers and exposing to the sun should be adequate for drying except during the rainy season.

### Grading System

A grading system should be devised to pay for grain on a dry matter basis, thus discounting grain with excessive moisture and paying a premium for drier grain. This will give farmers an incentive to dry the grain before delivery and will minimize storage problems with mold and insects and reduce the bulk to be stored and transported.

The grading system should include discounts for foreign matter such as stones, pieces of stem, chaff, weed seeds, moldy grain, rotten grain and other grains.

### Equipment Needs

Each buying station should have a battery-powered moisture tester for quick determination of grain moisture content before the grain is purchased. A grain trier

and a set of sieves for each type of grain purchased (corn, millet, sorghum, etc.) will facilitate sampling bags of grain and determining the amount of foreign matter and grade of the grain.

Each warehouse should have a battery-powered moisture tester, a trier, a probe-type thermometer and, possibly, a hygrometer. The moisture testers for the warehouses should be more accurate than those used at the buying stations.

The estimated cost of equipment is itemized in Annex G.

#### Warehouse Construction Costs

Cost of the 1975-76 warehouse construction quoted by ONCAD is approximately \$100 per metric ton (MT) of rated storage capacity or an approximate cost of \$18.60 per sq. ft. of floor space.

Assuming a usable capacity of 784 MT and 1,640 MT for the warehouses rated at 1,000 and 2,000 MT, the unit costs for the storages are \$127.55 and \$121.95 per metric ton, respectively.

The U. S. Embassy Office Building construction contractor, SATOM, estimated the cost of the 1,000 ton ONCAD warehouse at 20,000,000 CFA (\$91,000) and the 2,000 ton warehouse at 36,000,000 CFA (\$164,000) as of November, 1975. SATOM's estimate is to the 3' line around the building and does not include utilities. Inflation could increase the costs by 1½ to 3% per month.

Estimated erected cost for a white-painted, prefabricated steel building (60' x 180') from the U. S. of size comparable to the 2,000 ton ONCAD unit, except with 20' sidewall height (ONCAD's warehouse has 13.1' sidewall), is approximately \$143,000, if duty free.

Adding 15% for site preparation and contingencies boosts the estimated cost for a prefabricated steel building to approximately \$165,000, which is essentially equal to SATOM's estimate for the ONCAD warehouse.

Similarly, the estimated cost for a 60' x 90' prefabricated steel building (1,000 tons capacity) is approximately \$95,700 (compare to \$91,000 for the ONCAD warehouse as estimated by SATOM). The prefabricated steel buildings have an advantage in being approximately 2 meters higher than the ONCAD warehouses which allows stacking to at least 4 meters with clearance to walk on top of the stacks.

The prefabricated steel building price includes a continuous ridge ventilator but no under-eave inlets. The ONCAD units have both under-eave and ridge ventilation which cannot be closed. In humid areas during the rainy season, moisture absorption by the stored grain may be reduced by closing all openings at night and other intervals when the relative humidity exceeds 70 percent.

Erected costs of typical U.S. corrugated steel farm quality grain bins 27' in diameter with 16' sidewalls (22' - 10" overall height, rated at 8,350 bushels level full) is approximately \$75 per metric ton if filled to about the 15' level to leave 1' eave clearance for covering the grain for fumigation. This cost does not include equipment for filling or emptying the bin, which should be offset by the savings from reduced labor from

bulk handling. If material must be received and shipped in bags, the advantage of a bulk storage system is questionable. Certainly, less sacks may be required.

The extra flexibility and the minimization of technology required for the proposed ONCAD flat-storage warehouses may well be worth the extra cost.

#### Comparison of ONCAD Warehouses with Prefabricated Steel Buildings

The ONCAD warehouse design has walls and roof with greater insulation values and less heat reflectivity so that the heat gain should not differ substantially for the ONCAD warehouse compared to a white painted prefabricated steel building.

The inner surface of the walls on the ONCAD warehouses will be more difficult to clean than the walls of a steel warehouse, however the corrugations in the steel walls will tend to trap grain at the floor level and make clean-out of grain from the floor around the walls more difficult in a steel warehouse. Again, about a trade-off in advantages between the two designs. A disadvantage of the ONCAD warehouses would be the likelihood of cracks developing and creating sanitation problems. The walls of the ONCAD warehouses would be more resistant to bumping by equipment than would corrugated steel siding.

The ONCAD warehouses have excellent provision for ventilation under the eaves and at the ridge whereas the steel prefabricated building has only ridge ventilation but has the advantage that the ventilation opening can be closed during the night in regions of high humidity. Note: Louvered openings, either fixed or closeable, could be located in the walls of the prefabricated steel buildings for increased ventilation but at considerable cost.

The construction of the ONCAD-designed warehouses has the following advantages, compared to a prefabricated steel building from the United States:

- a. More utilization of local labor;
- b. Less training required for unfamiliar building techniques;

**Figure 7: Summary of Estimated Warehouse Construction Costs**

	1,000 M. Ton ONCAD WAREHOUSE	1,000 M. Ton PREFAB STEEL WAREHOUSE	2,000 M. Ton ONCAD WAREHOUSE	2,000 M. Ton PREFAB STEEL WAREHOUSE
Dimensions (outside)	20m x 25m	18.3m x 27.4m	20m x 50m	18.3m x 54.9m
Area (gross)	500 m <sup>2</sup>	502 m <sup>2</sup>	1,000 m <sup>2</sup>	1,003 m <sup>2</sup>
Sidewall Height	4 m	6.1 m	4 m	6.1 m
Estimated Cost	\$91,000	\$95,700	\$164,000	\$164,600
Est. Cost per Sq. Ft.	\$16.91	\$17.72	\$15.24	\$15.24
Est. Net Capacity M. Ton (3.5m stacks vs. 4m stacks)	784	858	1640	1792
Est. Cost/M. Ton Cap.	\$116.07	\$111.54	\$100.00	\$91.85

- c. Fewer logistical problems in shipment of components, lost packages, etc.;
- d. No building specialists from the United States required to oversee construction;
- e. No problems with British-sized components in a metric society;
- f. Less need for power tools (such as nut-runners for putting screws in metal buildings).

Annual Warehouse Costs

The following fixed cost for a 2,000 ton warehouse is based on a building cost of \$200,000.

Building Depreciation, 20 years	\$10,000
Interest @ 6% on ½ of bldg. cost	6,000
Insurance @ 1% of bldg. cost	2,000
Maintenance @ 1% of bldg. cost	2,000
Total Annual Cost	\$20,000

Annual Building Cost Per Ton  
Based on 2,000 Ton Capacity                      \$10 per M. Ton

GRANT PORTION OF PROGRAM (\$500,000)

The grant portion of the proposal is designed to provide technical assistance and training for ONCAD in order to provide the necessary trained manpower for the expanding commercialization of food grains. The discussion of the need for and types of training proposed follows below:

GRAIN PRESERVATION AND QUALITY MAINTENANCE

The importance of preservation and maintenance of cereal grain (millet, sorghum, maize, rice, wheat) quality has not been fully realized in Senegal. Efforts are being made to increase production so that imports of cereals can be reduced and reserve stocks accumulated for periods of drought and poor production. As greater quantities of cereals are produced and reserves accumulated the need for adequate storage facilities and knowledge of improved

methods of preservation increases.

The following parts of this section review the:

Present status of grain preservation and quality maintenance;

Status of personnel trained in grain storage;

Past, present and proposed grain storage training program;

Need for additional training;

Benefits to be derived from training.

A plan for training Senegalese in grain preservation and quality maintenance has been developed and is included in this paper.

#### Present Status of Grain Preservation and Quality Maintenance

Cereal grains are stored at several points in the marketing system in Senegal. At each level of storage, and in the movement from one level to another, there are opportunities for losses in quantity and quality of the cereal grains. Each of the various levels of storage present special problems in grain preservation and quality maintenance and are discussed separately in the following paragraphs.

Farm/Village Storage - According to a recent study, approximately 85 to 89 percent of the millet remains on the farm in the Diourbel and Sine-Saloum regions.<sup>1/</sup> Millet stored on-farm serves as food for the family and as "savings" from which other necessities may be purchased. Although no actual surveys have been conducted at farm level, the general consensus is that losses are quite low, (1-5%).

In harvesting, stalks are cut down and heads of millet cut from the stalks and piled in ricks on the ground. Field drying in this fashion for about one month reduces moisture from 20-25 percent to 15-16 percent. Field-stored millet is subject to attack by termites and birds.

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<sup>1/</sup> Rolston, W.D. (1975) The 1975 followup Mission to West and East Africe - The Post-Harvest System and Its Problems as Perceived by the Small Farmers and Traders. Paper presented at the IDRC Post-Harvest Technology Workshop, Dakar, Senegal, 10 Nov. 75.

After field drying, heads of millet are bundled and carried to the village for storage or are stacked in rectangular piles approximately one meter wide, 1.5-2.0 meters high and length depending on quantity. Millet heads, partial heads or threshed millet are later placed in traditional bins of woven wood sticks said to possess insecticidal properties. Head storage capacity of traditional bins is approximately 2 MT each.

According to several sources (SODEVA, CNRA and IDRC) traditional storage methods are quite effective in preserving millet on farms. Losses in the range of 1 to 5 percent may be experienced due to insects, primarily termites. Because of the potential for cooking fire sparks igniting storage units, they are usually placed outside the living compound. While reducing the fire potential, this practice makes the stored grain more susceptible to theft and cross infestation by insects from the field.

Very dry climatic conditions during the initial storage period results in continued drying of the millet in storage with little subsequent loss.

Pesticides are not commonly used at the farm level. However, increased farm storage of sorghum and maize has resulted in ITA and SODEVA efforts to develop improved techniques which may include insecticides. Losses of sorghum and maize are higher (10 percent estimated by SODEVA) than millet in farm storage.

SODEVA indicated that 40 kg capacity polyethylene bags filled with shelled maize and treated with carbon tetrachloride (CCl<sub>4</sub>) are quite popular in the Sine-Saloum region where a maize intensification program is being conducted. Cost for the bag and treatment is 120 CFA/40 kg bag (3 CFA/kg).

ITA has developed an air tight steel drum for storage of cereal grains. However, the initial cost is high (6000 CFA/drum), the capacity low (180 kg/drum) and drums are preferred for water over cereal grains storage.

CNRA and SODEVA are working with a crib design for ear maize storage. Cylindrical (3 to 12 MT capacity) and rectangular (partitioned 16 MT capacity) bulk storage units are being tested by CNRA. Effectiveness of the crib has not been determined. Cylindrical storage units (Carera) are too costly at capacities required by the farmer. The rectangular unit is in the initial stages of development. It is divided into several small compartments ranging in size from 1.9 to 6.3 m<sup>3</sup> (1.6 to 5.1 MT capacity) and provides space for a variety of commodities, i.e. millet, maize, sorghum, groundnut, etc. An additional advantage is realized in that farmers may cooperatively obtain credit and share this type of storage facility.

Dealer Storage - Dealer and/or commercial storage conditions vary widely in their condition and practices.

Local dealers' storage was not observed by the team. ONCAD is to have a monopoly on cereal grain purchases and will sell to dealers. It is doubtful that dealers would maintain storage facilities under this system because of the reduced potential for profit. It is highly probable that a clandestine dealer trade will exist at the local level.

SOCOPAO, a commercial storage company, appears to maintain a good storage operation. It functions as a general warehouse, storing various items and commodities (including rice, wheat, fortified cereal blends, etc.).

Storage conditions at the SOCOPAO warehouse visited in Dakar appeared good. Bagged grains were neatly stacked on tarpaulins spread on a concrete floor about 1 meter above grade. SOCOPAO has three warehouses with approximately 6000 MT capacity each. An open asphalt storage area will accommodate approximately 20,000 MT of cereal grain in the Dakar SOCOPAO operation.

Although the team did not visit other SOCOPAO warehouses, they do exist throughout Senegal and it is presumed warehouses elsewhere in Senegal are operated in the same manner.

ONCAD Storage - Present ONCAD storage facilities are primarily devoted to groundnut storage. There are said to be some 500 to 620 seccos used for storage of groundnut seed. In Sine-Saloum there are 137 seccos with 54,226 MT total storage capacity. When seeds are planted in June-July the seccos are available for storage of other cereals until the following groundnut harvest (roughly October-November). At this time cereal grains are moved outside for storage in favor of groundnut seed.

This type of storage practice (maneuvering of stocks) does not lend itself to the maintenance of cereal reserve storage.

ONCAD stores commodities at several levels in the marketing system. Groundnuts are purchased at "Coops" and stored in large piles directly on the ground. A Coop probably exists for every 5 villages. From the Coops, groundnut is moved to seccos where best quality groundnuts are placed in covered warehouse storage for seed purposes. Market groundnuts are left in piles in bulk on the ground or on concrete pads. Bagged groundnut or woven fence may be used to bulkhead piles of groundnut.

Pesticides are commonly dusted over storage pads (or ground under the pile) and around the periphery of the piles of market groundnut. This treatment is primarily for termite and millipede control. Pesticides previously used were BHC (lindane) or DDT dust, however, these materials are no longer approved. Malathion is approved and may be used for this purpose and may also be dusted over the surface of the groundnut pile. Pesticide dusts are also used in treating seccos prior to storage of seed groundnut and in treating layers of seed groundnut stored in seccos in bulk. ONCAD indicates Baygon is now used for this purpose.

Personnel at CNRA have obtained good results using Bromophos dust on groundnut seed-stock, on an experimental basis. Bromophos is not, however, approved for general use.

Millet purchased by ONCAD must be threshed and delivered to seccos in sacks by the farmer. A farmer indicated he receives an empty sack in return if the one delivered is servicable. If not, millet is resacked and the unservicable sack returned to the farmer.

Although transportation does not appear to be a major constraint seccos are less convenient than Coops for farmer delivery of millet for sale.

In the past, millet has probably been stored in groundnut seed warehouses during the wet season (June-September) and may be moved outside, depending on need for groundnut seed storage, in November. This year millet and sorghum from seccos has been moved to central storage areas in cities such as Koalack, Thies, Diourbel, St. Louis and Ziguinchor. Only small quantities of current (1975/76) millet production have been received at seccos through November 20. The present rate of procurement of locally produced cereals is 6000 MT/week and controlled by release of funds to ONCAD. The secco at Birkalane (Sine-Saloum) had about 7 MT and the one in the Thies region about 3.5 MT.

Conditions of storage at the two seccos varied considerably. At Birkalane the masonry warehouse where new crop millet was stored was poorly maintained. Wooden doors at the side were rodent chewed and there was extensive evidence of rodent (small rat) activity inside the warehouse in millet spillage, fertilizer and unserviceable bags. Although live insects were not noted on the bags of millet, infestation in the spillage will soon result in cross infestation. The galvanized metal warehouse to be used for groundnut seed was not observed on the interior.

At the secco in Thies region, bags of recently purchased millet were stored in a small room in the "office" structure. A Trogoderma larva was observed on one bag, obviously a result of cross infestation from the environment. The galvanized metal warehouse across the yard from the "office" was quite clean and had been dusted with Baygon in anticipation of the approaching groundnut harvest. A nearby warehouse of the same construction as observed at Birkalane but in greater disrepair was not to be used for millet or groundnut. Repairs to doors, roof and vents could possibly make this structure serviceable.

At present ONCAD is said to have approximately 45,000 MT of millet in reserve storage from the 1973/74 and 1974/75 crops in the following locations:

<u>Region</u>	<u>City</u>	<u>Quantity</u>
Thies	Thies	2,800 MT
Sine-Saloum	Kaolack	19,000 MT
Fleuve	Saint Louis)	
Diourbel	Diourbel	)23,200 MT
Casamance	Ziguinchor )	

Condition of the millet and central storage facilities at Kaolack and Thies was observed by the team. At Kaolack millet is stored in two warehouses each of 10,000 MT capacity and also outside under tarpaulins adjacent to and between the warehouses and in an area near the warehouses. A total of 19,000 MT are stored at Kaolack- 8,000 MT in one warehouse, 6,000 MT in the other and 5,000 MT are stored under tarpaulin. Several "stack" record cards were observed which indicated that the millet when received was infested with Trogoderma and that it was fumigated the same date received. Receipt dates as early as May 5, 1975, were noticed and as late as mid-October 1975. Even though the millet had been fumigated as recently as October 10, 1975, there was evidence of live insect infestation on the bags.

Older stacks of millet showed obvious evidence of Trogoderma infestation. Infestation noted on more recently received millet was primarily Tribolium Sp., however, there was evidence of light Trogoderma infestation and some Ephestia sp. moth infestation.

All produce stored in these warehouses was on pallets, however, there was extensive spillage of millet under all pallets, between rows of stacks of bags and along walls. Dust, moth webbing and other evidence of insect activity were noted on walls. Piles of used bags and millet were also noted at various points in the warehouses. Evidence of rodent activity was also noted in the warehouses.

Grain stored outside the warehouse was under tarpaulin and not readily accessible for inspection. A drainage ditch system and accumulation of material in the system makes this an ideal situation for rodents. Millet stored outside was stacked over the drainage ditch in some areas.

At Thies, millet and sorghum stored in a small warehouse at the Regional Office compound has been heavily infested with Sitophilus sp., and to a lesser extent with Rhizopertha domnica and Trogoderma sp. Bags were stacked on woven reed mats. There was extensive spillage in all areas of the storage facility.

Millet stored at another complex of small warehouses (about 7, each with dimensions 12 x 30 meters) was on pallets but with extensive spillage throughout the warehouse. Millet observed here had been heavily infested with Trogoderma sp.

Approximately 2,800 MT of millet was being stored in a hangar at a former military air base. The hangar would hold a maximum of 8,000 MT (60 x 80 x 8 meters). Spillage here was being swept and resacked, however, some spillage existed in the storage area. Millet being stored here had not been fumigated as yet and there were live Trogoderma larvae on the exterior of bags in several locations. Pits in the walls of the masonry hangar had accumulations of dust, groundnut residues and evidence of Trogoderma infestation.

The purpose of the rather lengthy description of storage conditions observed, points up the following deficiencies in storage methods now employed by ONCAD:

1. Preparation of storage facilities for millet and sorghum storage does not appear to get the same degree of care as for groundnuts;
2. Pesticides are used in preparation for groundnut storage and although the team was told that millet warehouses are cleaned and treated with insecticide prior to storage evidence was to the contrary;
3. Conditions favoring cross infestation of commodities exist in all facilities where millet and sorghum were observed in storage;

4. Present methods of grain storage and preservation are not effective in preventing losses to the reserve stock of millet.

Inspection procedures as outlined by ONCAD employees include inspection of all stocks in storage every 15 days with records of the inspection sent to ONCAD/Dakar.

What percentage of bags from each stack are sampled, how much sample is taken, ultimate disposition of the sample and decisions or action to be taken on basis of sample analysis have not been fully determined.

Stack records of millet observed at Koalack indicated an initial inspection at time of receipt but no subsequent inspections. Stack records were not observed in use at other ONCAD storage sites.

ONCAD indicated that a contract for 30,000 MT of 1,000 and 2,000 MT capacity warehouses has been completed and should be under construction in the near future. Storage under contract and additional storage required is shown in Figure 8.

Figure 8:

Region	Capacity Proposed	Capacity Proposed
	Construction By ONCAD	Construction by USAID *
Fleuve	5,000	5,000
Thies	-	10,000
Diourbel	10,000	6,000
Sine-Saloum	15,000	6,000
Casamance	-	3,000
Senegal Oriental	-	-
	<u>30,000 MT</u>	<u>30,000 MT</u>

\* The rationale for these locations will have to be verified by the TDY Team preparing the Project Paper.

Annex B, Structures for Cereal Storage, indicates an initial distribution of warehouses by size and localities.

Processor Storage - As indicated previously 85-89 percent of the millet is probably stored on farms at present. Cereals consumed on the farm are hand pounded by women using wooden mortar and pestle implements. Storage at this level has already been discussed.

Custom processors probably do not store quantities of cereal grains but process those brought to the mill by customers.

Two large commercial mills exist in Dakar, Les Grands Moulins de Dakar and the SENTENAC mill.

The Grand Moulin has a processing capacity of 500 MT/24 hrs. and produces approximately 70,000 MT of flour per year. Wheat is the only cereal processed and is supplied primarily from France.

Wheat received in 8,000-10,000 MT lots by ship is unloaded pneumatically using 4-50 MT/hr units (200 MT/hr total). Bulk wheat from the ship is conveyed into a large concrete flat storage area leased by the Grand Moulin. A total capacity of 30,000 MT is available (this probably includes some outside storage), at dock side.

Bulkheads of 200 liter drums filled with wheat and draped with jute bags have been constructed to bear the lateral pressure of bulk grain. Cracks in the concrete walls indicate previous load problems. The mill indicates they do not have insect problems because the wheat is disinfested in France before shipment **and the wheat** is only stored for about one month. The drum-bulkhead constitutes a major insect problem even though the mill claims no loss. The drums of wheat and jute bags were heavily infested with several species of insects (including Trogoderma sp., Sitotroga cerealella, Cryptolestes sp. and others) and would constitute a

source of cross infestation to any grains stored in the facility. A similar bulkhead system exists under a covered area adjacent to the concrete structure.

Wheat is loaded from the bulk storage area into trucks using portable augers and transported to the mill where 2,000 MT storage capacity in the form of 12 round concrete silos exist.

The SENTENAC mill processes wheat and maize and is equipped to process millet. Approximately 15,000 MT of wheat and 5,000-15,000 MT of maize are processed each year.

Grain is received in bulk by ship and unloaded by "clam-shell" lifts into trucks and delivered to the mill. There is 3,000 MT of silo storage at the mill. If insect problems occur, grain at the mill is fumigated with Phostoxin either in bulk or under 200 mil polyethylene tarps (SENTENAC makes polyethylene). If grain is fumigated at the dock, SEAC fumigates at 400 CFA/MT. Cost for fumigation at the mill (by mill employees) is 150 CFA/MT.

Port Facilities Storage - Storage at the Port of Dakar includes the bulk storage leased by the Grand Moulin, two 14,000 MT capacity warehouses operated by ONCAD, and warehouses operated by groundnut processors.

Considerable storage of commodities appears to exist under tarpaulin in the Port area.

No estimates of loss to grain at the Port are available.

#### Status of Personnel Trained in Grain Storage and Preservation in Senegal

There are a minimum number of technically qualified grain storage specialists in Senegal. The emphasis in the past has been on groundnut storage and although storage practices are quite similar, storage of cereal grains requires special knowledge.

Probably the best qualified individual in Senegal at the present time is Dr. Gordon Yaciuk. He is stationed at CNRA, Bambey and working on farm storage

problems. Dr. Yaciuk is a Canadian on two-year assignment with the Ministry of Rural Development.

ITA has a storage section headed by an entomologist who has recently assumed the position. He is assisted by two technicians in presenting "three or four" grain storage training sessions annually for ONCAD personnel. The qualifications of the section leader and technicians are not known.

ONCAD has, under the Direction Technique, a Quality Section with subsections for Seeds, Storage Protection and a Laboratory. The head of the Seeds and Storage Protection subsection has been trained at ITA. At each of the ONCAD regional offices there is a technical group with a Quality Section. Within the Quality Section are a leader and two fumigators per departmental subdivision of the Region. The team was told by ONCAD that these men receive annual training at ITA. Responses to team member questions indicate the fumigators and regional personnel have some knowledge of grain storage preservation, however, certain inconsistencies and the status of grain storage operations indicate the need for improved training and/or opportunity to apply the training.

Only two commercial pest control companies in Senegal are licensed to do fumigations. They include SEAC (Mr. A. Glaszer) and Chimie Afrique (a chemical supplier). Mr. Glaszer is a well-qualified fumigator and has a staff of technicians who do custom grain fumigation. From discussions with Mr. Glaszer it is apparent he is aware of the grain storage problems in Senegal.

Commercial warehousing firms, such as SOCOPAO, apparently rely on SEAC for fumigation and inspection services. The Grand Moulin also relies on SEAC for fumigation services when they are used. SENTENAC on the other hand, employs SEAC in fumigation on the docks when necessary but apparently fumigates its own grain at the mill.

SODEVA does have some personnel in the Sine-Saloum region equipped with portable storage fumigation units

capable of handling 100 MT of sacked seeds per unit. Qualifications of personnel are not fully known, however, there is evidence the units are probably not being used effectively.

Past, Present and Proposed Grain Storage Training Programs in Senegal

Past Training Programs - USAID recently conducted the following seminar-type training session in Senegal which related to post harvest pest controls.

A seminar in Food Storage and Handling Practices, Dakar, Senegal, November 4-8, 1974.

The stated objectives of the Seminar were as follows:

- \* To create an awareness of the problems associated with the handling and storage of grain and cereal foods. Throughout the seminar the comments were directed to storage and handling at port and warehouse levels. Although information on village and farm storage was not included since a seminar on that topic was scheduled for the Sahel area during December of 1974, it was a recommendation of the attendees that this topic be covered in future seminars.
- \* To enumerate the quality control procedures that are available to determine the safety and nutritional value of food.
- \* To review the research and development of specialized packaging materials and handling procedures.
- \* To illustrate the problems and conditions that could contribute to the deterioration of foods.
- \* To demonstrate the methods, equipment and chemicals that are presently available to aid in the reduction of food losses.
- \* To instill a desire to improve food storage conditions and handling practices.

Training involved lecture sessions and practical demonstration of techniques. Fifteen African countries were represented. Ten Senegalese took part in the training sessions, primarily representatives of ONCAD.

Institut de Technologie Alimentaire initiated a series of grain storage protection training sessions in 1969. With the financial assistance of IDRC through 1972, ONCAD personnel attended the training sessions. Now ONCAD funds the training of its personnel.

The training sessions included 3 weeks of basic and 3 weeks of practical training in the field.

As an outgrowth of the training sessions held 1969 through 1972, FAO developed and published a training manual <sup>1/</sup> which is quite comprehensive and practical.

Discussions at ITA indicate that training sessions are now 2 weeks basic/2 weeks practical in length.

ONCAD indicated 54 of their personnel have been trained at ITA under this program.

Present Training Programs - The only current training appears to be that of ITA for ONCAD personnel. As indicated in the preceding paragraphs, IDRC funded this training from 1969-1972. Since that time ONCAD has financed the training of its own personnel. The six weeks training formerly provided has apparently been reduced to 4 weeks.

Discussion with ONCAD personnel indicates that all ONCAD fumigators receive annual training.

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<sup>1/</sup> Pattinson, I., J. Deuse, R. DiFuria, F. Manis and I. Diop (1973) Confernces sur les Aspects Techniques et Economiques de l'Entreposage des Grains. Institut Technologie Alimentaire-Senegal. UNCP/FAO, AGS/SEN/64/505, Rapport Interne No. 102, Rome:FAO, 145 p.

Proposed Grain Storage Program - Other than the training proposal developed in a later section of this paper, the team is not aware of other new training through the Government of Senegal or donor agencies.

It is assumed that ITA will continue the current training program for ONCAD in the event the program proposed here is not accepted. If accepted, it is presumed that ITA will be involved in the current proposal.

Need for Additional Training:

Observations and conclusions made by the team indicate a definite need for additional improved training in the areas of grain storage and preservation. This is especially true in light of the Government of Senegal's decision to enter into a grain reserve program where 200,000-300,000 MT of cereal grains will be stored.

Extent of Losses - At present it is difficult to quote accurate loss figures for cereal grains stored at various levels within the marketing system.

Figures quoted for losses at the farm level range from 1 to 5 percent. Although based on only a minimum number of observations, the team would agree that losses at the farm level is not an immediate area of concern. Several sources interviewed indicated the same basic conclusion. It seems to be a general consensus that greater losses are being experienced in farm storage of maize and sorghum with estimates by SODEVA of 10 percent. SODEVA and CNRA are currently working on improved farm/village level structures to fit in with the movement toward diversification of cereal grain crops, i.e. increased production of maize and sorghum.

As large quantities of cereal grains are assembled for extended storage, such as the proposed reserve

program, the potential for large-scale loss increases unless proper precautions are taken to preserve the quality of the grain.

There are no reliable estimates of losses occurring in present large-scale storage operations such as that performed by ONCAD, SOCOPAO and mills. Team observations indicate the potential for significant losses to occur, especially in ONCAD reserve storage, if improved warehousing and preservation techniques are not implemented.

The same opportunity for losses exist at ONCAD seccos for the same reasons as indicated for ONCAD central and reserve storage facilities.

Lack of Trained Personnel - It may be incorrect to say there is a lack of trained grain storage and preservation personnel in Senegal. ONCAD, for instance, has at least 60 persons who have received ITA training. It may be more correct to say that their training may be inadequate or is not being properly utilized. Interviews with ONCAD personnel indicate they recognized the general aspects of grain storage and preservation but they do not understand the significance of inspection results, house-keeping functions and how to react with corrective measures. There is also the possibility that administrative and management support is not as responsive as necessary to maintain a good storage and preservation program. Delegation of authority on when to apply corrective measures to central warehouse managers might make the system more responsive.

Present and Future Training Programs - At present, the only training in effect or proposed is that conducted at ITA for ONCAD and the program proposed in this report.

Benefits to be Derived from Training:

It is anticipated that training as herein proposed would provide the quality managers and technical cadre of the national and regional offices of ONCAD with the

basic knowledge and techniques to improve the grain storage and preservation situation in Senegal. Warehouse managers would also be made aware of the problems involved in maintaining the quality of grains in storage over extended periods of time.

Reduced Losses of Food Grains - By implementing and maintaining an integrated pest management program at ONCAD reserve stock warehouses it is estimated that losses due to rodents, insects and poor storage and handling techniques can be materially reduced. Assuming an annual loss of 10 percent per year of the proposed 200,000-300,000 MT cereal grain reserve would amount to a 20,000-30,000 MT loss per year. Through improved storage and handling practices and effective use of pesticides losses could probably be reduced from 10 to 5 percent. The savings in millet/sorghum food supply would be equivalent to the needs of approximately 110,000 Senegalese.

Reduced Hazard from Pesticides - In the past, heavy reliance has been placed on the use of pesticides in the preservation of cereals and especially groundnuts. Training herein recommended would place emphasis on improved grain management through improved inspection techniques, good housekeeping and handling practices and physical and mechanical control measures and will limit the use of pesticides (insecticides and fumigants).

Pesticides are a necessary part of any grain preservation program, however, improperly used they can be a contaminant to the foods they are used to protect and to the environment in which they are used. An effective inspection program will allow for application of fumigants only when necessary and good housekeeping procedures will assure that pesticides that are applied are more effective. Pesticide safety will be a major item of concern.

Monetary Benefits - Limiting the amount of pesticides used will also result in a cost savings. Whereas, previous superficial

inspections and poor housekeeping practices may have necessitated frequent fumigations of stored cereal grains, an integrated program, as proposed, would reduce the number of fumigations necessary as well as reducing losses to the grain stocks. For example, if the 300,000 MT grain reserve is fumigated three times during a year the cost in fumigant alone is 157,500,000 CFA, (\$720,000.00). One less fumigation per year made possible through improved inspection and housekeeping would result in a monetary savings of 52,500,000 CFA or roughly \$240,000 per year.

A PROGRAM TO TRAIN SENEGALESE IN GRAIN STORAGE AND PRESERVATION

The following program is proposed as a means of effectively training key personnel within ONCAD and ITA to provide a nucleus of technically qualified managers and technicians to maintain the Government of Senegal's grain reserve stocks.

The program is designed to inform personnel at all levels within ONCAD (i.e., National Quality to Seccos managers) in the storage techniques and management practices necessary for effective grain preservation.

Technical Assistance

Technical assistance should be provided the Government of Senegal in the form of (1) a Grain Storage and Preservation Advisor, (2) training of a Senegalese Grain Storage and Preservation Specialist in the U.S., (3) Grain Storage and Marketing Short Course training for ONCAD national and regional storage quality personnel and (4) Grain Storage and Marketing Short Course training for the ITA storage section leader.

Grain Storage and Preservation Advisor -

It is proposed that a grain storage and preservation advisor be supplied to work with ONCAD in training ONCAD personnel and implementing a sound storage and preservation program.

The Grain Storage and Preservation Advisor will be responsible in Senegal for the following activities:

Serve as Advisor to ONCAD on problems relating to cereal grain storage and quality preservation.

Develop a two-month in-country training program in cooperation with ITA, CNRA and KSU for training a four-man in-country training team.

Coordinate training of ONCAD reserve, central and Seccos warehouse managers.

Assist ONCAD in development and implementation of improved storage techniques and facilities.

Assist ONCAD in development and implementation of effective grain management practices to reduce losses due to insects, rodents and other factors.

Assist ONCAD in cooperation with ITA in development and implementation of a simple set of grain standards.

Assist ONCAD in development and conduct of a grain storage loss survey.

It is suggested that the Advisor attend the short course training proposed for ONCAD quality personnel in June-August 1976 and be in Senegal October 1st, 1976, to assume his duties as Advisor to ONCAD. It is assumed that the Advisor will work closely with the GOS, ONCAD National Quality Director.

Estimated cost of supplying the Grain Storage and Preservation Advisor for 24 months is \$160,000.

Assistance to Develop Program for In-Country Training Team - It is proposed that Kansas State University under contract IAD/ta-C-1162 be involved in the development of a program for the in-country training team, preparation of training materials and conduct of a two-month period of instruction for the training team.

Estimated cost of KSU participation is \$17,000 and would include a two-month consultancy and development of training materials.

### Overseas Training

Grain Storage and Preservation Trainee (Senegalese) - It is proposed that a Senegalese candidate be selected to receive training in the United States to prepare him for a position as Grain Storage and Preservation Specialist, ONCAD. It is assumed that after training in the U.S. the specialist will assume the duties performed by the Grain Storage and Preservation Advisor and become a permanent member of the ONCAD Quality Staff.

The trainee will need to meet certain qualifications. The trainee should:

Have the equivalent of a Bachelors Degree in Agricultural Engineering, Entomology or Agronomy and acceptable records to allow enrollment in U.S. universities;

Be fluent in English. If not, English language training should be provided to pass A.I.D. requirements for U.S. training.

Have qualities of leadership, initiative and an intense interest in the field of grain storage and preservation.

It is suggested that the trainee attend the Short Course Training ~~herein~~ proposed in June-August 1976 and enroll for a two-year program in residence at Kansas State University for the Fall Semester, September 1976. The trainee would be provided sufficient time to complete an M.S. Degree in Grain Storage and Preservation, and be back in Senegal approximately three months prior to departure of the Grain Storage and Preservation Advisor.

It is estimated that cost of training for the grain storage and preservation trainee will be approximately \$16,000.

#### Grain Storage and Marketing Short Course Training in the U.S. -

It is proposed that the ONCAD National and Regional Quality Section Leaders and the ITA Storage Section Leader attend a two-month Grain Storage and Marketing Short Course conducted at Kansas State University under contract AID/ta-c-1162 Technical Assistance in Grain Storage, Processing and Marketing and Agribusiness Development. It is also proposed that the Grain Storage and Preservation Advisor and Grain Storage and Preservation Trainee also attend this short course.

The short course is offered each year from mid-June until mid-August. Lecture, discussion, laboratory, workshop and field trips are included in the training. Course materials are prepared in English, French and Spanish with training in English with simultaneous French and Spanish translation.

An outline of material covered at the Short Course is presented in Annex E. A core curriculum is presented on the basics in grain storage and marketing with special emphasis either on the marketing or technical aspects of grain storage depending on participant preference. The participants in this case would pursue the technical emphasis in training.

Estimated total cost of Short Course training is \$60,000 for the following personnel.

- 1 - ONCAD National Quality
- 6 - ONCAD Regional Quality
- 1 - ITA Storage Section Leader
- 1 - ONCAD Storage and Preservation Trainee
- 1 - Grain Storage and Preservation Advisor.

### In-Country Training

In-Country Training Team - It is proposed that an In-Country Training Team consisting of four persons be assembled and receive 2 months instruction in grain storage and preservation, training methods, use of audio-visual training aids and demonstration techniques. In cooperation with ITA, C.N.R.A. and KSU the in-country training team will develop course outlines, manuals and training aids for a series in-country training sessions to be conducted for:

- 6 - ONCAD Regional Quality Leaders
- 54 - ONCAD Regional Fumigators
- 47 - ONCAD Reserve Warehouse Managers
- 6 - ONCAD Central Warehouse Managers
- 500 - 600 - ONCAD Secco Warehouse Managers.

The training team should be coordinated by the Grain Storage and Preservation Advisor and utilize ONCAD, ITA and C.N.R.A. personnel on the training team. At present, ONCAD has quality section leaders and/or fumigators that could be used as trainers, ITA has an entomologist and technicians that could be employed and C.N.R.A. has researchers that could be called on to assist in the training.

The training team should include persons qualified to instruct in the following general subjects:

- Insect and rodent biology and damage
- Proper storage management and methods
- Pest control techniques and equipment
- Equipment maintenance and supplies.

In-Country Training of ONCAD Personnel - It is proposed that the training team conduct four one-month training sessions for the ONCAD Regional Quality Manager, ONCAD Regional Fumigators and ONCAD Reserve and Central Warehouse Managers; two two-week Refresher Courses for Fumigators; and twelve one-week Seminars for Secco Managers.

To provide this training a mobile training unit consisting of a vehicle, audio-visual equipment and demonstration equipment will be needed. Estimated cost of this unit is \$15,000.

Estimated cost of maintaining the training team to provide the proposed in-country training is \$200,000 (including the cost of the mobile training unit).

#### IV. AID AND OTHER RELATED EXPERIENCE

The agency has had other experiences in the warehouse construction field in Mauritania, Niger and Upper Volta. The implementation of the projects in Mauritania were carried out under the Sahel emergency R&R program in 1973/74 and thirteen warehouses with a capacity of 1,000 to 2,000 metric tons were constructed throughout the country. The program had the collaboration, cooperation and financial assistance of FED.

AID had a Cereals Sector Loan with the Entente Fund in 1972 which financed the first two years of warehouse requirements and office facilities for the National Cereals

Offices of Niger and Upper Volta. This loan totaled U.S. \$1,800,000 and called for the construction of 16 warehouses in Niger with capacities between 500 MT and 1,500 MT as well as 11 warehouses in Upper Volta with the same variety of metric ton capacity. Two of the warehouses built in Upper Volta and Niger were prefabs and we understand that they are giving excellent results. The prefabs were built in Upper Volta as demonstration units and have proven themselves to be completely acceptable to the Government officials and officers of the Cereals Office in that country.

Fumigation Training and Warehouse Storage Management:

Although the Senegalese have been exposed to many seminars, both bi-lateral and multi-national, they have not been the type foreseen under the present agreement. The numerous training programs and seminars have during the past always focused on the heads of Offices of Cereals, Transporters, Port Directors and chiefs of large urban warehouses. In addition, few Senegalese have attended the seminars as all Francophone countries have been involved. The plans under this agreement outline a system for training a GOS Team which in turn will return to Senegal; its major duty will be to train teams within the country to teach proper fumigation and management techniques.

In a recent IGA Inspection Report dated October 10, 1975, covering AID Drought Relief Programs in West Africa, the IGA has insisted that AID incorporate proper pest control features in the design of any future grain storage and warehouse construction projects that it is considering financing. USAID therefore feels that the fumigation and management training programs as outlined in the PRP are a vital part of the entire program and is in line with the recommendations of the IGA report on the Sahel Drought Program.

V. Beneficiary:

The primary beneficiaries of the proposed activity are the subsistence farmers raising millet and sorghum

as food crops. The secondary beneficiaries would be the general populace in Senegal who in the eventuality of a drought year would have sufficient buffer stocks of grain for emergency relief.

Small farmers (less than 12 ha) produce 80 percent of the millet and sorghum grown in Senegal and should receive most of the benefits from storage and pricing stabilization programs. Small farmers in Senegal need an alternate cash crop to groundnuts to increase their farm income as well as a hedge against a crop disaster.

High risk areas of food grain production such as Senegal needs a grain reserve as an emergency safeguard. The history of West Africa has had a bleak food situation recurring more often than other high risk areas. Drought is probably the number one reason, however, inadequate food storage and distribution programs have worsened the problems. The population in rural areas usually have storage "on the farm" for one or two years but droughts lasting longer than one or two years usually cause the greatest hardship to the rural population. The proposed storage system would distribute warehouses throughout the rural areas, thus adding protection against food shortages and malnutrition.

The role of Senegalese women cannot be expected to change markedly as a direct result of the addition of the storage facilities which the development loan will build. Women could feasibly be trained and serve equally as well as men to carry out protection measures of stored grains. This is made all the more likely since the Director of the ITA, where such training could take place, is a Senegalese woman.

However, indirect benefits to women will be the more likely to occur. For example, these activities are expected to create a more favorable situation for the formation of cooperatives and women may participate in these. The increased storage element of this project

will enhance the on-going USAID/SODEVA cereals project, and in particular the Promotion Humaine add-on phase of that project. These activities are designed to enhance positive change in the role of women in a number of ways. Some of these are reducing illiteracy, encouraging craft work (to take up slack time as tasks of drudgery are eliminated), and enabling them to understand better the role of agriculture in the commercial world as opposed to production for subsistence only.

Certainly as the market for cereals expands and production increases to build a stored reserve and to feed a program of commercialization, the present drudgery task of hand threshing grains done by the women will have to give way to the mechanization of this operation in order to keep pace. Commercialization of locally produced cereals will result in commercial processing of the grains. This will produce the twofold benefit of relieving women of hand work processing in the home and of having improved retail products from these grains with which to prepare foods for the family. Millet flour for bread and cous cous from millet are examples of these products already possible from processes developed at ITA and ready to be commercialized.

ONCAD has indicated that the establishment of cooperatives in conjunction with the operation of the storage facilities is part of their marketing plan. Women in Senegal have in the past used cooperatives as a means of expression and change. It is anticipated that the processing of millet and sorghum, (threshing) could become part of cooperative functions in rural Senegal. The addition of millet and sorghum threshers at the cooperative level would free an estimated 2 - 4 hours a day that women are now spending threshing grain by hand.

## VI. Feasibility Issues

Much of the additional analysis and data required for determination of the feasibility of the ONCAD Program for commercialization of food grains and amount of storage capacity required will be available from an IBRD study in time for the Project Paper preparation. An outline of the study is in Annex C. The estimated time of completion of the IBRD study is April, 1976.

The preliminary data and analysis performed for the Project Review Paper indicates an immediate need of 30,000 to 100,000 metric tons of additional storage capacity, a commitment on the part of the GOS in general and ONCAD in particular for purchasing all grain (primarily millet and sorghum) offered for sale in any amount, an adequate pricing structure for grain (CFA 30/kg), a planned study for storage expansion, and an acceptable engineering design for the storage units.

The proposed sites and sizes of the first tranche of warehouses are in Annex B. The economic issues are discussed below.

The GOS will need to fully develop a marketing policy that integrates its storage program and activities with a pricing policy that continues to encourage millet and sorghum production. Credibility must be established with good follow through in announcing buying policy well in advance of planting time of grain crops. If several surplus years create a situation where storage facilities potentially will become filled to capacity, an advance alert system should be built into the program so old stocks are either sold on the export market or advance notice is given to farmers prior to planting time. There appear to be no technical or financial constraints that would significantly reduce the success of this activity. The GOS has indicated its willingness to supply 50 percent of the first tranche (60,000 MT) storage facilities. ONCAD has stated that it has either credit assurances or funds for its working capital to carry out a buying program in 1975-76 for 100,000 MT of millet and sorghum. The infrastructure, equipment and organization exist to carry out the assembly of the grain to and from the proposed storage locations. The human resources to carry out the training activity appears to be in good supply.

Benefits of a storage system can in part be estimated by estimating savings from decreasing storage losses due to insects, rot, and damage. Estimates have ranged around the ten percent level and above, ONCAD studies have indicated that losses can be reduced substantially with good warehouse management and sanitation. Plans by the GOS, to store a reserve of millet and sorghum from 200,000 to 300,000 metric tons give a range of potential saving from an improved and expanded storage program to be significant. Considering only the 60,000 MT of storage proposed, and if present losses are reduced from 10% to 5%, the savings from losses alone are estimated to be 3,000 MT or 90,000,000 CFA (\$407,000).

Benefits other than direct savings from reduced losses are directly related to the increased capability of the GOS to implement a grain stabilization policy.

In normal years, over one-third of Senegal's cereal requirements are imported, averaging some 315,000 tons a year. In 1972, at the height of the recent drought, 400,000 tons were imported.

Considerable benefits can be realized by a grain storage and compatible pricing policy that encourages domestic production. The benefits are brought about by (1) reducing the imports which have created a burden on the balance of trade, (2) allowing millet and sorghum to become more competitive for a share of the urban cereal market.

#### VII. Other Donor Coordination in Project Field

The team has been in contact with the German Government who recently informed us that they had also received a request from the GOS to assist them in their warehouse storage deficit. The German Government has had a reserve amount of 4½ million marks (about U.S. \$2 million) set aside for this possible assistance in warehouse construction. However, for the present, there are no active considerations being given in this direction. They seem to feel that they will let ONCAD spend their budget, let the U.S. loan go through and then take a look at the additional requirements.

In conversations with FED the team was informed that most of their projects involving warehouse construction are related to seed crop protection and that during the past years they have assisted in the construction of 25/30 hangar type shelters for seed crop protection. These were all small warehouses in the 100/300 MT category. They have at the present plans to construct more of these small hangars, however, they are not doing any work on the construction of warehouses for the protection of the harvests.

FAC advised that they had had no requests from ONCAD or the GOS for assistance in the project field; they also have no funds budgeted for such assistance during the coming year.

One of the French technician advisors to the GOS did inform the team that they hoped to obtain some additional help in warehouse construction from the World Bank who in turn they thought would request the required financing through the Arab countries.

VIII. Financial Plan

1. Financial Requirements

Following are itemized estimates of the foreign exchange and local cost requirements for the proposed project. The loan disbursement will be handled under Fixed Amount Reimbursement Procedure. If U. S. procurement of the prefabricated construction is opted then partial payment will occur when the materials are landed in Dakar with the remainder of the cost paid as buildings are erected. If GOS design is opted the payments will occur as warehouses are constructed.

<u>Item</u>	<u>Foreign Exchange</u> \$	<u>Local Costs</u> \$	<u>Total Costs</u> \$
Commodity Purchases and Land	3,500,000.00	2,300,000.00	5,800,000.00
TA Salaries (Grant)	180,000.00		180,000.00
Overseas Training (Grant)	100,000.00		100,000.00
In-Country Training (Grant)	<u>220,000.00</u>	<u>200,000.00</u>	<u>420,000.00</u>
	\$4,000,000.00	\$2,500,000.00	\$6,500,000.00

2. Financial Plan

	<u>Foreign Exchange</u> \$	<u>Local Costs</u> \$	<u>Total Costs</u> \$
A.I.D.	3,500,000.00		3,500,000.00
A.I.D. Grant	500,000.00		500,000.00
GOS Contribution	<u>                    </u>	<u>2,500,000.00</u>	<u>2,500,000.00</u>
	\$4,000,000.00	\$2,500,000.00	\$6,500,000.00

An inflation rate of 15% per annum has been included into the calculations of the AID Loan amount and 20% into the calculation of the GOS Contribution.

IX. Project Development Schedule

PRP	Submitted to AID/W	Dec. 1975
PP	TDY Team in Field	May, 1976
PP	Submitted to AID/W	June, 1976
AID	Authorized Project	July, 1976
GOS	Signs Loan/Grant Agreement	Aug., 1976
PIO/T	Issued for TA and recruitment initiated	Aug., 1976
PIO/C	Issued	Aug., 1976
TA	Staff arrives	Sept.-Nov., 1976
	Commodities arrive	Dec., 1976
	Regular Project-Implementation	Jan., 1977-Dec., 1978
	Project Evaluation	Dec., 1978

ANNEX A

PRESENTATION NOTES OF THE AGRICULTURAL LAW-PROGRAM

GOAL

Sponsored by the Prime Minister, the agricultural law-program has as its goal, to facilitate the financing of investments intended for the gradual resorption of the food deficit. It will be complemented with actions seeking to solve some particular problems, such as the shortage of sheep for the Tabaski (religious celebration) and the satisfaction of the domestic needs for tomato concentrates.

This law finally deals with a reafforestation program for the protection of the environment.

METHOD OF ELABORATION

First of all, a forecast of the national needs for the 1976-77 (end of 4th Plan) 1980-81 (end of 5th Plan), 1984-85 horizons and the long term horizon of the year 2000.

Then a global analysis of the national production capacities that will be articulated to satisfy their needs. Given these capacities, certain medium term objectives were set.

Finally an investment strategy was elaborated in order to reach these objectives.

The law includes two types of investments:

Direct investments: Their realization will increase the national production capacity.

Supporting investments: Necessary in order to guarantee the program's efficiency. These supporting investments will deal with the protection of the soil through reafforestation, with technical studies for the search for water, finally with agricultural projects development.

Reference: No. 02256/MDRH/CT 4, Dakar 10 Apr. 75  
Ministre du Développement Rural et de  
l'Hydraulique, République du Sénégal.

An important remark to put this law-program into perspective:

It was conceived to serve as complementary financing to aid from foreign governments. That's why a number of cereal development programs are not mentioned here, because they are financed through outside help. The cereal development program (corn included) for the peanut belt for example is financed through loans from the World Bank, the EEC, USAID and the National Investment Budget, the Eastern Senegal Rice Development Program is financed by the European Development Fund, Rice growing in Sedhiou, Casamance by the World Bank and the Delta by the AID and Development Fund (French).

This law-program was then conceived as, on the one hand, complementary financing for projects that have not yet found financing from the outside (corn operation in Eastern Senegal and Casamance, sheep development operation, reafforestation actions) and on the other hand, as a means of accelerating other programs that might find outside financing, but not in the immediate future (the South Kasak Bassin Development).

FORECAST OF NATIONAL CEREAL DEMANDS AND CAPACITIES OF THE OFFER

A preliminary evaluation of the national consumption was made for the five years going from 1969 to 1973. For 1973 the breakdown is as follows:

Wheat	22.7	kg/year/inhabitant
Corn	14.35	- " -
Rice	80.85	- " -
Millet and sorghum	114.89	- " -

We notice that this national consumption has changed very little during that time except for millet and sorghum where because of the drought the consumption went down from 137 kg/year/inhabitant in 1969 to 114.85/kg/year/inhabitant in 1973.

The imports for that last year were as follows:

Wheat	105.422	tons
Corn	51.453	"
Rice	295.629	" (equipment in paddy)
Millet and sorghum	41.402	" - " -

**COMPREHENSIVE PROGRAM OF ACTIONS**  
**TO BE TAKEN**

Cereal programs	Research prog.	Seed prog.	Provisioning program	Development program for realization studies
Actions millet and sorghum	Continued Researches GAM millet Souna II Short cycle sorghum	Multiplication of varieties with high yield	Increased use of termaire fertilizers	
Financing	ISRA Bank	Seed service bank	LPA subsidy	
Actions Rice (Wheat)	Continued researches	Multiplication of varieties	Increased use of fertilizers	Nianga Tellel Matam Grande Bakel digue <u>Other developpts.</u>
Financing <u>LPA</u>	ISRA Bank	SAED SODEFITEX Seed service	F.M.D.R.	<u>LPA</u> SAED FAC-IDA FED-USA
Actions Corn	Research on varieties	Creation of a seed farm corn	Increase use of fertilizers	
Financing <u>LPA</u>	ISRA Bank	<u>LPA</u>	F.M.D.R. budget	
Actions Industrial Tomatoes	Continued researches on varieties		Use of fertilizers and nematocides	South Kasack (500 km Dagana)
Financing <u>LPA</u>	Camberene ISRA and SAED	SAED	SAED	<u>LPA</u> IDA

Production technical program	Storage program	Transport program	Transformation program	Studies program
Intensification of the popularization program SODEVA	Increase of storage capacities		ITA program on seminola and couscous	Economic study of agricultural development alternatives
SODEVA budget Generalizing draw cultivation	<u>LPA</u> ONCAD	ONCAD	ITA budget Shelling	<u>LPA</u>  Econ study of agricultural development alteri
- SAED - SODEFITEX - Casamance Projects  SODEVA and SODEFITEX re-inforcement action (Sine Saloum)	Projects  Creation of a storage capacity	Roads and secondary roads project  Trucks	SAED SODEFITEX project  Peeling plant	
SODEVA budget SAED staffing	<u>LPA</u>	<u>LPA</u>	<u>LPA</u>  - SOCAS - Dagana and - Sine Saloum projects	<u>LPA</u>  Italconsult
			- stabilization coffer - Italia Germany	

Despite importations, the total amount available per year and per inhabitant has remained inferior to 250 kg, an amount that represents the average consumption level.

The following table summarizes the probable evolution of the national needs up to the year 2000. It is based on an average consumption of 250 kg/year/inh. and the assumption will remain constant. This hypothesis might be false in the long run, but is true in short and medium term.

Note: Hyp. D. (Demographic) indicate two demographic increase hypothesis: 2.2 and 2.5%.

Cereal Hypoth.	Demogr. Hyp.	76/77	80/81	84/85	2000
Total amount of cereals	2.2%	1,103,000	1,202,750	1,312,500	1,879,000
250 kg stability	2.5%	1,118,750	1,235,500	1,304,000	2,075,250
Millet and Sorghum 127 kg	2.5%	562,864	610,997	666,750	954,786
	2.5%	568,325	627,634	692,912	1,054,227
Rice 85 kg	2.2%	327,020	408,935	446,250	639,030
	2.5%	380,375	420,070	463,760	705,585
Corn	2.2%	66,180	72,165	78,750	112,770
	2.5%	67,125	74,130	81,840	124,515
Wheat (23 kg)	2.2%	98,936	110,653	120,750	172,914
	2.5%	102,925	113,666	125,488	190,983

The following series of tables indicates the foreseen supply capacity for the different cereals.

They were made according to projects going on at the present time and other projects already elaborated and to be completed during the 4th and 5th Plan.

Rice - Horizon 1980-81

Region	Ha	Average yield	Total yield	Observations
<u>Fleuve</u> SAED complex	20,000	4 tons	80,000 T	- Surface developed 25,000 ha - Production surface 20,000 ha - The Diama dam will be in operation
<u>Eastern Sene- gal and Upper Casamance</u>	13,300	2.4 T	32,000 T	Program run by SODEFITEX
<u>Casamance</u> Sedhiou II	11,500	2.8 T	32,000 T	Takes into account Nyassa- Guidel development and of the first flood-gate dam
Normal Rice	40,000	1.5 T	60,000 T	
Total. . .	51,000	2.4 T	92,000 T	
Total I	84,800	2.4 T	204,000 T	
SODAGRI (Anambe)	25,000	8 T	200,000 T	Mixed economy company for double crop (upper Casamance)
Total II	109,800	3.67T	404,000 T	

3.3.2.2. Corn - Horizon 1980-81

Projects	Ha	Average yield	Total yield	Observations
<u>Traditional production</u>				
- Casamance	20,000			
- Eastern Senegal	13,000			
- Other regions	5,000			
	38,000	0.8	30,400	
Sine Saloum Project	10,800	8.36	25,500	Managed by SODEVA
Eastern Senegal and Upper Casamance Projects	16,000	2.5	40,000	Managed by SODEFITE
Total	64,800	1.48	95,800	

3.3.2.3. Wheat in 1980

Projects	Ha	Average yield	Total yield	Observations
SAED wheat	5,000	3 T	15,000	

3.3.2.4. Millet and Sorghum in 1980

Projects	Ha	Average yield	Total yield	Observations
<u>Irrigated crops</u>				
SAED Sorghum	10,000	2 T	20,000	
<u>Dry crop culture</u>				
Traditional Millet and Sorghum	500,000	0.5 T	300,000	
Traditional Millet and Sorghum	400,000	1 T	400,000	Farmers supervised by SODEVA, SODEFITE and the Casamance
Total	1,000,000	712 kg	720,000	

If all projects to be developed are normally completed, the cereal deficit of the country will totally be resorbed by 1981. One must, however, keep two important points in mind:

1) As far as rice is concerned, the national needs will be covered only if the SODAGRI Project of 25,000 hectares is actually completed. If it is only partially realised, it will be necessary to accelerate the development of new areas in the river valley, in order to make-up the difference.

2) For wheat, it will only be possible to cover 15,000 T of the total need, the culture of wheat being possible only on part of the land on the river valley, and being moreover limited by the quantities of water available in the dry season.

The national need in wheat will only be covered after the Manantali Dam is completed.

The needs for corn will however be covered to 131% and for millet and sorghum the coverage will reach 116%.

The evaluations are based on the present structures of cereal consumption.

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Source: Projet de synthèse du travail du groupe loi-programme de l'Alimentation au Sénégal. Mars 1974. Groupe d'Etudes sur la loi-programme de l'alimentation.

## LIST OF WAREHOUSES BY ORDER OF PRIORITY OF COMPLETION

REGIONS	ORDER NUMBER	LOCALITY	CAPACITY T	REGIONS	ORDER NUMBER	LOCALITY	CAPACITY T
S/SALOUM	1	KAFFRINE +	2,000	DIOURBEL	23	KEBEMER +	2,000
DIOURBEL	2	DIOURBEL +	2,000	S/SALOUM	24	DJILOR +	1,000
FLEUVE	3	PODOR	2,000	THIES	25	FISSEL	1,000
DIOURBEL	4	LINGUERE +	2,000	S/ORIENTAL	26	KOUMPENTOUM	1,000
S/SALOUM	5	NIORO +	1,000	CASAMANCE	27	VEGINGARA	1,000
FLEUVE	6	DAGANA +	2,000	S/SALOUM	28	M.SABAKH +	1,000
S/SALOUM	7	GOSSAS +	2,000	DIOURBEL	29	D. MOUSTY	2,000
FLEUVE	8	MATAM +	1,000	THIES	30	TIVAOUANE	1,000
DIOURBEL	9	MBACKE +	2,000	S/SALOUM	31	FATICK +	2,000
S/SALOUM	10	OUAKH GOUNA+	1,000	FLEUVE	32	OUROSSOGUI +	2,000
DIOURBEL	11	BAMBEY +	2,000	S/SALOUM	33	SOKONE +	1,000
S/SALOUM	12	KOUNGEUL +	2,000	THIES	34	NIAKHENE	1,000
THIES	13	MBOUR	2,000	S/SALOUM	35	K.MADIABEL	1,000
THIES	14	JOAL	1,000	DIOURBEL	36	LOUGA	2,000
FLEUVE	15	AERELAO	1,000	FLEUVE	37	THILLE BOUBA	1,000
CASAMANCE	16	SEDHIOU	1,000	S/SALOUM	38	KAOLACK	2,000
S/ORIENTAL	17	KEDOUGOU	1,000	THIES	39	THIES	2,000
S/SALOUM	18	COLOBANE +	2,000	S/SALOUM	40	FIMELA	1,000
DIOURBEL	19	DAHRA	2,000	THIES	41	THILMAKHA	1,000
FLEUVE	20	BAKEL	1,000	S/SALOUM	42	BIRKILANE	1,000
CASAMANCE	21	KOLDA	1,000	THIES	43	MEKHE	1,000
FLEUVE	22	DIOUM	1,000	S/SALOUM	44	NDOFFANE	1,000
CASAMANCE				THIES	45	NOTTO	1,000
				S/SALOUM	46	GANDIAYE	1,000
				THIES	47	THIADIAYE	1,000

+ To be completed in the first phase by the Government of Senegal

## ANNEX C

### OUTLINE FOR WORLD BANK STUDY

#### SENEGAL

#### SINE-SALOUM AGRICULTURAL DEVELOPMENT PROJECT

#### Draft Terms of Reference for a Cereal Marketing and Storage Study

The purpose of the study would be to determine the policies, procedures, and investments required to promote local cereal production to help Senegal grow more of its cereal requirements. The study would involve an analysis of the present cereal production and marketing situation, medium-term consumption and production projections, and proposals for marketing procedures, price policies, investments, and qualified personnel.

#### 1. Analysis of present situation:

- (a) Production trends by crops and geographical areas,
- (b) Consumption trends,
- (c) Trading pattern for domestic cereals,
- (d) Trading pattern for imports,
- (e) The trading systems and impacts of Government regulations,
- (f) Analysis of marketing constraints for domestic production,
- (g) Inventory and condition of storage facilities.

#### 2. Demand and Supply Projections:

- (a) Estimated demand for cereals by crop and origin including demand for animal food and processing,
- (b) Estimated domestic supply projections by crop and origin of supply,
- (c) Estimated need for imports,

- (d) Market constraints on substituting imports by local products, including inter alia consumer taste preferences and processing convenience.

3. Marketing Procedures and Storage:

- (a) Recommendations for improving the marketing system,
- (b) The role of private traders in marketing, storage and processing for domestic and imported cereals,
- (c) The responsibility of Government and state controlled institutions in future market, storage, and processing operations,
- (d) Need for improved storage facilities including types and location,
- (e) Links with marketing arrangements for other crops,
- (f) Links with credit supply for cereal production,
- (g) Need for and means of enforcing grading systems and other market controls,
- (h) Means for collecting and disseminating marketing information.

4. Price Policies:

- (a) Consumer price policies for imported cereals,
- (b) Price policies for domestic cereals,
- (c) Impact of price policy variants on supply and demand projections,
- (d) Need for and means of maintaining a price stabilization fund,
- (e) Need for and means for maintaining a strategic reserve of cereals to cover emergencies.

5. Investment Proposals

- (a) Based on the institutional arrangements proposed in 3, the supply and demand projections and the evaluation of existing facilities, determine (i) the financial requirements for stocks, facilities, equipment, and qualified personnel required by the public sector over the next five years; (ii) the need and means for providing credit to private traders, millers, and processors to finance stocks, equipment and facilities; and (iii) the needs, means and costs for improving on-farm storage.

6. SODEVA would employ consultants to carry out the study during the first project year. A short list of consultant firms would be invited to submit proposals for the study based on the above draft terms of reference. The study team would include an economist, storage/processing specialist, and a marketing specialist. Field work and report writing would be completed within a total of nine months.

Source: IBRD (1975) Appraisal of Sine-Saloum Agricultural Development Project - Senegal. Report No. 661a-SE., Western Africa Regional Office, International Bank for Reconstruction and Development, International Development Association, 24 p. and Annexes 1-18.

## ANNEX D

### GOS Marketing Policy Background Paper

The ONCAD has been chosen by the Government to execute the project.

#### II - Marketing Policy

The cereals marketing Program under ONCAD has to satisfy the following requirements:

- Setting-up of a marketing network adapted to the production structures. This marketing network should essentially be used 10:

- (a) Increase the value of the production at the market price set by the Government;
- (b) Eliminate speculators from the market (in earlier speculative markets, the producer caught up in a situation where they needed money badly, were compelled to sell a good part of their production at low price at the beginning of the harvest period);
- (c) Constitute and maintain stocks in marketing areas (the closest possible to the production areas) in order to forestall the lack of foresight on the part of some producers, and also to provide guard against shortage of between-crops food reserves in so-called production areas.
- (d) Harmonize stocks movements with the millet and sorghum. That is either imported or given to Senegal by this project or other sources.
- (e) Set-up a distribution network that makes it possible to have a balanced food distribution between the zones with an excess of food and those are deficient and also with the urban areas.
- (f) Efficiently supply industrial transformation programs, in cereals. In this area a good possibility for expanding production will be furnished by the project developed by the Institute for Food Technology.
  - Produce couscous and semolina
- (g) Set-up a storage network for long-term storage, intended for the regrouping and conservation of excess cereal produced.
- (h) Develop an efficient transportation program, that will help reduce costs and will also provide extra transportation possibilities for the primary and secondary automotive pools.

### III - Definition of the means for Short-Term Action

#### A. Marketing Structures

To complete this project ONCAD will utilize all the existing marketing structures.

The Coops Structures. A vigorous action to make coop-organizations aware of the project and get them interested in it will enable us to make use of a marketing network that already in place and is wide-spread. These coops that have so far devoted themselves only to marketing peanuts will have from now on to open themselves up to a new multi-functional conception of their activities, thus creating for themselves new resources and a more stable economic basis.

Their location pattern on the national territory presents two aspects:

- (a) The zones of the peanut belt is totally covered.
- (b) The so-called peripheral zones where the coverage is looser, will necessitate a restructuration based primarily on cereal programs that will serve as a commercial support.

The setting up of this network will give the project important means of intervention that will enable it to effect the marketing control by the presence on the market of the producers through their cooperatives. The coops will be supervised and supported by the project. Beyond providing that network, the organisation by cooperative will also furnish the project with the necessary funds to :

- Complete a 5 year medium-term program of family size silos through the agricultural loan program, thus opening new possibilities in the area of individual equipment.
- Create first an investment credit for collective equipment, second a series of new possibilities through the use of the common investment fund that will enable the cooperatives to actively participate in a medium-term investment program to build marketing facilities with financial assistance provided by the project.

#### ONCAD's Direct Intervention Structures

The structures are represented:

- (a) by the ONCAD "seccos" (storage facilities that can serve in all the areas as marketing unit that will be ONCAD's own).
- (b) the ONCAD collecting points representing marketing units located in a determined area and making it possible to satisfy the needs in distribution structures for the products and functioning temporarily for a given objective.

ONCAD has therefore, because of its statutory prerogatives, the possibility of intervening in the area of marketing to supplement cooperative and government structures in case of insufficiency.

Intervention of the Private Sector. The intervention of private businessmen must form the subject of an agreement subject to ONCAD's advice. In the future, their activities must be subjected to a permanent control to avoid any deviation from the stabilization policy being implemented and for which their actions should be complementary to the project's own.

B. Organization of Marketing Services at the National Level.

The realization of the project will be effected by the marketing office ( of the Ministry) which with the help of the experts will formulate the course action on the basis of a coherent application of the policies, and will define the means that will be articulated.

This will necessitate the setting up of a cereal office -- called earlier ---, office of secondary marketing -- that will be in charge of the execution and follow-up of marketing operations, of collecting all cereals produced by the project, and on the other hand of organizing their distribution in rural area by coordinating the different actions, to the satisfaction of all needs and at the most favorable economic costs possible.

The service will be effected by:

- an officer of deputy rank (senior officer) having solid knowledge of marketing organization, financing and stocks management;
- three controllers in charge of control of the execution of marketing operation and stocks management; academic level; brevet supérieur de commerce or accountant with solid knowledge in stock management;
- an accountant in charge of stocks movements and accounting; he will record the data collected and after verification will supply every month a situation report of the accounts and of the stocks at regional and national level.

At the Regional Level. The chief regional manager will be responsible for execution of the project. At this level will be created a regional marketing office the size of which will depend on the development of cereal production in the area. At the outset, the project will use the existing marketing structures for the financing of purchases and the collecting of the documents according to the existing procedure UPC-COR or ABD-DAC-AC. The information and documentation elements are afterwards sent to the DIG/COM, which after verification transmit them to the accounting dept.

An appropriate procedure will be developed.

- A regional assistant will be in charge of the Cereal Office, representing the decentralization of the national structures.

At the District level. To start the project, the heads of COR and UCP will effect all the operations of verification and the control of the quantity and quality of commercialized products and also the execution of directives at the primary level. They will report every week, through the established channels to the regional manager that will transmit to the head office -- Marketing Dept.

#### IV. Technical Assistance

The technical help will be supplied by the ONCAD technical Dept. in rapport with the ITA.

National Level. The technical department is responsible for studies to, on the one hand satisfy the quest for technical solutions to be articulated for the realization of storage facilities, equipment and their maintenance ; and on the other hand to develop and apply the conservation techniques and to train officers.

Regional Level. The regional technical department will organize the treatment programs. It will also periodically inspect the stocks to inform itself of their phyto-sanitary conditions, in order to take the necessary action to avoid all risks of infestation.

#### V. Storage Infrastructures

##### The Storage Infrastructures for Basic Marketing

The ones presently existing are both summary and insufficient to insure the marketing. It will be necessary to use, in the immediate period, the means that are available in areas where the marketing takes place, thus avoiding costly transportation. It will be made use of stores or premises fulfilling the following criteria: walls in bricks, cemented floor, water-tight roof, robust doors and allowing a good protection and also a good ventilation.

In the immediate period, these premises will be used in the most rational way possible by paying a monthly rent of about 4,000 to 5,000 F/CFA to store 30 to 50 tons of millet, which amounts to about 1,000 to 1,500 CFA per ton per crop season (10 months, average).

For the coming crop season a study should be made of the means to use in order to solve that problem.

##### The Large Capacity Storage Facilities

ONCAD has presently a group of warehouses capable of being used for regrouping of cereals; a study of the most rational way of using them will be done. These facilities of different capacities are broken down as follows:

(a) Premises belonging to ONCAD

- Ziguinchor	2,000T
- Kaolack	13,000T
- Thiès	2,000T
- Dakar	8,000T

(b) Renting possibilities

To supplement this storage set-up, which for the most part could be found inadequate both for the geographical distribution and the technical and economic requirements of the stabilization program, a prospection will be made of the possibility of renting space. Some information on this is given here for information:

Casamance Region	Velingara	1.000 T
	Kolda	1.000 T
Diourbel Region	Diourbel	1.000 T
Fleuve Region	St.Louis	2.000 T
	N'Dioum	200 T
Sine Saloum Region	Koungheul	200 T
	Kaffrine	500 T
Eastern Senegal Reg.	Tambacounda	1.000 T
	Koussanar	200 T
	Total	<u>7.100 T</u>

VI. Realization of the New Infrastructures

The realization of new storage facilities, adapted to the basic structures, is the determining factor for the success of stabilization policies.

These policies should be conceived according to norms studied for the different execution studies of these policies and that are represented by:

- 1) Family type silos of small capacities: 2 to 3 T divided in compartments for a diversified use. As soon as the studies made by SODEVA and IRAT are completed, this type of silo can be integrated to the agricultural program depending on its cost.

A certain amount of popularization will be done with financing from the program in different locations.

- 2) The storage warehouses at the so-called primary marketing. These warehouses of various capacities, from 50T to 300 T will be conceived to store bagged grains, at the coop level. Their location should take into account the marketing capability of the coop, that must have a vocation having to do with handling cereals. These warehouses should follow these criteria:

- a. to be used for storage of bagged grain in order to take into account the present handling ; and transportation restraints, with all possibilities of diversified utilization.
  - b. possibility of reconversion for bulk storage which is the final objectives of the project and that should be realized as soon as the appropriated transformations of the technical means and the equipment for the transportation and the handling of bulk grain are realized. The financing of these infrastructures should be looked for in the scope of this project.
3. The warehouse/silos of various capacities for the regrouping and the long-term storage. These facilities should be located in areas of heavy production and in Dakar according to their capacities:
- a. Warehouses of 1,000 to 5,000 capacity
    - in Casamance: in heavy production areas of the border zone with Sine Saloum;
    - in the Fleuve or in Diourbel area, to service the entire northern part of Senegal;
    - in eastern Senegal: in the area bordering on the railroad and in areas that are isolated during the rainy season.
  - b. Large capacity warehouses 10,000 to 15,000 T
    - in Dakar in areas close to the harbor and susceptible of satisfying the needs of importation of cereals in bulk.

The program for realization of this type of facility will be given in annex.

#### VII - Training Program

A program will have to be formulated at 3 levels -- level of senior officers responsible for the definition of policy application, for evaluation of the financing program and for the resources.

- a. Senior officers:
  - a project director
  - a deputy director in charge of the Cereal Office
  - a management controller
- b. Medium-level officer in charge of executing the "medium-level officer-technical agents". Programs.
- c. Level of executing agents - Warehouse manager.

VIII - Marketing Program for the 1973/74 Crop Season

While the first early millet harvests were satisfactory, harvest of other varieties of long-cycle millet are very much endangered by the drought that has occurred at the end of the rainy season.

In some areas of the peanut belt: Diourbel, Fleuve, Siné-Saloum and Thiès, the harvest of these long-cycle varieties, will be very small and the necessity of an immediate intervention to satisfy the needs for food is already felt in areas hardest hit.

It will, therefore, be necessary, starting in this crop season to promote and to articulate the stabilization program by marketing the excess in grain of good production areas to the benefits of the needy zones (zones with deficit harvest).

IX - The Harvests and Marketing Forecasts

Breakdown:

Cap Vert	360 T	
Casamance	91,000 T	
Diourbel	101,000 T	
Fleuve	13,000 T	
Eastern Senegal	35,000 T	
Siné Saloum	180,000 T	
Thiès	<u>62,000 T</u>	
Total	482,360	(roughly 480,000 T)

Based on these harvest forecasts, the marketing program will be established as follows:

Cap Vert	0 T	
Casamance	3,500 T	
Diourbel	6,800 T	
Fleuve	200 T	
Eastern Senegal	5,000 T	
Siné Saloum	6,000 T	
Thiès	<u>3,500 T</u>	
Total	25,000 Tons	

The effort to market this will essentially concentrate on the Souma millet and will emphasize in good production areas both the establishment of efficient redistribution circuits, and the fight against speculating traders who feed the illicit markets and the illegal exportation toward bordering markets.

X - The Financing

The financing for the commercialization project will be effected by the consortium loan to ONCAD, that was given by a consortium of banks, the leader of which is the BNDS.

The necessary funds for the marketing project (625,000,000 CFA) are available.

It will, however, be necessary with this project, to study whether any possibility exists of intervening in the financing to minimize the financial costs by using funds available in the special account or through financing from other resources.

XI - Marketing Set-Up

As earlier indicated, the use of the coop organizations as basic structures for marketing activities remains the goal of the project.

Measures will be taken so that as early as the next crop season, the coops will take over the cereal marketing. Consequently, the principle has been agreed upon that wherever the coops are capable of normally functioning, the ONCAD "seccos" will cease to function.

This will make it possible:

- a. to locate marketing points near the production areas, in order to better control cereal movements;
- b. to effect, before the end of the project, a functional location pattern capable of serving as a support to any clean-up action of the marketing circuits, and also to realize our goal of cereal stabilization;
- c. to allow the coops to take advantage within the framework of the national agricultural loan program of the volume of cereals to be marketed in order to improve their credit capability to the benefit of more consequent individual equipment for the cereal producers. This in return will have a favorable effect on cereal production;
- d. to make more real the participation of coops in the investment effort for the creation of marketing and storage facilities, and to make them more profitable by:
  - a rational utilization of the common investment fund
  - creation of multiple functions in storage, supply for the distribution of first necessity products
  - creation of new resources that will make it possible to give the most dynamic coops, permanent managers.

On the other hand, we must take note of, as an advantage of this orientation:

1) The participation of the coop in creating a more responsible management at the gathering level. This participation is guaranteed by the anti-fraud deduction of 1 CFA per kg of marketed millet or sorghum. Indeed, this anti-fraud deduction will cover all losses due to poor quality of delivered products not imputable to the manager or the cooperative president. It is given back to the producers after total delivery and control of the quality, and after deduction for rehandling for any defect or presence of impurities over the accepted norm. This will get the farmers more attentive to the marketing process and more willing to take a more direct control of it.

2) The involvement of coop presidents in the profit sharing scheme by payment of the marketing bonus is also a factor in encouraging them to exercise their control power within the cooperative.

#### XII - The Producer's Price

The producer's price fixed at 25 F.CFA/kg will certainly be a more real encouragement factor to production. It can be broken down as follows:

- instalment on producer's price to be paid cash and on all quantities bought:	24 F.CFA/kg
- anti-fraud withholding to be freed as refund to the producers at the end of operation, after verification, quality control, and rehandling resulting from it and not imputable to managers and coop presidents:	1 F.CFA/kg
Thus, price/kg to the producer:	25 F.CFA/kg

#### XIII - Estimated Cost Price

The computation of the cost price was done as follows:

- purchase price of 25,000 T at 25 F.CFA/kg	625,000,000 CFA
- insurance at 25 F.CFA/ton	625,000
- cost of setting-up funds	1,413,000
- financial costs (7months)	37,335,000
- presidents' bonus (0.10 F/kg)	2,500,000
- weighers remunerations (0.20 F/kg)	5,000,000
- storage losses (2% of selling price 32 F/kg)	16,000,000
- bags (250,000 bags at 200 F/piece)	50,000,000
- treatment costs and fumigation	17,000,000
- participation to ONCAD's general costs	28,000,000
- transportation and handling costs (2,400 per ton)	60,000,000
- mecanography cost	1,700,000
	<hr/>
	875,706,000 CFA

which comes up to the cost price of 35,028.25 F.CFA per ton.

The selling price for the producer having to be fixed at 32 F/kg, which amounts to 800,000,000, we must register a marketing loss of 75,000,000.

To cover this loss, sums of money must be found, in agreement with the Government, in the project resources.

A special effort will be made on financial cost, storage doors, transportation costs in order to utilize as much as possible the project resources for profitable investments, i.e. realization of storage infrastructures and means of treatment.

#### XIV - Transportation and Handling Costs

Production in this crop season is normal in so-called border areas of Casamance and Eastern Senegal, and medium in the Peanut Belt where there are areas hard hit by the end-of-cycle drought, in the areas:

- North of Siné Saloum and Diourbel Regions
- South of Thiès Region
- On the whole territory of Fleuve and Cap-Vert Regions.

To satisfy the needs in these areas (we must add to them the urban areas), it will be necessary to transfer part of the production from far-away areas where production was normal (specially Casamance, Eastern Senegal, Southern part of Siné Saloum Region) to zones that have a deficit.

Our forecasts for transportation and handling are as follows:

5,000 T to carry on long distances (Casamance, Eastern Senegal to the Northern Areas: Louga, Lingere, Kebemer, Fleuve area) at the average price of 7,000 F/ton	35,000,000 CFA
5,000 T to carry on intermediate distances at 2,200 CFA/ton	11,000,000 CFA
10,000 T to carry on short distances for charges and regrouping (consolidation)	12,000,000 CFA
5,000 T will be moved in case storage facilities exist locally but need handling (repairs)	2,000,000 CFA
Global transportation costs which means 2,400 CFA per ton.	60,000,000 CFA

This area will be the subject of particular attention in terms of the evolution of marketing in different areas.

ANNEX E.

GRAIN STORAGE AND MARKETING SHORT COURSE

The following outline is a guide to the material covered during the Kansas State University A.I.D. Grain Storage and Marketing Short Course. Lecture and laboratory outlines are prepared in English-French-Spanish. Instruction is in English with simultaneous French and Spanish translation. The course is 8 -weeks long with 1-week orientation in Washington, D. C., 5 weeks intensive lecture, laboratory field trip training on the KSU Campus, and 2 weeks tour in rice area and port facilities.

Grain Storage and Marketing Short Course Outline

- I. Introduction to Course.
  - A. Importance of Grain Storage and Marketing.
  - B. Purpose and Scope of Course.
    1. Provide basic fundamentals of Grain Storage and Marketing.
    2. Provide practical knowledge and techniques needed in Grain Storage and Marketing.
- II. Review of Grain Production, Storage, Marketing and Utilization in Participant's Countries.
- III. Fundamentals of Grain Storage.
  - A. Grain kernel structure.
  - B. Moisture and its measurement.
  - C. Mold: moisture relationships.
  - D. Chemical, physical, and nutritive changes during storage.
- IV. Grain Inspection - Standard, Sampling, and Grading.
- V. Grain Handling:
  - A. Movement of grain.
  - B. Methods and facilities for conditioning grain.
  - C. Aeration - cooling of grain.
  - D. Grain drying - principles, types of drying, types of driers, and drier operation.
  - E. Equipment maintenance.

VI. Storage

- A. Storage methods and procedures.
- B. Types of structures - farm, warehouse, and elevator storage.
- C. Structural maintenance.

VII. Sanitation Program

- A. Inspection - methods and equipment.
- B. Housekeeping - storage sites, structures and equipment.
- C. Insect control - biology and identification; physical, mechanical, and chemical methods; pesticide safety.
- D. Rodent and bird control - biology, identification, and methods of control.
- E. Microbial control - molds, mycotoxins, and control methods.

VIII. Economics of Marketing Management and Operations.

- A. Principles of management
- B. Principles of operation
- C. Organization of the grain business - business, financial, operational structures, and facilities planning.
- D. Facilitating grain operations - public warehousing, financing and rise, crop forecasting, price reporting, standardization, and price differentials.
- E. Bookkeeping, accounting and inventory control.
- F. Government and marketing.

IX. Field Trips to Demonstrate Classroom Instruction.

X. Laboratory Work Sessions to Complement Lectures.

- A. Grain inspection.
- B. Moisture determination.
- C. Effects of grain drying and aeration.
- D. Insect identification.
- E. Demonstration of pest control methods.
- F. Business procedures and marketing analysis methods.
- G. Records keeping for warehouses and elevators.
- H. Assessment of grain storage and marketing economy.

**ANNEX F**

**FP/SG  
REPUBLIC OF SENEGAL  
PRIMATURE**

**GENERAL DELEGATION  
FOR SCIENTIFIC AND TECHNICAL  
RESEARCH**

**P R E S E N T A T I O N   O F   T H E  
M I L L E T   T H R E S H E R**

English translation  
January 1975

National Center of Agricultural Research  
Bambey

Senegalese Institute of Agricultural Research  
(I.S.R.A.)

## Motivation

Most of the population in the underdeveloped countries is involved with agriculture. Thus the industrialization of their food industry is one of their principal aspirations.

At the time, the economy of cereals in the sudan-sahelian countries of Africa is characterized by a divergence between population growth and food production.

The production of cereals, which used to represent 50 to 80 % of the total agricultural production has suffered a painful loss.

This phenomenon is explained by the extreme sensibility of the African farmers to the classic economic stimulants such as market openings and stable prices even in such labor intensive crops such as groundnuts and cotton.

The local cereals are unfortunately far from knowing the same price stability. Their potential is important however especially in regions with poor soils and ~~with~~ little rainfall.

The introduction of systems of marketing, storage, processing and price readjustment are capable of changing this tendency towards price speculation such that the farmer could handle his crop in a shorter period, with less field damage by insects.

The millet and sorghum thresher appears therefore like an indispensable link to substitute local cereals for imported ones and to satisfy the expanding market needs for cereals in industries such as : breadmaking, biscuit making, brewing and raising of stock.

It is for this reason that CNRA Bamby has carried out, parallel with crop improvement, a study of a millet thresher. Under the social plan of the country, this machine could satisfy the desire to relieve the woman of the heavy daily work load now present due to manual methods of threshing, decortiating and grinding.

### The product to be threshed

The form of the millet head (souma-sanio), the mode of placement of the grain on the rachis, the resistance of the peduncle, and the characteristics of the involucre are the factors one must take into consideration to determine a principle of harvesting different than classic principles employed in threshers used for wheat, rice, or sorghum.

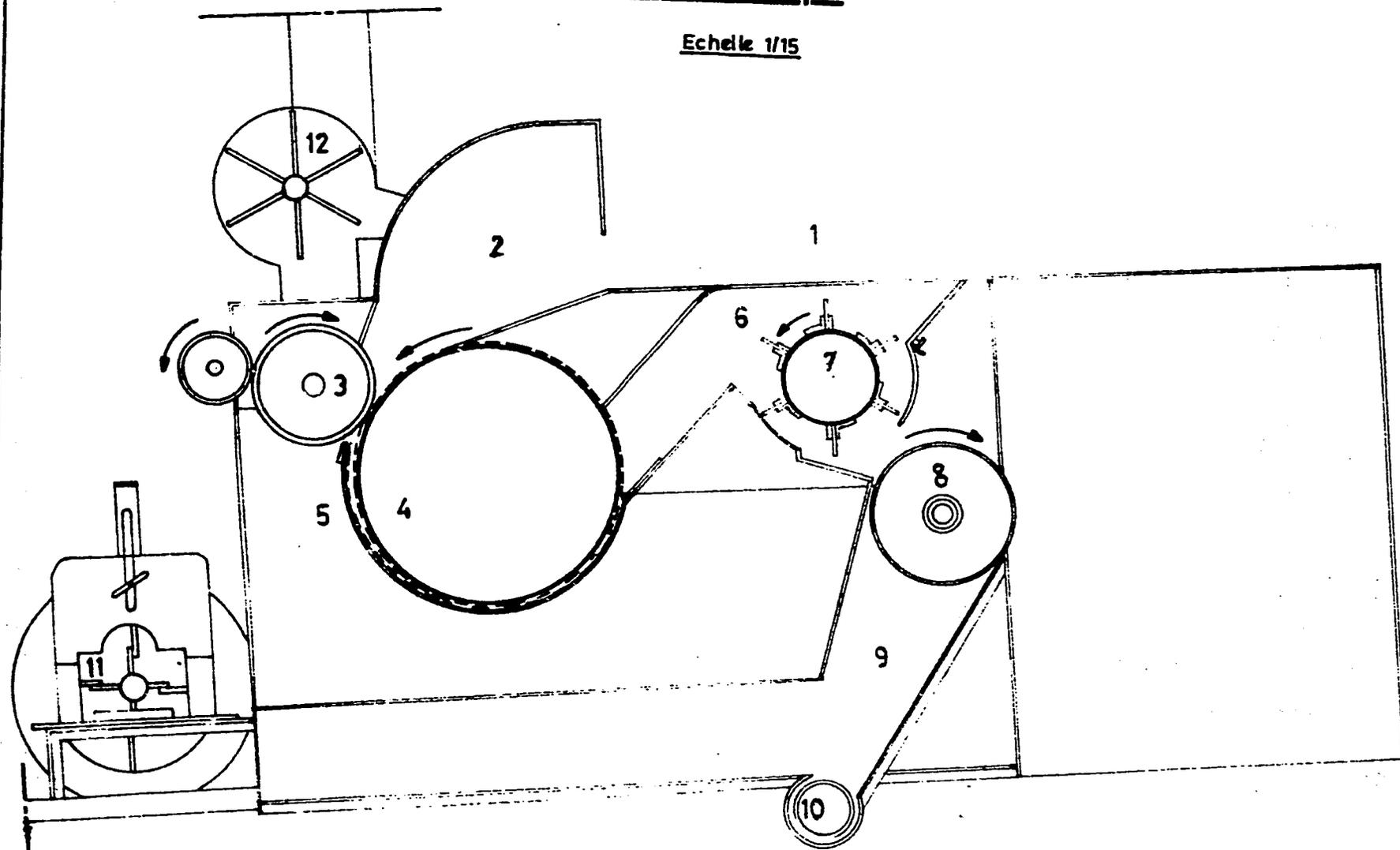
### Principle of threshing

The process invented, tested and adapted consists of drawing in the heads and letting them roll on each other and then between two surfaces ; one fixed, the other mobile. The two surfaces are provided with a rasp-like facing treated against wear.

# BATTEUSE A MIL PROTOTYPE 1971

## Vue en coupe

Echelle 1/15



## Background

The technical realization of this basic principle, apparently simple, has made necessary the creation of a series of prototypes, each benefitting from changes dictated by observations of this machine in action at CNR. Bambey as well as changes dictated by socio-economic and industrial needs.

## Chronology

- 1953-55 - 1st prototype - study and adaption of principles
- 1954-61 - 2nd prototype - addition of a winnowing system to the first prototype
- 1962-64 - 3rd prototype - manufacturer : STE ARARA
- 1965-70 - 10 machines constructed by SISCOMA on an assembly line basis
- 1971-73 - 4th prototype - this prototype was able to thresh more per hour than former models
- 1973 - On an assembly line basis, SISCOMA constructed one machine of the fourth prototype. This machine was subsequently introduced at the village level.

## Conclusion

It is certain that the social and economic consequences which will arise from the introduction of this type of machine (which to the best of our knowledge exists only in Senegal) will be considerable. From now on, one can foresee :

- an increase in cultivated acreage
- a decrease in the deficit of foodstuffs
- storage, marketing and processing of the grain
- a lightening of the work constraints.

### Millet and Sorghum thresher 1971 model

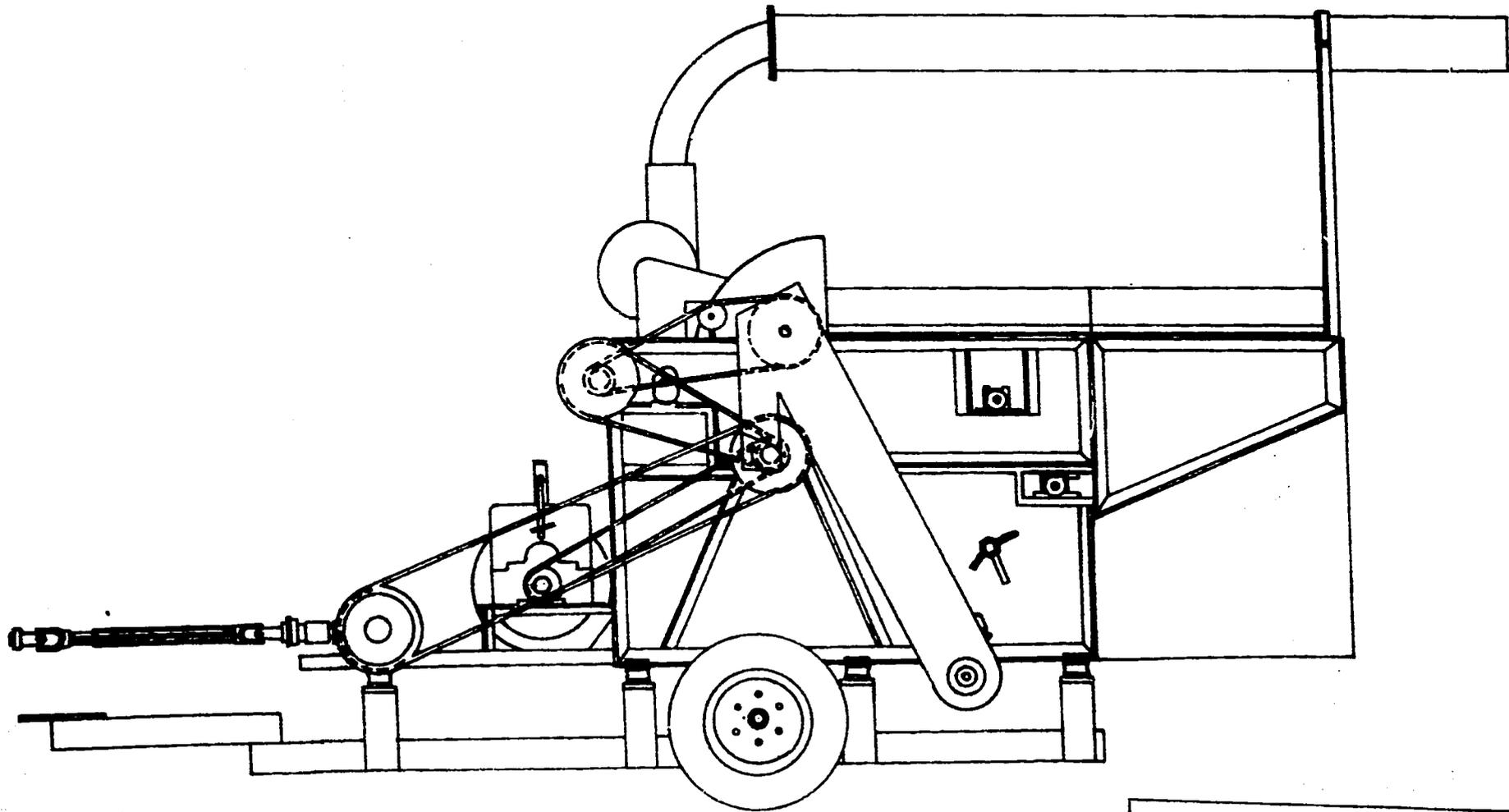
## Characteristics

- metal construction
- weight : 1 100 kg
- driven by power take off and shafts with universal points
- requires only 35 h.p. motor
- transported behind tractor with weight distributed between single axle and tractor hitch
- all movements are rotary and on pulleys with sealed bearings
- the cylinder and concaves are tempered against wear
- simple adjustment
- mean hourly rate is 800 kg.

# BATTEUSE A MIL PROTOTYPE 1971

2

Vue de côté : gauche



Etudié par : F. PLESSARD

Dessiné par : M'Baye GADIAGA

Echelle : 1/25 2-6-71 CNRA. BAMBEY

### Cost of use of machine

Cost is 4 francs CMA per kilo of threshed grain which represents 16 % of the value of the grain (using 1973 market prices).

### Principles of threshing (see sectional view)

The heads placed on the feeder (1) are introduced manually under the hopper head (2). A drum sheller (3) forces the heads between the cylinder (4) and the concave (5). The threshed product is received in a chamber (6) and carried away by the blades (7) on the sieve (8).

The grain falls through the mesh of this sieve into the cleaning chute (9) towards the screw conveyor (10). The cleaning of the grain takes place by separation by weight. A current of air from the fan passes by the cleaning chute (9) and through the mesh of the sieve (8) carrying away the chaff and straw.

The greater portion of the dust is removed by an exhaust fan.

ANNEX G

ESTIMATED COST OF GRAIN GRADING EQUIPMENT

Equipment for 47 warehouses:

Moisture Testers, 47 at \$1500	\$70.500
Triers, 1/2" x 30", 47 at 40	1.880
Thermometer, 47 at 35	1.645
Hygrometer, 47 at 40	1.880
Subtotal	<u>\$75.905</u>

Equipment for 600 Buying Stations

Moisture Testers, 600 at \$250	\$150.000
Triers, 1/2"x 30", 600 at \$40	24.000
Sieves, 600 sets at \$80	48.000
Subtotal	<u>\$222.000</u>

Total estimated cost of equipment  
for 47 warehouses and 600 buying stations \$297.905

## ANNEX II

### Environmental Impact

This activity will benefit the environment of Senegal by (1) limiting the amount of pesticides required for grain preservation, (2) reducing the incidence of cereal grain pests, (3) simultaneously reduce the losses to grain in storage.

With improved inspection and housekeeping procedures generated by the training program smaller amounts of residual insecticides for structural treatment will be required. With a power incidence of pests there will be less opportunity for cross- and reinfestation and a commensurate reduction in the number of fumigations and amounts of fumigant required.

Improved structural design will make housekeeping more easily accomplished and the applied pesticides more effective.

Pesticides required in the preservation of cereal grains in storage will be those recommended for use in Europe and the U. S. A.

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

(INSTRUCTION: THIS IS AN OPTIONAL FORM WHICH CAN BE USED AS AN AID TO ORGANIZING DATA FOR THE PAR REPORT. IT NEED NOT BE RETAINED OR SUBMITTED.)

Life of Project: From FY 76 to FY 78  
Total U.S. Funding: 4,000,000  
Date Prepared: 22 Nov. 1975

Project Title & Number: Senegal Grain Storage Construction, Cereals Preservation/Management Training  
685-011/685-0209

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes: (A-1)</p>	<p>Measures of Goal Achievement: (A-2)</p>	<p>(A-3)</p>	<p>Assumptions for achieving goal targets: (A-4)</p>
<p>1) Increase the commercialization of Food Grains in Senegal</p> <p>2) Establish adequate and reliable buffer stocks of food grains for drought relief.</p>	<p>1) Increase of food grains sold by farmers</p> <p>2) Increase of land farmed devoted to food grains</p> <p>3) Increase in amount of food grains in storage</p> <p>4) Decrease in loss of food grain in storage due to improper handling and insects.</p>	<p>1) Measuring change over 5 year period after project implementation of percent of food grains sold by farmer.</p> <p>2) Measuring change over 5 year period after project implementation of percent of land farmed devoted to food grains</p> <p>3) Measuring change in amount of grain stored over 5 year period after project implementation</p> <p>4) Annual inspection of grain in storage.</p>	<p>1) The GOS has made a sincere commitment to the commercialization of food grains.</p> <p>2) ONCAD has the institutional capacity to administer such a program</p>

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Project Title & Number: **Senegal Grain Storage Construction,  
Cereals Preservation/Management Training**

685-011/685-0209

Life of Project From FY 76 to FY 78  
Total U.S. Funding \$4,000,000  
Date Prepared: 22 November 1975

DESCRIPTIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Project Purpose: (B-1)</p> <ol style="list-style-type: none"> <li>1) Increase in storage capacity of ONCAD</li> <li>2) More efficient utilization of existing and planned storage</li> <li>3) Reduction in loss of grain stored by ONCAD.</li> </ol>	<p>Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)</p> <ol style="list-style-type: none"> <li>1) Additional storage warehouses constructed.</li> <li>2) Increase quantity and improved quality of grain stored by ONCAD.</li> <li>3) Judicious and timely application of all good grain storage practices.</li> </ol>	<p>(E-1)</p> <ol style="list-style-type: none"> <li>1) Observation of warehouse constructed at selected sites.</li> <li>2) Periodic inspection of warehouses by ONCAD.</li> </ol>	<p>Assumptions for achieving purpose: (B-4)</p> <ol style="list-style-type: none"> <li>1) ONCAD will probably utilize the expanded storage capacity for the exclusive use of food grains.</li> </ol>

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

Senegal Grain Storage Construction,

Project Title & Number: Cereals Preservation/Management Training

685-011/685-0209

Life of Project:

From FY 76 to FY 78

Total U.S. Funding \$4,000,000

Date Prepared: 22 November 1975

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NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Project Outputs: (C-1)</p> <ol style="list-style-type: none"> <li>1) 60,000 MT of additional storage. (30,000 MT as part of the GOS contribution)</li> <li>2) Trained warehouse managers operating ONCAD storage facilities.</li> <li>3) Trained insect control personnel employed at storage units.</li> <li>4) A quality control manager for each of the districts.</li> <li>5) 1 training team of 4 men each.</li> </ol>	<p>Magnitude of Outputs: (C-2)</p> <ol style="list-style-type: none"> <li>1) 60,000 MT of storage in units of 1,000 and 2,000 warehouses.</li> <li>2) A manager with certificate of training at each of ONCAD's warehouses.</li> <li>3) 6 trained teams for fumigation (one in each region) composed of 2 persons.</li> <li>4) 6 graduates of training program at KSU or comparable US institution.</li> </ol>	<p>(C-3)</p> <ol style="list-style-type: none"> <li>1) Observation of warehouses after construction.</li> <li>2) Evaluation of ONCAD's grain storage operation.</li> </ol>	<p>Assumptions for achieving outputs: (C-4)</p> <ol style="list-style-type: none"> <li>1) ONCAD will implement the protection activities required to minimize storage loss of food grains.</li> <li>2) ONCAD will construct 30,000 MT of storage capacity in CY 1976.</li> <li>3) The training programs proposed in this activity is adequate for the expanded needs of ONCAD.</li> </ol>

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Life of Project: From FY 76 to FY 78  
Total U.S. Funding \$4,000,000  
Date Prepared: 22 November 1975

Project Title & Number: Senegal Grain Storage Construction, Cereals 685-011/685-0209

Preservation/Management Training

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Project inputs: (D-1)</p> <ol style="list-style-type: none"> <li>1) Materials and labor for warehouse construction.</li> <li>2) Technical assistance.</li> <li>3) Overseas training.</li> <li>4) Incountry training.</li> </ol>	<p>Implementation Target (Type and Quantity) (D-2)</p> <ol style="list-style-type: none"> <li>1) Sufficient cement and steel to construct 30,000 MT of storage capacity in 1000 and 2000 MT units or prefabricated buildings in similar units for an equal amount of storage.</li> <li>2) 3 man years of technical assistance.</li> <li>3) 4.5 man years of overseas training.</li> <li>4) 8 man years of incountry training.</li> </ol>	<p>(D-3)</p> <ol style="list-style-type: none"> <li>1) Observation of warehouse construction.</li> <li>2) One MS Degree person trained and 10 persons with short-term certificate of training from U.S. institution.</li> <li>3) 1 four man Senegalese team accomplishing training of 715 ONCAD personnel as follows:               <ol style="list-style-type: none"> <li>a) 600 Secco level staff with one (1) week training.</li> <li>b) 115 Department level staff with four (4) weeks of training.</li> </ol> </li> </ol>	<p>Assumptions for providing inputs: (D-4)</p> <ol style="list-style-type: none"> <li>1) Senegalese with prerequisite background and orientation are available for training.</li> </ol>

# memorandum

6850209-6  
PD-ACC-157

3p

DATE: June 17, 1977  
REPLY TO: AFR/DR/SFWAP, T. Kellermann  
ATTN OF:  
SUBJECT: ECPR Review of Grain Storage - *Senegal*

TO: SEE DISTRIBUTION

Attached is a draft summary of findings from subject review. Would appreciate clearance or comments by COB Tuesday, June 21, 1977.

### DISTRIBUTION

- AFR/DP:WTate
- PPC/PIAS:PPeterson
- SER/ENGR:DO'Riordan
- AFR/DR:JKelly
- PPC/DPRE:JArtaud
- AFR/DR:SKrause
- AFR/DR:WScofield
- PPC/PB:DWalsh
- AFR/SFWA:HFarnham
- AFR/SFWA:JLanglois
- AFR/GC:STisa
- AFR/DR:DDibble



Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

C. Technical Assistance. The general consensus was that due to the nature/magnitude of overall project and strong possibility for future technical assistance in areas of marketing and pricing policy - while it was not necessary to put actual funds in project, that a paragraph should be added to PP and Grant Agreement indicating AID's provision of short-term TA. for this purpose at that time when such expertise is requested as determined by evaluation.

D. Life of Project Funding. There was general agreement to LOP funding at \$4.9 million level and the Desk indicated there would be no problem in finding the money. However, since there has been a \$1.3 million increase in funding over the initial OYB FY 77 request, this also needs to be included in the CN. (FYI, once Senegal's program reaches \$8.9 million 653(b) Reg. requires that two additional letters of notification be sent to the House and Senate via OMB for ten days - and we should approach this problem with the Bakel Irrigated Perimeter Project).

E. Grant vs. Loan. Although the Committee recommended grant financing on the basis of PP rationale, PPC has indicated that the Agency still has not identified sufficient development loan funded projects to meet its legislative floor target of \$335 million (furthermore, only 18% has been obligated thus far) and that PPC would probably not approve it if OYB change received. Since it was agreed that any further discussion was beyond the competency of the committee, as the next step it was decided to resolve this matter with PPC before requesting Dakar to ask GOS if loan would be acceptable. (Senegal's latest cable 4113 reconfirm's GOS need for grant financing). AFR/SFWA will prepare grant justification for discussion with PPC.

3. Other Areas of Concern

A. ONCAD'S Liquidity. There was general consensus that instead of the covenant or clause mentioned in the PP and grant agreement assuring ONCAD's liquidity for the purchase of grain; that a condition precedent will be required instead. PPC/PIAS (P. Peterson) will prepare language for the condition precedent.

B. Phasing of Construction. AFR/GC will prepare covenant or covenants to assure to the extent possible that warehouse will not stand empty.

Talked to Kelly & Kellerman  
re liquidity. on 6/21/77

Ed Lipinski is reviewing new text prepared  
by Pat Peterson. H.

UNITED STATES GOVERNMENT

# Memorandum

*Bruce*  
*file*  
6850209-①  
PD-AAC-157

DATE: December 8, 1975

TO : Distribution

FROM : AFR/CWR/Senegal Desk, Dennis Baker *Salin*

*2p*

SUBJECT: Project Review Committee Report on Senegal Grain Storage Loan

The following are the questions and issues that were discussed on December 5, 1975 and transmitted therefor, to the ECPR for consideration,

1. Recommendations/Additional Information Required
  - A. What assurances are there that the warehouses will be used only for food grains vice peanuts? It is not recommended that this be developed into a condition or covenant for the loan but that mention should be made in the Project Paper of monitoring/reporting requirements to assure intended use.
  - B. Does the GOS plan to announce buying prices before planting and hold to that price through the harvest? It is recommended that a covenant be placed in the Project Paper to "encourage the GOS to implement a policy of early pricing."
  - C. An analysis of the grain flow into and out of storage facilities over the entire year is needed. And in relation to this we need to know the peak storage capacity requirements necessary and the length of time such capacity is needed.
  - D. Construction costs need to be re-confirmed. In addition an engineering analysis is needed to make the necessary Section 611 determinations. Kansas State University will be making a further study and advising AID on this matter.
  - E. Evidence is needed to assure that beneficiaries will include small farmers. While the PRP states that the GOS will buy from anyone, it is not clear that small farmers will avail themselves of this opportunity. The percent of small farmers to larger property holders will need to be known in addition to some indication of what if any incentives will be required for small farmer participation.
  - F. While the ecology assessment seems adequate for a PRP, it would be well to expand this section in the PP to include discussion on the impact of the pesticides and insecticides to be used in the project.



- G. Can the local design warehouses be modified to meet some of the drawbacks outlined in the PRP (e.g. ventilation, overhead space)?
  - H. The PP must address and outline an evaluation plan.
  - I. What are the long run implication of high prices to be paid by the GOS for grains and can/should this be maintained over a long period of time. The stability and supportability of such pricing policies needs requires careful examination and supportive evidence.
  - J. GOS and RDO should provide sufficient explanation of the need for 200,000-300,000 MT buffer stocks and their purpose.
  - K. Does evidence exist that ONCAD has sufficient experience grain procurement/marketing to justify supporting this effort.
  - L. Will A.I.D.'s technical assistance be adequate:
    - (1) who only one grain storage and preservation specialist for long term training?
    - (2) should AID finance experts in marketing and price analysis?
2. Issues
- A. Should the technical assistance and training proposed be grant or loan funded?
  - B. What type of construction should be used: U.S. pre-fab or local construction (requiring a waiver)? A decision on this issue will possibly alter the size and modality of the loan.
  - C. Is the question of beneficiaries and social analysis sufficiently significant to hold the PRP in abeyance or can we proceed to PP stage and treat the topic there?
  - D. Does the storage program represent the "least cost" response to stabilizing grain supplies?

Drafter: AFR/CWR, DBaker

Clearances: AFR/CWR, JPatterson (draft)  
 AFR/DP, EParfrey  
 SER/ENGR, GThompson  
 JCallaway  
 AFR/DS, PPeterson  
 PPC/DPRE, BOdell

Distribution: Above Clearances  
 As per DP List

*1 - 2 - ... - 100/100000 consider permitting*