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Rice Policy in Senegal

by

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INTRODUCTION

For over a century, Senegal has exported peanuts and imported rice to cover its food deficit. That deficit has grown over time, and during the drought of the late 1960s and early 1970s, Senegal imported large quantities of rice at high world prices.

As a result, the government has increasingly emphasized the expansion of local rice production in its development plans. Because of Senegal's unstable climate, the government has opted for secure but costly irrigated systems of rice production. The expansion of production has been supported by parastatal land development agencies that distribute subsidized inputs as part of improved technological packages. But large capital investments plus high levels of modern input use have led to high production costs for rice, forcing the government to adopt protective trade policies. While some success has been achieved in expanding local rice production, these increases have been insufficient to meet growing demand.

This paper seeks to analyze the evolution of the political and economic influences on the rice sector in Senegal. The succeeding section discusses the physical setting for agriculture and the conditions of production, milling, marketing, and consumption of rice in the country. This is followed by a description of historical changes that have influenced national economic policy in general and rice policy in particular. The next section evaluates major policies with respect to their impact on overall economic objectives. A summary and conclusion follows.

TECHNICAL AND ECONOMIC SETTING

Economic Geography

Senegal lies in the Sudano-Sahelian zone of West Africa and has an area of 197,000 square kilometers. The country is divided into eight regions:

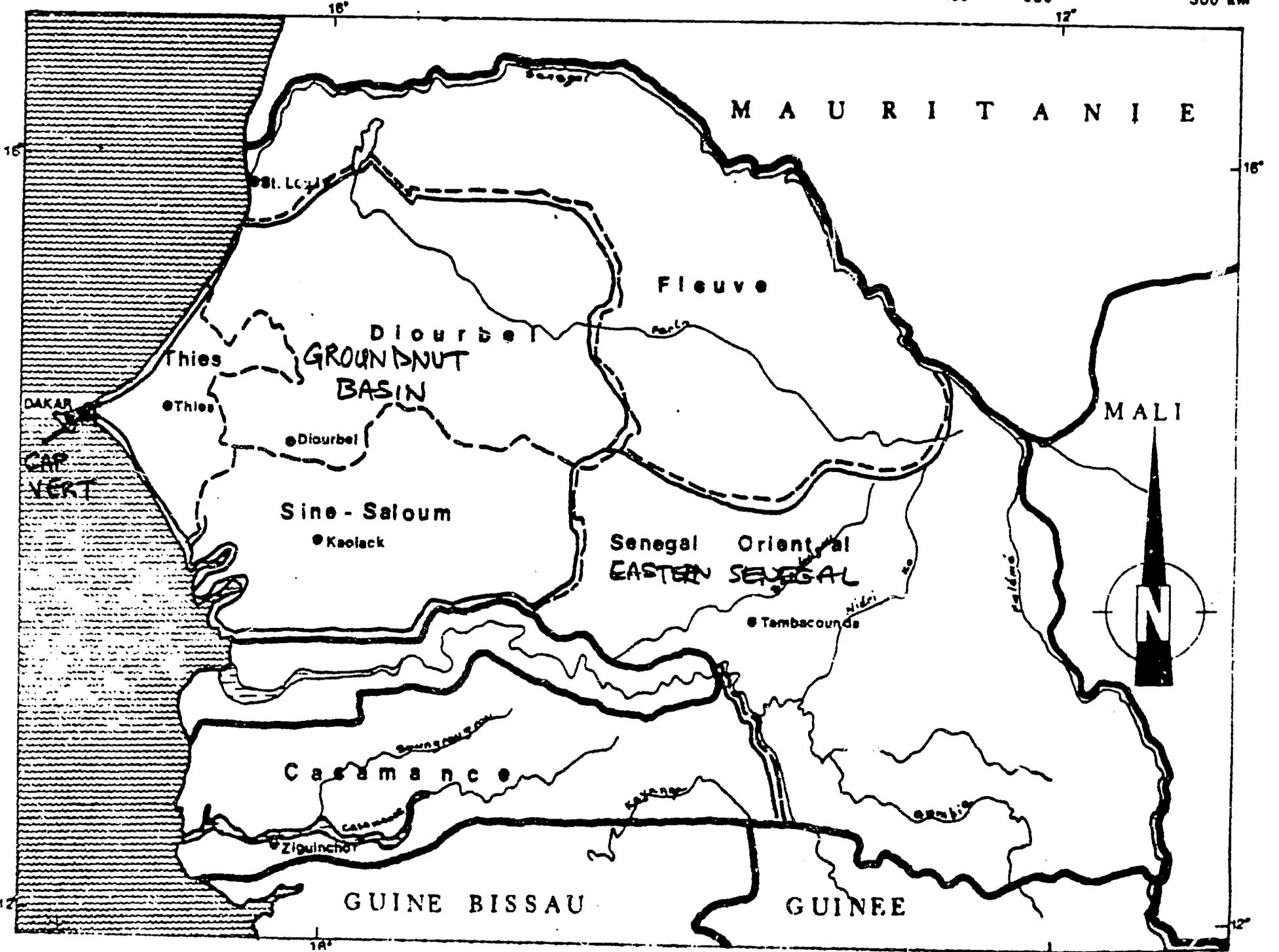
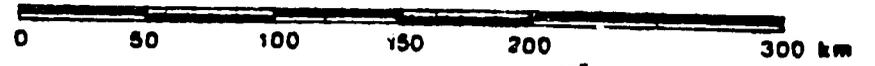
urban Cap Vert in the west; Diourbel, Thies, Louga, and Sine Saloum which form the Groundnut Basin in the center-west; the northern Fleuve which follows the Senegal River; the Oriental province in the east; and the verdant Casamance to the south of the Gambia (see Map 1).

Senegal's population was estimated at just over 5 million people in 1976 and is thought to be growing at about 2.6 percent per annum (42). The Cap Vert region in which the capital city, Dakar, is located has grown at 5 percent per year since independence in 1960 and now contains one-fifth of the country's population. The rural population is expanding at a rate of about 1.9 percent per annum (42).

Senegal has a good network of all-weather roads that connects Dakar with the northern, central, and southern areas of the country although the southeastern part remains relatively isolated. Slow service and insufficient capacity at the Gambia River ferry have created a major bottleneck on the road connecting Dakar with the Casamance and have contributed to the continued isolation of this southern region.

Only about 13 percent of the total land area in Senegal was under cultivation in 1976, up from 10 percent at independence. It is estimated that nearly twice this amount is cultivable. Senegalese soils are generally poor--a condition that has been aggravated in areas of high population density where the land has been overcropped. The presence of marine salts in the richer alluvial soils, which are found along the banks and in the mouths of the major rivers, restricts their full utilization for agriculture.

The absolute amount, seasonal distribution, and variability of rainfall are major physical constraints to Senegalese agriculture. Generally, the quantity of rainfall increases and its variability diminishes as one moves from north to south. The northern Fleuve region, which lies in the Sahelian zone, receives 500 millimeters or less of rain during a three-month period.



A Sudanese transitional zone extends from south of the Fleuve to just north of the Gambia and has a higher, more reliable rainfall of 700-800 millimeters a year. The major peanut-producing region lies in this middle zone. The southern, subtropical (Guinean) regions of the Casamance and part of Eastern Senegal have a four- to five-month rainy season with up to 1,800 millimeters of rain.

Because of climatic differences, Senegal's three major zones have specialized in different patterns of crop production. As seen in Table 1, the northern Fleuve region, which is subject to a short, erratic rainy season, has traditionally grown short-cycle millets intercropped with cowpeas and, when possible, flood recession sorghum. Irrigated rice was first introduced into the region prior to independence, and the area is currently the country's second largest rice producer. The central Groundnut Basin, as its name implies, specializes in peanut (groundnut) cultivation while continuing to produce important quantities of millet and cassava.¹ Traditional swamp rice is cultivated in the Lower (western) Casamance, while in the upper reaches of this region and in Eastern Senegal, cotton, peanuts, and millet predominate.

Table 2 shows that over the past 40 years, the percentage of total cropped area devoted to peanuts and millet--the principal cash and food crops, respectively--has remained stable at about 90 percent. However, there appears to have been a shift away from the major cereal crop to peanuts. The peanut-foodcrop competition takes place mainly in the Central Basin, Upper Casamance, and in Eastern Senegal through the demand for labor. There has also been some switching from rice to peanuts in both the Lower and Middle Casamance due to the greater profitability of peanuts.

Table 1.--Area of Land Devoted to Principal Crops
by Region, 1976*
(thousand ha)

	Rice	Peanuts	Millet	Cotton	Total
Fleuve	7.7	9.2	91.7	--	108.6
Central Basin	4.0	1,119.8	676.6	5.9	1,806.3
Casamance	64.1	145.9	88.8	18.1	316.9
Eastern Senegal	5.4	46.8	94.2	19.8	166.2
Other	--	1.9	1.1	--	3.0
Total	81.2	1,323.6	952.4	43.8	2,401.0
As percent of total cultivated area ^a	3.2	52.0	37.7	1.7	95.0

* Data are from Senegal, Government of, Ministère du Développement Rural et Hydraulique, Direction Générale de la Production Agricole, Rapport Annuel, Campagne Agricole 1976/77, Dakar, 1978.

^a2,529.09 ha.

Table 2.--Percentage Distribution
of Total Cultivated Area by Major Crop*

Years	Peanuts (percent)	Millet/sorghum (percent)	Rice (percent)	Total area cultivated (thousand ha)
1936-37	48	45	3.7	1,411.1
1959-60	48	40	3.6	1,846.0
1976-77	52	38	3.4	2,529.1

* Data are from Valy Charles Diarassouba, L'Evolution des Structures Agricoles du Sénégal, Editions Cujas, Paris, 1968, pp. 122, 124; and Senegal, Government of, Ministère du Développement Rural et Hydraulique, Direction Générale de la Production Agricole, Rapport Annuel, Campagne Agricole 1976/77, Dakar, 1978.

The Senegalese economy is highly dependent on agriculture and agricultural exports--particularly peanuts--for government revenue and foreign exchange earnings. Approximately 70 percent of the labor force works in activities directly related to agriculture which provides about one-third of the gross domestic product (43).

Although rural per capita income grew during the early 1960s, low export prices for peanuts coupled with a series of droughts at the end of the decade led to a decline in the real value of rural income between 1961 and 1971. During this same post-independence decade, the importance of Dakar as the administrative center of the French West African colonial empire was diminished with the withdrawal of the French from the area. This shift, together with the decrease in agricultural income, led to a fall in the real value of per capita income earned in urban areas by 2.4 percent (5). In 1976 the average per capita income was approximately \$400, and there was a wide disparity between urban and rural areas (9, p. 1).

With the exception of the central peanut regions, agricultural land is widely available.² Throughout the country, however, there is a seasonal shortage of labor. The peak in labor demand is closely tied to the timing and duration of a short rainy season. Once the rains begin, all crops must be planted almost simultaneously. In most areas, land preparation prior to planting cannot even start until the soil has been sufficiently softened by rain.

Production

There are two major rice-producing regions in Senegal. The bulk of production (65-70 percent) comes from the Casamance where swamp and upland rice have been grown traditionally as a basic staple crop. Traditional rice

cultivation depends heavily on the rainfall calendar. Land preparation is done with a few handtools. Rice is transplanted in June or July and knife-harvested over an extended period beginning in November.

About 51,000 ha of rice are cultivated in the Casamance. With yields varying from 0.8 to 1.2 tons/ha, annual production from traditional farmers is about 50,000 tons of paddy. The basic production unit for this technique is the small family farm of between 4 and 5 ha of which one-half to 2 ha are in rice (33, 36). This average figure includes the Lower Casamance, where rice is the predominant crop, and the Middle and Upper Casamance, where it is planted along with millet, peanuts, and maize or cotton.

Recently, the government has begun extending improved rice techniques into this region, primarily aimed at swamp rice. Under the supervision of public agencies, modern inputs, including improved seeds, chemical fertilizers, and insecticides, have been introduced, more effective soil preparation, seeding and weeding have been encouraged, and limited land improvements have been made. Following nearly a decade of extension work, substantially higher yields of 3 tons/ha have been obtained on the 13,000 ha of riceland which are under project supervision.³ Thus far, irrigation has only been introduced on a small scale in the region, although tentative plans have been made to develop a large, mechanized irrigated scheme in the Upper Casamance. In addition, some smaller complexes of water control near the coast are being planned to control salt incursion on cultivable riceland.

Despite the preponderance of output from the southern region, most government investment in rice development has been concentrated along the Senegal River Valley in the North. There insufficient rainfall

precludes rainfed rice cultivation so that only irrigated techniques can be employed. Polders were initially constructed to control flooding, but these soon proved inadequate. The rise and fall of the Senegal River, on which this type of irrigation depends, vary markedly from year to year and reliance on natural flooding does not always assure sufficient inundation for a 120-day rice crop. As a result, since independence--and particularly since the drought period of 1968-73--water security has been improved by pumping on leveled parcels where high-yielding varieties can be used. Yields have increased from about 1 ton/ha to 3.5 or 4 tons/ha, and large interannual production variations are avoided in all but severe drought years when there is little water in the river. At present, polders have varying degrees of water security, but it is planned that all will ultimately have total water control through leveling, installation of pumps, and construction of irrigation and drainage canals.

All rice production along the Fleuve is under the supervision of a large, parastatal organization--Société d'Aménagement et d'Exploitation des Terres du Delta (SAED)--which provides improved seed, chemical fertilizers, insecticides, and herbicides on credit to the project rice farmers. Short-stalked varieties, mainly I Kong Pao, are used on levelled parcels, and longer stalked varieties, such as D52-37, are used on unlevelled areas. In addition to these inputs, SAED provides machinery services for plowing and seeding on credit to farmers on the larger perimeters. On the smaller perimeters all these operations are carried out by hand. Perimeter areas range from 2,000-3,000 ha in the lower delta to 15 to 20 ha in the upper valley around Matam. Average holdings of rice land are 1 to 2.5 ha per farmer on the

large projects and .25 to .50 ha on the smaller projects. These latter, labor-intensive polders have the highest yields in Senegal with 5 to 5.5 tons of paddy per ha for a single rice crop.

Most polders are in the Senegal River Delta where only one crop a year can be grown due to saltwater incursion from the sea between March and July. In 1976 there were about 7,500 ha under rice in the Delta, with an average yield of 2 tons/ha, compared with only 3,000 ha further upstream, where yields average more than 4 tons/ha.

Upriver, two rice crops are feasible, although maize and industrial tomatoes are usually preferred as the dry-season crop due to the lower water requirements and higher profitability. If too much water is drawn off for irrigation upriver, the ocean saltwater moves further upstream making agricultural land adjacent to the river uncultivable. This saline incursion plus the general insecurity of water availability from the river have generated considerable interest in a downstream saltwater barrage (Diama) and an upstream storage dam (Manantali). Already, with only 3,000 ha under irrigation in the Middle and Upper Valley, upstream-downstream water management has become a critical issue. Future expansion of rice cultivation along the river will ultimately be linked to the decision to build these dams.

Marketing and Milling

Three-fourths of Senegal's total rice consumption is met by imports. The quantity imported each year varies according to the size of the domestic harvest, the world price, and the stocks on hand. In an unusually bad year for domestic rice production, such as 1974, imports may exceed 200,000 tons, while in favorable years, such as 1975, they decline to around 100,000

tons. Between 1969 and 1975, annual rice imports averaged 160,000 tons compared with about 120,000 tons for each of the first five years of the 1960s.

The official rice-marketing structure in Senegal has two branches-- one for imported rice, which constitutes over 95 percent of total official sales, and the other for locally produced paddy/rice which handles only 8,000 to 12,000 tons of paddy per year. In addition to the operations of the government marketing agency, the Office National de la Cooperation et de l'Assistance au Développement (ONCAD),⁴ an illegal private market in domestic paddy/rice also exists, although the area and extent of its activities are difficult to determine.⁵

Retail prices for imported rice are set in Dakar on the basis of the c.i.f. import price plus a variable levy. Small, fixed marketing margins are added to this base price which allow wholesale and retail prices to differ regionally as a function of transport costs.

The government maintains a monopoly over most rice imports, though some imports of wholegrain and packaged rice by licensed private traders are also permitted.⁶ An average of 90 percent of the value of all imported rice is low quality, often 100 percent broken. Imports are delivered in sacks to Dakar where they are released to wholesale-retail traders approved by the Ministry of Finance. ONCAD also maintains its own storage and distribution centers to supply traders in the outlying regions. Most small towns in Senegal have access to imported rice year-around at both government retail stores and from private stores which buy from the larger wholesale-retail traders.⁷

Official purchases of domestic rice come almost exclusively from government-supervised projects. SAED, for example, marketed an average of 40 percent of its annual production of paddy between 1969 and 1976. Seasonal farmer

debts for inputs, machinery services, and water charges are collected in paddy at harvest time and form the bulk of SAED purchases.⁸ Perhaps 10 percent of total production in this area is sold on the private market.⁹ In other rice projects, the amount of paddy sold through official channels is lower than in the Fleuve, probably because farmer indebtedness to the projects in these areas is less.¹⁰

ONCAD maintains a de jure monopoly for the collection, transport, and milling of paddy. These tasks are sometimes hired out to the private sector, however, when a project lacks transport or milling capacity.

In order to offset the differences between delivered costs of local and imported rice, a common official retail price is established through the operations of a stabilization fund, the Caisse de Péréquation et Stabilisation des Prix (CPSP).¹¹ The official price schedule in 1976 for locally produced rice from SAED is presented in Table 3. The total cost of rice to ONCAD at the warehouse has recently been 94 CFA francs per kilogram of rice.¹² This compares with the real cost of imported rice delivered to the ONCAD warehouse in St. Louis of 61 CFA/kg in 1976, when the official retail price in St. Louis was 82 CFA francs/kg.

Most paddy that is not officially purchased is apparently stored on the farm and hand-pounded for local consumption. Most sales of paddy occur after harvest and cover immediate cash needs. Evidence of the existence of such trade is found only in producing areas where imported rice deliveries are irregular.

At present, there are four large rice mills operating in Senegal with a combined rated hourly capacity of 17 tons, or 85,000 tons of paddy a year.¹³ A two-ton per hour private mill in the Casamance works under government

Table 3.--Price Schedule for Domestically Produced Rice, SAED, 1976*

Cost category	Official price (CFA/kg paddy)	Official price (CFA/kg rice)
Producer price	41.5	
Transport and handling	8.75	
Milling costs	7.70	
Subtotal/kg of paddy	57.95	
Subtotal/kg of rice (at .66 milling outturn)		87.66
Mill storage		.85
Sales of by-products		.53
Subtotal/kg of rice		87.98
Purchase by ONCAD, ex-mill		85.44
Delivery cost to St. Louis		1.10
ONCAD charges		7.89
Total ONCAD cost at St. Louis warehouse		94.43

* Office National de la Cooperation de l'Assistance au Développement, (ONCAD), "Barème du Riz Usiné par la SAED, 1975/77," Dakar, 1976?, mimeograph.

contract while the other three mills are owned and operated by land development agencies. Given the low levels of official paddy purchases, all of these mills operate at below 20 percent of their rated capacities. The quality of milled outturn also varies greatly--from 90 percent brokens at the SAEP mill in Ross Béthio to 50 percent brokens at the southern mills.

In certain areas in both the north and the south, small diesel-powered rice hullers operate despite the fact that they are officially discouraged.¹⁴ In the Fleuve, easy access to these machines has helped reduce transport costs, handling, and commercial margins, and has made it profitable for an estimated 10 percent of production to flow into private milling and trade. In the Casamance, these hullers are used primarily during the times of peak agricultural labor demand when women working in the field do not have enough time to pound rice for the family meals.

Consumption

Rice is an important element in the Senegalese diet. Of a total average daily calorie consumption of 2,300 per capita, rice contributes 680 calories or about 30 percent (55, pp. 481-85). The absolute amount of rice consumed annually remained fairly stable between 1965-75, while per capita consumption declined. As Table 4 shows, however, these national averages mask highly uneven rice consumption patterns, especially between urban and rural consumers and among different regions.¹⁵

Urban centers, the largest consumers of rice, are supplied almost exclusively with imported rice.¹⁶ The Cap Vert region has 20 percent of total population and probably consumes between 100,000 and 130,000 tons of rice per year, or between 40 and 60 percent of net available rice.¹⁷ As seen in Table 4, in other urban areas outside of Cap Vert, per capita consumption

Table 4.--Regional Population and Rural/Urban Rice Consumption Per Capita , 1973-74*

Region	Regional population ^a	Population ^b		Rice consumption ^c	
		Rural	Urban	Rural	Urban
Cap Vert	36.2	0	100	0	103
Peanut Basin					
Thiès	664.5	75.3	24.7	2	71
Diourbel ^d	801.3	85.1	14.9	8	70
Sine Saloum	958	85.3	14.7	17	110
Oriental (Eastern Senegal)	272.1	86.3	13.7	11	74
Casamance	700.2	82.7	17.3	58	130
Fleuve	502.4	78.1	21.9	30	80
Total	4,834.7	70.4	29.6		

* Although consumption of rice in 1973-74 may have been influenced by the drought it is the only year for which such a breakdown is available.

^aThousands of inhabitants. Estimated back from 1975/76 population, assuming a constant 2.56 percent growth rate per annum. The 1975/76 population data are from Sénégal, Government of, Ministère des Finances et Affaires Economiques, Bureau National de Recensement, Résultats Provisoires du Recensement Général de la Population d'Avril 1976, Dakar, 1977, mimeograph.

^bThe percent breakdown of regional population by rural and urban groups is from Senegal, Government of, Ministère des Finances et Affaires Economiques, Bureau National de Recensement, Résultats Provisoires du Recensement Général de la Population d'Avril, 1976, Dakar, 1977, mimeograph.

^cRice consumption is in kg/per capita for 1973/74. Urban refers to towns and cities of 10,000 persons or more. Source: Senegal, Government of, Ministère des Finances et Affaires Economiques, Direction de la Statistique, "Essai d'Evaluation de la Production de l'Agriculture: Productions Vivrieres," Dakar, 1975, mimeograph.

^dThe Department of Louga was split off from Diourbel to form an eighth region in 1976-77.

is well above the surrounding rural areas, mainly because of higher relative incomes and easier access to supplies of imported rice.

Average per capita rice consumption since 1968 has been below the average for the previous eight years.¹⁸ This declining trend might be explained in part by falling incomes. As noted above, Senegal experienced an annual decline of 1 percent in real per capita gross national product between 1965 and 1975.

The government expects that future rice consumption will rise at least as fast as income growth.¹⁹ Given the high proportion of rice consumed in urban areas, the rate of urbanization should also be considered as a factor in future consumption. Unfortunately, the lack of empirical data on demand elasticities for rice and cross elasticities between rice and other cereals means that consumption projections cannot be made with any reasonable degree of assurance.

Except in parts of the Casamance and the Fleuve, millet is the predominant cereal in rural Senegal. The fact that the government has chosen to emphasize rice production may be due to the lack of available technological innovations for increasing millet production--particularly of high yielding varieties. The difficulty in increasing the domestic supply of millet has also been a major obstacle to greater urban millet consumption and to government attempts to encourage substitution of millet for both rice and wheat (in bread).

HISTORICAL BACKGROUND TO SENEGALESE RICE POLICY

Peanuts were introduced into Senegal because European soap and vegetable oils manufacturers were seeking new sources of raw materials. Peanut cultivation spread rapidly in Senegal in the early 1840s and 1850s.

By the end of the nineteenth century, nearly 100,000 tons were exported from the new French colony as thousands of virgin and foodcrop hectares were converted to production of the crop. Millet farmers rapidly adopted peanut cultivation because of its higher returns. This expansion was supported by private traders who bought peanuts and sold food and other articles.

Rice was imported from French Indochina to sustain the growing urban areas as well as the peanut farmers during the "hungry season." By the eve of the First World War, Senegal was exporting nearly 300,000 tons of peanuts (7, p. 27) and importing about 26,000 tons of rice (47, p. 364). The demands for imported food in the countryside were made greater by the annual inflow of up to 70,000 peanut workers from neighboring countries. Because of the importance of this increased labor for Senegalese exports, the government provided migrants with reduced train fares, and vaccinations and food on arrival (18, p. 224).

To aid peanut expansion, the government constructed roads, railways, and river wharves. Strong administrative support for peanuts was, in turn, encouraged by the French colonial policy that all colonies must strive for financial self-sufficiency; given Senegalese conditions, no other crop was so profitable as peanuts. The principal political as well as economic objective during this early colonial era, therefore, was to expand peanut exports as much as possible, and with them national income and budgetary revenue.

1930-59

With the collapse of the world vegetable oils market during the 1930s, farmers turned increasingly back to subsistence farming (29, p. 834). Paper money nearly ceased to circulate in the countryside (14, p. 119),

and government revenues dropped sharply. In response, new concerns about dependence on a single commodity began to be voiced in government circles. Old suggestions that the entire Senegal River basin be improved through water control so that other crops could be developed were taken down off the shelf,²⁰ and in 1934 the Mission d'Etudes du Fleuve Senegal was formed in order to study the feasibility of dams and irrigation works for the area. This group was replaced in 1938 by the Mission d'Amenagement du Senegal whose primary aim was the installation of cotton schemes along the river. But lack of financing and the outbreak of the Second World War held up implementation of the project.

With the disruption of shipping and trade during the Second World War, Senegalese peanut farmers were forced to retreat into subsistence millet farming to an even greater extent than they had during the 1930s (18, p. 254). Rice imports dwindled from 70,000 tons per annum to a few thousand tons imported from outside West Africa and were supplemented by 8,000 to 10,000 tons from the French Sudan (now Mali) and Guinea (3, p. 344; 2, p. 33) and 20,000 tons of maize from Dahomey (51, p. 163).

Despite its flirtation with diversification, the government remained solidly committed to peanut production after the war. New policies aimed to improve peanut production through seed selection, improvement of soil fertility, and the introduction of animal traction (29, p. 856). In order to assure a steady supply of vegetable oil and to respond to pleas for financial help from its colonies, France instituted preferential tariffs against all oil-seed products originating in non-French territories. Administrators in Senegal also encouraged production by reducing head taxes, transport (train) tariffs, and the peanut export tax (29, p. 864).

World cereals markets recovered after the War and in spite of preferential railroad tariffs, Sudanese rice could not compete with imports from other sources (53, p. 372). Moreover, supply difficulties from French Indochina forced Senegal to search for sources of rice supplies outside the franc-zone. Scarcity of foreign exchange made this a difficult undertaking.

In late 1951, Senegal's main supplier--Indochina--suspended rice exports. The official retail price on the Dakar market rose to 40 francs/kg. Difficulties in finding other suppliers led to temporary shortages which drove retail prices up from 75 to 100 francs/kg on the private market (1, p. 27). The government came under considerable pressure from trade unions and the press to lower the retail price of rice. But little could be done. After import quantities returned to normal, the government faced higher c.i.f. prices than it had in the past (1, p. 33). During this era, the trade unions also suggested the creation of a rice stabilization fund much like that which existed for peanuts (1, p. 33).

The problem of acquiring imported rice underscored the wartime concern for domestic food self-sufficiency and resulted in inflows of foreign capital for new agricultural projects. Between 1947 and 1956, French public investment in all of French West Africa was twice as great as it had been in the previous 43 years (18, p. 280). About 20 percent of this investment found its way into agricultural development projects in Senegal, while most went to finance transport infrastructure and social services. A fully mechanized scheme for rice cultivation, covering 6,000 ha, was planned at

Richard-Toll near the head of the Senegal River delta. By 1948, a 120 ha experimental plot had been expanded to 600 ha, but equipment delivery delays and problems with pests resulted in unforeseen cost overruns and disappointing yields (31). In Sine Saloum and in the Lower and Middle Casamance, increased rice sales and better farm practices for rice cultivation were encouraged (53, p. 253). Nevertheless, by independence Senegal's annual food deficit was approximately 60,000 to 80,000 tons of grain while local rice production had expanded by only 5,000 to 10,000 tons.²¹

1960-68

After independence in 1960, Senegal's new leaders continued to follow pre-war orientations in their economic policies. The basic economic objective remained income growth based largely on peanut export expansion, with some new concern for expanded food production. Under the First Four Year Plan (1960-64), initial investments continued to be made predominantly in social services with agriculture receiving only 10 percent of total outlays (15, p. 452).

The new government also attempted to bring certain economic forces under closer government control. The Office de Commercialisation Agricole (OCA) was created to handle domestic marketing of important crops such as peanuts (but not peanut oil), rice, millet, and imported wheat, as well as to import and distribute agricultural inputs and equipment (27, p. 34). A number of other government organizations, working through the cooperative system, were set up to supply farmers with food, farm equipment, and credit. Financial assistance for the cooperatives' marketing operations came from the Banque

Nationale de Développement du Sénégal (BNDS) which provided short- and medium-term credit. ONCAD, created in 1966, was responsible for the formation of cooperatives, buying cooperative products, distributing inputs, and collecting cooperative debts for the BNDS. The Office de Commercialisation Agricole du Senegal (OCAS), which supplanted OCA, was given the responsibility for domestic and foreign marketing of all agricultural goods collected by ONCAD and became the sole importer of "essential" consumer goods such as rice and wheat (27, p. 58).

Nevertheless, control over economic forces was not always within the new government's reach. Conditions developing outside of Senegal had a profound impact on the country's economic fortunes. France's accession to the European Economic Community (EEC) meant that it had to drop its preferential price supports for Senegalese peanuts by 1967.²² The loss of this support, which amounted to approximately one-sixth of total export earnings, had serious implications for the entire economy (19, p. 3). The Senegalese government responded by reducing producer prices for peanuts by nearly 16 percent between 1963 and 1968 (19, p. 11) and by renewing efforts to develop crops that would either supplement peanut exports, such as cotton, or substitute for food imports, especially rice. The government was financially able to do this because the EEC and France had established sizeable aid programs to help Senegal and other former colonies adjust to the new trading conditions.

Government efforts to participate directly in agricultural development were furthered by the establishment of land development agencies (LDAs) to facilitate receipt of this foreign aid. They were initially concerned with the promotion of one or two crops in a limited geographical area, but later they became more comprehensive in their approach to rural development

within each region.²³ LDAs combined a number of different functions, including marketing, input delivery, credit, and extension. The government supported this approach because such concentrated investments were felt to yield faster, more tangible results than broader approaches to rural development. The government also instituted the Programme Agricole in 1964, which provided subsidies on fertilizers, farm implements, and machinery. While cooperatives channeled these benefits to peanut farmers, the LDAs provided access to a few cotton and rice farmers. But unlike the cooperatives, the LDAs were also able to undertake large investments such as major irrigation works. In all these activities, the LDAs were aided by their access to foreign financial and technical assistance.

LDAs were among the first institutions to be made the object of explicit policies concerning rice production. In 1961 a number of public agencies were set up in the Fleuve region to develop rice projects.²⁴ In a concerted attempt to reduce the nation's food deficit, these agencies constructed perimeteral dikes, sluice gates, and irrigation networks in order to expand rice cultivation on previously unfarmed land.²⁵ In addition to Richard Toll, 9,000 to 10,000 ha of rice land were developed in the Delta through the construction of controlled submersion polders. While development costs of these polders were low, recurrent costs were high because mechanical services, other inputs, and free extension services were not covered by the projects' receipts. Furthermore, lack of control of the height and timing of river flooding meant that these polders were risky investments. To avoid this, water security had to be increased.²⁶ In contrast, apart from the partial transformation of an old peanut scheme into a rice scheme in 1964, rice production in the Casamance remained in the hands of the traditional farmers and outside of the influence of state projects and subsidies.²⁷

During this era the government attempted to carry out a program of consumer price stabilization for rice. Stabilization operations were implemented by a variable levy on imports. Although large increases in the world price of rice were passed on to consumers, smaller, temporary fluctuations were absorbed by government taxes or subsidies. To generate revenues for the rice stabilization fund, consumer prices were usually set above the c.i.f. import price. In addition, because the cost of producing local rice was higher than the average c.i.f. import price, the higher retail price afforded protection to domestic rice producers.

The 1968 drought occurred at a time of rising world food prices. The domestic production short-fall had to be made up with imports, the price of which rose 40 percent between 1966 and 1968. As a result, in 1968 14 percent of total export earnings were used to purchase rice imports. Nevertheless, in 1967 and 1968 the government continued to pursue its policy of retail price stabilization by subsidizing rice consumption. These subsidies forced OCA to pay out 710 million CFA francs, which exhausted its resources and caused its dissolution in 1968. The coincidence of drought, increased quantities of rice imports, and high world prices led to the first serious budgetary crisis of independent Senegal.

1968-77

With the exception of one normal year, 1969-70, the drought lasted from 1968 through 1973. Output of the major cereals, millet and rice, fell to half of their pre-drought levels. As seen in Table 5, net domestic rice production which had diminished to 31,200 tons in 1969 recovered to 85,900 tons with favorable weather the following year, but fell sharply in 1973 to 19,600 tons. In 1975, pre-drought levels were finally regained.

Table 5.-- Net Availability of Rice in Senegal,
1965-76*
(thousand tons)

Year	Production ^a	Imports	Net availability	Per capita availability ^b	Self sufficiency ratio ^c
1965	60.6	179.2	239.8	62.3	.25
1966	68.1	159.3	227.4	57.6	.30
1967	69.8	153.4	223.2	55.1	.31
1968	76.4	185.2	261.6	62.9	.29
1969	31.2	145.9	156.8	41.6	.18
1970	85.9	125.6	211.5	48.4	.41
1971	49.1	186.8	235.9	52.6	.21
1972	59.8	165.8	225.6	49.1	.26
1973	19.6	192.5	212.1	45.0	.09
1974	35.0	207.2	242.2	50.0	.14
1975	65.2	102.1	167.3	33.7	.39
1976	61.3	235.4	298.5	58.8	.21

*Data are from West Africa Rice Development Association, "Prospects of Intraregional Trade of Rice in West-Africa," Monrovia, November 1977, Table A-10.

^aNet domestic production minus seeds and losses at milled rice equivalent (.65).

^bIn kilograms per capita.

^cProduction of local rice (net) divided by net availability.

18a

The duration of the drought plus the experience of paying high world prices, especially between 1972 and 1974, led the government to place much greater emphasis on income security rather than income growth. As part of this new concern, government policies focused on food production security and on ultimate self-sufficiency in food.²⁸ The drought hit the northern and eastern parts of the country hardest and pointed up the need for more infrastructural and production investments to protect incomes in these areas. Plans were made to invest more resources in irrigation facilities and LDAs were encouraged to focus more intensively on food crops in their extension efforts. This new policy orientation lent impetus to increased rice production under more secure conditions.

Production Investment Policies.--Progress in developing more secure rice production was slow. In the Senegal River Valley, all public development efforts, including on-going rice projects, were centralized under SAED's control. The policy of establishing settlement schemes in the Delta, part of SAED's original charter, was abandoned. Because of the series of droughts, SAED's major aim became instead the extension of water control on existing polders rather than the expansion of production area. Therefore, efforts were begun to convert existing polders to total water control. In the absence of double cropping, however, the yields on these rice polders were not sufficient to cover the high investment costs required. Double cropping has not been possible, except on a limited scale in the Middle Valley, due to lack of water during the low flood period and the problem of saltwater incursion in the Delta.

Small village-level perimeters were established in 1974 upriver around Matam under the auspices of the Food and Agriculture Organization and the Societe d'Aide Technique et de Cooperation (SATEC), a French consulting firm. Although still under SAED's control, these perimeters are very different in design from the rice projects along the middle and lower river. The schemes at Matam have achieved high yields at low cost, and decision making for each polder remains at the village or farmer level.

In 1972, after nearly a century of proposals for developing the Senegal River basin, Senegal, Mali, and Mauritania formed the joint Organization pour la Mise en Valeur du Fleuve Sénégal. This international organization is currently considering construction of two dams. One, the Diama, is a saltwater barrage planned for the Delta near St. Louis; the other, the Manantali, is a regulatory high dam in Mali on the Bafing--one of the Senegal River's main tributaries. Construction of these dams would permit double cropping on a much wider scale.

Until the foundation of the Société pour la Mise en Valeur de la Casamance (SOMIVAC) in 1977, the Casamance did not have a regional development agency like SAED. Instead, a number of jointly-funded agencies operated in each of the departments within the region. In the Lower Casamance, the European Development Fund financed a Dutch-supervised project (ILACO) in 1969 to improve mangrove swamps through saltwater control and the introduction of improved cultivation techniques to smallholder farmers. The scope of this project was limited and its efforts plagued with technical difficulties related to the drought--specifically, insufficient rainwater to permit desalinization of mangrove swamps. In 1974, the ILACO project merged with another group of projects to form the Project Interimaire pour le Développement

Agricole de la Casamance (PIDAC). In 1978, PIDAC received major funding to revive and expand the old ILACO project, including the construction of a number of saltwater barrage/retention dams on the tributaries of the Casamance River.

In the Middle Casamance the World Bank-financed Project Rural de Sedhiou has been operating as an integrated agricultural project on 11,000 ha, of which about 5,700 ha are in rice. The project has been very successful in raising rice yields by introducing simple improvements such as better weeding, better timing of planting, the use of fertilizer, and animal traction. In Eastern Senegal, the Société de Développement des Fibres Textiles (SODEFITEX), the former French cotton development company, has introduced improved rice cultivation techniques and has had relative success by providing an efficient extension and collection service and timely input deliveries. In the early 1970s, SODEFITEX extended its operations to the Upper Casamance where it took over several rice projects from SATEC.

A large portion of the rice development costs were met by the substantial foreign aid that flowed into Senegal during and after the drought. Between 1969 and 1976, rice projects received 20 percent of total development outlays and 10 percent of all foreign funds, much of which was in the form of grants. Thus, the country did not bear the full capital cost of these projects.

Input Subsidy Policies.--For a number of years, subsidies on fertilizers were about 50 percent of the cost price, while those on seed, mechanical implements, and other chemical inputs were more modest. These input subsidies were not confined to rice producers and in fact probably had a greater impact on peanut and cotton production. In the Casamance, in particular, the problem of

input distribution and the difficulties that traditional rice farmers have had in gaining access to the distributing agent, ONCAD, has lessened considerably the potential influences of the subsidies on rice output.

Producer Price Policies.--Official producer prices for local paddy production were introduced in 1964. In 1968, just prior to the drought, the producer prices for millet, cotton, and peanuts were 21 CFA francs/kg, 37.7 CFA francs/kg, and 17.67 CFA francs/kg, respectively, while that for paddy was 21 CFA francs/kg. In November 1974, when the government raised the official retail prices of imported rice and peanut oil, the producer prices were raised as well. The paddy price was increased 66 percent to 41.5 CFA francs, equal to that of peanuts, while the millet price was raised 20 percent to 30 CFA francs/kg, and cotton prices by 37 percent to 47 CFA francs/kg. In practice, however, only the increase in the producer prices for the export crops--peanuts and cotton--were relevant for most farmers because these are the only crops widely purchased by ONCAD. The official price for paddy serves more as the means of evaluating government purchases in development projects than of assuring incomes to farmers.

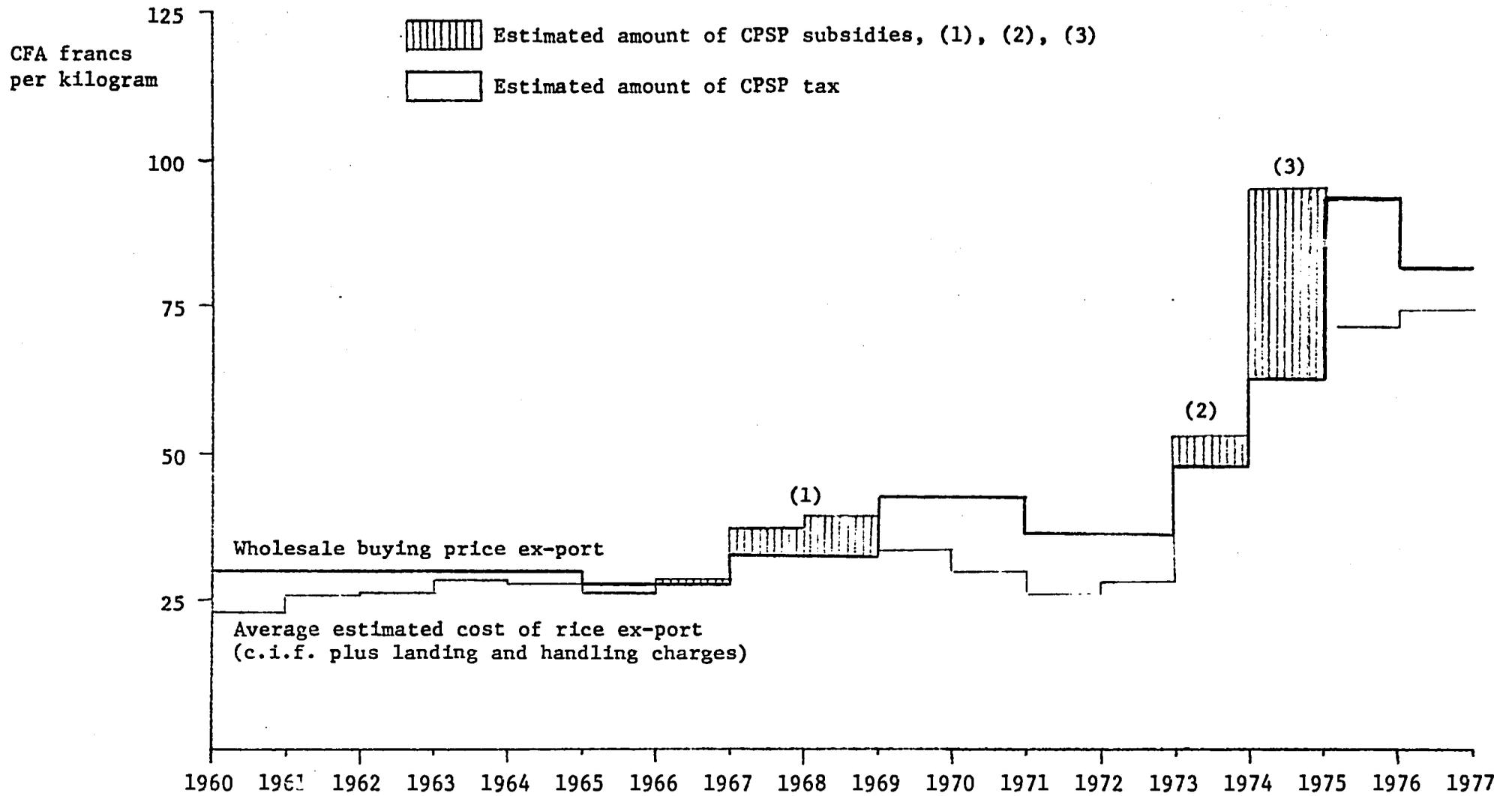
Consumer Price Policies.--While working to expand rice production, the government remained committed to maintaining adequate cereals supplies at stable consumer prices through its rice import policy. During the drought the government greatly increased cereal imports. Between 1970 and 1974, an average of 320,000 tons of grain were imported per year, or nearly one-third of total consumption requirements. Since the government had to pay much higher prices per unit between 1972 and 1974, it was more difficult to maintain stable consumer prices than it had been in the past.

In the early 1960s, the variable levy on rice had been maintained just above the c.i.f. landed price, ex port. The small amount of tax that the government realized through the levy was used to smooth out modest fluctuations in price. In 1967, however, import prices rose above the consumer price level and the government chose to subsidize rice prices in order to keep them close to former levels. Then in 1968 the government made an upward adjustment in the official wholesale and retail prices.

As can be seen from Chart 1, if the 1968 landed import price had remained the same through 1969, the government would have realized approximately the same level of net tax on imported rice that it had imposed during most of the 1960s. But the import prices fell, and the government made a larger net gain than it had in the past. When the import price continued to fall through 1971, the government decided to lower consumer prices, but this time left a substantially larger margin between their costs and receipts.

Import prices shot up in 1973 and the government found itself once more in the position of subsidizing consumers. This time, it reacted more rapidly, and by mid-1973 consumer prices were raised above the import

Chart 1.--Estimated Variable Levy and Resulting CPSP Taxes
or Subsidies per Kilogram of Imported Rice*



* Source: See Table 7.

price level. The period of price instability was not yet over, however, and in 1974 world prices rose to 235 percent over the average level of 1970 through 1972.

These fluctuations in import prices created financial strains on the Senegalese economy. Because of the increased requirements for cereals and petroleum imports at much higher prices, Senegal's international reserve position deteriorated rapidly. Total reserves fell from \$38 million in 1972 to \$6 million in 1974.²⁹ In that same year, the consumer subsidy on the rice account alone reached 5.5 billion CFA francs. As a result, the CPSP was unable to repay ONCAD for subsidies on input sales to cooperatives. ONCAD in turn ran behind in its repayment of short-term credit extended by the BNDS for marketing and input purchases. If high 1974 prices had persisted into the following year, the estimated subsidy on rice, sugar, and oils would have reached 27 billion CFA francs, which was not only much more than the funds available to the CPSP, but was also larger than the entire development budget of Senegal. Pressure to revise prices began to build within the government.

In November 1974, the government intervened with a major upward adjustment in price levels. The subsidy on rice imports was totally eliminated and those on sugar, oil, and wheat were substantially reduced. The retail price of rice was raised from 60 to 100 francs; sugar and oil prices were raised 88 and 33 percent, respectively. As compensation, people subject to a fixed wage structure, such as those earning the minimum wage and some professional groups, were granted wage increases.

Because world rice prices fell after 1974, the adjustment of the domestic price levels led, temporarily, to a situation where the official consumer retail price was much higher than the c.i.f. price for imported rice.

This significantly increased government revenue from rice imports. The taxes accruing through the variable levy gave the government a substantial buffer against future price rises. In May 1976, following the continued downward drift of the c.i.f. price, consumer prices were reduced 20 percent, and the tax margin was reduced accordingly.

EVALUATION OF RICE POLICIES

During most of Senegal's history, the government's major economic objective has been economic growth, based largely on peanut exports. Concentration on peanuts rather than on traditional food crops was facilitated by up-country traders who bought peanuts and sold food. Because the rapidly growing urban areas were not being fed entirely by the countryside, they had to import a considerable amount of their foodstuffs, primarily rice. This system worked reasonably well, although disruptions in peanut production, world markets, and shipping often made the country painfully aware of its dependence on imported food. New policies were implemented in an effort to cover some of the national cereals deficit through expanded domestic food production, but never directly at the expense of peanut production. With independence, the government attempted to bring all of agriculture--and peanuts in particular--under more careful supervision. A new government organization replaced the private peanut buyers and took over the provision of imported food to the countryside.

The effect of the loss of franc-zone supplies of inexpensive rice was compounded by the elimination of the French preferences on peanuts and the period of droughts and unstable world prices in the late 1960s and early 1970s. Until this time, cheap imported rice had supported the major economic objective of income growth. But during the period of instability,

rice imports became a constraint on that objective. The large sums needed to pay for rice imports and price subsidies impinged on both Senegal's international reserve position and its domestic budgetary stability.

In the post-drought era, Senegal has tried to reduce the risk of income insecurity. The dependence of national income and government budgetary revenues on fluctuating peanut production and prices has been eased somewhat by the expansion of phosphate production and higher world phosphate prices. In order to aid the stability of farm family income, the government has tried to develop more reliable production methods, especially for food crops, and to introduce better farming techniques and modern inputs through regional development agencies. By emphasizing rice production systems based on water control and irrigation, the government has sought to avoid the impact of wide fluctuations in the prices and quantities of rice it has had to import in recent years. This focus on domestic rice production can be seen as an effort to break an important perceived constraint to further national growth.

Senegalese policies directed toward the rice sector have primarily involved public investments in land development for producers and price stabilization measures for consumers. In both instances, the immediate goal of the policy instruments has been to reduce the instability of food supply in Senegal. An analysis of the success of these policies involves both costs and effectiveness. By examining each major type of policy, the following sections assess the contribution of these efforts to both stability and national growth.

Production Investment Policies

Because of Senegal's climatic instability, the only secure systems of food production are probably those that can assure the availability and distribution of water when needed.

The need to control water is the main rationale behind the government's investments in irrigation systems for rice. This effort to increase the security of water delivered for production is wholly consistent with the major physical constraint in much of Senegalese agriculture. An examination of costs, production security, and productivity at the micro level suggests the strategy has been moderately successful. Virtually complete water control can be achieved, with reasonable assumptions about cost, at an increase of about 150 percent over the costs of current, secondary perimeters. The security of production would then rise from roughly two-thirds to well over 90 percent, and yields could increase by 500 to 600 percent.³⁰

In the Fleuve, which has been the focus of these policies, progress has been slow, despite sizeable investments. Although the first land improvements were begun in 1947, only 14,700 ha currently have any form of water control, and during 1971-77, only 4,500 ha were upgraded from rudimentary empoldering. A full record of costs is not available, but almost ten billion CFA francs were expended during 1974-78.³¹ In addition to high costs, the policy has been impeded by difficulties of resettlement, double-cropping, and farmer incentives.

At the macro level, production information suggests that the strategy has failed thus far to achieve either an increase in annual production or greater stability of this production. A comparison of annual averages for the two periods, 1961-68 and 1975-78, prior to and succeeding the main drought years, shows that national yields have risen insignificantly, yearly paddy production and area planted in paddy have actually fallen slightly, and the variability of all three indicators has increased:

	<u>1961-68</u>	<u>1975-78</u>
Average paddy yields (mt/ha)	1.252	1.270
(standard deviation)	(0.171)	(0.179)
Average national paddy production		
(thousand mt)	103.5	101.7
(standard deviation)	(25.2)	(26.6)
Average area in paddy		
(thousand ha)	81.8	79.0
(standard deviation)	(11.2)	(11.6)

Given the stagnation of production, imports have continued to rise, thwarting the government's goal to replace imports with secure domestic production. During the 15 years between 1961 and 1976, imports grew an average of 4,000 mt per year, or at an annual rate of 2.9 percent.³² During the same period, population increased at an estimated 2.6 percent per year. On balance, imports grew faster than population when per capita consumption was either constant or falling. In contrast to very low imports in 1975, which resulted from large stock carryovers from 1974 (56,000 mt) and a good harvest in 1974-75, 1976 imports were the highest in history.

The investment strategy of the government can be judged on two major counts--stability and profitability. The issue of stability depends on whether relying on the world rice market is inherently more

unstable than depending on domestic rice production. An analysis of paddy production and rice imports for Senegal during the period 1961-76 gives no evidence to support the argument that the world market is less stable than Senegalese production. In fact, the opposite is true when the c.i.f. price per unit is compared to local production; domestic output is over twice as variable as the nominal price of imports.³³ Of course, the impact of the variability in the world price of rice will also depend on tonnages imported and the value of major export commodities. Empirically, these factors increase the variability of trade in rice for Senegal, but only slightly. The conclusion still holds that the government's investment strategy has not been justified on the grounds that import substitution for rice reduces the insecurity of food supplies.

Although the major irrigation investments in the past have been located in the Fleuve, the long-run stability of production in this region may well depend on the construction of the two proposed dams--the Diama and the Manantali. Recent production has suffered from the interconnected problems of low rainfall, the inability to pump or flood-irrigate, and saltwater incursion. Until these technical difficulties are resolved, the predictability of future production from this area will be tenuous. Because of the emphasis placed by the government on water security, more attention might be paid to the Casamance, because the frequency, reliability, and total amount of rainfall are considerably higher there than in the North.³⁴

The profitability of the investment program focuses on two elements which influence costs of production--geographic location and choice of technique. The techniques of rice production associated with the large-scale irrigation schemes have had high capital costs, borne mainly by foreign aid, and

large recurrent costs, which must be supported by the government budget. Recent evidence demonstrates that the small-scale Matam-type model of rice production, as well as similar techniques in the Casamance, are relatively more efficient than the large-scale, heavily mechanized, and centrally-directed schemes in the Delta and lower Fleuve (54, pp. 25a-26a). Despite the seasonal labor shortages in much of Senegal, the small-scale, relatively labor intensive techniques are still more efficient than those utilizing heavy machinery. In the context of Senegalese conditions, large mechanization increases, rather than reduces, production costs.

Investments in rice development should be judged on their social profitability, that is, whether they contribute to or diminish national income. When investments are designed to replace imports with domestic rice, national income will fall if imports cost less than their domestic substitutes. At current costs, local rice production cannot be expected to replace imports in the capital city, except at great cost to the economy. The Fifth Four-Year Plan projects that the Fleuve region will produce 114,000 tons of paddy by 1980-81. At the social costs of production and world prices that prevailed in 1975-76, the attainment of this target would cost the Senegalese economy about 3.25 billion CFA francs (\$13 million) in the loss of production efficiency alone.³⁵

In areas far from Dakar, there is evidence that production and milling costs for certain rice production techniques are low enough and transport costs for moving imported rice from Dakar are high enough to permit domestic rice to compete with imports in the local market. In Matam, as well as in Kolda and some other areas of the Casamance, local production can profitably

replace rice imports and lead to local self-sufficiency. Domestic rice will be able to compete with imported rice further away from these local production centers and closer to Dakar as local production and milling costs are further reduced. While some economies of scale and lower costs (especially in milling) might be realized through increased output alone, major cost reductions will probably come only from important technological innovations.

Input Subsidy Policies

In addition to large investments in infrastructure, the rice sector has enjoyed subsidies on agricultural inputs, with those on fertilizer being by far the most important. As shown in Table 6, subsidies on composite fertilizers have averaged nearly 55 percent since 1970. Although a complete series of data is not available for urea, subsidy rates seem to be similar.

Except for agricultural extension, which is provided free by the LDAs, the other inputs--including insecticides, herbicides, oxen equipment, and mechanical services such as deep plowing--are charged to farmers at cost or only slightly less. Selected seeds carry a somewhat higher subsidy at a rate of 15-20 percent. In addition, the input distribution system both subsidizes the delivery of most inputs to the farm, and finances the working capital required for their purchase.

Although no particular agricultural crop seems to be favored by special subsidy rates on various inputs, total input subsidies paid to rice have been negligible. The main reasons are that rice land amounts to less than 10 percent of the land devoted to peanuts and cotton, which are virtually always fertilized, and that the majority

Table 6.--Fertilizer Subsidies for Rice^{*a}

Crop year	Purchase cost ^b (CFA francs per kg)	Farm price (CFA francs per kg)	Per unit subsidy (CFA francs per kg)	Percent subsidy	Fertilizer applied to rice (thousand mt) ^c	Estimated total cost of subsidy (million CFA francs)
1966-67	15.9	12	3.9	25	1.0	3.9
1967-68	15.9	16	0	0	1.3	0
1968-69	20.0	16	4.0	20	1.2	4.8
1969-70	22.8	12	10.8	47	2.0	21.4
1970-71	24.0	12	12.0	50	0.5	5.9
1971-72	24.0	12	12.0	50	0.7	8.5
1972-73	26.3	12	14.3	54	0.8	11.3
1973-74	21.0	12	9.0	43	1.9	17.1
1974-75	34.4 ^e	12	22.4	65	2.1 ^f	46.2
1975-76	54.7	16	38.7	71	2.7 ^f	104.9
1976-77	48.2	20	28.2	59	n.a.	n.a.
1977-78	n.a.	25	n.a.	n.a.	n.a.	n.a.

*Prices are based on Government of Senegal, l'Office Nationale de Coopération et d'Assistance au Développement (ONCAD), personal communication, Dakar. Figures on fertilizer consumption are taken from Government of Senegal, Ministère du Développement Rural et de l'Hydraulique, Direction Générale de la Production Agricole, personal communication, Dakar. Fertilizer usage for 1974-75 and 1975-76 is based on growth rates estimated by the International Fertilizer Development Center, West Africa Fertilizer Study, vol. 2, "Senegal," Florence, Alabama, April 1977.

^aThese price figures refer only to composite fertilizer (N-P₂O₅-K₂O) used on rice, primarily 16-48-0.

^bThis cost equals only the ex-factory price. Since it excludes the costs of transport, storage, financing, and delivery, the subsidy figures are conservative estimates.

^cThese figures represent all fertilizers, both composite and urea. Tonnages are in gross fertilizer weight, not nutrient tons.

^dThe subsidies indicated are only estimates and are not confirmed by any actual budget figures. Although the subsidies present all fertilizers used, cost data apply only to composite fertilizers. It is not known if the cost and subsidy structure for urea is similar. Subsidies on transport, storage, financing, and delivery of fertilizers are excluded.

^eBecause the price for rice fertilizer is not available, the price of fertilizer for groundnuts and millet has been used. In subsequent years, all fertilizers had the same purchase cost.

^fThese values have been estimated, based on assumed growth rates from 1973-74.

of rice producers use few modern inputs. For example, during the period 1961-74, less than 3 percent of all fertilizers used were applied to rice.

Large variations in climatic conditions make it difficult to assess accurately the effect of the fertilizer subsidy on fertilizer use on rice. The available evidence shows no strong relationship--applications in 1974-75 were scarcely larger than in 1969-70. Despite a favorable price ratio of nitrogen to paddy in 1975 (approximately 8-10), distribution remains limited, in part because most LDAs have not been organized to reach widely dispersed, small-scale traditional farmers.³⁶

As a result of the limited use of fertilizer on rice, the budgetary impact of this policy has not been large. During the ten years between 1966-67 and 1975-76, the total value of these subsidies amounted to less than a quarter billion CFA francs. Compared to investment policies for rice which provided over 1.5 and 3.0 billion CFA francs to SAED alone in 1975-76 and 1976-77, respectively, input subsidies have been unimportant as a national policy.

Price and Trade Policies

Since independence the government has made an effort to stabilize consumer prices by adopting an official price of rice which it has defended with large quantities of imports. By using a variable levy on the value of imports, the government attempted to compensate for changes in world prices without altering official prices.

The government has not been able to defend official prices very effectively. During the ten years (1967-76) for which comparable data are available, the observed market price for 100 percent broken in Dakar averaged 22 percent above the official price. The divergence between these prices does not seem to be correlated with shortfalls in either production or imports, but it does suggest that imports were insufficient in most years to defend the official price.

Given this failure to defend official prices, it is not surprising that Senegalese consumer price policy has failed to reduce the variability of official wholesale prices. As the following statistics show, both import and wholesale price series are very similar.

	<u>c.i.f. price</u>	<u>Official wholesale price</u>
Average price (CFA francs/kg)	36.80	42.35
Standard deviation	18.58	19.60
Coefficient of variation	0.50	0.46
Range	65.22	66.00

Domestic prices have basically tracked the c.i.f. import prices, with slight lags in adjustment, as shown above in Chart 1 (p. 23a). In most years, imports have been taxed to a small degree. When world prices rose rapidly, imports were subsidized for one or two years, before domestic prices were brought into line with import costs. Large taxes accrued to the budget only when world prices fell rapidly and domestic prices were not lowered accordingly. Based on estimates for 1960-76 (see Table 7), the average annual tax levied on rice imports amounted to just over 200 million CFA francs per year, or less than 4 percent of the average value of rice imports. It is significant to note that between 1961 and 1974, the cumulative budgetary gain on rice imports was negative, which means that rice imports had, on average, been slightly subsidized since independence. By 1977, this cumulative figure was somewhat positive, following two years of fairly high taxation of rice imports.³⁷

In addition to its impact on the consumer price level and stability, Senegalese price policy has also affected domestic rice production. The effect can be divided into two parts--trade protection and domestic producer price supports. As evidenced above, the trade protection provided

Table 7.--Variable Levy on Rice*
 (CFA francs per kg of imported rice, unless otherwise noted)

Year	c.i.f. price ^a	Estimated landing margin ^b	Estimated import cost ^c	Estimated official wholesale buying price ^d	Estimated variable levy ^e	Estimated annual budget revenue (billion CFA francs) ^f	Actual CPSP rice import revenue (billion CFA francs)
1960	21.8	1.4	23.2	30	6.8	0.6	n.a.
1961	24.6	1.4	26.0	30	4.0	0.4	0.2
1962	25.0	1.4	26.4	30	3.6	0.4	0
1963	27.3	1.4	28.7	30	1.3	0.1	0.3
1964	26.7	1.4 ^g	28.1	30 ^g	1.9	0.4	0
1965	25.0	1.4	26.4	28	1.6	0.3	0.1
1966	27.2	1.4	28.6	28	-0.6	-0.1	0
1967	35.9	1.6 ^g	37.5	33	-4.5	-0.7	n.a.
1968	38.1	1.4 ^g	39.5	33	-6.5	-1.2	n.a.
1969	32.0	2.0	33.4	43	9.6	1.4	n.a.
1970	28.0	2.0	30.0	43	13.0	1.6	n.a.
1971	24.7	3.0	25.7	37 ^g	11.3	2.1	n.a.
1972	25.0	3.0	28.0	37 ^g	9.0	1.5	n.a.
1973	50.0	3.0	53.0	48.5 ^{g,h}	-4.1	-0.8	n.a.
1974	87.0	8.0 ^g	95.0	63.3 ^{g,i}	-31.7	-6.6	0
1975	59.3	11.7 ^g	71.0	94.5 ^g	23.5	2.4	n.a.
1976	68.5	5.7 ^g	74.2	82.3 ^{g,j}	8.3	2.0	n.a.

* c.i.f. prices are taken from Government of Senegal, Ministère de Finances et Affaires Economique, Direction de la Statistique, Importations: Commerce Special, Dakar, various years. Landing margins are taken from Government of Senegal, ONCAD, Budget Provisionelle, Dakar, various years, and Bilan, Exercice 1974-75, Dakar. Wholesale prices are based on ONCAD, Direction de la Commercialisation, personal communication, Dakar, 1977, and on West Africa Rice Development Association (WARDA), Rice Statistics for Senegal, Monrovia, 1976. Official prices are

also regularly published in Government of Senegal, Journal Officiel, Dakar, weekly. CPSP revenue comes from Government of Senegal, Caisse de Péréquation et de Stabilisation des Prix (CPSP), Direction Générale, personal communication, Dakar, 1977.

^aThese prices are the average of broken and wholegrains.

^bThe landing margin includes unloading at the port, storage, financial charges, and administrative costs.

^cThe estimated import cost equals the c.i.f. price plus the estimated landing margin.

^dThe estimated official wholesale buying price is that price at which wholesalers purchase rice from ONCAD. It is based on the official retail price minus official commercial margins.

^eThe estimated variable levy is calculated as the difference between the estimated wholesale buying price and the estimated import cost.

^fEstimated annual budget revenue equals the product of total annual rice imports and the estimated variable levy. This figure is hypothetical.

^gThese values are actuals; others have been estimated on the basis of these figures.

^hThis price is the average of 37, which prevailed through May, and 51 which existed from June on.

ⁱThis price is the average of 57, which prevailed through October, and 94.5, which existed from November on.

^jThis price is the average of 94.5, which prevailed through May, and 74, which existed from June on.

by the variable levy has probably not been significant, although quantitative import restrictions may have caused the real market price to stay significantly above the world price in some years. The competitiveness of local production is hampered because Senegal usually imports inexpensive qualities of rice. Even with international shipping tariffs included, it is difficult for Senegalese rice to compete with 80 to 100 percent broken rice from Southeast Asia, which is the quality that is most frequently imported. Consequently, government policy to purchase large quantities of 100 percent broken rice which is only lightly taxed creates little incentive for local production to replace imports.³⁸

The effectiveness and cost of producer price policy depend on the consistency of government efforts to maintain official paddy prices, the relation of these official prices to import and market prices, and the costs of production. As the following data show, official producer prices have recently exceeded official wholesale prices when both are expressed in equivalent units.³⁹

<u>Year</u>	<u>Official paddy price farmgate (CFA francs/kg paddy)</u>	<u>Wholesale equivalent of paddy price, Dakar (CFA francs/kg rice)</u>	<u>Official wholesale rice prices, Dakar (CFA francs/kg rice)</u>
1972	21	53	37
1973-74	25	59	37
1974-75	41.5	84	57
1976	41.5	84	74

If these official prices are respected, government buying programs must subsidize the post-harvest sector. To the extent that government processing costs are higher than those used in estimating equivalent wholesale prices, the subsidies would be larger than implied above. The budgetary impact of these official prices is not large, however, owing to the small amount of official marketings.

The market price of rice will also be associated with some paddy price, depending on costs of processing and marketing. As shown below, these prices tended to be below estimated production costs until prices were increased in 1975:⁴⁰

	<u>1973-74</u>	<u>1975</u>	<u>1976</u>
Market wholesale price, Dakar (CFA francs/kg rice)	61/66	116	84
Estimated equivalent farmgate paddy price (CFA francs/kg paddy)	26/29	62	41
Estimated private farm-level production costs (CFA francs/kg paddy)			
Matam		26	
Delta		41	
Traditional swamp		72	
Improved swamp		39	
Improved rainfed with oxen		24	

As a result, there was little incentive to produce for shipment to Dakar, a conclusion consistent with empirical evidence. Even though market prices for rice usually exceed official prices, this additional incentive still appears insufficient to generate a large enough supply of rice to replace imports. The costs of production for most techniques and locations have been above prices in the private market.

In conclusion, producer price policy has been ineffective in the past because prices were set below costs of production. Moreover, producer prices appear to have been set with little regard for consumer prices, which have been closely linked to movements in import prices. As a result, implementation of official pricing policies has required subsidies to the post-harvest sector. Private producer prices, which are heavily influenced by official and private consumer prices, have probably been too low to cover costs of producing paddy and delivering it to Dakar.

SUMMARY AND CONCLUSION

Recent Senegalese rice policy has aimed at expanding domestic production under conditions of more secure water availability. This policy has been implemented by LDA extension activities, government investments in irrigation projects, and input subsidies. At the same time, the desire on the part of the government to protect rice consumers and national income has reinforced the historical policy of importing the least expensive rice available on the world market, whenever possible. There is thus a policy conflict between the desires for income growth and for income security.

Price policy has clearly been tied to movements in world prices. While consumers may have lost slightly as the result of government restrictions, producers have seldom gained much from price policy. On balance, the government budget seems to have realized small amounts of revenue from imports, which may have been transferred to handlers of domestic rice. Both the investment and input subsidy policies have made large demands on the government budget, with no apparent increase in stability of output, yields, or area of production. Rice imports have not been replaced significantly by domestic production. Real costs of production have not fallen, in part because the production policies seem often to have been focused on the wrong areas and techniques. As a result, potential income has been reduced, without much compensating gain.

If the expansion of domestic rice production continues to be a focus of government policy, the methods need be improved and the costs of production, milling, and marketing reduced so that local rice is at once the source of greater food security and a profitable food alternative. To this end, the choices of production technique and location are important.

The country could promote a variety of intermediate water control schemes, such as the one at Matam where costs are low, yields are high, water security is good, and the socioeconomic dislocation associated with the large-scale developments is not a problem. Increased effort could be directed at the development of swamp rice in the Casamance. There is also an important need to give more attention to rainfed cultivation in areas of sufficient and reliable rainfall, such as the Casamance and Eastern Senegal.

If domestic rice cannot be produced more cheaply than imports, the government needs to weigh the loss of national income resulting from expanding domestic rice production against the benefits it perceives from producing more of its food domestically. For example, regional development outside the Groundnut Basin has been furthered by the large rice investments in the Fleuve, but the use of capital-intensive, costly schemes is an inefficient method of income redistribution. Domestic rice production has also been intended to increase the security of food supplies, even though efforts to date have not met with much success.

Finally, the government might consider policies other than increased rice production to help achieve its objectives. To reduce the instability of food imports, Senegal might join other countries to establish an import insurance scheme to protect itself against high world prices and large domestic shortfalls. The need to rely on domestic rice production might also be reduced by the improvement of local production and processing of maize and millet, which could be low-cost substitutes for rice.

FOOTNOTES

¹Cassava is usually consumed as a condiment and not as a staple food, but the quantities produced are nonetheless quite large (176,000 tons, 1969-73 average).

²Although Senegalese agriculture has in the past generally been practiced using extensive techniques, in areas such as the central Groundnut Basin and southwestern Casamance there is now population pressure on the land, resulting in declining fallow periods, reduced soil fertility, and even feuds over prime agricultural land. But for most of Senegal, sufficient cultivable land is still available (63).

³Planners anticipate that an additional 17,000 ha can be brought under this kind of supervision by 1980 (61).

⁴ONCAD has a monopoly on the purchase and processing of paddy and the selling of rice. At the official margins ONCAD has found transactions in local cereals unprofitable, however, so that rice and millet operations remain secondary marketing activities of the agency which focuses mainly on peanuts.

⁵See SONED report (50, p. 103ff) for a description of the private market. One of the difficulties encountered in this study was the inadequacy of spatial and temporal data on prices and quantities marketed.

⁶The quantity of wholegrain imports has fluctuated in the 1969-75 period in response to relative changes in prices of wholegrains and broken. Fourteen percent of total imports in 1969 and 39 percent in 1971 were wholegrains, yet in other years these imports amounted to less than 1 percent. See (56, p. 21).

⁷The Société Nationale de Distribution (SONADIS) maintains some 100 outlets throughout the country.

⁸Nianga, a mechanized SAED polder in the Middle Valley, marketed 690 tons of paddy or 33 percent of production in 1976. Eighty-five percent of this was for debt repayment, while only 15 percent were "true sales." A true sale is one in which the commodity is not sold as a payment on a debt.

⁹The gap between net production retained by farmers and current estimates of family rice consumption in the Fleuve is about 10 percent.

¹⁰In Eastern Senegal, the Société pour le Développement des Fibres Textiles (SODEFITEX) purchased only 21 percent of paddy production in 1976-77, half of which were true sales. Official purchases are even less than this in the Middle and Lower Casamance, reflecting lower yields, greater local consumption of rice, and more private trade.

¹¹In May 1976 the official retail price in Dakar was established at 80 CFA francs/kg for 100 percent brokens. This price is set by an interministerial committee, the Comité Permanent Interministeriel des Grands Produits Agricoles (CGPA), which each November also sets the producer prices for rice, peanuts, maize, millet, and sorghum (9, p. 39).

¹²The real cost is 96.97 CFA francs/kg because ONCAD only pays 85.44 CFA francs/kg instead of 87.98. The difference is covered by the stabilization fund (CPSP) which subsidizes SAED.

¹³A 6-ton/hour Schule (installed in 1971) and a 7-ton/hour Guidetti (installed in 1952) are located in Ross Béthio and Richard Toll in the North. Two 2-ton/hour Schule units are located in Séfa and Kedougou (installed in

1957 and 1975, respectively). Annual capacity has been calculated assuming a 20-hour day and 250 days of operation per year, or a total of 5,000 hours per year.

¹⁴These small machine hullers are illegal in the Fleuve, but their status is unclear in the rest of the country where they are rare but operate openly.

¹⁵Derived consumption figures based on production and import estimates do not account for the flows that occasionally take place clandestinely between Senegal and the Gambia. Stocks of local and imported rice are also not accounted for in these figures.

¹⁶A Statistical Office study (44, pp. 12 and 21) found that 87 percent of all imports in 1973-74 went to urban areas, 61 percent of which was consumed in Cap Vert, Dakar.

¹⁷According to a 1974 budget study conducted by the Institut Universitaire de Technologie (IUT) (22, 2 vols.), average per capita consumption in Cap Vert was 132.5 kg/year, 29 percent above the estimates of the Statistical Office (44, p. 12).

¹⁸This observation seems to conflict with some government planning assumptions that the national demand for rice has grown faster than population (13, pp. 10-11; 49, p. 1; 57, p. 1).

¹⁹A recent government cereals strategy statement (38) projected an income growth of 20 percent between 1977-85 and demand for rice, if unchecked, of 284,000 tons in 1981 and 335,000 tons by 1985.

²⁰A water storage facility had been under study in the Fleuve since 1925.

²¹Production figures prior to independence can only be estimated. The assumption here is that production was between 50,000 and 55,000 tons of paddy around the Second World War and had increased to about 60,000 tons by 1960.

²²In 1963 Senegal was informed officially that peanut support prices would be discontinued in 1966. The EEC pledged support during the phasing out period until 1967 (25, pp. 507-09).

²³In the Senegal River Valley, SAED's main function is to promote rice production. In the Peanut Basin, the land development agency is the Société de Développement et de Vulgarisation Agricole (SODEVA). In 1977-78, the Société pour la Mise en Valeur de la Casamance (SOMIVAC) was founded. In Eastern Senegal as well as in the Upper Casamance, the Société pour le Développement des Fibres Textiles (SODEFITEX) is engaged in cereals production in addition to its primary concern--cotton.

²⁴The Société de Développement Rizicole du Sénégal (SDRS) took over the private operations at Richard Toll, while two sister organizations--the Organisme Autonome du Delta (OAD) and Organisme Autonome de la Vallée (OAV) established rice perimeters elsewhere. SAED was set up later to do other work in the Delta and eventually took over all these operations.

²⁵SAED was responsible for resettling hundreds of people into designated project areas in the Delta. Without the barrier dikes that had been constructed, there was little cultivable land in the Delta prior to the rice projects.

²⁶This was accomplished in three stages: primary, involving diking and the construction of sluice gates; secondary, involving provision of pumps and irrigation and drainage channels; and tertiary, involving leveling the fields within the diked area.

²⁷The government's decision to invest in irrigated rice production in the Fleuve instead of in rice development in the Casamance is difficult to explain, but may be attributed to a number of factors. Plans to control the waters of the Senegal River for agricultural and navigational purposes go back to the beginning of the colonial era. Once some investments were actually made there in the 1930s and 1940s, money and personnel, required for their maintenance, focused attention on carrying out additional projects in the same area. In addition, the Fleuve's economic preeminence during the early slave and gum arabic trades have given it a certain prestige, and strong political connections still exist between Dakar and St. Louis--the former capital. Finally, since the Fleuve was not a traditional peanut-growing area and hence the investments in land and labor there would not directly jeopardize production of the country's leading export crop, it was thought to be an ideal area in which to emphasize food crop production. On the other hand, the Casamance was effectively cut off from the rest of Senegal until the completion of the trans-Gambian highway in 1958. The scale, dispersion, and the highly evolved traditional techniques of its rice producers probably also dissuaded the government from attempts to introduce new techniques.

²⁸At the beginning of the Fourth Plan (1973), the target date for self-sufficiency in rice was set for 1985 (16).

²⁹To finance its growing trade deficit, Senegal borrowed on the Eurocurrency market at commercial rates. Its debt service/export earnings ratio doubled to 14 percent in 1974 alone (5, p. 57).

³⁰See (41, p. 9). Security is measured as the percent of planted land which is harvested, and the estimate of two-thirds is based on data for the Delta in 1970-74 and 1976-77. Complete water control can never assure 100 percent security because of salt incursion during the years of low floods. Yield differences are based on 1976-77 SAED estimates.

³¹These figures include foreign funds, central budget funds for land development, and Treasury transfers to cover SAED operating deficits.

³²These figures are based on the trend line regression of import quantities, the results of which are: constant = 123,745 mt; slope coefficient = 4,188 mt per year; standard error of slope coefficient = 1.970. The level of confidence for the slope coefficient exceeds 95 percent.

³³This relationship is statistically significant at a 90 percent probability level. All analyses were made using the variances of the trend line regression estimates, normalized to account for differences in units. Data and results are available upon request.

³⁴For the drought years 1972, 1973, and 1974, when rainfall in the North of Senegal was 37 percent, 44 percent, and 61 percent of normal for the June-September rainy season, the rainfall in the Casamance was 69 percent, 92 percent, and 94 percent normal for the same years (5, p. 27).

³⁵This estimate assumes that 46 percent of the Fleuve production comes from highly mechanized operations in the Delta, 38 percent from the middle valley, also heavily capital intensive, and 16 percent from the labor-intensive, small-scale perimeters near Matam. See (61, Table F-10). The social profitability of production is negative, averaging -45.8 CFA francs per kg of rice produced and delivered to Dakar. See (54, p. 25a).

³⁶These price ratios are based on the following assumptions: a paddy price of 41.5 CFA francs/kg; a fertilizer (16-48-0) price of 12 CFA francs/kg, which gives a price of N equal to 75 CFA francs/kg; and a response rate of 15-20 kg paddy per kg N.

³⁷The figures for budgetary revenue used in the text are estimates. Actual revenue data, available only for 1961-66, are less than one-half the estimates for these six years. Consequently, the budgetary impact of rice imports is probably more strongly negative than indicated by the estimates in Table 7.

Moreover, the Senegalese government has not really followed an import price stabilization scheme. Revenues from the variable levy are often used to pay the subsidies on domestic rice milled by national agencies. During 1961-66, the Caisse de Riz showed a net deficit of over one-half billion CFA francs as a result of these expenditures.

³⁸The selection of import quality may be strongly affected by the government's desire to supply cheaper, rather than more expensive, foodstuffs to consumers.

³⁹The official farmgate paddy prices have been converted to rice equivalent, Dakar, by adding 14 CFA francs per kilogram of paddy for collection, milling, and distribution, and by converting to rice at a milling ratio of 0.66.

⁴⁰The market wholesale price is estimated at 95 percent of the retail price. The equivalent farm price is calculated using information given in footnote 39. Production costs are from (54) and include all government taxes and subsidies.

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Table A-1--Population*

Year	Total ^a	Per Annum growth rate (percent)	Rural ^b	Urban ^c	By Ecological Zone and Region				
					<u>Sahelian</u>	<u>Sub-tropical</u>		<u>Canarian</u>	<u>Soudanian</u>
					Fleuve	Casamance	Oriental	Cap Vert	Basin ^d
1976 (5)	5,085,388	2.56	3,622,281 71.2%	1,463,107 28.8%	528,473 10.4%	736,527 14.6%	286,148 5.7%	984,660 18.9%	2,549,580 50.5%
1975	4,958,000		3,557,000	1,401,000	n.a.	n.a.	n.a.	n.a.	n.a.
1974	4,835,000		3,493,000	1,342,000	n.a.	n.a.	n.a.	n.a.	n.a.
1973	4,714,000		3,428,000	1,286,000	n.a.	n.a.	n.a.	n.a.	n.a.
1972	4,596,000		3,364,000	1,232,000	n.a.	n.a.	n.a.	n.a.	n.a.
1971	4,482,000		3,302,000	1,180,000	n.a.	n.a.	n.a.	n.a.	n.a.
1970	4,370,000		3,240,000	1,130,000	n.a.	n.a.	n.a.	n.a.	n.a.
1969	4,261,000		3,179,000	1,082,000	n.a.	n.a.	n.a.	n.a.	n.a.
1968	4,154,000		3,120,000	1,034,000	n.a.	n.a.	n.a.	n.a.	n.a.
1967	4,051,000		3,058,000	993,000	n.a.	n.a.	n.a.	n.a.	n.a.
1966	3,949,000		2,998,000	951,000	n.a.	n.a.	n.a.	n.a.	n.a.
1965	3,851,000		2,940,000	911,000	n.a.	n.a.	n.a.	n.a.	n.a.
1960 e	3,110,000	2.2 e	2,409,000 77.5%	701,000 22.5%	350,000 11.3%	530,000 17%	150,000 4.8%	440,000 14.2%	1,640,000 52.7%

* Data are from the 1975-76 Census, Government of Senegal, Ministère de Finances et Affaires Economiques, Direction de la Statistique, Bureau de Recensement, "Resultats Provisoires du Recensement General de la Population", April 1976, and from the "Enquete Demographique 1960-61". Due to inconsistencies between the most recent estimations and earlier censuses, for the 1965-75 period historical extrapolations were made using the growth rate figure of the 1975-76 census. The sample survey results of the "enquete Demographique 1970-71" for instance underestimated the population at 3,956,616 persons.

^a Includes all legal residents.

^b Includes rural and semi-rural classification, defined as agglomerations of 9,999 persons or less.

^c Urban is defined as towns over 10,000 persons. The most recent census gave an urban growth rate of 4.4 percent per annum, which was used to estimate earlier urban populations. Rural figures are total population minus estimated urban population.

^d The Basin comprises the following four administrative regions: Sine-Saloum, Thies, Diourbel and Louga.

^e Estimates of the "Enquete Demographique 1960-61".

Table A-2--Gross Domestic Product

Year	GDP (billion francs CFA)		Population (000)	Per capita GDP (thousand francs CFA)		Share in GDP (constant prices)	
	Current prices	Constant prices		Current prices	Constant prices	Agriculture (percent)	Rice (percent)
1965	203.24	212.82	3.851	52.76	55.26	23.79%	1.13%
1966	207.04	212.13	3.949	52.43	53.72	30.93	1.27
1967	200.82	200.82	4.051	49.57	49.57	29.23	1.31
1968	216.52	214.38	4.154	52.12	51.61	30.56	1.31
1969	217.78	211.03	4.261	51.11	49.53	25.83	.57
1970	236.46	220.58	4.370	54.11	50.48	26.81	1.25
1971	241.17	217.47	4.482	53.80	48.52	21.01	.86
1972	291.73	247.65	4.596	63.47	53.88	25.31	.78
1973 ^a	278.30	210.50	4.714	59.03	44.65	17.20	.40
1974 ^a	338.00	219.00	4.835	70.07	45.29	17.70	.42
1975 ^a	394.75 ^a	195.91 ^a	4.958	79.61 ^a	39.51 ^a	19.48	1.29

* Data were taken from Government of Senegal, Ministère de Finances et Affaires Economiques, Direction de la Statistique, Comptes Economiques du Senegal, Dakar, (1962-), and population figures from Table A-1. The share of rice in GDP was estimated from Ministère du Développement Rural et Hydraulique, Direction Générale de la Production Agricole, Rapport Annuel, Campagne Agricole (various) data for the gross value of the rice sector output.

^a Preliminary estimates of the Direction de la Statistique.

Table A-3--Area Planted, Yield, and Production of Major Crops*

Year ^a	Rice ^b			Groundnuts ^c			Miller ^d			Cotton		
	ha (000t)	Yield (mt/ha)	Production (000t)	ha (000t)	Yield (mt/ha)	Production (000t)	ha (000t)	Yield (mt/ha)	Production (000t)	ha (000t)	Yield (mt/ha)	Production (000t)
1961	68.6	.984	67.5	977	.913	892	762	514	392.0	-	-	-
1962	73.7	1.126	83.0	1026	.969	995	831	489	413.0	-	-	-
1963	72.1	1.068	77.0	1015	.900	914	865	490	424.0	-	-	-
1964	74.7	1.419	106.0	1084	.878	952	959	497	477.0	-	-	-
1965	86.6	1.270	110.0	1055	.966	1019	1011	526	532.0	1.7	.360	0.6
1966	89.2	1.368	122.0	1114	1.007	1121	1069	518	554.0	1.5	.838	1.2
1967	88.1	1.424	125.5	1114	.769	857	977	424	432.0	1.8	1.213	2.2
1968	101.2	1.357	137.3	1164	.864	1005	1155	566	654.0	4.0	1.054	4.3
1969	78	.746	58.22	1191	.697	830	1054	427	450.0	6.7	1.458	9.8
1970	104	1.484	154.4	953	.828	789	1037	612	633.0	9.8	1.172	12.0
1971	92.8	.975	90.445	1049	.556	583	972	412	402.211	14.0	.830	12.0
1972	84	1.289	108.31	1060	.932	989	975	597	582.713	18.0	1.155	21.0
1973	50	.732	36.6	1071	.532	570	936	344	322.8	20.0	1.154	24.0
1974	65	.988	64.2	1026	.658	675	1074	467	570.7	29.0	1.155	33.0
1975	86	1.360	116.975	1052	.932	980	1155	688	795.045	39.0	1.098	42.0
1976	87	1.330	116			1154	n.a.	n.a.	618.045			45.0 (4)
1977	81	1.383	112				899	435	391.0			
1978	62	1.004	62				950	605	575.0			

* Data are from Government of Senegal, Ministère du Développement Rural et Hydraulique, Direction Générale de la Production Agricole, Rapport Annuel, Campagne Agricole, Dakar, 1961-75. 1976-78 data are from United States Department of Agriculture, Foreign Agricultural Service, "Senegal: Grain and Feed", Report SN 8006, Abidjan, August 3rd, 1978.

^aThe production year refers to later year of the crop year. For example, 1975 production is from 1974-75 crop year.

^bPaddy.

^cRefers to unshelled oil groundnuts only.

^dRefers to Millets and Sorghum.

Table A-4-- Processing and Marketing of Rice by Public Agencies*

Year	Paddy Collected (mt)	Percent of total production	Rice Marketed (mt)
1969-70	11565.5	7.5	6765.8
1970-71	4131.9	4.6	2417.4
1971-72	11542.4	10.7	6752.3
1972-73	3007.0	8.2	1760.0
1973-74	5845.5	9.1	3420.0
1974-75	11642.7	9.9	6811.0
1975-76	8329.8	5.8	4875.0

* Data are from Societe d'Amenagement et d'Exploitation des Terres du Delta (SAED)/Division Administrative et Commerciale (DAC)-Subdivision Commerciale, Rapport des Activites fin de Campagne, Recapitulation Generale des Evacuations Paddy, and l'Office National de Cooperation et d'Assistance au Développement (ONCAD)/ Commercialisation (COM)-Commercialisation des Produits Agricoles (CPA), Production et Commercialisation Riz Paddy 1961 a 1975.

Table A-5--Milling and Storage Capacity of Public Agencies

Location	Region	Construction Year	Milling capacity (mt paddy/year)		Outturn (percent)	Storage	
			Theoretical	Real		Paddy (mt)	Rice (mt)
Ross Bethio	Fleuve	1971	30,000t (6t/hr)	6,000t ^a (4,5t/hr)	66	5,000	1,500
Richard Toll	Fleuve	1952	35,000t (7t/hr)	b	(3)	6,000	n.a.
Séfa	Casamance	1957	10,000t (2t/hr)	2,000t n.a.	64	10,695 ^c	n.a.
Kedougou	Oriental	1975	10,000t (2t/hr)	2,000t (2t/hr)	68	1,300	n.a.
		Total	85,000mt/yr 17t/hr	10,000mt/yr 12% of theoretical capacity			

* Data are from van Ruiten, WARDA, "Post-Harvest Technology Inventory, Senegal", monrovia 1976. and data supplied by Mr. Maitre, Societe de Management et d'exploitation des Terres du Delta, Division Industrielle-Rizerie.

^aThe quantity of paddy milled has varied from 8-3000 mt/yr.

^bThis mill was repaired in 1977-78, and outturn was estimated at 65 percent of paddy.

^cIncludes storage estimates for all of the casamance.

Table A-6.--Rice Imports

(Quantities (Q) in 000mt, Values (V) in billions francs CFA)

Year	By quality						By major supplier (brokens)					
	Total		Brokens ^a		Whole grains		Thailand		Pakistan		Italy	
	Q	V	Q	V	Q	V	Q	V	Q	V	Q	V
1960	82.37	1.797	82.2	n.a.	.16	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1961	109.78	2.697	109.66	n.a.	.12	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1962	118.14	2.949	99.76	n.a.	18.37	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1963	100.77	2.75	76.24	n.a.	24.53	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1964	184.49	4.92	156.83	n.a.	27.66	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1965	179.22	4.476	168.92	4.09	10.3	.386	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1966	159.29	4.33	120.72	3.08	38.57	-1.25	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1967	153.44	5.51	152.64	5.46	.80	.047	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1968	185.16	7.05	183.71	n.a.	1.45	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1969	145.9	4.674	125.73	3.98	20.17	.70	26.6	.78	n.a.	n.a.	n.a.	n.a.
1970	119.24	3.335	118.93	3.31	.31	.023	68.2	2.06	n.a.	n.a.	n.a.	n.a.
1971	187.51	4.64	114.8	2.89	72.71	1.75	76.7	1.80	n.a.	n.a.	n.a.	n.a.
1972	169.91	4.25	168.73	4.19	1.18	.059	165.6	4.12	n.a.	n.a.	n.a.	n.a.
1973	191.97	9.52	191.43	9.465	.54	.054	74.5	2.84	7.2	.40	16.2	.85
1974	207.18	18.032	206.9	17.975	.29	.057	67.8	5.9	36.7	3.42	32.4	2.9
1975	102.125	6.47	101.7	6.00	.42	.47	17.2	1.31	32.0	1.88	41.5	2.3

* Data are from Government of Senegal, Ministère de Finances et Affaires Economiques, Direction de la Statistique, Commerce Extérieur du Senegal, Commerce Spécial, and Importations: Commerce Spécial, Dakar, Annual.

^a100 percent brokens wherever possible.

Table A-7. Selected Prices of Rice
(per kilogram)

Year	c.i.f.	Retail (Dakar)			Wholesale Brokens	Producer (official)	
		Official Brokens	Market Brokens Whole grains			Paddy	Milled equivalent
1960	21.82	32	n.a.	89.2	n.a.	n.a.	n.a.
1961	24.56	32	n.a.	81.0	n.a.	n.a.	n.a.
1962	24.96	32	n.a.	93	n.a.	n.a.	n.a.
1963	27.29	32	n.a.	88	n.a.	n.a.	n.a.
1964	26.67	32	n.a.	96	n.a.	19	29.23
1965	24.98	30	n.a.	94	n.a.	19	29.23
1966	27.19	30	n.a.	110.6	n.a.	21	32.31
1967	35.92	35	47.0	106	n.a.	21	32.31
1968	38.07	35	49.8	102	n.a.	21	32.31
1969	32.04	45	49.75	110	n.a.	21	32.31
1970	27.97	45	52.92	116	42	21	32.31
1971	24.74	40	54.42	108	37	21	32.31
1972	25.03	40	51.33	124	37	21	32.31
1973	49.59	40/60 e	63.83	148	37	25	38.46
1974	87.04	60/100 f	69.00	332	37/57	25/41.5 f	38.46/63.85
1975	59.30	100	121.75	368	57/94	41.5	63.85
1976	68.50 g	100/80 h	87.92	280	94/74	41.5	63.85

* Data are from Government of Senegal, Ministère de Finances et Affaires Economiques, Direction de la Statistique, for c.i.f. and retail prices. C.i.f. prices were calculated from Importations: Commerce Special. Retail prices are from unpublished monthly price series. Wholesale prices for brokens were provided by Mr. Cisse of l'Office National de Cooperation et d'Assistance au Développement (ONCAD). Producer prices were obtained from ONCAD/Commercialisation (COM) and the Journal Officiel de la Republique du Senegal.

^a Average c.i.f. prices in CFA francs of calender year imports calculated from Importation: Commerce Special data.

^b Annual averages.

^c Paddy producer prices were not instituted until 1963-64.

^d Milled equivalents of paddy were converted to rice at a milling ratio of 65 percent.

^e Price changes effective July 1973.

^f Price changes effective November 1974.

^g Preliminary estimates of ONCAD/COM.

^h Price changes effective May 1975.

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Table A-8 --Selected Producer Prices of Major Crops

(francs CFA per kilogram)

Year	Rice	Groundnuts ^a	Weighted average price ^b	Millet ^c	Weighted average price ^d	Cotton
1962	n.a.	18.68-22.45	20.75	19.12	n.a.	n.a.
1963	n.a.	18.87-22.45	20.76	19.12	n.a.	n.a.
1964	19	19.00-22.45	20.90	19.12	n.a.	n.a.
1965	19	19.03-22.45	20.79	19.12	n.a.	n.a.
1966	21	19.82-22.51	21.45	20	n.a.	n.a.
1967	21	19.02-22.69	20.85	n.a.	n.a.	n.a.
1968	21	16.598-18.442	17.67	17-18	17.43	37.7
1969	21	16.598-18.442	17.66	17-18	17.98	32.6
1970	21	16.598-18.442	17.66	17-18	17.86	33.0
1971	21	17.6-19.442	19.08	17-18	17.71	37.8
1972	21	23.10	23.1	17-18	17.92	37.8
1973	21/25	23.10/25.5	23.1	n.a.	n.a.	34
1974	25/41.5 e	25.50/41.5 e	25.5	25/30 e	n.a.	34/47 e
1975	41.5	41.50	41.5	30	n.a.	47

* Data for paddy, groundnuts and millet from l'Office National de Cooperation et d'Assistance au Developpement, (ONCAD)/Commercialisation (COM)/Commercialisation des Produits Agricoles (CPA), cotton prices data from Société pour le Développement des Fibres Textile (SODEFITEX). These data are official producer prices. No data are available on market prices.

^aNot a regionally uniform price until 1971-72. The figures quoted are the low-high producer prices of regions.

^bGroundnut producer prices weighted by total sales of the regions.

^cNot a regionally uniform price until 1972.

^dMillet producer prices weighted by total sales of the regions.

^ePrice changes became effective November 1974.

Table A-9--Selected Retail Market Prices of Major Foods*
(francs CFA per kilogram)

Year	CPI ^a		Broken rice	Millet	Cassava	Sweet potatoes	SMIG (Fcfa/hr)
	Total	Food index					
1967	100	100	47	38.5	31	23	44
1968	101	n.a.	49.8	33.42	28	20	44/50.6 ^b
1969	103.2	n.a.	49.75	36.1	43	27	50.6
1970	107.2	108.9	52.92	31.1	33	19	50.6
1971	110.9	107.7	54.42	41.83	31	22	50.6
1972	117.8	127.6	51.33	39.83	39	33	50.6
1973	132.9	145.9	63.83	71.92	64	52	50.6/58.19 ^c
1974	154.7	139.4	69.00	37.0	64	49	58.19/66.91 ^d
1975	201.5	198.4	121.75	44.58	70	65	107.05 ^e
1976	206.9	203.2	87.92	54.75	82.7	75.8	107.05
1977	218.0 ^f	245.5	86.8	57.20	110.2	94.6	107.05

*Data are from Government of Senegal, Ministère de Finances et Affaires Economiques, Direction de la Statistique, unpublished monthly market price series (1967-). Salaire Minimum Interprofessionnel Garantie (SMIG) series was obtained from Banque Centrale des Etats de l'Afrique de l'Ouest (BCEAO), Rapport Annuel (1963-76).

^aRefers to the consumer price index based on a traditional consumption basket in Dakar, 1967=100.

^bSMIG changes effective July 1, 1968.

^cSMIG changes effective August 1, 1973.

^dSMIG changes effective February 1, 1974.

^eSMIG changes effective November 1, 1974.

^fData refers to January-May only.

Table A-10--Rice Availability and Consumption
(000mt)

Year	Availability				Self-sufficiency ratio	Consumption Per capita ^e
	Production ^a	Seed and Losses ^b	Net imports ^c	Net availability		
1961	43.9	10.4	109.8	143.3	.23	41.2
1962	53.95	11.5	118.1	160.55	.26	45.0
1963	50.1	11.7	100.8	139.2	.28	38.1
1964	68.9	14.5	184.5	238.9	.23	63.6
1965	71.5	10.9	179.2	240.3	.25	62.4
1966	79.5	11.4	159.3	227.4	.30	57.6
1967	81.5	11.7	153.4	223.2	.31	55.1
1968	89.5	13.1	185.2	261.4	.29	62.9
1969	37.8	6.6	145.9	177.1	.18	41.6
1970	100.3	14.4	125.6	211.5	.41	48.4
1971	58.8	9.7	186.8	235.9	.21	52.6
1972	70.3	10.5	165.8	225.6	.26	49.1
1973	23.8	4.2	192.5	212.1	.09	45.0
1974	41.8	6.8	207.2	242.2	.39	50.1
1975	76.1	10.9	102.1	167.3	.15	33.7
1976	75.4	12.3	235.4	298.5	.21	58.7

* Production, seeds and losses data are from Ministère de Développement Rural et Hydraulique (MDRH)/Direction Generale de la Production Agricole (DGPA), Rapport Annuel (1961-). Data on imports are from Ministère de Finances et Affaires Economiques (MFAE), Direction de la Statistique, Importation: Commerce Special.

^aIn rice equivalents of paddy at a milling ratio of 65 percent. Production refers to later year of crop year.

^bSeed use is on average 80 Kgs of paddy per hectare. Losses are estimated at 10 percent of paddy production. Both seeds and losses are converted to rice equivalents at the 65 percent milling ratio.

^cImports minus exports and transshipments. The following years include rice food aid: 1970 7,000 mt, 1973 500 mt, and 1974 3,200 mt.

^dSelf-sufficiency ratio has been calculated as production minus seeds and losses divided by total net availability

^eNet availability divided by population data from Table A-1.

Note on the Analysis of the Instability
of the Production and Import of Rice in Senegal

The purpose of this note is to present the data and results of regressions used to test the hypothesis that rice imports into Senegal are more unstable than domestic production of rice. None of the results supports this hypothesis. In fact, the opposite tends to be true: domestic production is more unstable than imports.

The tests use an F statistic calculated using the variance of trend line regressions for the various series. These variances equal the sum of the squared residuals of the regression estimates, divided by the degrees of freedom ($n-2$). In order to avoid biases caused by different units of measurement (such as thousands of metric tons or CFA francs per kg), the residuals are calculated using data normalized to have zero mean and unit variance (that is, the values used in the regressions equal the differences between the actual values and the mean of the series).

Table 1.--Data Used to Analyze Stability of Rice Production and Imports*

Year	Paddy production (thousand mt)	c.i.f. price of rice imports (CFA francs/kg)	Rice imports (thousand mt)	Value of rice imports (million CFA francs)	Index of export values ^a	c.i.f. price deflated by export index (CFA francs/kg) ^b	Import values deflated by export index (million CFA francs)
1961	67.5	24.6	109.8	269.7	100	24.6	603.2
1962	83.0	25.0	118.1	294.8	97	25.9	645.2
1963	77.0	27.3	100.8	275.1	121	22.6	616.8
1964	106.0	26.7	184.5	492.1	118	22.7	605.0
1965	110.0	25.0	179.2	447.6	118	21.2	529.6
1966	122.0	27.2	159.3	433.1	113	24.2	656.9
1967	125.5	35.9	153.4	551.0	111	32.5	1,165.5
1968	137.3	38.1	185.2	705.1	112	33.9	1,289.2
1969	58.2	32.0	145.9	467.5	119	27.0	865.4
1970	154.4	28.0	119.2	333.4	132	21.2	592.8
1971	90.4	24.7	187.5	463.9	144	17.2	425.9
1972	108.3	25.0	169.9	425.3	161	15.6	389.7
1973	36.6	49.6	192.0	952.1	228	21.7	1,076.7
1974	64.2	87.0	207.2	1,803.5	389	22.4	1,949.4
1975	117.0	59.3	102.1	605.5	308	19.3	1,143.0
1976	116.0	68.5	235.4	1,612.5	236	29.0	1,988.8

* Data on paddy production are taken from Government of Senegal, Ministère du Développement Rural et Hydraulique, Direction Générale de la Production Agricole, Rapport Annuel, Campagne Agricole, Dakar, 1961-75. Data for 1976-78 are from U.S. Department of Agriculture, Foreign Agricultural Service, "Senegal: Grain and Food," Report SN 8006, Abidjan, 3 August 1978. Data on import prices and quantities are from Government of Senegal, Ministère de Finances et Affaires Economiques, Direction de Statistique, Commerce Extérieur du Sénégal, Commerciale Spécial and Importations: Commerce Spécial, Dakar, annual. The price index for exports is taken from the World Bank, Price Prospects for Major Primary Commodities, Report No. 814/77, Washington, D.C., June 1977.

Table 1 (continued).

^aThis index is based on current U.S.\$ and is for a weighted composite of sugar, oranges/tangerines, lemons/limes, bananas, beef, coconut oil, copra, groundnut oil, groundnuts, palm oil, fishmeal, and soybean meal.

^bThe deflated values are calculated as the quotient of the real values divided by the index of export values.

Table 2.--Regression Results

Dependent variable in trend line regression	Standardized beta coefficient	R ²	Variance of the regression (based on normalized residuals)	F statistic compared to rice production regression ^a
Senegalese paddy production	0.053 (0.446)	0.003	1.069	n.a.
Current c.i.f. price of rice imports	0.719 (3.868)	0.517	0.518	2.062
Current value of rice imports	0.681 (3.481)	0.464	0.578	1.861
Deflated c.i.f. price of rice imports	-0.202 (0.773)	0.041	1.013	1.040
Deflated value of rice imports	0.591 (2.740)	0.349	0.697	1.532

^aWith degrees of freedom equal to 14 and 14, the F statistics should be compared to the following values:

95 percent confidence interval: 2.48
90 percent confidence interval: 2.02
75 percent confidence interval: 1.44