RICE COMSUMPTION AND THE EFFECTS OF RICE SECTOR REFORMS IN SENEGAL

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1 INTRODUCTION

The purpose of this report is to update information about Senegalese rice consumption and identify actual and expected impacts of rice sector reforms on rice consumption patterns and consumer incomes and well-being Ultimately, the success of rice market liberalization depends on its effect on consumer incomes and well-being (including nutritional status) Paradoxically consumers have not figured importantly in the debate on market reforms

Much of the debate about the merits of market liberalization has concerned its impact on the production of local rice and the financial health of the local rice industry This has been the focus because local production is considered by some to be the best (and some would suggest, only) way to ensure long term food security Unfortunately, the concepts of food self-sufficiency and food security have frequently been confused in the debate The food self-sufficiency argument rests on the assumption that relying on trade is dangerous because it exposes countries to the vagaries of trading partners (and the world market) The reverse side of the coin is that attempting to achieve food self-sufficiency can be very costly by not allowing countries to exploit goods and services (which may not include basic foodstuff) in which they have a comparative advantage Sustainable and growth-fostering agricultural development relies on identification and specialization in areas of comparative advantage The corollary to this argument is that subsectors that do not enjoy comparative advantage are allowed to decline

The critical question that needs to be answered in the context of rice sector reform in Senegal is whether the local rice industry can be a regular source of low cost food when measured in terms of true economic benefits (i e comparing true economic costs with true economic returns) A companion report funded by the USAID Rice Sector Adjustment Project (RSAP) has found that some of the local rice production systems operate at an economic loss, rice produced in these systems can not compete with cheap imported rice without important subsidies, which ultimately hurt rice consumers and the overall economy (Metzel, 1998)

No in-depth analysis of the economics of rice consumption has been done since the Kite, et al study (Kite, et al , 1992) With the benefit of results from the Senegalese household study (ESAM)[1] and a subsequent study of urban Dakar households, Kite's report can be updated and new light can be shed on consumption patterns, levels of expenditure and consumption response of rice consumers This in turn can inform policy makers about the effects of rice subsector reforms on rice consumption and consumption of substitutes, especially local grains such as millet, maize and sorghum, and ultimately its effects on consumer welfare

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[1] The Enquête senegalaise aupres des menages (ESAM) was conducted by the Statistics Directorate (DPS) of the Ministry of Finance from March 1994 to April 1995 It is an LSMS (Living Standards Measurement Survey) type survey often conducted as part of Social Dimension of Adjustment projects The ESAM was conducted on a sample of 3 300 households urban and rural in each of the regions of Senegal Information on revenues and expenditures comes from 33 34 days of observation one 33 day visit for urban households two 17 day visits with a 6-month break in-between for rural households It took place after the devaluation but before the rice price was permitted to fully adjust to the devaluation and before any other reforms were implemented

2 RICE CONSUMPTION IN SENEGAL

Rice is the single greatest supplier of calories in Senegal a position that until the mid-to-late 1970s was held by millet As a result of large increases in imports since the 1980s rice has surpassed millet and sorghum combined as the most important food in Senegal consistently supplying more calories than millet and sorghum in the last two decades In addition to being the dominant source of calories, rice is especially important as a wage good in urban areas Consequently, it is a strategic good that the government feels it must either control or monitor very loosely Additionally, there is anecdotal and circumstantial evidence that millet producers who also consume rice, attempt to "peg" or link millet prices to rice prices[2] This contributes to making rice an important determinant of overall inflation

Historically, rice has not been a traditional staple food for much of Senegal outside of the Casamance River Valley, where the Dioula have grown it for centuries Before rice was introduced to other areas of the country, millet and sorghum (and fonio) were the staple foods With rapid urbanization, a policy of providing cheap rice, and little improvement in millet and sorghum production and processing systems, rice overtook these traditional grains in the Senegalese diet This happened first in urban areas, where ease (speed and low cost) of preparation gave rice a distinct advantage over other grains More recently, anecdotal evidence is that rice has been overtaking the traditional coarse grains even in rural areas

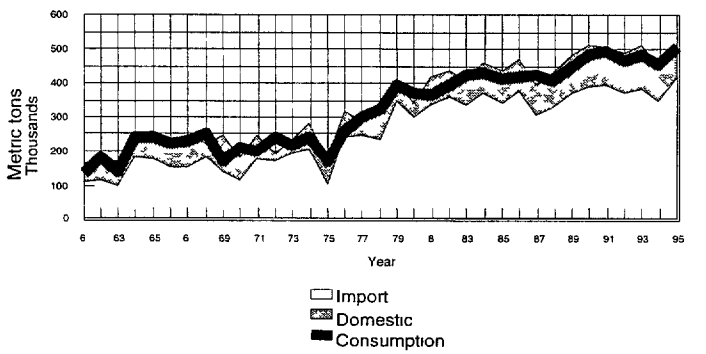
2 1 Trends and Fluctuations in Aggregate Consumption

Rice consumption in Senegal has grown strongly over the past three decades since independence Most of this growth has been fed by rice imports, which were equivalent to 80 percent of rice consumption in the 1961- 1995 period Domestic production has played a relatively small role in meeting rice demand

Aggregate consumption levels grew from approximately 150 000 MT in 1961 to over 500,000 in 1995, as Figure 1 shows Carryover stocks (the difference between consumption and the sum of local production and imports) have generally been small Overall growth in rice consumption in the 1961-

Figure 1

Domestic Production Imports and Consumption of Rice 1961 1995



Source FAOSTAT, from FAO website, 1997

[2] There is strong correlation between rice and millet prices at retail despite sharp seasonal fluctuations in the latter Over the 1990 1997 period the correlation was 0 85 which is indicative of a real (significant) linkage between the two price series (CSA 1997)

rice consumption in the 1961-1995 period averaged 5 6 percent per annum Domestic rice production grew at a relatively rapid annual average of 11 2 percent, but from a low base Imported rice, grew at a slower pace of 7 9 percent each year

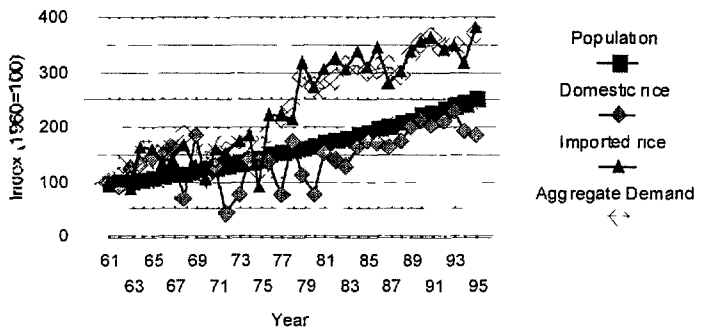
Trends in rice consumption are clearly upward, but the rate of increase has been slowing down in more recent years This holds true for local production and imports as well, as Table 1 shows

Table 1 Average Annual Growth Rates in Local Production Imports and Consumption of Rice in Senegal 1961 1995

Period	Local production		Imports		Consumption	
	percent	CV	percent	CV	percent	CV
61-69	20 9	3 1	7 2	4 8	6 8	4 8
70 79	12 1	5 4	18 3	2 8	11 1	2 0
80-89	9 7	3 6	1 2	9 9	1 4	4 1
90-95	0 9	-10 5	2 5	4 2	2 2	3 3
61-95	11 2	4 4	7 9	4 2	5 6	3 5

Notes The sum of local production and imports will not necessarily equal consumption the difference is carry over stocks losses and non food uses
Source FAOSTAT 1998

Figure 2
Growth of population and domestic production imports and consumption of rice 1961 - 1995



Source FAOSTAT 1998

Growth in demand for rice has exceeded population growth signifying that changing tastes as well as population growth have fueled growth in rice consumption Figure 2 shows that rice imports and rice demand have fairly consistently outstripped population growth since the 1960s Domestic production, however, has not kept pace with population growth since the mid-1980s

Per capita consumption has grown from an average of 50 kilograms per annum in the early 1960s to 60 kilograms in the mid-90s There has, however, been substantial year-to-year fluctuation in consumption caused by even larger fluctuations in rice imports and domestic production Table 2 presents average per capita levels of local rice production, imports, and consumption for multiple-year periods between 1961 and 1995 Coefficients of variation allow comparison of variability The most notable point is the relatively high variability in the contribution of domestic production to per capita rice availability This greater variability was most marked in the 1970s and 1980s Variability in imports and consumption is lower because of reliance on the much larger world market Another notable aspect of the table data is that all variability has declined substantially since the

early 1980s Since most of the variability was in domestic production something clearly occurred (improved irrigation systems?) to stabilize production [3]

Growth rates in per capita rice consumption, high in the 1960s and 1970s, have dropped substantially in the 1980s and early 1990s, as Figure 3 shows Average annual rates of growth in per capita demand have fallen from 7 9 percent in the 1970s to -0 4 percent in the early 1990s The decline in the rate of growth of rice consumption could either mean that rice has saturated the Senegalese market or that high prices (and low purchasing power) in the early 1990s have led some consumers to substitute other foods for rice[4]

Table 2 Per Capita Production, Imports and Consumption of Rice in Senegal, 1961-1995

Period	Local production		Imports		Consumption	
	Kgs	CV	Kgs	CV	Kgs	CV
61-69	19 8	0 25	39 7	0 20	55 0	0 20
70 79	13 4	0 33	42 3	0 28	53 4	0 19
80 89	13 6	0 17	54 5	0 09	65 2	0 05
90 95	14 8	0 11	49 3	0 08	61 7	0 06
61 95	15 3	0 29	46 3	0 21	58 6	0 16

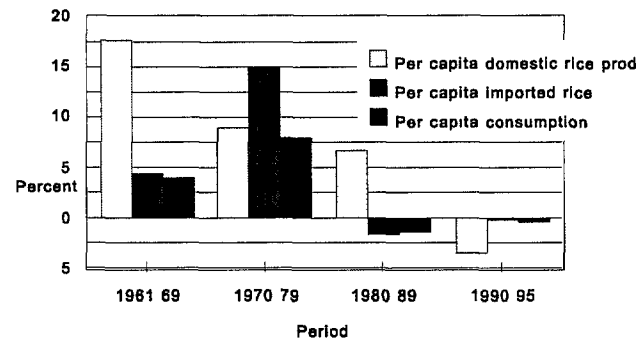
Notes The sum of local production and imports will not necessarily equal consumption the difference is carry over stocks losses and non food uses
Source FAOSTAT 1998

The 1970s was the period of greatest growth in rice consumption It was a period of relatively rapid economic growth and rapid increases in quantities of rice imported By contrast, growth in local rice production was already declining from its 1960s highs

2 2 Structure of Rice Consumption

The Senegalese rice market is unique for its high reliance on broken rather than whole grain rice Only neighbors Gambia and Mauritania have similar reliance on broken rice For historical reasons associated with the French colonization of Senegal, broken rice, which is far less expensive than whole rice, has become the dominant type consumed in Senegal The importance of this

Figure 3
Average annual rice production imports and consumption growth rates 1961 1995 (per capita)



Source FAOSTAT 1998

[3] The results in Table 2 (and our interpretations) might also be simply artifacts of poor data quality

[4] The latter explanation as we show below appears unlikely rice prices relative to potential substitutes have not increased

artifact of Senegal's colonial history is that the rice consumed in Senegal is among the least expensive in the world, it is essentially a by-product of rice milling

Broken rice accounts for roughly 97 percent of the rice consumed by the average Senegalese household Most of this is "100 percent brokens," a trade category characterized in the world market by Thailand "A1 Special," and generally known to Senegalese consumers as "Siam" rice Among Senegalese consumers, "Siam" applies to high quality (sorted and cleaned) broken rice from origins other than Thailand (Baudoin and Simantov, 1996) With the exception of a short period early in the market reform process, Thailand A1 Special has dominated the Senegalese market Further below we discuss details of the broken rice market and consumer preferences

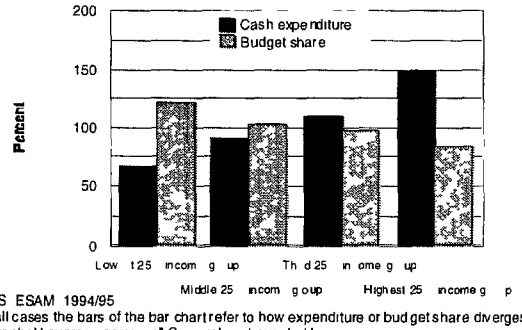
Average monthly household rice consumption in 1994/1995 is estimated from ESAM household survey data to have been 54 kilograms [5] From the same database we compute that average monthly household rice expenditure (cash basis) was 10,000 FCFA, which is 19 percent of total food expenditure and 8 4 percent of total cash expenditures[6]

In the sections below, we review the structure of rice consumption in Senegal by analyzing household consumption and expenditure pattern differences by income level, region and place of residence (urban vs rural) These are important factors influencing consumption They need to be taken into consideration when evaluating the effects of rice sector reforms on levels of consumption and consumer welfare

2 2 1 Consumption and Expenditure Variation by Income Grouping

Income level is an important determinant of the amount and quality of rice that will be consumed by a household It is also an important determinant of the importance of rice in overall expenditure (the rice budget share) Thus, households at different levels of income can be expected to react differently to changes in rice prices and need to be looked at

Figure 4
Monthly Rice Expenditures and Rice Shares of Food Budget, as percent of overall household average, 1994-1995



DPS ESAM 1994/95
In all cases the bars of the bar chart refer to how expenditure or budget share diverges from the household average across all Senegalese households

Note Overall household averages are 10 000 FCFA cash expenditure and 19% budget share

[5] This estimate is derived by working back from ESAM estimates of household rice expenditure levels and dividing by average prices prevailing during the survey period This is close to the estimate that would result from multiplying average monthly per capita consumption (5 kilograms) by average household size (approximately 10) Refer to Footnote 1 for information on ESAM

[6] The definition of expenditures in this report is cash expenditures as opposed to total expenditure including consumption of goods produced by the household Unless otherwise mentioned all references to expenditure refer to cash expenditure

separately For this report we have divided households into four income quartiles The first quartile is made up of the twenty five percent of households with lowest income, the fourth quartile includes households with the highest income Figure 4 illustrates how rice expenditures and rice budget shares change with income levels Variation from 100 shows the degree to which the average household in each income category differs from the overall Senegalese household average

The richest households spend one and a half times as much on rice (15,000 FCFA) as the average Senegalese household, but their rice budget share as a percent of total food budget (15%) is eight-tenths of the average By contrast, the poorest households spend 68 percent (6,800 FCFA) of the average household on rice but have a rice budget share that is 120 percent (23%) of the average

This primarily represents a difference in the quantity of rice consumed Richer households consume more rice than their poorer counterparts The difference in the quality of rice purchased by the average household in the top and bottom quartiles is not as large as might be expected ESAM data show that among the poorest 25 percent of households the importance of broken versus whole grain rice purchases is identical to the average household (Table 3)[7] This ratio declines only slightly for the richest quartile of households This should not be taken to imply, however, that there are no quality differences in the rice consumed by rich and poor households Broken rice is sold in many quality/price combinations—fragrant vs plain, 100% broken vs intermediate (less than 100% broken), high quality "Siam" versus lower quality "Indian" and "Pakistani" rice, etc Even when rich and poor households consume broken rice for the traditional dish of "chebujen " the richer households are more likely to purchase choice, fragrant 100% broken rice, while the poor purchase cheaper non-fragrant, less homogeneous rice

Table 3 Importance of Broken Rice in Average Household Rice Expenditure

Household income group	Broken rice expenditures as percent all rice expenditures	Relative reliance on broken rice (as percent of avg household)
Lowest 25%	97 6	101
Second 25%	98 8	102 2
Third 25%	96 5	99 8
Highest 25%	93 4	96 7
All households	96 7	100

Source ESAM DPS 1995

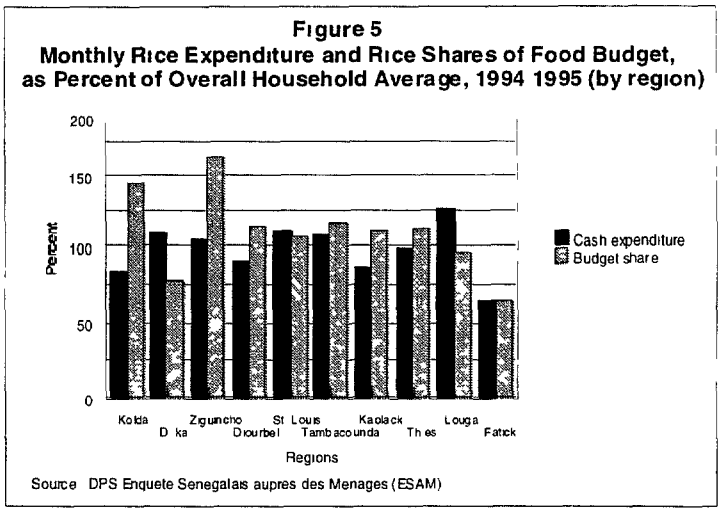
Note Overall household averages are 10 000 FCFA cash expenditure and 19% budget share

2 2 2 Consumption and Expenditure Variation by Region

Rice is the dominant food throughout the country, but is not equally important everywhere There is substantial regional variation from the average monthly household rice

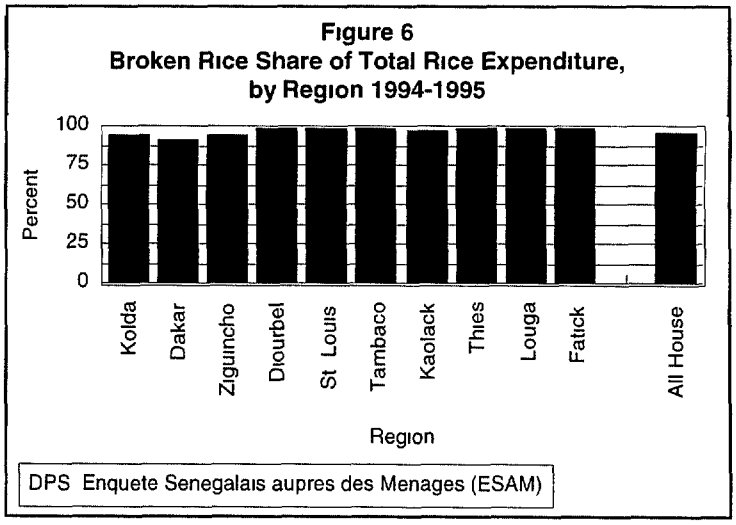
[7] The ESAM study subdivided rice into two categories broken and whole In fact there are far more distinctions than that This is a limitation of the survey but should not have much bearing on our analysis

budget of 10 000 FCFA and the 19 percent food budget share for rice Some of these differences are presented in Figure 5



In terms of actual expenditure levels, the largest variations from the norm are in the regions of Louga and Fatick, where rice expenditures are 127 percent (12,700 FCFA) and 65 percent (6,500 FCFA), respectively, of the Senegalese household average Some of this of course, is related to income differences Based on the preceding analysis, we would expect households in richer regions to consume more rice and spend more for it But there are other factors at work When Dakar is removed from the sample, Louga households are better off than the average Senegalese household, but their rice budget shares are only slightly below the average This is surprising, because richer households would be expected to spend a smaller proportion of their budget on rice than poorer households On the other hand, Fatick households are less well-off then the average, but also have lower than average rice budget shares, which also points to non-income factors influencing rice consumption across regions Some of the difference can be explained by the relative availability of rice and other local cereals Consumption habits obviously also play a role in the differences Note that Dakar rice purchases are only slightly above the average

There are also some large regional differences in rice budget shares The proportion of overall household expenditure that goes to purchasing rice is low in Fatick (13%) and Dakar (15%), and very high in Kolda (27%) and Ziguinchor (31%) Income differences may be responsible for the high shares in Kolda and Ziguinchor, as both regions have lower than average (or average) rice expenditure We point out below, as well, that these regions tend to use more of the relatively expensive whole grain rice These differences in rice budget shares show that there are important dissimilarities in the vulnerability of households to variation in rice prices For example, changes in rice prices will have a smaller income effect on households in Fatick (low household income, but low rice-shares) and Dakar (high income and low rice shares) than elsewhere They will have a larger income effect on households in Kolda and Ziguinchor (low household income and high rice shares)



Survey data show that households consume broken rice almost exclusively, which is in keeping with conventional wisdom Figure 6 shows how little variation there is across regions in the importance of broken rice in the rice budget The only regions in which rice has any appreciable importance are Dakar Kolda and Ziguinchor Much of the difference in Dakar results from greater urbanization and relatively high incomes Even then, broken rice purchases make up 90 percent of the average Dakar household's rice purchases

2 2 3 Urban-Rural Differences in Rice Consumption

The urban-rural difference in rice expenditures, budget shares and quality are substantial They are presented in Table 4 which shows three important differences First, urban households spend nearly one and one-third as much on rice per adult equivalent as their rural counterparts

Table 4 Urban-rural Differences in Rice Expenditure, Budget Shares and Quality

Household level	Urban	Rural	National
Average monthly rice budget per AE (F CFA)	1410	1095	1221 58
Average annual rice expenditure (F CFA)	133921	110596	119983
Rice share of food budget (percent)	16 42	22 64	19
Rice share of total budget (percent)	5 84	14 85	8 4
Broken rice share of rice budget (percent)	94	99	97

Notes Broken rice share of total rice budget is still a preliminary estimate Initial questionnaires made the distinction between whole and broken rice but these data did not undergo the same degree of analysis and cleaning by DPS staff working on ESAM as other data
Source Division des Previsions et de la Statistique Enquete senegalais aupres des menages (ESAM)

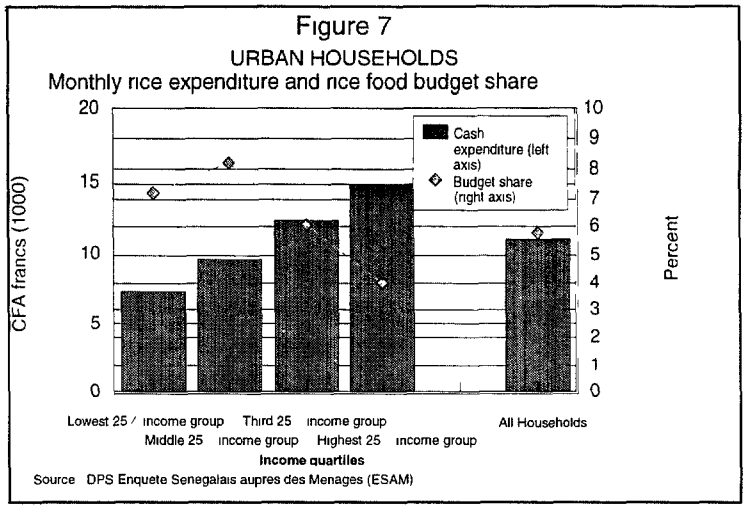
Second, despite larger expenditures, the rice budget represents a smaller share of the food and overall budget of urban households than it does of rural households We explore below how this varies across income groups within urban and rural segments of the population The importance of rice in the average Senegalese diet is demonstrated by the urban-rural differential in rice expenditures as a share of the food budget versus its share of total expenditures The rice-to-food expenditure ratio for rural households is about 133 percent that of urban households When compared to total expenditure, however, the rural household's rice budget share is nearly 300 percent that of urban households In order to maintain a consumption level similar to their urban counterparts, rural households are making relatively large outlays for rice

The third important difference between urban and rural households is that urban households, generally being richer, buy higher quality, higher price rice than their rural counterparts These differences between urban and rural households will condition the strength of their response to rice price changes as well as changes in prices of substitute foods The differences also influence consumption responses to income changes

We have observed differences in rice consumption and rice budget shares across income groups and regions and between rural and urban households Below, we continue this analysis with an assessment of income level differences within urban and rural households

Urban Rice Consumption Differences by Income Level We have seen above that the average urban household consumes more rice than its rural counterpart Rice expenditures however represent a smaller share of urban households' budgets Consequently their diets are less exposed to the risk of price variability in the rice market There are however differences among urban households across income levels

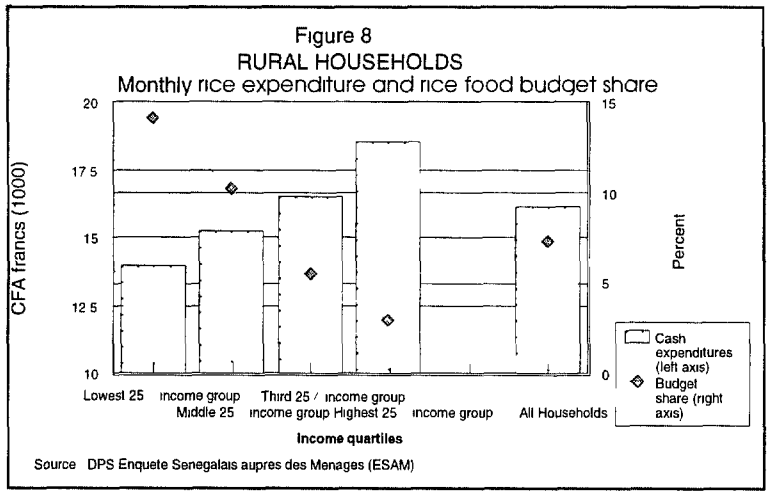
Urban households in the bottom income quartile, earning on average 7,243 CFA francs per adult equivalent each month, spend nearly 18 percent of their food budget on rice (Figure 7) This is seven percent greater than the overall urban household average and 21 percent higher than the upper income average Actual rice expenditures of the lowest income households is, however, only 65 percent of the average urban household



At the other end of the spectrum the richest urban households have rice budget shares that are 89 percent of the average urban household, but spend 1 1/3 as much on rice as the average urban household

There are small income-related differences in the broad qualities of rice consumed by urban households The poorest households' broken rice budget share is roughly 3 percentage points higher than that of the richest households This does, however, mask quality differences within the broader categories of "whole grain" versus "broken" rice

Rural Rice Consumption Differences by Income Level Rice expenditure differentiation by income level is not substantially different in rural areas from what it is in urban areas Lowest income households have a rice budget between two-thirds and one-half the average rural household (Figure 8) Highest income households spend not quite half-again as much on rice as the average There is a greater disparity, however in the



importance of rice in the food budget (rice food budget share) In the rural areas the poorest households have a rice food budget share that is nearly 25 percent above that of the average rural household The richest households' rice budget shares are just below the average

2 2 4 A Look at Income Elasticities of Demand for Rice

The data we have presented shows that there are some smallish income effects on rice demand As income changes there are slight changes in demand for rice A review of income elasticities gives quantitative evidence of this The income elasticities presented below come from estimations of Engel's functions on the ESAM data

Table 5 shows income elasticities of expenditure resulting from estimation of a double logarithm Engel's equation with the natural logarithm of per capita rice purchases as the dependent variable The independent or explanatory variables include the natural logarithm of total expenditures, the natural logarithm of household size, the natural log of millet expenditures, region, sex of head of household, and household strata

The results show that the income elasticity of rice expenditures in Senegal is positive but less than one (0 377) Rice can thus be considered a normal good and a necessity Demand (expressed as expenditure) for rice increases as incomes increase, but it increases at a slower rate than the increase in income Technically, this means that across all Senegalese households a one percent increase in total expenditures (equivalent to income) will result in a 0 377 percent increase in rice purchases Note the lack of significance of the millet expenditure variable, which is indicative of a lack of substitutability

Table 5 Results of Engel's Equations Estimations for Rice Expenditure in Senegal*

	Sample size	R-squared	Constant	ln total expenditure	ln millet	ln hh size
Entire sample	1680	0 16	4 676**	0 377**	0 070	-0 670**
Poorest 25 percent	371	0 27	1 045	0 669**	0 018	-0 859**
Richest 25 percent	466	0 12	5 294**	0 281**	0 105**	-0 495**
Urban households	1041	0 10	6 266**	0 232**	0 095**	-0 491**
Rural households	643	0 35	1 571**	0 696**	0 037	-1 010**

* The dependent variable is the natural logarithm of rice budget shares
** Significantly different from zero at the 95% significance level

The poorest households have a larger income elasticity of demand for rice (0 669), which means that rice is close to the cusp between being a necessity and a luxury good for them For richer households, rice demand has a very small income elasticity, but remains positive, which means it is not considered an inferior good [8] Urban households, which also tend to be richer, on

[8] An inferior good is one whose consumption declines with increases in income

average have a smaller income elasticity of rice expenditure than do rural households A one percent increase in total expenditure will result in a 0 70 percent increase in rice demand for the average rural household but only a 0 23 percent increase for the average urban household

Table 6 shows income elasticities of *expenditure shares* (as opposed to quantities consumed) resulting from estimation of a double logarithm regression equation with the natural logarithm of rice budget shares as the dependent variable The independent variables are the natural logarithms of total expenditure, millet budget shares and size of household

Table 6 Results of Engel's Equations Estimations for Rice Budget Shares in Senegal*

	Sample size	R squared	Constant	ln total expenditure	ln millet budget share	ln size of household
Entire sample	1680	0 27	8 332**	0 554**	0 070**	0 330**
Poorest 25 percent	371	0 15	5 568**	0 313**	0 018	0 141
Richest 25 percent	464	0 25	9 415**	0 614**	0 105**	0 505**
Urban households	1041	0 27	10 433**	0 673**	0 095**	0 509*
Rural households	643	0 08	6 004**	0 267**	0 037	-0 010

* The dependent variable is the natural logarithm of rice budget shares
** Significantly different from zero at the 95% significance level

The results show that income elasticity of rice expenditure shares is negative, with an absolute value lower than one This means that as incomes increase the proportion of expenditures that goes to rice purchases declines This is precisely what is suggested by economic theory for necessities For the average household, a one percent rise in income leads to a 0 55 percent decrease in the rice budget share, which is probably replaced by higher priced foods such as meat or bread, and non-food items

The negative income elasticity for rice budget share is even more marked among high income households, whose rice budget shares decline more sharply with income increases than their poorer counterparts A similar, albeit stronger, pattern holds for urban versus rural households A one percent increase in total household expenditure in the average urban household results in a 0 67 percent **decrease** in the share of the household budget that goes to rice purchases For rural households, the same increase in expenditure results in a 0 27 percent drop off in rice purchases as a percentage of total expenditure

Rice is already consumed by most households in Senegal We see from the results of Engel's equation estimations that increasing incomes result in reduced importance of rice in the food budget, but certainly no movement away from rice Economic statistics show that real per capita GDP has grown during the liberalization period Consequently, we would expect rice shares to be declining, but overall consumption to have increased[9]

[9] On the other hand if incomes are actually declining as the "man on-the street" appears to insist we should expect to see rice claim an ever greater part of household budgets

2 3 Consumer Preferences and Patterns of Consumption

Rice consumption patterns in Senegal are well established most households eat broken rice which we have pointed out comprises approximately 98 percent of rice consumed by the average household and 19 percent of total household food expenditures

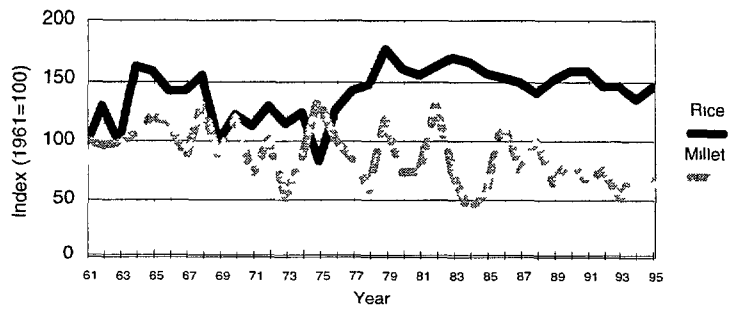
Broken Rice is Preferred Broken rice is the type of rice most commonly consumed which supports the conventional wisdom that it is preferred by Senegalese consumers In fact, RSAP research confirms the perception that broken rice of the "Siam" quality is the ideal base for "chebujen" the national rice and fish dish Broken rice appears better able to soak up the oils and sauces from fish and other ingredients that are cooked in one pot with the rice (Baudoin and Simantov 1996)

There is another reason for the popularity (read frequent use) of broken rice, of course, it sells at roughly half the price of whole grain rice This makes it difficult to determine whether broken rice is truly preferred to whole grain rice In fact, it is possible, if relatively rare, to find "chebujen" made with whole grain rice Furthermore, a few of the cooks interviewed in the ICEA/IRIS study on consumer preferences and patterns of consumption insisted the primary reason more broken rice is used is because of its relative cheapness Price mixes with taste, habit and custom to determine use

Imported Rice is Preferred The only homogeneous broken rice on the market is imported rice Locally produced rice is intermediate, neither whole grain, nor homogeneous broken rice, which makes it less sought after (Baudoin and Simantov, 1996) Imported rice, while still dominant, was especially dominant in the broken rice market under the CPSP-SAED regime controlling imports and local production Under that system local production did not respond to consumer preferences for "mixed meals" such as "chebujen" (which called for homogeneous broken rice) or "sauce-based meals" in which whole grain tends to be used Local rice put on the market by these parastatal organizations was not particularly well suited to either type of rice dish Consequently, imported rice became reputed for its quality and acceptability Only since liberalization have local millers attempted to differentiate their product and provide homogeneous broken rice to consumers while attempting to penetrate the much smaller, but more lucrative whole-grain market

Rice is Preferred Over Local Coarse Grains Evidence abounds that rice has been crowding out other cereals in the diet of the average Senegalese In the 1960s, the average Senegalese consumed 55 kilograms of rice and 82 kilograms of millet each year By the first half of the 1990s, the consumption levels had changed to 62 kilograms of rice and 55 kilograms of millet This shift can be seen in Figure 9, which presents

Figure 9
Per capita rice and millet consumption indices
1961 1995 (1961=100)



Source FAOSTAT 1998

indices of per capita rice and millet consumption Per capita millet consumption has been declining for the past 30 years In 1995 it was roughly 60 percent of 1961 levels, and is continuing its downward trend Per capita rice consumption on the other hand has followed a less clear path In 1995, rice consumption was nearly 50 percent greater than in 1961, but that level is part of a downward trend from the high per capita consumption levels of the late 1970s and early 1980s, a period of relatively high economic growth

There is also substantial anecdotal evidence that rice is crowding out millet and other local coarse grains (sorghum and maize) in the average Senegalese diet The statistics, which show a growing gap between per capita consumption of millet and rice, confirm this (Figure 9) Urban rice consumers state that millet is an unacceptable substitute to rice for the mid-day meal, citing the "millet is heavy and causes drowsiness" argument (Baudoin and Simantov, 1996) Rice is also much more easily prepared Furthermore, comparison of rice with partially processed millet generally indicates that rice is less expensive, as we show below[10] There are also social considerations associated with millet consumption at mid-day Paradoxically, frequent consumption of millet based meals is considered an indicator of poverty (Baudoin and Simantov, 1996) even though millet based meals are more expensive or, if made in the home from unprocessed or semi-processed millet, require large amounts of household labor Household labor, especially in urban areas, is unlikely to have a zero opportunity cost

Despite what appears to be continued movement away from local coarse grains (millet, sorghum and maize), there has been some evidence in 1996 and 1997 that millet products are making new inroads into the diets of some Senegalese The prevailing view is that increases in rice prices combined with real drops in incomes (mostly in urban areas) have resulted in some consumption shifts into millet products primarily for the least well-off households A local newspaper article reported growing demand among the least well-off households for millet products (Sud, 6/97) There is no evidence that the average household has lost income, however, and aggregate data point to income increases in the period during and following structural reforms, including rice market liberalization (Berg, et al 1997), so the mechanisms that would be driving increased consumption are not completely clear

The perception of lost income resulting from devaluation is probably most true in urban Dakar (as opposed to the rest of the country) where there is likely to be a larger proportion of workers on relatively fixed incomes It is worth noting in this regard, as an example, that farmers growing millet have experienced price increases for their millet that have surpassed rice price increases The more plausible explanation for the still very slight increases in millet/sorghum consumption is the donor-funded campaign to improve the image and acceptability of local cereals-based foods The European Union has taken the lead in supporting efforts to understand constraints to and promote increased consumption of local cereals

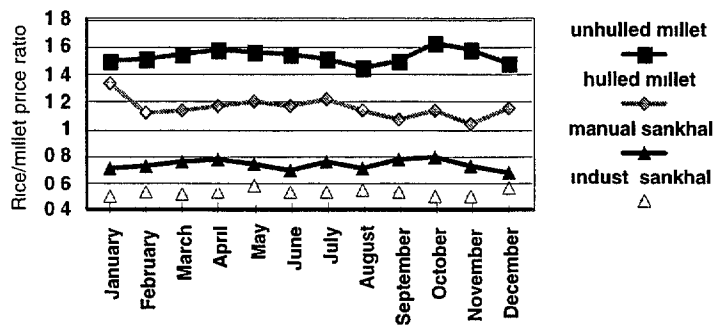
Relative Cheapness of Rice-based Meals The dominance and cheapness of imported broken rice also has ramifications for the consumption of other local cereals One of the

[10] To understand relative cost it is preferable to compare rice price with the price of partially processed rather than whole millet grain

objectives of the RSAP was to bring about conditions that would lead to increased consumption of local cereals Of these millet products are the most likely substitutes[11] to rice Here again conventional wisdom and tradition appear to limit the extent to which millet-based meals can compete with rice-based meals Millet products compete for evening meals but are rarely eaten for the mid-day meal The ICEA/IRIS study concluded that there were a number of factors associated with this including cost, time of preparation, availability and custom (1996)

Another reason millet-based meals are not consumed more frequently is that it takes much time to prepare millet products such as soungouf and sankhal, potential rice substitutes The high cost of processing millet shows up in the price of millet products, which cost roughly the same as whole grain rice Even manually produced ' sankhal" costs about twice as much as broken rice (Figure 10) Hence there is an important cost factor, which, however, does not fit with the predominant perception that households that eat millet-based meals at lunch are relatively poor and unsophisticated

Figure 10
Rice-to-millet product ratios (millet-relative prices)
Senegal 1997



Source CSA 1997

Unhulled millet remains cheaper than broken rice (Figure 10), but this is not the proper product to compare with rice Hulled millet, which is what households are more likely to purchase when they do not buy fully-processed millet products such as sankhal or soungouf, approaches price parity with broken rice Households that can process millet cheaply at home can probably consume millet-based dishes for less than rice The results of a consumer panel on local cereals (IRIS 1997) showed that even among urban households, most of the millet products consumed were prepared in the household But, these households only engaged in the final stages of production of millet-based products such as "thiere" after purchasing semi-processed products such as sankhal or soungouf For such households the cost of millet products remains high

Frequency of Purchase We have seen above how much the average Senegalese household pays for rice and how important rice is as a share of food and overall budgets We have also seen how this varies across income levels, regions and between rural and urban households In order to understand how changes in rice policy influencing rice prices affect consumer behavior, rice consumption and overall nutritional status it is important to understand how households acquire the rice that they consume The speed with which price changes modify

[11] Millet is not a perfect substitute for rice especially in the short to medium run There are many cultural habits and customs that tend to relegate millet consumption to the evening meal In the short run millet (and other local coarse grains maize and sorghum) should be considered weak substitutes This is supported by the insignificant coefficients for the millet price/expenditures in the Engel s functions

consumption depends to a large extent on the frequency with which rice is purchased by households A household that buys rice daily or weekly will be able to react more quickly to changes in rice prices than one that buys every month

Survey results indicate that most rice purchases are made in two-kilogram units most frequently in a neighborhood grocery shop ("boutique"), but also in a local marketplace (ESAM 1994/95) Payment is generally made in cash but credit arrangements (around one percent of all transactions) also exist There is also anecdotal evidence of what amounts to a loose type of forward contracting whereby a consumer will give a sum of money equivalent to a month's supply of rice to a local shopkeeper The rice which the household will consume over the course of that month is sold at a predetermined price This serves the interests of both the household and shopkeeper The household can reduce its exposure to intra-monthly price fluctuations without physical possession/storage of the rice The shopkeeper receives a float from his customer, which allows him or her to purchase more goods, including rice

Consumption Patterns are Entrenched Consumption habits are so entrenched that the conventional wisdom allows almost no change in habits What must be kept in mind in analyzing consumption in the short, medium and long term is that habits reflect a mix of factors including taste, cost, income level and alternatives Rice has not always held such a dominant place in the Senegalese diet In fact, broken rice was introduced into Senegal by the French as part of France's triangular trade with Indochina, as a cheap food for St Louis (and later, Dakar), the capital of French West Africa

For a combination of price and taste reasons, Senegalese consumers unlike their counterparts in much of the rest of West Africa, prefer broken rice to whole grain rice for their national dish (chebujen) Conventional wisdom is that broken rice goes better with dishes such as chebujen in which the condiments and the rice are cooked together with liberal amounts of oil But, the same dish can be found in some cases made with whole grain rice A study conducted as part of RSAP found that there are some physiological aspects to broken rice that seem to make it better hold the flavors and sauces of dishes in which the condiments are cooked directly with the rice (Baudoin and Simantov, 1996)

As far as consumers are concerned, this is of no great note, tastes vary around the world, and if the Senegalese consumer has determined that broken rice, which costs about half the cost of whole grain rice is what he or she wants to eat, it only shows the shrewdness of the Senegalese consumer Preference for inexpensive imported broken rice causes a serious problem for the local rice industry, however It has been much harder for the local rice industry to compete in the absence of explicit State support

3 CHRONOLOGY OF KEY REFORMS

The rice sector has undergone an extensive restructuring with the dismantling or reorienting of two key state structures (CPSP, SAED) for controlling rice imports and sales and local production of high-input irrigated rice Prior to the reforms undertaken with donor financial assistance, the rice sector was heavily controlled by the State, from upstream (inputs and investments) to downstream (processing, storing and marketing) There was little room for private sector activity outside of sales at the retail level under margin and price controls

In order to support the development of rice production in Valley and to provide above-parity prices to the rice sector, rice consumers were effectively taxed, providing a subsidy to rice producers and millers as well as supporting the costs of employees and managers With the devaluation of the CFA franc, this policy began to impose a heavy burden on the State treasury by creating large deficits

The components of the rice sector reform that have had greatest significance for consumers have been those that have affected the quantity, type and price of rice available to consumers Among these, the most important were those directly affecting prices and availability of imported rice Consequently, elimination of pan-territorial prices, liberalization of importation, marketing margins and ultimately of import prices for broken rice, and the dismantling of the Caisse de Pérequation et des Stabilisation des Prix (CPSP) are the most important We review, below the evolution of reforms directly aimed at the rice market or having important ramifications on the market Not all the events included below are reforms There are other important events, in some cases reactions to reforms, that have been included to provide an complete picture of the chain of events associated with market liberalization

Table 7 presents a brief chronology of key rice reform events For a more thorough review of the chronology of rice reform events and reactions to rice reforms, refer to "Third and Final Rice Situation Report " (Tardif-Douglin, et al , 1998)

Table 7 Chronology of Key Events in Rice Policy Reform, 1994-1997

1994	January 12	Devaluation of the CFA franc
	February 28	RSAP agreement signed between USAID and GOS
	June 6	Elimination of fixed producer paddy price
	June 28	Sale of SAED/URIC rice mills
	June 30	End of CPSP collection and processing of paddy distribution of local rice
	December	—APAP team begins to collaborate with UPA on rice reform program
		—Test period of 'private sector imports (60 000 MT) organized by CPSP (imports occurred in April 1995)
1995	March 3	All rice marketing margins liberalized
	April	CPSP raises wholesale price for broken rice due to higher world prices
	June	CPSP closes all warehouses in the interior and ends transport subsidies USAID/UPA conducts field inspection of compliance with first tranche conditionality
	August 29	Law on rice border protection passes Parliament (not implemented until 1996)
	Aug Oct	Increase in retail prices due to bottleneck created by CPSP system of authorizations required for private traders to take delivery of rice from CPSP Dakar warehouses (some rent taking)
	September	Decree 95 887 (9/19/95) Private sector authorized to import broken rice
	November	Large supplies of cheaper broken rice (Indian and other) put downward pressure on domestic prices
	December 29	Law 95 35 CPSP is dissolved a state appointed liquidator is to sell assets
1996	February	CPSP ends imports private importers buy rice from shipments that had been ordered by CPSP
		(beginning heavy use of "batteaux flottants") month of Ramadan passes with large rice supplies and
		reasonable prices
	March	UPA teams conduct second field verification of RSAP conditionalities
		Ministry of Commerce warns rice traders on high prices
	May 8	Decree 96 345 and Ministerial Arrete 003600 The SIMRIZ is created in the Ministry of Commerce
		(Cellule de Gestion et de Surveillance des Marches du Riz) and its organization and missions defined
	July	Pressure from mills and rice self sufficiency advocates in Valley for GOS support to rice prices
	December	Rice border protection law implemented
1997	February	Ministry of Commerce under pressure from consumer groups fixes for two months allowable marketing margins in the rice market local and world prices begin to diverge
		—USAID/UPA/PASR (APAP) seminar on rice market reforms held in Dakar
		—UPA/USAID team conducts field verification of RSAP conditionalities
	April	Ministerial decree controlling rice marketing margins expires option to renew one time is not taken,
		market once more becomes fully liberalized
	June	SIMRIZ begins to collect and publish information about international and domestic rice market conditions

4 IMPACT OF RICE REFORMS ON CONSUMPTION AND CONSUMER WELFARE

The rice market has changed dramatically in the three years since serious reforms began to be instituted The market has gone from being almost completely state controlled to private sector driven Private importers have shown themselves to be up to the job of importing the large quantity of rice needed to meet national demand Average nominal prices have risen, but only as the liberalized market has come to more closely reflect worldwide supply and demand conditions The range of prices and qualities of rice on the market has also expanded, providing consumers at different income levels greater control over their rice budgets

In this section, we attempt to answer questions about the impact of rice sector reforms on rice consumption and overall consumer welfare The approach we have taken is to respond to concerns that have been raised in various fora — workshops, seminars, the media, by consumers, consumer protection groups and policy makers The questions epitomize those the authors have heard and debated during the reform period

4 1 Were Reforms Responsible for Damaging Price Increases?

With the liberalization of broken rice imports and elimination of official pricing, some observers of the rice market predicted steep price increases Such an occurrence would be damaging to consumers, causing important reductions in consumption or serious declines in income, or both There are two parts to formulating an answer to this concern First, it is important to determine whether the real cost of rice to consumers increased as a result of rice sector reforms Second, it must be shown if and for whom such increases (including price volatility) had a substantial effect on incomes[12] Our conclusion is that the real cost of rice has not increased substantially since the market was liberalized The largest part of the increase in nominal prices during the reform period was a consequence of devaluation **before liberalization of prices and imports**[13] Below, we present our argument

4 1 1 Has the Real Cost to Consumers Increased?

Nominal or observed prices for broken rice have increased from their pre-devaluation and pre-liberalization levels From the beginning of the 1990s until 1993, national average nominal and real (CPI-deflated) retail prices tracked each other very closely at around 135 CFA francs per

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[12] In this context we use income in the broad economic sense in terms of purchasing power An increase in the cost of a good or service purchased by a consumer necessarily represents a reduction in income because it limits the amount of other goods and services that can be bought

[13] Devaluation was not technically part of rice sector reforms even though it was considered to be so in the mind of the lay-person

kilogram With devaluation, nominal rice prices increased sharply relative to real prices The gap between real and nominal prices has become large as reforms have progressed and the market has become increasingly privatized The relationship between nominal and real annual prices is presented in Table 8

Table 8 Average Broken Rice Prices at Retail in CFA Francs per Kilogram

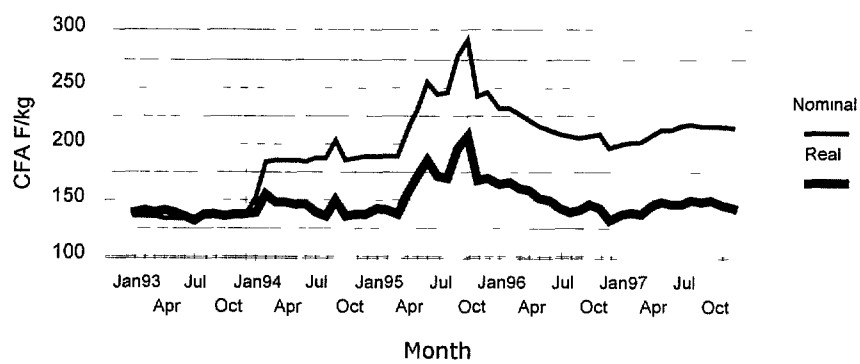
Period	Nominal	Real	Difference
1990	135 6	135 6	0
1991	136 6	139 1	-2 5
1992	136 2	138 6	-2 4
1993	135 7	139 1	-3 4
1994	184 9	143 6	41 3
1995	234 6	168 5	66 1
1996	214 4	149 9	64 5
1997	211 1	145 0	66 1

Source CSA/SIM MEFP DPS
Real prices are nominal prices deflated by CPI (1990=100)

CPI-deflated, or real prices have undergone the same trends as nominal prices an initial increase following devaluation, followed by a return to lower levels In the case of real prices, however, the decline has returned prices to pre-reform levels This difference is also evident in Figure 11 which shows average monthly prices

Both nominal and real prices have become more variable since devaluation Price controls and a complex system of taxation and subsidization combined with government control of imports, kept retail prices stable under the CPSP regime This was the explicit policy of the government Before the market was liberalized, consumer prices were effectively detached from world prices Since price controls have been removed and imports liberalized local prices have begun to reflect world price fluctuations, which has also led to greater price variability

Figure 11
Nominal and Real Prices of Imported Broken Rice
Senegal, 1993-97



Source CSA/SIM for nominal prices MEFP DPS for consumer price indices
Note Real prices are computed by deflating nominal prices by the Dakar CPI (1990 = 100) using a 1967 food basket
Prices are unweighted averages of regional averages

Fluctuations in the world price of Thailand A1 Special (100 percent broken rice), which has traditionally dominated the Senegalese rice market have "explained" 68 percent of the fluctuations in nominal domestic retail rice prices from 1994 to 1997, as can be seen in the table below[14]

[14] This estimation of causality is arrived at by running a simple regression equation with the world price of A1 Special rice as the independent variable and retail price of 100 percent broken rice as the dependent variable The resultant coefficients of determination (R-squareds) are listed in the table above

This link was most tenuous in 1994, when the government through the CPSP, decided not to raise rice prices as high as the devaluation would have dictated Rather than doubling them as would have been required under free market conditions, the government increased rice prices by somewhat under **40 percent**

Period	Coefficient of Determination (R-squared) (in percent)
1994	26
1995	72
1996	86
1997	48
1994 1997	68

Real prices have not doubled as might be expected following the devaluation, since real prices capture changes in nominal prices relative to other prices Consequently, real rice price levels by the end of 1997 are only five to ten percent above their 1990 levels It is these prices, rather than nominal ones, that have a real impact on consumer welfare

Relative Prices Have Not Shown an Upward Trend The trend in rice-to-millet price ratios is further evidence of the modest increase in rice prices as compared to general inflation or the increase in prices of other commodities This ratio, which can also be considered the millet-relative price of rice, shows substantial millet-induced seasonality (Figure 12), but no generalized upward trend (Table 9) There was a sharp devaluation-induced increase in early 1994, reflected in the high ratio in 1994 Aside from that, millet-relative prices of imported broken rice have not changed much since 1990 In fact, as compared to the 1990-1993 average (before devaluation of the CFA franc), 1995-1997 millet-relative prices were low and relatively stable (low CVs) Figure 12 presents a picture of the sharp drop-off in millet-relative prices following devaluation, and the basically flat but oscillating price ratio in the subsequent years as rice prices have returned to their pre-reforms levels in terms of millet

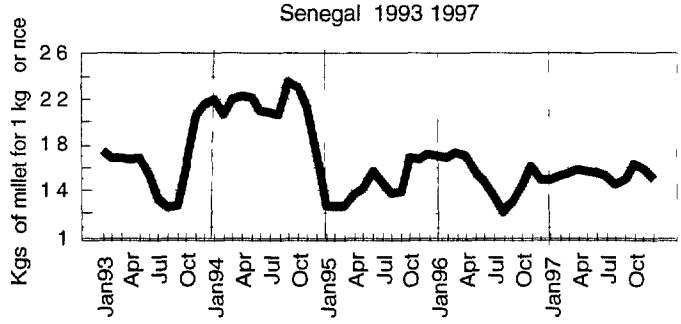
Table 9 Average Millet-Relative Price of Broken Rice at Retail

Period	Rice/millet	CV
1990	1 48	0 06
1991	1 43	0 11
1992	1 74	0 04
1993	1 64	0 17
1994	2 14	0 07
1995	1 45	0 12
1996	1 52	0 11
1997	1 53	0 03
1990 1993	1 57	0 13
1995-1997	1 50	0 10
1990-1997	1 61	0 16

Source CSA/SIM MEFP DPS
CV (coefficient of variation)

The best way to think of the millet-relative price of rice is as the number of kilograms of millet that can be purchased with one kilogram of broken rice On average, one kilogram of rice could "purchase" 70 grams fewer of millet in the three years (1995-1997) during and after major rice sector reforms than was possible in the four year period (1990-1993) before devaluation and rice reforms, rice became cheaper relative to millet Furthermore, price variability and risk (in millet-relative prices) declined slightly from 13 percent to 10 percent

Figure 12
Millet Relative Price of Imported Broken Rice
Senegal 1993 1997



Source CSA/SIM 1997
Note Millet relative price is the ratio of rice price to millet price

Relatively Little Effect on Prices as a result of Rice Sector Reforms The conclusion about price increases depends on which price consumers actually respond to—nominal, or relative (CPI versus millet-relative or relative to some other commodity) The nominal price is obviously what is most readily apparent, it also shows an obvious and, initially sharp upward movement as a consequence of devaluation and the removal of price controls (Figure 11) in situation report, put it here) CPI-deflated prices also increased sharply in 1994 and 1995, but have since returned to levels approximating the early 1990s Millet-relative prices have actually declined (Figure 12) The authors' conclusion is that rice sector reforms had relatively little effect on real or relative rice prices, which is what ultimately drives consumer decision making

Potential Confusion in Referenced Prices Even if one insists that the nominal price is the price to which consumers respond, further analysis must be made and greater understanding of reported prices is necessary before it is concluded that rice sector reforms led to damaging price increases

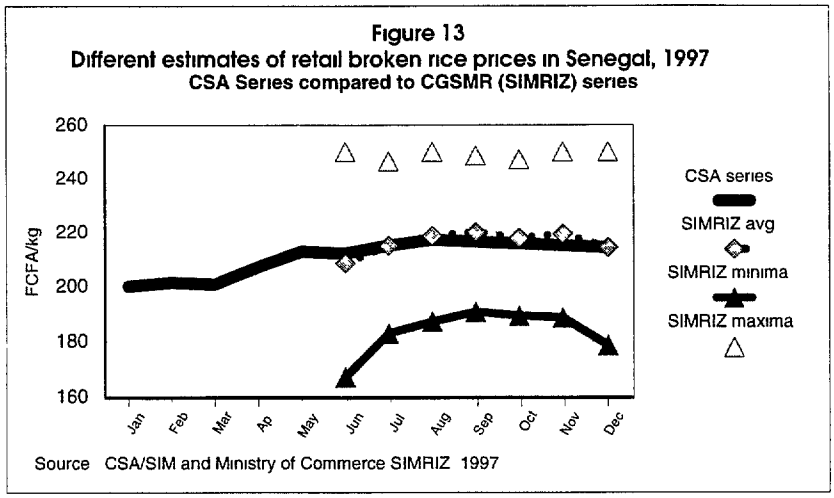
For many years under the CPSP import monopoly on broken rice a highly uniform type of rice, typified by Thailand A1 Special 100 percent brokens, was normally placed on the Senegalese market It was the retail price of this "Siam" rice that has historically been reported by the Food Security Commission (CSA) and other price information systems As market reform became more imminent, however, and importation was finally liberalized, first the CPSP and then private merchants began to purchase different qualities of broken rice As this began to happen, the "Siam" price began to trace the upper end of the price scale for broken rice It is not clear that the CSA price reporting system understood the magnitude of the shift in rice quality on the market enough to recalibrate its reported price accordingly[15] Thus it is altogether possible that in the wake of import liberalization and the removal of fixed marketing margins the prices of the new more affordable broken rice, such as broken rice from India and Pakistan, that was

[15] The implicit policy of the CSA with respect to rice is to record and report on the lowest prices in the markets CSA staff track (personal communication with head of CSA/SIM)

increasingly available in Senegalese markets did not receive its proper "weighting" in the estimation of average prices

One way of assessing the extent to which this might have occurred is to look at the difference between CSA price series and SIMRIZ series of price minima (Figure 13) To estimate a national broken rice price, CSA prices are averaged (unweighted) across all markets and regions SIMRIZ minima prices are computed by averaging market price minima to the regional level and then averaging regional minima to achieve national price minima The same is done with price maxima It is clear from Figure 13 that CSA has tended to overestimate the prices that some consumers are paying for their rice The average difference between CSA prices and SIMRIZ minima from June - December 1997 was 29 6 CFA francs, or 13 4 percent of CSA levels

Figure 13 shows that while price averages from CSA and SIMRIZ approximate each other, at least in the post-reforms period, there is a wide range of prices (and qualities) on the market The average gap between broken rice price maxima and minima since SIMRIZ began recording prices (June 1997) has been 32 5 CFA francs per kilogram, or 15 1 percent of the price maxima



Only nominal prices are substantially higher in the post-reforms period, and they increased by less than is generally perceived The CSA series shows that in 1997, average broken rice nominal prices were somewhat over 50 percent above pre-liberalization levels The price range also expanded during this period, however Consequently not everyone was forced to pay the new higher nominal prices Some consumers chose to buy the cheaper Indian and Pakistani rice

4 1 2 Were Consumers Hurt By Sharp Fluctuations in Rice Prices?

Attempting to estimate the likely impact of rice sector reforms on consumers is difficult because the effect is dynamic, influencing incomes, rice purchase decisions and decisions about other purchases, savings and investments Here, we will depart from the real dynamic situation and make the assumption that household rice consumption levels (average 54 kilograms per month) remain the same in the early post-reform period as they were before We will also further assume that overall expenditures have not changed substantially Two factors make these assumptions reasonable First rice represents only 8 4 percent of the average household's

budget Second, relatively price inelastic demand for rice (see Appendix) suggests that rice consumption has not changed substantially (import data have confirmed this) Thus we can look at price fluctuations and observe their likely effect on cash outlays and rice budgets for the average household as well as households at different income levels

Mean nominal retail broken rice prices in the 1994-1997 period were 55 percent greater than in the 1990-1993 period All other things the same this would mean that the average rice budget share had increased from 8 4 percent to 13 percent Most of the price increase between the reference periods, however, is due to CFA devaluation The best way to separate the effect of market liberalization from the devaluation effect is to compare the period between January 1994 and February 1995 ("devaluation, pre-reform") with the March 1995 through 1997 ("reform period") The CFA franc was devalued in January 1994 The first reforms directly affecting prices were made in March 1995

Average nominal prices in the "reform period" were 19 percent above their levels in the "devaluation, pre-reform" period This would suggest that rice market reforms (allowing greater transmission of world prices to the Senegal market) were only responsible for approximately one third of the overall increase in nominal prices The likely direct effect of rice sector reforms was a slight increase in rice budget shares from 8 4 to 10 percent The bulk of the change is attributable to devaluation

The impact of this change has not been the same on all consumers Those with the highest rice budget shares, generally the poorest, had the greatest negative income effects The table below compares rice budget shares between 1994/95 (the ESAM baseline) and 1996/97 assuming that neither quantities consumed nor overall household expenditures changed

	Rice budget shares (%)	
	1994/95	1996/97
Lowest income households (Quartile 1)	13 2	15 7
Quartile 2 households	11 0	13 0
Quartile 3 households	8 6	10 2
Highest income households	5 0	6 0

This, of course, departs from reality, since household incomes and expenditures will also have changed But, the advantage of this approach is that by assuming away income increases it provides a conservative assessment of the likely income effects of rice sector reforms on Senegalese households To put this in perspective, to procure the same amount of rice as before, the lowest income households will have spent on average 1,292 CFA francs (2 20 USD) more each month in 1996/97 than they did in 1994/95 Richest households would have spent 2,840 francs (4 80 USD) more Average per capita income (GDP) in 1996 was 355 179 CFA francs (602 USD)

What has certainly been more difficult for consumers to support, especially the less well-off ones, has been the greater price variability Prices were very stable under the CPSP ' regime this was a policy objective The table below compares coefficients of variation (CV) and average nominal prices in two four-year periods 1990-1993 and 1994-1997

Period	Average price	Min	Max	CV
1990 93	136	134	139	006
1994 97	211	151	291	12

This shows that riskiness of rice expenditure increased substantially in the wake of rice sector reforms During the September-October 1995 peak in nominal retail rice prices, the rice budget share was equivalent to 20-21 percent of 1994/95 average total household expenditures for the poorest households This represented a monthly cash outlay difference of 3,930 (6 66 USD)

4 2 Has Consumption Declined and Put Consumers at Nutritional Risk?

There is no evidence that aggregate rice consumption has declined as a result of market liberalization Economic theory predicts relatively little consumption reaction to price fluctuation for a product such as rice Furthermore, price elasticities of demand for rice suggest relatively small quantity adjustments, generally smaller than the percentage change in price (see Appendix) The relatively small number of close substitutes for rice (millet, the closest substitute is not heavily commercialized) means that consumption will not be much affected by price changes at least in the short- to medium term The fact that potential rice substitutes are also relatively expensive further supports the argument that rice consumption has remained stable or increased

The evidence points to greater consumption or at least greater availability, substantially greater quantities of rice entered Senegal in the first year following import liberalization than before (Randolph and Gueye, 1998)

Year	Tons of rice imported	Percent 94 level
1994	335 290	129
1995 (imports lib)	435 528	129
1996	627 247	187
1997 (est)	420 273	125

Consequently, at least in the first years of the liberalized market, average per capita rice availability has increased[16] By the second year following liberalization (1997), imports had returned to levels more closely approximating the pre-liberalization period

Poorer households, for whom rice expenditure represents a larger share of overall expenditures would be the most likely to have sought to reduce rice consumption in the face of increased rice prices The question even for poorer households is what would have been consumed in place of rice We have referred above to some anecdotal evidence that consumption of millet-based foods has increased since rice market liberalization, but the quantities are unlikely to have been great Any important declines in rice consumption would have been accompanied by large increases in millet marketing

The only empirical evidence of changes in household rice consumption that we have comes from comparing urban Dakar data from two studies done by the DPS, one in 1994-1995, the other in 1997 Table 10 presents the only available sample data comparing household expenditures and the size of the rice budget over time The data presented come from urban Dakar households surveyed by the Statistics and Forecasting Direction (DPS) of the Ministry of Finance The ESAM survey was conducted on rural and urban households in 1994/1995 The EDMC survey was conducted on urban Dakar households in 1997 This provides fairly neat "before" and "after" "snapshots" of urban household consumption and the relative importance of rice expenditures To facilitate comparison between ESAM and EDMC data, only the urban Dakar (without Rufisque) sub-sample was used The results presented in the table are for urban Dakar Outside of unavoidable sampling and non-sampling errors, differences reflect real changes resulting in part from rice subsector reforms

The most important changes in the two-plus years between ESAM and EDMC are in food expenditures and the rice share of the food budget [17] Monthly food purchases per adult equivalent increased by 87 percent from 1994/95 to 1997 Because rice expenditures have remained relatively stable (they have increased by only about 11 percent), rice's share of the food budget has dropped by 32 percent for the average urban Dakar household This stability in average household rice expenditure per capita (adult equivalent) is partly due to relatively small increases in relative prices (see rice/millet ratios) We reiterate the point made above that the apparent price increase only presents part of the true situation of the liberalized rice market Out of habit, prices of higher quality "Siam" continued to be reported most frequently by the primary price reporting systems even though other less expensive rice could also be found on the market (and sometimes dominated) after rice market reforms

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[16] Of course the size of carryover stocks may have gone up or down since liberalization Factors promoting reduced carryover stocks would include the fact that without subsidies or CPSP monopoly the true costs of storage (time interest and spoilage) are more apparent to merchants Reduced certainty about procurement and sales as well as increased number of participants are factors that could contribute to increasing aggregate carryover stocks Randolph and Gueye (1998) estimate large increases in carryover stocks Their estimates are based on consumption requirements that expand as a direct function of population growth

[17] Both are measured in terms of expenditures per adult equivalent

Table 10 Expenditure Changes Over Time in Urban Dakar

Survey Period of survey	ESAM (March 94-April 95)	EDMC (March - June 1997)	EDMC/ESAM (as percentage)
Sample size (N)	1 009	1 008	
Household averages per adult equivalent per month (in F CFA)			
Total expenditure	33,592	56,681	169
Food expenditure	9,778	18 312	187
Rice expenditure	1 410	1 576	111
Percentages			
Food / Total	29 1	32 3	111
Rice / Food	12 7	8 6	67
Millet+Sorghum / Food	0 04	0 4	1000

Unfortunately, because the EDMC survey was designed to recalibrate the consumer price index for urban Dakar and not necessarily to come up with quantities of rice consumed, there is no way from these data to accurately compare the quantity of rice consumed between the two periods These data show that at least in urban Dakar, per capita rice consumption has declined, even if only slightly

The importance of millet and sorghum in the urban Dakar food budget appears to have increased very strongly over time, albeit from a very small base This confirms the reports we alluded to earlier

4 3 Has the Quality of Rice Deteriorated to the Point of Endangering Consumers?

In the year following import liberalization, the question of the edibility of the lowest quality of rice entering the market began to be debated Implicit, but not always explicitly stated in the debate, was the issue of the public role in ensuring consumer safety Paradoxically, the first importer to provide the low quality Indian rice that dominated the market in 1995 and 1996 and was the focus of the debate was the CPSP, itself Despite this, the blame for low quality rice tended to be placed by consumer advocacy groups and representatives of the government on the private sector, which was making its first, tentative, steps into the market

The APAP/UPA/RSAP team has not been able to document any cases of illness or death attributable to consumption of contaminated rice On the other hand it was also unable to determine the food value or nutritional benefit of old rice stocks, such as the Indian rice that was put on the market as a result of the Indian government renewing its security stocks What evidence we do see is that consumer resistance is keeping the worst rice off the market

A policy issue that must be addressed is the point at which the government should be involved in quality control versus relying on the rule of *caveat emptor*, buyer beware This cuts to the heart of the larger debate on the missions of the government in agriculture and food What

type of quality questions should be left to be resolved between merchants and consumers through the market process? Obviously if there is a public health question it is the responsibility of the government to ensure that rice that enters the market will not put consumers health and lives at risk [18] On the other hand, if the rice is simply of relatively poor quality and does not have the same nutritional status as better quality rice or requires more cleaning before meal preparation, should the government also intervene? These questions of grades and standards and who establishes them—the government, industry associations or even consumer groups—is the next generation of food and agriculture policy questions, coming after market liberalization

4 4 Are Consumers Being Held Hostage to a Private Rice Cartel?

This issue has been addressed in the market impact report (Randolph and Gueye, 1998), which is a companion document to this one Our brief review of the topic reinforces the view that it is unlikely that undue market pressure has forced consumers to pay abnormally high rice prices

The perception that rice reforms have resulted in replacing a public monopoly on rice commercialization and pricing by a private monopoly controlled by a small number of rice importers and associations of merchants is strong among consumer advocacy groups As the argument goes, this "cartel" can and does control prices through quantitative restrictions and control of who can sell rice at all levels of the market

The argument continues that middlemen are generally little more than employees or subsidiaries of large importers who are vertically integrated in the rice market When they are not "employees," they are tied to their suppliers by credit relationships that limit their commercial freedom, including freedom to price as they see appropriate Other arguments point to price uniformity in many locales, stating that such can occur only through collusion Theory and empirical observation show that this is simply not true Competition will also tend to price uniformity since merchants in the same area face similar costs and demand structures and will be forced (by competition) to bring their profit structures into line with one another

Another pervasive argument used to 'prove' the existence of uncompetitive behavior is the 'fact' that retail prices are higher at the port of entry (Dakar) than in the interior Here again, observers are not looking clearly at factors affecting prices Certainly the wholesale costs of rice delivered to the interior (from Dakar) will be higher then in Dakar But, rice pricing is a function of more than transportation costs Many handling costs are likely to be more expensive in Dakar than in the interior These and the higher costs of warehouse and selling space would increase marketing costs Also, the Dakar market, being richer is also likely to be more discriminating, requiring retailers to spend more labor sorting and cleaning There is also the normal tendency for merchants to price to what the market will bear

[18] Results from WARDA's grain quality specialist survey of rice in the St Louis (Senegal) market indicated there are no problems that would have health impacts (Randolph communication 1998)

Furthermore observers have confused the prices to which they refer in the debate As the rice market has been liberalized it has also become more complicated A multiplicity of prices and qualities of rice has appeared on the market, but price reporting mechanisms have not become sufficiently refined to identify these differences Hence, for example, the retail price of broken rice in the interior may be lower than it is in Dakar simply because a lower quality of broken rice (Indian or Pakistani rice, for example) is sold in the former market than in the latter

Randolph and Gueye analyze rice market concentration at the importer level (1998), and find no evidence of excessive market power The forthcoming ACG marketing margin study (ACG, 1998) also provides information about market margins and importers that contributes to a better understanding of the nature of competition in the newly liberalized rice market This is an empirical question that can be solved with information on the evolution of marketing margins and the degree of concentration in the rice market With the SIMRIZ rice market information system the government has a potentially powerful tool with which to assess the degree of market power and its effect on consumers

5 CONCLUSION AND RECOMMENDATIONS

Rice Has a Strong Hold on the Senegalese Diet Rice continues to have a strong hold on the Senegalese diet None of the events associated with RSAP are likely to change the dominance of rice in the Senegalese diet This is especially so of inexpensive imported broken rice which remains dominant in the average household's diet Rice sector reforms have not substantially changed the real price of rice, nor the relative cost of rice to other foods

Imported Rice, by Virtue of Its Cheapness, Is Likely to Remain Dominant Because of geographical and historic reasons, cheap imported broken rice is likely to remain dominant in the Senegalese diet for some time to come This of course means that Senegal is not likely to be self-sufficient in rice into the medium term future, but we would argue that food security resulting from increasing incomes (through access to cheap rice) is more important than rice self-sufficiency Continued importation of inexpensive broken rice could help improve incomes by keeping food costs down The trade balance ramifications of huge rice imports need to be weighed, of course The risk of exposure to variability in the world rice price and in rice availability also needs to be assessed

Low Price and Income Elasticities of Demand Mean Most Households Will Not Shift Consumption away from Rice to Other Cereals for Price or Income Reasons Price elasticities of demand for rice are near inelastic, which means that changes in prices are not likely to have substantial direct effects on rice consumption levels Price changes will affect incomes in the short run, since consumers will find it difficult to shift their consumption away from rice Income elasticities are also relatively inelastic

But Some Income Groups Are Increasing Their Consumption of Local Cereals, in Particular "Fondé" Inroads by local cereals will depend largely on improvements in processing techniques, increased production, and better physical communications between producing and consuming areas There is no doubt that consumption of local cereals also suffers from stereotypes and inaccurate perceptions (heaviness, etc) Publicity campaigns could counter these views It should be pointed out, however that there is anecdotal evidence that the consumption of local cereal products is growing, albeit from a low base

In Senegal, production of couscous-like products from millet is highly labor intensive The more mechanized the product the less it is appreciated by the consumer For consumption to increase there will need to be a two-pronged approach First, the prejudice against millet consumption and its relegation only to limited meals, could be countered by information campaign such as those funded by donors More importantly, the cost of processing millet products must be reduced so as to bring their prices closer to parity with broken rice

The local alternative to cheap imported rice is not expensive local rice, but low cost local cereal-based products such as araw, sankhal and soungouf For, in the final analysis it is as much price as habit that keeps broken rice dominant in the Senegalese diet Both can be addressed if

local cereals are to make inroads that could lead to more rapid income increases among consumers and producers alike

With Increased Price Volatility, Households Now Have Greater Budgetary Risk Rice prices have become more volatile Being relatively unable to shift consumption away from rice (low price elasticities of demand) rice consuming households have experienced budgetary stress when prices have risen sharply, as happened in the second and third quarters of 1995 as market reforms were beginning to be made Consequently, fewer other goods and services (or savings) can be purchased, and households effectively experience declines in incomes These have not been large and to some extent households may have been able to switch from the more expensive Thailand A1 100% broken rice for cheaper broken rice from India or Pakistan, but the volatility has increased household budgetary risk

The Poorest Households, Which Would Normally Have Higher Price Elasticities and Be Expected to Shift away from Rice to Other Cereals, Will Lose Relatively More because of the Size of Their Rice Budget Shares The income effect of rice price increases will be felt more strongly by the poorest households despite their theoretically higher price elasticity of demand than that of richer households One reason for this is that their rice budget shares are greater (approximately 10% of total budget) Another factor is that poorer households are likely to buy their rice in smaller units, more frequently This actually exposes them to greater price risk as prices fluctuate

To the Extent That Rice Remains the Principal Food of Most Senegalese Households, Increased Price Fluctuations Increase Food Insecurity It is not surprising that nominal rice prices have become much more variable since market liberalization a fixed pan-regional price regime under the CPSP has given way to a market-determined system The issue of importance for consumers is whether the price that affects their purchasing behavior has become more variable, thereby increasing income and nutritional risk

In fact, while nominal prices have become quite variable in the wake of reforms, rice prices deflated by millet prices (rice-to-millet price ratio) have remained relatively unaffected by the reforms Real (GDP-deflated) rice prices have also fluctuated, but somewhat less

However, Greater Choice of Price and Quality has Palliated Whatever General Increases in Rice Prices and Price Variability have Occurred With market liberalization a wide range of qualities of rice has been imported and placed on the market This provides consumers with a range of prices to choose from in order to continue to meet their rice needs with minimal negative effect to their overall budget This is not to say that consumers did not need to pay any more for their rice in the post liberalization period, although because of the way price data were collected during the transition period, we are unable to know for sure what prices were for the cheapest rice on the market during the period of high prices The point is that consumers had more choice than available price information suggests

In the short run liberalization of the rice market has been far more positive than many thought it would be Certainly, nominal prices of recognized qualities of rice (those that had been imported before rice sector reforms) have increased since market reforms, but relative and real prices have changed very little Furthermore, greater price and quality choice has been provided to consumers The most potentially problematic aspect of market liberalization has probably been the greater price variability, which creates greater price, income and nutritional risk especially for the poorest households

Finally, Market Concentration Should Be Monitored Market concentration is probably the best, most easily obtained indicator of market power available to rice market regulators Market analysis indicate that the rice market has not become concentrated (Randolph and Gueye 1998) Economic theory suggests that the rice market would be exceedingly difficult to "cartelize " Unexpected lower retail prices in Dakar as compared to interior markets may or may not be evidence that merchants are engaging in undue market power Unanswered perceptions of a market "stacked" against consumers could lead to policy reversals The ability of SIMRIZ, UPA and the "Commission sur la Competitivite" to monitor the market must be strengthened and supported if the gains of rice sector reforms (RSAP) are to lead to a strong and effective private sector-led rice market

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APPENDIX: PRICE ELASTICITY OF DEMAND ANALYSIS

We have shown above what the expected rice consumption reaction is to changes in income This is the income elasticity of demand for rice We have presented this in order to better understand how changes in rice prices affect consumption of rice and ultimately nutritional status Price affects consumption behavior in two ways First it affects income if prices increase, in the very short run incomes decrease[19] But, prices changes also set in motion substitution of the more expensive item with a less expensive item The extent to which this substitution takes place is determined by the degree of substitutability of other foods for the good in question This is measured by the cross-price elasticity of demand which shows how sensitive the consumption of rice is to changes in prices of other substitute or complementary goods Thus, the full price effect on consumers of a change in price is determined by the combination of income and substitution effects

In order to understand the effects of changes in rice prices that have occurred as a result of rice sector reform, it is important to estimate the price elasticity of demand for rice Knowledge of income elasticity helps set the boundaries of probably price response We know from the empirical analysis above and from theory that rice is a necessity for most Senegalese households Thus, we should expect that price elasticity of demand will be small That is, changes in prices will have little effect on consumption levels Correspondingly changes in prices will lead to larger changes in income and most of the consumption modification resulting from price changes will occur through the income effect

Kite (1992) indicates that previous estimates of price elasticity of demand for rice have been in the range of - 250 to - 886 (see Table A-1) Most estimates are closer to the upper end of the range Kite's estimate of compensated price elasticities result in the lowest price elasticity estimates[20] The general conclusion is that Senegalese rice consumers are relatively insensitive to changes in rice prices Their demand for rice is inelastic with respect to price This means that Senegalese consumers will not reduce their rice consumption by an amount commensurate to the increase in rice prices when the latter increase

Table A 1 Rice Price Demand Elasticities

Price elasticity	Study type and location	Data Period	Author
0 866	Cross-section rural Ziguinchor	82/83 - 83/84	Jolly
0 745	Time-series	1979	Jabara
-0 628	Time-series	1966 1986	Delgado
-0 250	Time-series (Delgado data)	1966-1986	Kite

Source Kite (1992)

[19] This is an economic concept An increase in the price of one good that is purchased by an individual or a household is equivalent to a reduction in other goods or services (or savings) that can be purchased by the individual or household This is equivalent to a reduction in income

[20] Assuming the consumer is compensated for the income effect of a price change

They are constrained by the lack of appropriate substitutes in the short run and thereby will undergo real reductions in income because of their inelastic demand What Kite's result suggests in contrast to other results, is that the income effect is likely to be greater and that substitution is even less likely for rice consumers Consumers would experience greater negative income effects from price increases

Methodology

Generally, cross sectional data are unable to provide the price information necessary for computation of price elasticity estimates In this report we have used a technique developed by Deaton (1988, 1989, 1990) for estimating price elasticities from price-absent cross-sectional data Required data include household expenditure by commodity quantity of each commodity consumed, and household characteristics Data collected in household clusters is most amenable to this technique because each cluster can be assumed to face relatively uniform prices

In the absence of price data, which often are not recorded in cross-section surveys, analysts have simply divided total expenditures for a particular good by the quantity of that good purchased by the household This gives unit values paid which may or may not equal prices What differentiates unit values from prices is the possibility of variation in the quality of the product purchased Essentially unit value mixes quantity and quality Concretely, this means that one household's total expenditure for rice could include different qualities of rice each having a different price Consequently, dividing total expenditure by quantity results in a sort of a composite which is not an observed price In principle this problem holds for rice purchases in Senegal and for the ESAM data set, but rice purchases were separated into two key quality/price categories "100% broken rice," and whole grain rice Estimates of price (unit value) elasticity of demand have been made on the two subsets of data First, on purchases of broken rice, second on purchases of whole rice Within the former, there was little room for quality differentiation in the CPSP-dominated era, when the ESAM data were collected There has historically been more quality variability in the whole (or non-100% broken) rice market This could compromise the results on whole rice

Results

Hence, before applying the more complex Deaton approach to eliminating quality effects, we estimated price elasticities using unit values in place of observed prices Those estimates are presented in Table A-2 The key independent variable is LNUNITVA, the natural logarithm of the unit value of household rice purchases (broken or whole rice) The variable which is being explained is LNQTYAE the natural logarithm of the quantity of broken or whole rice consumed per adult equivalent in the household

The results are consistent with theory, but are not completely consistent with past studies Recall that Deaton (1990) has pointed out that use of unit value as a proxy for price is likely to result in overstated price elasticities That said, we note that unit value elasticity of demand is

just barely but significantly in the elastic range for broken rice[21] It is substantially more elastic for whole rice Assuming that we have to reduce elasticity estimates to adjust for the overestimate inherent in using unit values rather than prices we can conclude that price elasticities for broken rice are close to being unit elastic, but are for the most part still inelastic That is that most Senegalese households will not substantially alter their consumption of broken rice in the face of small changes in prices This is not at all true for whole rice whose consumption changes substantially with price changes

Table A-2 Regression Results for Broken and Whole Rice Consumption

	Broken rice		Whole Rice	
Variable	Coefficient	t-value	Coefficient	t-value
LNDEPTOT	-0 062	1 802	0 120	-0 762
LNUNITVA	-1 014	3 093	-2 197	-5 804
Ethnic group	0 020	1 684	0 015	-0 338
Region	0 132	3 640	0 265	-1 167
Sex of head of hh	-0 056	-0 900	0 023	0 082
Household size	-0 103	-20 811	-0 084	-4 922
Dependent Variable	LNQTYAEQ			
R-square	0 269		0 215	

For most households there are relatively few perfect substitutes for rice in the short run In the absence of data with which to estimate cross price elasticities, for example the response of rice consumption to changes in maize, millet sorghum and bread prices it is possible to resort to relationships that have been found to hold among own-price, cross-price and income elasticities The homogeneity condition states that the sum of cross price elasticities must equal the difference between own-price and income elasticities if both income and price elasticities have normal signs This is derived from a mathematical form of the fact that price effects are a combination of income (hence income elasticity) and substitution (hence cross-price elasticity) effects Our estimates suggest that the total of cross price elasticities for broken rice is approximately 0 637 (price elasticity of -1 014 and income elasticity of 0 377) which is to say that a one percent change in all substitutes and complements for rice would bring about only a 0 6 percent positive change in the consumption of rice

The homogeneity condition allows us to go from estimates of income elasticity of rice (inelastic) and price elasticity of rice (tending toward inelastic) to reasonable assumptions about cross price elasticities With two additional assumptions, the homogeneity condition suggests that the absolute value of own-price elasticity is larger than the sum of cross-price elasticities The assumptions are that the good is a normal good (income elasticity is positive) and that most other goods are substitutes (cross-price elasticities are positive) Note also that the homogeneity condition requires that the income elasticity sets the lower limit for own-price elasticity and that own-price elasticity sets the upper limit for income elasticity

Our results, based on unit values (expenditures divided by quantity) rather than on prices, show a slightly price-elastic demand for rice This should be tempered by Deaton's (1988, 1989,

[1] Unit value elasticity is our proxy for price elasticity It should be considered with the caveats we have provided above

1990) findings that price elasticity estimates based on unit value rather than on direct prices tend to overestimate elasticity of demand Consequently we consider our results to be consistent with earlier findings of an inelastic demand for rice

What inelastic demand implies is that with price increases that have occurred during the rice market reform period rice consumers have been unable or unwilling to shift consumption to substitute products, and have consequently experienced reductions in incomes Market reforms appear to have been responsible for a 19 percent increase in nominal rice price levels over their post-devaluation pre-reform levels Table A-3 presents the likely range of effects this increase in nominal price levels has had on the average consumer's rice expenditure

Table A 3 Effects of Increase in Nominal Rice Price on Rice Consumption

Analysts	Price Elasticity of Demand for Rice	Change in Rice Consumption (%)	Change in Rice Expenditures (%)
Jolly	-0 866	-16 45	+ 2 55
Jabara	-0 745	-14 16	+ 4 85
Delgado	0 628	-11 93	+ 7 07
Kite	0 250	- 4 75	+14 25
Tardif Douglin and Diouf	-0 913*	17 35	+ 1 65
Assuming elastic demand	-1 500**	-28 50	- 9 50

* Revised on the assumption that the unit value elasticity of demand overestimates price elasticity of demand by 10 percent

** For comparative and instructional purposes only

Other things the same, this loss of income should have a negative effect (but small) on rice consumption Our price elasticity results for richest and poorest households separately did not conform to theory (richer households had higher elasticities) If however their relative elasticities conform to theoretical relationships, the households most likely to feel the income effect of price increases in rice are the poorest households Not only would they be expected to be less able to shift consumption away from rice, their rice budgets are larger as a percent of their overall expenditure and income and, consequently, they are more vulnerable to negative effects of price increases

Nonetheless, price increases have been small especially when deflated by the CPI or divided by millet prices and it is probably not being insensitive to say that only the most marginal households have had their nutritional status seriously affected by rice sector reforms