

Staff Paper

**IMPACTS OF DEVALUATION ON
SENEGALESE HOUSEHOLDS:
POLICY IMPLICATIONS**

by
Valerie Kelly, Thomas Reardon,
Bocar Diagana, Amadou Abdoulaye Fall

Staff Paper No. 94-20

March 94



Department of Agricultural Economics
MICHIGAN STATE UNIVERSITY
East Lansing , Michigan

MSU is an Affirmative Action/Equal Opportunity Institution

**Impacts of devaluation on
Senegalese households:
Policy Implications**

by

Valerie Kelly

Thomas Reardon

Bocar Diagana

Amadou Abdoulaye Fall

Authors

Kelly is assistant professor and Reardon is associate professor, in the Department of Agricultural Economics, Michigan State University; Diagana and Fall are researchers in the Institut Sénégalais de Recherches Agricoles.

Abstract

This paper simulates the impact of devaluation on real incomes in rural and urban Senegal using detailed household income and expenditure data. The key result is that some rural areas, considered potential beneficiaries because they produce exportable peanuts, are as negatively affected as the urban areas where a large share of expenditure goes to imported rice. The negative impact in rural areas is due to higher consumption of imported rice and lower production of peanuts than suggested by conventional wisdom. These consumption and production patterns leads to greater negative demand-side effects and smaller positive supply-side effects than expected in most rural zones.

Acknowledgements

The authors thank USAID/Senegal, A.I.D./Sahel and West Africa, via the PRISAS project, and the Swiss Development Cooperation for support for this research. An earlier version of the paper was presented in December 1992 at a workshop sponsored by IFPRI and ISRA in Senegal. Comments by Mame Cor Sene, David Jones, and John Staatz on earlier drafts of the paper are gratefully acknowledged as is help with the data analysis provided by Aliou Diagne.

**IMPACTS OF DEVALUATION ON SENEGALESE HOUSEHOLDS:
POLICY IMPLICATIONS**

A wave of price increases, labor disputes, demonstrations and violent clashes has spread across West Africa in recent weeks, prompted by France's decision to devalue the currency used by tens of millions of people in more than a dozen of its former African colonies.¹

This quote describes the reality of implementing a devaluation in countries where incomes are low and unemployment is high. January 1994 was the first devaluation since 1948, thus the shock is enormous. It now takes 100 rather than 50 FCFA to purchase one French franc -- the currency has lost half its value.

Efforts are already underway to identify and provide relief for the neediest groups. For example, the IMF has promised a large aid package to soften the blow; and France is setting up a special development fund to help the poor in the affected countries.² The most difficult tasks, however, are to identify correctly the most negatively affected groups and to design cost-effective programs to protect them, thus improving the likelihood of achieving the desirable long-run macroeconomic objectives. Accomplishment of these tasks requires detailed knowledge of household income and expenditure patterns. Such knowledge cannot be gleaned from national accounts data and aggregate statistics commonly used in macroeconomic analyses.

In this paper we make two contributions. First, we simulate the net effect of devaluation on real household income in the short-run using detailed household data on expenditure and income. Second, we suggest accompanying measures to protect the zones most harmed by devaluation, as it is easier to target programs to zones

than to specific types of households. In making these contributions, we also make a case for using disaggregated household data to design and evaluate policies that have direct impacts on household welfare.

Our key result is that real income drops substantially in the northern Peanut Basin and in the urban areas. A negative impact in any rural area goes against the conventional wisdom that Senegalese farmers, because they produce exportable peanuts, would gain from the devaluation; and only urban households, because they consume large amounts of imported rice, would lose. Our survey data show, however, that rural rice consumption is higher and peanut production lower than previously thought in most rural zones. These two facts combined lead to greater negative expenditure-side effects and smaller positive production-side effects than conventional wisdom implies.

Background on the data, study zones, and sample

Data cover 180 rural and 70 urban households surveyed by the Institut Senegalais de Recherches Agricoles and the International Food Policy Research Institute.³ The data set contains fortnightly observations on household income and expenditures from October 1988 through July 1991. Data for October 1989 through September 1990 are used in our analysis because the relatively good 1989 harvest resembles the 1993 harvest preceding the devaluation.

Sample households are located in the principal areas of rainfed crop production: the Peanut Basin and Senegal Oriental. The Peanut Basin is covered by six study zones: five rural zones representing the north, west, center, southwest, and southeast and one urban zone in Kaolack. Senegal Oriental is covered by a rural zone representing the central part of the region and an urban zone in Tambacounda. We use these eight zone names throughout the article. The population differs by zone (see Table 1), hence the overall results are weighted by zone population. Total Senegalese population is about 7.5 million; 61 percent live in urban areas.

The zones examined represent 50 percent of the rural and 6 percent of the urban population.

Table 1 presents zone and sample characteristics useful for interpreting the simulation results. Table 2 presents the income and expenditure shares used in the analysis.

In the Peanut Basin, peanuts and millet are the principal crops. Peanuts are grown mostly as a cash crop which is processed in Senegal and exported as oil and cake. Millet is produced primarily for home consumption. Households allocate about half their land to each crop. In Senegal Oriental, the principal coarse grains are maize and sorghum rather than millet.⁴

Most agricultural inputs are domestically produced. Seed represents more than 95 percent of input costs. Fertilizer is rarely used. All households use animal traction equipment that is old and in need of replacement.⁵

The index of cereal production adequacy in Table 1 shows that no zone produces enough cereal to provide the minimum daily requirements of 2400 calories per adult equivalent.⁶ Three-quarters of households in the north and in Senegal Oriental and half of those in the other rural zones consume more cereal than they produce. Urban areas earn less than 1 percent of income from cropping and purchase all their cereals.

Average annual rainfall and soil quality increase from northwest to southeast. Rainfall is the main constraint to cropping in the north and the center. Population densities are greatest in the southwest, west and center; they are lower in the north and southeast and very low in Senegal Oriental. Land is a constraint in all zones except the north, but is most constraining in the densely populated west and southwest.

Average income per adult equivalent varies considerably across zones. It is highest in the urban areas. The high-income rural zones are the southwest and the southeast, characterized by good rainfall, soils, and infrastructure. The low-income zones are (1) the drought-prone north, (2) the land-constrained and drought-prone west, and (3) the infrastructure-poor Senegal Oriental. Income for

15-35 percent of households in these zones fails to cover minimum needs.⁷ We call these three low-income zones the "vulnerable zones" because they are susceptible to price shocks and likely to suffer hardship if devaluation reduces real incomes.

Food accounts for 73 to 89 percent of household expenditure across study zones. Table 2 shows that the principal foods consumed are coarse grains (6 to 49 percent of total expenditure), imported rice (3 to 28 percent) and peanuts and peanut products (7 to 13 percent).⁸ The importance of rice and coarse grains varies across zones. Rice is most important in the north (28 percent of total expenditure) and the towns (15-20 percent). The center and southwest consume less rice; but it still represents 12-13 percent of total expenditure. Coarse grains are most important in the west (49 percent of total expenditure) and Senegal Oriental (43 percent).

Other foods -- 19 to 45 percent of total expenditure -- are most important in urban areas and the center (37 to 45 percent) and least important in the west and southwest (19 and 23 percent). Most of these foods (meat, fish, milk, for example) are produced in Senegal. Nonfoods of local and imported origin (textiles, clothing, toiletries, for example) account for 11 to 27 percent of total expenditure.

There are well-enforced price controls on rice and peanuts. Before devaluation the export parity price for peanuts was 40 FCFA per kilo at farmgate and 60 FCFA FOB Dakar after adjustment for transport and marketing costs. The government guaranteed peanut producers 70 FCFA per kilo, paying a 30 FCFA subsidy. Rice was imported at 80 FCFA per kilo, taxed 42 FCFA per kilo (26 FCFA tariff plus 16 FCFA costs of implementing the tariff) and sold to consumers for 135 FCFA per kilo after marketing margins (13 FCFA per kilo) were covered. The pre-devaluation producer subsidy on peanuts and the consumer tax on rice partially corrected for the overvalued exchange rate by moving domestic prices in the direction that a devaluation would have moved them. For example, devaluation would have made rice more expensive relative to domestic cereals --

the rice tariff accomplished this. The 50 percent devaluation in January 1994 increased the FOB Dakar price of peanuts from 60 to 120 FCFA and the CIF price of rice from 80 to 160 FCFA per kilo. Government decisions about how these price changes were passed to consumers and producers are discussed below.

Price controls and restrictions on transporting coarse grains within Senegal were eliminated in the mid-1980s. Pre-devaluation consumer prices averaged 60 to 80 FCFA/kilo in rural zones and 80 to 115 in towns. From a consumable calorie perspective, coarse grains were cheaper than rice if their price was below 107 FCFA per kilo -- a price often surpassed in urban areas.

Methods

The analysis examines short-run (6 to 12 months) changes in real incomes accounted for by price changes in the three key agricultural product groups: peanuts, rice, and coarse grains. We do not treat the nonagricultural sector; hence, the analysis is partial equilibrium. We assume (with one exception noted below) that producers and consumers do not change the product composition of production and expenditure in the short-run; thus, the analysis is comparative-static.

With devaluation, one expects both the subsidy and the tariff to be reduced, because they were used to correct for overvaluation. The amount of the reduction, however, is a major policy question, as the tariff is a source of government revenue and both the tariff and the subsidy are instruments at the government's disposal for managing the impact of the devaluation on different groups.

We examine five scenarios for implementing the devaluation: (1) the "implemented" scenario, (2) a "pro-producer" scenario, (3) a "pro-consumer" scenario, (4) a "pro-government" scenario, and (5) a "cereal substitution" scenario.

The "implemented" scenario was officially announced by the government in January 1994 and represents the current situation. It eliminates the peanut subsidy and reduces the rice tariff.

Controlled prices changed as follows: peanuts +43 percent, peanut oil +24 percent, and rice +33 percent.

We present hypothetical scenarios 2 through 4 to illustrate how the government's choice of subsidy and tariff policy can influence the relative gains and losses of different groups by conditioning the impact of devaluation on producer and consumer prices. The pro-producer scenario illustrates what happens if the government continues subsidizing peanut producers after the devaluation, but drops to 20 FCFA per kilo. This subsidy results in a 71 percent increase in the producer price (from 70 to 120 FCFA) rather than the 43 percent increase now in effect. Consumer peanut prices rise by the same amount. We counterbalance the sharp rise in the peanut price by a reduction in the rice tax (from 42 to 20 francs per kilo). The resulting 44 percent increase in rice price is greater than the 33 percent now in effect and provides the government with more revenue to cover the costs of the peanut subsidy.

The pro-consumer scenario lessens the negative impact of the devaluation on peanut and rice consumers. We eliminate the peanut subsidy (as in the implemented case), and replace the 42 FCFA/kilo pre-devaluation rice tax with a 20 FCFA/kilo subsidy. This causes a 15 percent increase in rice prices (from 135 to 155 FCFA per kilo).

The pro-government scenario removes the peanut subsidy and maintains the pre-devaluation rice tariff, resulting in a 43 percent increase in peanut and a 60 percent increase in rice prices (compared to 43 and 33 percent for the implemented scenario). This is the best scenario for balancing the government budget.

The simplifying assumptions underpinning scenarios 1-4 -- constant product shares and no substitution -- cause the quantity of cereals consumed to fall if real income falls. In zones with small production-side benefits, the assumption of constant shares produces unrealistically low post-devaluation calorie levels. In the "cereal substitution" scenario, we fix cereal calories at pre-devaluation levels, but allow households to substitute among

cereals. The scenario unfolds in several stages. Households reduce rice consumption 20 percent in response to the 33 percent rice price increase, substituting coarse grains as necessary to replace rice calories. Increased demand for millet, due to substitution, causes millet prices to rise by 10 percent; consumers then reduce the quantity of millet 6 percent and replace lost calories with rice.⁹

We use the following simple procedures to simulate, for each scenario, the net impact of devaluation on real household income:

- (1) Calculate the percentage increases in peanut, rice, and millet prices;¹⁰
- (2) Multiply the income and expenditure shares (Table 2) times the percentage increases in prices to obtain the impacts on incomes and expenditures for scenarios 1-4; calculate the percentage increases in cereal expenditures required to maintain calories for scenario 5 and add them to the percentage increases in peanut expenditures;
- (3) Add the positive income effects to the negative expenditure effects to obtain the net percentage increase or decrease in real income.

Before turning to the simulation results, it is helpful to summarize anticipated impacts. On the production side, zones are more likely to gain from devaluation if households earn a large share of income from exportable peanuts. Unfortunately, peanut production provides only a small share of income for the three vulnerable zones (north, west, and Senegal Oriental), which have the largest share of households below minimum needs before devaluation. The big winners on the production side would be the central and southeastern Peanut Basin, which earn about half of their income from peanuts.

On the consumption side, zones that spend more on rice and peanut products are most likely to be hurt. Fortunately, rice and peanut expenditure is low in two of the three vulnerable zones (west and Senegal Oriental). Unfortunately, rice and peanut

expenditures are high in the third vulnerable zone (north). Urban households also have high rice and peanut consumption.

These, hypotheses, based on expenditure and income patterns, suggest that the towns and the north are the most susceptible to a reduction in real income after devaluation, regardless of the scenario. The center and the southeast are most likely to benefit. These hypotheses are confirmed by the simulation results presented below.

Results

Table 3 contains one line of results for each of the five simulation scenarios. The first line shows the percentage changes in real incomes given the "implemented" scenario. The overall impact is a 7 percent increase in real income for rural zones and an 8 percent drop in income for towns. The impact is strongly negative for the north and the towns (-8 to -10 percent) and mildly negative for the southwest (-.004 percent). The winners in this scenario are the big peanut-producing zones; real income increases by 16 percent in the southeast and by 14 percent in the center. Although the production-side effect is about the same in the center and the southeast, the net effect is lower in the center because rice consumption is higher (12 percent of expenditure in the center versus 4 percent in the southeast). The other rural zones (west and Senegal Oriental) have small increases (2-5 percent) increases in real income.

Although we do not simulate devaluation impacts on noncropping income, a side-note on that subject enriches the story. Households in the north earn a lot of income from livestock sales in Dakar. If urban households reduce meat consumption in response to a drop in real income, the north will lose even more income than suggested in our scenarios because of reduced livestock sales. Similarly, nonfarm rural income could drop further if urban households cut back on domestic help -- the major source of migration remittances for the west.

By contrast, the relatively well-off southwest earns about half its income in nonfarm activities linked to the farm sector (cereal and peanut marketing, in particular), so the modest -.004 percent drop in real income could be balanced by increased commerce income. Devaluation would also benefit Senegal Oriental via the 50 percent of migration remittances from abroad.

Moreover, although we do not stratify income groups in zones, a side-note on differential impacts on the poor is important and can be inferred from general information on income and expenditure patterns of the poor. The poor will realize smaller than average production-side benefits because they have a lower share of income from peanuts. Although the poor purchase less rice than the rich, rice provides a large share of total calories for the poor (39 percent in the north, 28 percent in the center, and 19 percent in the southwest); thus the poor will be hurt by increased rice prices.

The pro-producer scenario (second line of Table 3) increases overall real income by 12 percent above pre-devaluation levels in rural areas while reducing incomes by 15 percent in urban areas. The north and the towns suffer the most (14-16 percent drops in real income); the big peanut-producing zones gain the most (22 percent in the center and 27 percent in the southeast).

The pro-consumer scenario (third line of Table 3) increases overall rural incomes by 9 percent while reducing urban incomes by only 7 percent. The big peanut producing zones are still the winners (15 and 17 percent increases); these results approximate those for the implemented scenario (14 and 16 percent). Real income in the vulnerable north drops 5 percent below pre-devaluation levels, but is 3 percent better than the implemented scenario. Incomes rise by 7 percent in the west and 2 percent in Senegal Oriental -- the other two vulnerable zones. This result is slightly better than the implemented scenario (5 and 2 percent, respectively).

The pro-government scenario (fourth line of Table 3) is best for balancing the government budget, but worst for rural zones as

overall real income increases by only 1 percent. The north loses 18 percent and the southwest 4 percent. Towns lose almost as much income (14 percent) as they did with the pro-producer scenario (15 percent). Only the southeast (15 percent) and the center (10 percent) still realize substantial gains.

In sum, the implemented scenario, with its accompanying subsidy and tariff policy changes, produces real income results that run a middle path between the extremes of the other three comparative-static scenarios. The net effect is negative on zones with substantial consumption of rice and peanuts (especially, the north and towns), but not as negative as the pro-producer or pro-government scenarios would have been. The net impact of the implemented scenario on real income for zones with substantial peanut production is slightly better than the pro-government scenario and about the same as the pro-consumer scenario, but substantially less than the pro-producer scenario.

Moreover, we calculate that in moving from pre-devaluation peanut and rice policies to the implemented policy, the government budget situation worsens by 1,715 million FCFA. This is substantially less than the net increase of 16,170 million FCFA we estimated for the pro-government scenario, but better than the net decrease of 8,764 million FCFA in the pro-producer scenario, and the decrease of 7,700 million FCFA implied by the pro-consumer scenario.¹¹

Regardless of the scenario, real income drops in the north and the towns; the range is from -7 to -18 percent depending on zone and scenario. Regardless of the scenario, real incomes increase in the big peanut-producing zones (center and southeast); the range is from 14 to 27 percent depending on zone and scenario. Because two of the three vulnerable zones consume little rice and earn only a small share of income from peanuts, changes in the scenarios cause relatively small changes in their net income. Both zones (west and Senegal Oriental) are slightly ahead (5 and 2 percent increases) with the implemented scenario. The small impact

(-4 to +2 percent) in the southwest is related to high rice consumption and a small share of cropping income from peanuts.

Results of the cereal substitution scenario are shown in rows 5 and 6 of Table 3. Row 5 is the change in cereal expenditure required to maintain pre-devaluation cereal calorie levels after substitution between rice and coarse grains; row 6 is the net impact on real income after the production-side effects (on both peanuts and coarse grains) are factored in. Households need to spend 15 to 24 percent more than they did before devaluation to maintain calories. Given the own price elasticity of .6 used, the cross-price elasticities required to maintain calories when rice consumption dropped by 20 percent were 1.15 and 1.64 for Kaolack and Tambacounda, .73 for the north, .19 to .22 for the southwest and the center and less than .1 for the other zones. The few available estimates of cross-price elasticities for Senegal are in the .2 to .25 range.¹² The net impact on real income from the substitution scenario is negative (-3 to -27 percent) across all zones but the two big peanut production zones which realize 2 to 3 percent increases.

Although the partial relaxation of the static assumptions does not tell the full story, these results show that for households to maintain pre-devaluation levels of cereal calories -- a reasonable objective given that average caloric intake was close to the "at risk" level prior to devaluation -- post-devaluation real incomes need to increase from 2 to 27 percent by factors not accounted for in this analysis (increases in real income from nonfarm sources, for example) if households in 6 of the 8 zones are to break even. This will not be an easy task.

Conclusions and policy implications

Our analysis shows that the short-run negative effects of devaluation are likely to be felt most in urban areas and the northern Peanut Basin, while the positive effects will be strongest in the central and southeastern Peanut Basin. Since the

devaluation, most concern has been focused on urban areas; this analysis shows that the benefits are unevenly distributed across rural zones and some are as negatively affected as urban areas.

This is perhaps a more negative (or, in some cases, ambiguous) impact in rural areas than we think policymakers expected. The difference between our rural results and what one might have anticipated is due to the higher-than-expected levels of rice consumption and the lower-than-expected shares of income earned from peanut production; these two facts together lead to a greater negative demand-side effect and smaller positive supply-side effects of devaluation several rural zones.

The potential of the devaluation to stimulate long-run economic growth depends on (1) maintaining political stability, (2) limiting inflation, (3) promoting job and income creation, and (4) raising peanut and millet production. Our analysis of the short-run impacts of devaluation suggest a number of steps that will help ensure a long-run positive devaluation outcome.

Protecting the poorest households against sharp drops in real income is not only humane but also the first step to maintaining political stability, particularly in the politically-active towns. The poor in the north and in the towns will be especially hurt because they earn little from peanut production and eat a lot of rice. Food-for-work programs, rather than food distribution programs, will be more likely to reach only the needier households.¹³ Programs should be concentrated in the most affected zones. They should also be considered for the two other vulnerable zones (western Peanut Basin and Senegal Oriental) that realize modest gains from devaluation but have a large portion of households with incomes below minimum needs. These poor households earn very small shares of income from peanut production and are, therefore, likely to have lower real incomes after devaluation than is suggested by the zone average. Using coarse grains rather than rice as payment should discourage better off households from participating simply to avoid higher rice prices.

Controlling inflation requires keeping food prices down, as more than 80 percent of household expenditure goes to food. The abundant 1993 harvest helped; however, Senegal will still need external supplies of cereal, as local production rarely covers more than half the demand. Given higher rice import costs and lower tariffs, the government will need food aid to ensure that grain markets are well-stocked. Food aid in coarse grains will be most appropriate as it will encourage consumption of products whose supply can be increased in the long-run through local production. Triangular aid in West Africa may be a useful option to bolster farm incomes in other countries affected by the devaluation. Policy initiatives that would lower transport and marketing costs for both domestically produced coarse grains and imports from neighboring countries could also help.

In accepting aid, the government should be vigilant that the aid contributes to (or at least does not depress) local job creation and income. For example, food aid in coarse grains rather than processed rice can help Senegalese mills to function more efficiently and create jobs. Mills frequently run under-capacity because local supplies of millet are inadequate. Also, to protect households in the north from further income loss, competition from low-cost meat imports that depress demand for local livestock products should be avoided. In the past "dumping" of frozen meats by industrialized nations has suppressed demand for local production.

The toughest task is to encourage increased agricultural production to control food price inflation in the long-run. There is ample evidence that crop production in rainfed areas declined during the 1980s due to lower use of modern inputs, declining soil quality, and difficult access to credit.¹⁴ Devaluation has changed input/output price relationships and relative crop prices. Higher producer prices for peanuts and millet could mean that some fertilizers are more profitable now despite higher import costs. Senegal produces its own phosphates and most soils in the Peanut Basin are considered phosphate deficient; thus, the post-

devaluation costs and benefits of simple phosphate applications should be examined. The relative profitability of government investments in irrigated rice production (which is very intensive in imported inputs such as pumps, tractors, and fertilizers) should be compared to investments in rainfed agriculture (which employ few imported inputs) using post-devaluation prices. Such analyses can provide the private sector with valuable information about where input demand is likely to be strong, thereby encouraging private firms to develop appropriate input supply networks.

Zones benefitting from the devaluation (the central and southeastern Peanut Basin) will have more cash on hand than usual. Input manufacturing, marketing and credit policies should be examined and redesigned to ensure that some of this cash is reinvested in crop production -- renewal of aging animal traction equipment stocks, or purchases of fertilizer and better quality peanut seed, for example. Opportunities for doing this through the private sector should be sought to avoid a return to the costly government programs that prevailed in the 1960s and 1970s. Support programs (training, marketing, credit, for example) that help local blacksmiths improve the quality and increase the supply of locally manufactured animal traction equipment is one possibility. Another option would be designing extension, credit and input marketing policies to encourage conservation investments such as windbreaks, tree planting, and bunds.

In sum, analysis of an unusually detailed set of household income and expenditure data permitted us to distinguish areas of post-devaluation promise from those with post-devaluation problems. This knowledge, hidden from view in macroeconomic analyses of aggregate devaluation impacts on national accounts, was then used to consider which types of policies would be most likely to encourage the long-run success of the devaluation. Particular attention was given to (1) policies to protect vulnerable groups (and thereby maintain political stability) and (2) policies to stimulate investment by groups realizing short-run increases in

income (thereby channeling the short-run benefits into actions that will foster long-run economic growth).

Table 1: Zone and sample characteristics

	People ('000)	Density: People per sq km	Rain (mm)	Princi- pal crops	Cereal consumption preferences	Income: FCFA per AE	Income: Percent from crops	Income: Percent livestock	Income: Percent migration	Percent below min- imum needs
Peanut Basin										
North	275	32	3-500	Pn/mil	Rice/mil	43000	17	19	6	15
West	373	81	5-700	Mil/pn	Millet	33000	79	3	3	35
Center	959	65	5-700	Pn/mil	Mil/rice	56000	76	5	3	0
SW	399	85	8-1000	Mil/pn	Mil/rice	67000	50	4	0	7
SE	205	32	8-1000	Pn/mil	Mil/sor	72000	71	18	0	0
Sen.Or.	82	7	8-1000	Maz/sor	Maz/sor	42000	37	22	19	21
Urban										
Kaolack	765	-	-	-	Rice/mil	108000	1	0	3	6
Tamba.	53	-	-	-	Rice/maz	103000	0	0	0	7

Source: Calculated from IFPRI/ISRA survey data and 1988 Senegalese census data.

Abbreviations used: AE=adult equivalent, Eq=equipment, Lb=labor, Ld=land, Maz=maize, Mil=millet, Pn=peanuts, Rn=rain, Sor=sorghum.

Table 2: Production and expenditure patterns

Zone	Percent income from peanuts	Percent income from millet	Index of cereal production adequacy	Expenditure on millet: % of total expenditure	Expenditure on imported rice: % of total expenditure	Expenditure on peanut products: % of total expenditure	Rice consumption of poor: % of total calories	Rice consumption of rich: % of total calories
Peanut Basin								
North	11	5	.20	20	28	13	39	51
West	31	48	.69	49	8	13	11	16
Center	49	26	.83	22	12	10	28	35
SW	22	28	.84	29	13	13	19	28
SE	48	21	.81	33	4	7	7	10
Sen. Or.	19	15	.59	43	3	13	7	6
Urban								
Kaolack	0	0	0	9	15	12	38	42
Tamba.	0	0	0	6	19	11	40	47

Source: Calculated from IFPRI/ISRA survey data 1989/90.

Notes:

1. The index of cereal production adequacy is based on covering minimum daily needs of 2400 calories per adult equivalent with coarse grain production.

Table 3: Changes in real household income given a 50 % devaluation under selected assumptions about tariffs and subsidies

Scenario	P e a n u t B a s i n						Rural	U r b a n		Urban	Impact on GOS Budget ¹
	North	West	Center	South- west	South- east	Senegal Orient.	Weighted Average	Kao- lack	Tamba	Weighted Average	
Implemented ²	-8%	5%	14%	-0%	16%	2%	7%	-8%	-10%	-8%	+2,695
Pro-producer	-14%	9%	22%	1%	27%	3%	12%	-15%	-16%	-15%	-8,764
Pro-consumer	-5%	7%	15%	2%	17%	2%	9%	-7%	-8%	-7%	-7,700
Pro-government	-18%	3%	10%	-4%	15%	1%	3%	-14%	-16%	-14	+16,170
Cereal substitution											
Increase in cereal expenditure	20%	15%	18%	17%	16%	15%		24%	23%		--
Net income effect	-19%	-3%	2%	-10%	3%	-11%	-4%	-27%	-27%	-27%	--

Source: Calculated from ISRA/IFPRI survey data 1989/90.

Notes:

1. Shown in millions of FCFA.

2. The "implemented" scenario is the one implemented by the government in January 1994; price assumptions for all scenarios described in text.

Notes

1. *The New York Times*, February 23, 1994, page A1.
2. Ibid.
3. See V. Kelly, T. Reardon, A. A. Fall, B. Diagana, and L. McNeilly. "Final Report for the IFPRI/ISRA Study of Consumption and Supply Impacts of Agricultural Price Policies in the Peanut Basin and Senegal Oriental", Washington, D.C.: International Food Policy Research Institute, September 1993, mimeo.
4. Cotton is also produced in Senegal Oriental, but there was no cotton income in 1989/90 due to a boycott.
5. See V. Kelly and C. Delgado, "Agricultural Performance Under Structural Adjustment" in C. Delgado and S. Jammeh (eds.), *The Political Economy of Structural Adjustment in Senegal*, New York: Praeger Books, 1990; and S. Commander, O. Ndoye, and I. Ouedraogo, "Senegal: 1979-88", in S. Commander (ed), *Structural Adjustment and Agriculture: Theory and Practice in Africa and Latin America*, London: Overseas Development Institute, 1989.
6. The index of cereal production adequacy is the ratio of coarse grain production to coarse grain needs. The Institute for African Nutrition Research (ORANA) recommends daily consumption for a moderately active Senegalese male of 3000 calories; 2400 represents the minimum acceptable level. Households consuming less than 2400 calories daily per adult equivalent are considered to be "at risk".
7. "Minimum needs" in rural areas is the cost of purchasing 1900 calories of coarse grains per adult equivalent plus 20 percent for other essential food and nonfood items. In urban areas, it is the cost of purchasing 1900 calories of rice per adult equivalent plus 30 percent for other essentials.
8. All rice consumed in the study zones was imported. Rice is produced in the Senegal River Valley (irrigated) and in the Casamance (both rainfed and irrigated). Despite large

investments in irrigated rice during the 1980s, local rice covered only 25 percent of Senegalese demand in 1989.

9. The 20 percent is based on an own price elasticity of .6 for both rice and millet; see R. Kite, "Evidence on Food Consumption Patterns and Behavior in Senegal: Implications for the Food Policy Dialogue", mimeo, USAID/Senegal, October 1992.

10. The percentage increase in price is the ratio of the new price to the old price. For example, if the new rice price is 180 FCFA/kilo and it was 135 FCFA/kilo, the ratio is 180/135 or 1.33, and the price increase is 33 percent.

11. These are estimates of marginal changes in the government budget given changes in tariff and subsidy policies. The estimates assume that 1993/94 peanut exports and rice imports will be the same in 1989/90. Under pre-devaluation peanut and rice policies the amount paid out in peanut subsidy was 4,410 million FCFA less than the rice tariff revenue.

12. See Kite, *op. cit.*

13. For more information concerning food aid and food-for-work programs, see P. Webb and J. von Braun, *Famine and Food Security in Ethiopia: Lessons for Africa*, Chichester: John Wiley and Sons, 1994.

14. See Commander, Ndoye, and Ouedraogo or Kelly and Delgado (cited previously); for a discussion of agricultural productivity during the 1980s.