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Rice Policy of the Ivory Coast

by

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INTRODUCTION

Ivorian economic growth springs from its agriculture. Since colonial times, agriculture has been carefully promoted by planning, research, and investments, aided by significant inflows of foreign labor and capital and by high world prices for export crops. A balance-of-payments constraint never posed serious problems and balanced budgets have generally helped to avoid inflation, despite high government expenditures.

Rice, however, is an exception to the Ivorian success story. This lack of success scarcely shows, for production has greatly increased. But increased production has been extracted at a high cost to the economy and to the government budget. In the face of constraints caused by factor endowments and geography, government policies have failed to introduce or develop the basic technological changes necessary to make the growth of rice production efficient.

The anatomy of these policies is the subject of this paper. It begins with a summary description of the country and its rice sector. A critical review of the historical evolution of government objectives and policies sets the stage for the analysis and evaluation of past and present interventions in the rice sector. A discussion of lessons and alternative policies concludes the paper.

SETTING

Population

In 1975 the Ivory Coast had a total population of nearly 7 million, of which one-third lived in urban areas and two-thirds in rural areas. Of this

total, approximately 5 million lived in the more prosperous forest zone while the remaining 2 million lived in the northern savannah zone, giving densities of 30 and 12 inhabitants per square kilometer, respectively. In the major rice-producing areas, population densities are among the highest.¹ Thirty-five percent of the rural population is involved in rice production, two-thirds of which is in the forest zone (22).

Although the overall population growth rate is high--4.1 percent in 1975--over a third is contributed by significant in-migration from neighboring countries. Non-Ivorian African migrants make up between one-quarter and one-third of the country's total population as well as most of the hired unskilled labor force in both urban and rural areas (22).

There are also two major internal migration patterns--from savannah to forest, and from rural to urban areas. Growth rates for the two ecological zones--5 percent per annum in the forest and only 2 percent in the savannah--are quite disparate. Census results reveal negative growth rates for the adult male population in the savannah zone (22). Urban growth rates average 8.5 percent per annum, but Abidjan, the capital city, is growing at an estimated 10 percent (22).

Consumption

The analysis of Ivorian rice consumption presents a paradox. While aggregate rice consumption has increased with population growth, there has been no pattern of growth in per capita consumption figures since 1965, in spite of large increases in real per capita income and a high rate of urbanization.² Per capita rice consumption has averaged slightly more than 40 kilograms (kg) during this period (Table 1) (6, p. 19). Unfortunately, little is known about how consumption is distributed between rural and urban

Table 1.--Rice Consumption*

Year	Current estimated population (000)	Total rice consumption ^a (000 mt)	Actual per capita rice consumption (kg)	Early population predictions ^b (000)	Projected consumption ^c (000 mt)	Actual domestic production of rice ^d (000mt)	Percent shortfall (-) or surplus (+) of production
1960	3,865	109.7	33.0	-	-	-	-
1961	3,984	116.6	29.3	-	-	-	-
1962	4,107	124.4	30.3	-	-	-	-
1963	4,234	145.4	34.3	-	-	-	-
1964	4,865	173.4	39.7	-	-	-	-
1965	4,500	207.5	46.1	3,688	170	129	-24
1966	4,684	213.2	45.5	3,781	172	131	-24
1967	4,876	167.6	34.4	3,875	137	144	+ 5
1968	5,076	227.9	44.9	3,972	178	181	+ 2
1969	5,284	247.9	46.9	4,071	191	192	+ 1
1970	5,500	237.8	43.2	4,172	180	159	-13
1971	5,725	259.4	45.2	4,277	193	162	-19
1972	5,959	276.4	46.4	4,384	203	205	+ 1
1973	6,202	285.1	46.0	4,494	207	168	-23
1974	6,456	182.0	28.2	4,606	130	175	+26
1975	6,720	201.8	30.0	4,721	142	222	+36
1976	6,950	309.6	44.5	4,839	210	242	+13
1977	7,300	342.5	46.9	4,960	230	224	- 3

* Data for current estimated population and for total rice consumption and actual domestic production of rice are taken from Charles P. Humphreys and Patricia L. Rader, "Background Data on the Ivorian Rice Economy," Stanford/WARDA Study of the Political Economy of Rice in West Africa, Food Research Institute, Stanford University, Stanford, June 1978. The early population predictions are based on data in Ivory Coast, Government of, Bureau d'Etudes et de Réalisations Agricoles, Ministère de l'Agriculture et de la Coopération, Plan de Développement de la Riziculture, 1963-1970, Abidjan, June 1962, p. 16.

^aThis series is equivalent to total net rice availability.

^bThese projections are estimated from the 1960 figure using the predicted 2.5 percent growth rate. They are consistent with those used in Ivory Coast, Government of, Ministère du Plan, Perspectives Décennales de Développement Economique, Social, et Culturel, 1960-1970, Abidjan, 1967, p. 139, but slightly lower than later revisions made by Ivory Coast, Government of, Ministère du Plan, Loi Plan de Développement Economique, Social, et Culturel pour les Années 1967-1968-1969-1970, Abidjan, 1967.

Continuation of Table 1.

^cProjected consumption is calculated from the early population predictions using actual per capita consumption rates.

^dThese figures are the previous year's production net of seeds and losses.

areas. Since 1965, the percentage of total calories that each of the several main starchy staples represents has not changed significantly, as shown in Table 2. Rice comprises about one-quarter. The large overall increase in available calories is accounted for by the high population growth and by upward revisions in production estimates after 1974. These data suggest that growth of income and urbanization may be less important than relative prices in determining the demand for rice.

Rice and bread are the only two starchy staples for which the government sets official consumer prices, seemingly well controlled through an extensive system of small retail outlets.³ In the face of rapidly increasing prices for yams, cassava, and plantains since 1974, government policy has made rice, along with bread, the cheapest starchy staple in terms of calories per CFA franc.⁴

Geography

The Ivory Coast covers an area of 322,500 square kilometers, about one-half of which is arable (24). It is divided into two main ecological zones, which correspond roughly with the forest and savannah zones depicted in Map 1. The forest zone consists of two parts extending over approximately the southern half of the country. There is a narrow coastal belt with high rainfall and acidic soils which produces industrial crops such as oil palm, pineapples, and rubber. The forest north of this coastal belt benefits from the most fertile soils in the country and produces the major cash crops--cocoa and coffee--and most of the foodcrops, particularly rice. This region receives 1,500 to 1,600 millimeters (mm) of rainfall per annum beginning in March or April and ending in October or November, split by a short dry season in July and August (33).

Table 2.--Annual Consumption of Starchy Staples in the Ivorian Diet^{*a}

Staple	1949-51		1960-61		1964-66		1975-76	
	Calories ^b	Percent						
Rice	211	12	414	20	725	24	1,184	23
Wheat	32	2	20	1	226	8	252	5
Corn	111	6	264	13	409	14	668	13
Millet/sorghum	125	7	105	5	112	4	181	4
Fonio	9 ^c	0.5	13	0.5	20	1	6	-
Yams	514	28	597	28	671	23	1,100	22
Banana plantains	173	9	186	9	225	7	411	8
Cassava	598	33	427	20	471	16	1,101	22
Taro (coco yams)	30	2	69	3	86	3	128	3
Sweet potatoes	9 ^c	0.5	11	0.5	13	-	8	-
Total	1,812	100	1,909	100	2,612	100	4,474	100

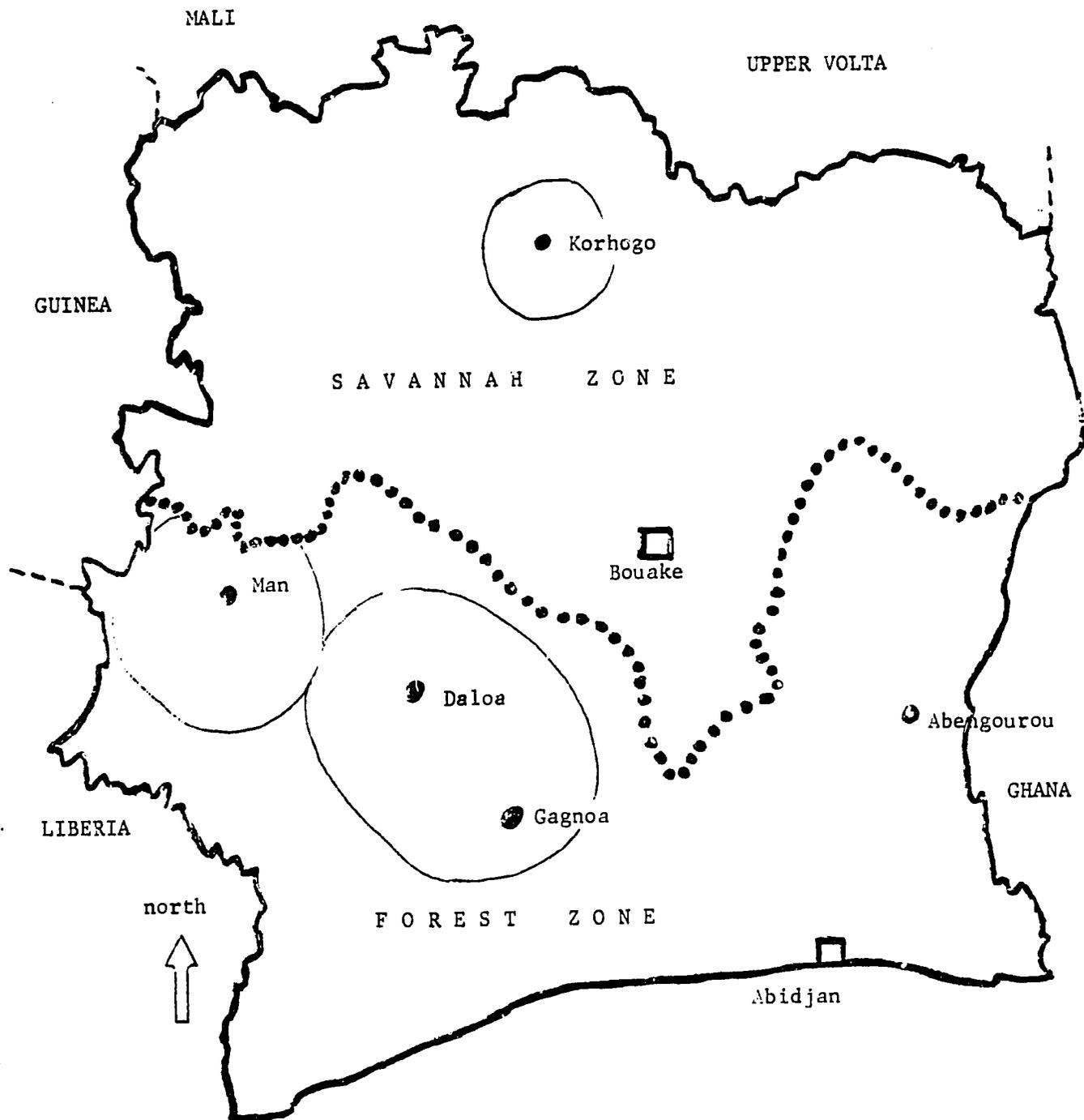
* Calories for 1949-51 are based on production and import data from Ivory Coast, Government of, Ministère du Plan, Service de la Statistique, Inventaire Economique de la Côte d'Ivoire, 1947-56, Abidjan, 1958. Data for other years come from Charles P. Humphreys and Patricia L. Rader, "Background Data on the Ivorian Rice Economy," Stanford/WARDA Study of the Political Economy of Rice in West Africa, Food Research Institute, Stanford University, Stanford, June 1978.

^a Edible quantities are calculated by deducting seeds, distribution losses, milling wastes, and other preparation losses (e.g. peeling) using coefficients based on assumptions in Food and Agriculture Organization, Food Balance Sheets, 1964-66 Average (Ivory Coast), Rome, 1971, pp. 291-2, and Ivory Coast, Government of, Ministère du Plan, Département des Etudes de Développement, Les Produits Vivriers de Base dans l'Alimentation en Côte d'Ivoire - Modes de Préparation, Coefficients de Transformation, by J. P. Chateau, Abidjan, 1973. Calories per kg are based on the U.S. Department of Health, Education, and Welfare, and the Food and Agriculture Organization, Food Composition Table for Use in Africa, by Woot-Tsuen Wu Leung, Bethesda, Maryland, 1968. A detailed table is available from the authors.

^b Calories are in billions.

^c These figures are estimated at 0.5 percent of total staple food calories, using the 1960-61 average.

Map 1.-- Major Rice Producing Areas of the Ivory Coast*



* Ivory Coast, Government of, Ministère du Plan, La Côte d'Ivoire en Chiffres, Edition 1977-1978, Abidjan, Société Africaine d'Édition, 1977.

●●●● boundary between forest and savannah zones

○ approximate limits of major rice growing areas

The northern savannah zone also comprises two parts.⁵ The center, around Bouaké, is a transition zone of highly variable rainfall over one or two seasons. It produces cotton, some coffee and cocoa, and foodcrops, especially yams. The second area in the savannah covers the northern third of the country, which is the driest and least fertile region characterized by latosols which, owing to lack of protective vegetation and intense rainfall, are susceptible to erosion and leaching. Crops grown here include cotton, the main cash crop, and cereals, which are mainly for home-consumption. In the savannah zone, the rainy season extends from May or June through September or October, providing 1,100 to 1,500 mm per year (33).

Production

Most agricultural production in the Ivory Coast comes from small family farms. It is generally land extensive, based on shifting cultivation with bush fallows. In more densely settled areas, which are also centers of rice production, these fallow periods are only two or three years for each one to two years of production. These shorter fallows do not reflect an overall shortage of land but indicate localized scarcities around population centers. Investments in equipment are quite small, and lack of working capital may constrain expansion.

Farms vary greatly but typical characteristics can be noted, especially when comparing the forest and savannah zones. Farms, especially in the south, are multiple crop enterprises, producing both food and industrial crops and hiring outside labor. Although families are smaller in the forest zone, farm sizes are larger, reflecting in part the extensive cultivation of coffee and cocoa and in part the use of temporary hired labor. Some aggregate and average

indicators are given in Tables 3 and 4.

Agricultural land use is divided between industrial and food crops, the latter composing about 45 percent or 4.5 million hectares (ha), a share which has changed little since 1965 (Table 5). Rice represents a relatively small part of this amount, comprising roughly one-fifth of foodcrop land, a ratio which is similar in both forest and savannah zones. Total land in agricultural production, including fallow, may be as high as 10 million ha, or nearly two-thirds of estimated arable land.⁶

Government intervention in agriculture has largely been oriented toward expanding the production of industrial crops through marketing programs and increasing their yields by supplying modern inputs. Input distribution for important cash crops is assured by government-owned development companies. Purchases of these crops are at floor prices fixed at the top level of government and effectively maintained. Rice is the only staple foodcrop for which there has been a state development company, SODERIZ, and fixed producer prices.⁷

Although official minimum agricultural wages have been in effect since 1955, they seem to have little impact on the cost of labor. Private wages are often as much as 100-200 CFA francs higher than the legal rate.⁸

Agricultural credit is furnished mainly by the government through the Banque Nationale de la Développement Agricole, (BNDA), usually at preferential interest rates.⁹ Half of the agricultural credit is used to finance government buying operations, and a fourth is loaned to farmers.

Virtually all traditional rice is rainfed, primarily upland. Of this rice, probably 90 percent is oryza sativa and the rest oryza glaberrima. The small amount of flooded rice in the northwest is relatively unimportant, and there are no indigenous water control systems. As shown in Table 4, four-fifths of paddy produced in 1976 came from this rainfed technique, although the proportion was higher in 1975. Most past expansion has usually been associated with demographic growth.

Table 3.--Summary Characteristics of Ivorian Agriculture*

Characteristic	Entire country	Forest Zone		Savannah zone	
		Quantity	Percent	Quantity	Percent
<u>General</u>					
Total farm population (<u>000</u>)	3,683	2,198	60	1,485	40
Average family size	6.7	6.6	-	6.9	-
Number of family farms (<u>000</u>)	550	335	61	214	39
Average farm size (<u>ha</u>)	5.01	6.08	-	3.33	-
Estimated farm revenue (<u>000CFA francs</u>)	219	248	-	92	-
<u>Rice-related</u>					
Farm population growing rice (<u>000</u>)	1,601	1,051	66	550	34
Farms growing rice (<u>000</u>)	237	162	68	75	32
Percent farms growing rice	43	48	-	35	-
Rice land per farm growing rice (<u>ha</u>)	1.29	1.35	-	1.15	-

* Data are taken from Charles P. Humphreys and Patricia L. Rader, "Background Data on the Ivorian Rice Economy," Stanford/WARDA Study of the Political Economy of Rice in West Africa, Food Research Institute, Stanford University, Stanford, June 1978.

Table 4.--Rice Production in Ivory Coast*

Type of production	Area harvested ^a (000 ha)	Yield (mt paddy/ha)	Production (000 mt paddy)	Percent paddy
Traditional rainfed, - forest	222	1.1	249	59
Traditional rainfed, - Savannah	107	0.9	95	22
Fertilized rainfed, - forest ^b	5	2.0	9	2
Fertilized rainfed, - Savannah ^b	8	1.7	13	3
Total rainfed	342		366	86
Irrigated, - forest (no fertilizer)	5	2.5	12	3
Irrigated, - Savannah (no fertilizer)	5	2.4	11	3
Fertilized irrigated, - forest	5	3.3	16	4
Fertilized irrigated, - Savannah	3	3.7	11	3
Total irrigated	18		50	12
Flooded ^c	5	1.7	9	2
Total Ivory Coast ^d	364	1.2	425	100

* Data for totals are for the crop year 1976 and taken from Ivory Coast, Government of, Ministère de l'Agriculture, Direction des Statistiques Rurales, Statistiques Agricoles, Abidjan, 1976. The breakdown into types of rice cultivation is based on information in Ivory Coast, Government of, Ministère de l'Agriculture, Société pour le Développement de la Riziculture (SODERIZ), Rapport Annuel, 1976, Abidjan, 1977, and Ivory Coast, Government of, Ministère de l'Agriculture, Compagnie Ivoirienne pour le Développement des Textiles (CIDT), Rapport Annuel d'Activité, Compagne 1976-77, Bouaké, August 1977.

^aThe area is in pure stand equivalents.

^bThis area includes manual (17 percent), oxen (30 percent), and tractor (53 percent) cultivation.

^cThis figure includes fertilized area (64 percent). The area estimate for flooded rice is subject to considerable uncertainty.

^dTotals may vary slightly due to rounding.

Table 5.--Land Utilized for Crop Production*

Crop	1965		1974	
	Physical hectares ^a (000)	Percent	Physical hectares ^a (000)	Percent
Coffee	680	32.4	1121	30.6
Cocoa	424	20.2	745	20.3
Corn	186	8.9	167	4.6
Banana plantains	120	5.7	480	13.1
Rice	209	10.0	258	7.0
Yams	142	6.8	149	4.1
Cassava	56	2.7	169	4.6
Taro (coco yam)	42	2.0	306	8.4
Millet, sorghum, and fonio	63	3.0	94	2.6
Oil palm	19	0.9	22	0.6
Cotton	62 ^b	3.0	34	0.9
Peanuts	37	1.8	34	0.9
Coconut	11	0.5	26 ^d	0.7
Rubber	10	0.5	16	0.4
Sugar	0 ^c	0	9 ^e	0.2
Others	36 ^c	1.7	34 ^e	0.9
Total	2,097	100.1	3,664	99.9

*The data for 1965 are taken from Ivory Coast, Government of, Ministere du Plan, Plan Quinquennal de Développement Economique, Social et Culturel, 1971-75, Abidjan, 1971, pp. 212-13. Improved cotton area for 1965 is taken from Ivory Coast, Government of, Ministère de l'Agriculture, Compagnie Ivoirienne pour le Développement des Textiles (CIDT), Rapport Annuel 1975-76, Bouake, August 1977. The 1974 areas come from Ivory Coast, Government of, Ministère de l'Agriculture, Direction des Statistiques Rurales, Recensement Agricole, Abidjan, 1974, vol. 1, pp. 116-19. The 1974 area in rubber is from Ivory Coast, Government of, Ministère de l'Agriculture, Direction des Statistiques Rurales, Statistiques Agricoles, Abidjan, 1975, p. 103.

^aTo account for mixed stands, areas have been reduced by 40 percent for millet, sorghum, fonio, cassava, sweet potatoes, coco yams, ground peas, plantains, and traditional cotton. To account for multiple cropping, areas have been reduced by 20 percent for rainfed rice, corn, yams, peanuts, and improved cotton.

Continuation of Table 5.

^bThis figure includes 41,000 ha of traditional cotton.

^cThis figure includes only ground peas, tobacco, bananas, sweet potatoes, and pineapples, in order of importance.

^dThis figure represents area planted only.

^eSpecific individual crops are not indicated.

Historically, rainfed paddy production has been localized in the northern savannah around Korhogo and extending to the west towards Guinea--now accounting for about one-fourth of traditional paddy production--and in the southwest near Man and the Liberian border. Climatically, these two areas are most suited to rainfed rice production (3). Since 1900 when the French introduced rice to feed the forced labor on coffee and cocoa plantations, rice has spread eastward through the forest zone. Natural conditions favor rice more in the forest zone than in the savannah: rainfall is greater and more regular; the growing season is generally longer; and traditional yields are 25 percent higher (1.1-1.3 metric tons (mt) paddy/ha).

The manual cultivation techniques and crop calendar used for improved rainfed rice differ little from those used in traditional production, although yields increase by 70 percent due to modern inputs, and sickle harvesting saves labor. Government subsidies on modern inputs, including extension, for rainfed rice average about 40 percent of actual costs (5). Use of fertilizers and selected seeds in upland production has greatly expanded in recent years.¹⁰

The government has attempted to introduce large-scale mechanization into rainfed rice production through partial subsidization (18 percent) of tractor services (5). Mechanized land clearing, which had exceeded 10,000 ha by 1976, is fully subsidized. Mechanization represents an effort to stabilize upland farming by using rotations, primarily with cotton and fodder. Oxen cultivation is expanding rapidly, although trypanosomiasis limits its use to the savannah zone.

Despite the overwhelming predominance of rainfed rice, government efforts to introduce modern rice cultivation have been focussed on irrigated rice.¹¹ The most widespread irrigation systems divert streams onto surrounding lowland areas of 10 to 15 ha. Investment costs are moderate (\$1,500/ha), three-fourths

being subsidized. The partial water control assures only one crop in most cases, although forest farmers average about 1.3 crops per year. By 1976, nearly 20,000 ha had been developed. Since the early 1970s, the government has also made considerable investments in dams, sometimes augmented by large pumps, to assure double cropping--especially in the savannah. Such projects usually cover 100 to 200 ha, and by 1976 about 4,500 physical¹² ha had been developed at a cost of approximately \$5,000/ha, virtually fully subsidized (6, p. 8). Recent estimates indicate that about 60,000 hectares could still be developed for irrigation at fairly constant costs¹³ although public financing will be required to realize such expansion.

Production techniques for irrigated rice differ mainly with respect to the degree of mechanization, although cultivation is usually manual on holdings of one-quarter to one-half hectare. Improved inputs appear to be used on only about half the irrigable area (6). There is a limited use of power-tillers, and there have been experiments with tractors and combine-harvesters on the areas irrigated by pumps. Accordingly, labor input is high.

Marketing and Milling

Two parallel marketing systems--the government sector with industrial-scale mills, and private transporters, merchants, and small-scale millers--exist in the Ivory Coast.¹⁴ Before the 1973-74 price increases, government buying programs failed to compete with home consumption as well as private merchants and millers who handled virtually all marketed rice, over both short and long distances.

The domestic price policy established in 1974-75, which fully subsidizes SCDEIRZ for its collection, milling, and distribution costs, has given the government control of the paddy market and permitted it to purchase a

quarter of national production, and perhaps half to three-quarters of all paddy sold. Although government policy has forced much of the traditional milling sector into dormancy, private paddy buyers and transporters remain important, as do private rice wholesalers.¹⁵

Since the mid-1960s, the government has increased its industrial-scale milling capacity two and one-half times to over 150,000 mt paddy in 1976. Outturns of rice have also improved from an estimated 45-50 percent to an estimated 66 percent in 1975/76. In addition, some 1,700 to 3,000 private small steel-cylinder mills have been installed by private operators, (6, p. 11) mostly in the forest zone.¹⁶ Although total capacity probably exceeds 500,000 mt, current utilization for the sector may be as low as 10-15 percent.¹⁷ Outturns are slightly lower than those of government mills, but the rice produced is often fresher and sells at a premium of as much as 10 percent above the official price.

Before 1974, the government market channel handled mostly imported rice, purchased and distributed by a cartel of import houses working with the government. As much as 50 percent of the imports are estimated to have been consumed outside Abidjan (20). Any domestic rice which did flow to Abidjan was channeled through the traditional private sector. Abidjan and the government mills served as basing points for official consumer prices. After 1975, when imports were temporarily halted, the distribution system had to be reversed. Government mills in the interior supplied Abidjan with rice, and domestic rice replaced imports. Because official consumer prices were equalized throughout the country, the government rationed shipments from its mills to urban centers, and the Caisse de Péréquation subsidized transport costs to Abidjan.¹⁸ A market in privately-milled rice continued to exist but operated over shorter distances, serving areas near producing centers.

The resumption of imports in 1977 has so far had no effect on the price structure, although it should ease pressure to ship rice to Abidjan from government mills.

Neither storage nor transport is a constraint. Transport of both paddy and rice is assured by a large private sector.¹⁹ Storage is decentralized in the private channels, and capacity and quality are unknown. Public storage was a constraint when the government began to dominate paddy marketing after 1974, but the government has reacted quickly by increasing capacity from about 15,000 mt to a projected 200,000 mt by 1979 (6, p. 11, 13).

HISTORY

The early evolution of Ivorian rice policy was gradual from the colonial period until 1974. Despite ambitious planning statements, self-sufficiency in rice was not viewed as an urgent goal before 1974. Government policy makers planned to increase rice production through a gradual process of technological change, since world prices were consistently low and Ivorian production was not competitive. But in 1973-74, the quadrupling of world rice prices and a doubling of imports catapulted the government into a new policy of price support which radically increased the scope and level of its intervention (Table 6).

Three distinct periods of Ivorian rice policy emerge: the colonial period; the period between 1960 and the 1973-74 price increases; and that after 1974. This section describes these three periods, highlights government objectives and policies, and offers explanations for particular government strategies.

The Colonial Period

The colonial period was a time of investment in both physical infrastructure and basic agronomic research. By 1960 an extensive internal road

Table 6.--Selected Historical Series for the Ivorian Rice Economy*

Year	Gross domestic product per capita at constant prices (base year 1973) (millions CFA francs)	Share in GDP at current prices		Rice ^b			Total net rice imports		Consumer price index	
		Agriculture (percent)	Paddy ^a (percent)	Area (000ha)	Yield (mt/ha paddy)	Production (000mt paddy)	Quantity (000mt)	Value (million CFA francs)	Total	Food
1960	58,458	40.0	n.a.	194.1	.82	160.0	35	868	102.5	105.4
1961	62,185	35.4	n.a.	n.a.	n.a.	156.0	33 ^c	1,008	114.1	125.6
1962	63,221	32.1	n.a.	n.a.	n.a.	230.0	43	1,418	112.4	118.7
1963	71,406	30.8	n.a.	n.a.	n.a.	220.0	25 ^c	786	112.4	118.3
1964	81,973	31.7	n.a.	247.6	1.00	247.9	58	1,949	113.9	118.9
1965	77,818	30.6	1.9	261.3	.96	250.0	78 ^c	2,216	117.0	122.4
1966	80,768	29.5	1.9	258.0	1.07	274.9	82	3,094	121.9	127.6
1967	79,653	26.3	2.3	300.9	1.15	344.6	24 ^c	869	124.6	126.6
1968	88,177	25.6	2.2	299.0	1.22	365.4	47	1,872	131.4	134.8
1969	88,731	23.3	1.7	288.3	1.05	303.0	56	1,878	137.1	141.6
1970	92,165	22.5	1.5	289.1	1.09	315.5	79 ^c	2,031	148.9	163.0
1971	95,326	21.9	1.8	282.0	1.37	385.1	97 ^c	2,200	147.7	160.1
1972	98,781	21.0	1.7	282.0	1.13	320.0	77 ^c	2,192	148.2	158.3
1973	97,309	20.4	1.7	290.0	1.16	334.9	145	8,496	164.1	186.3
1974	95,850	n.a.	3.7	310.7	1.36	422.1	65 ^{c,d}	7,781 ^d	193.1	220.0
1975	93,154	n.a.	3.9	360.6	1.28	460.9	2	210	215	242.6
1976	100,577	n.a.	2.5	364.0	1.17	425.5	- 30 ^e	201	241.4	260.5
1977	n.a.	n.a.	n.a.	n.a.	n.a.	400.0	159 ^f	10,191 ^g	307.4	364.7

*This information has been taken from Charles P. Humphreys and Patricia L. Rader, "Background Data on the Ivorian Rice Economy," Stanford/WARDA Study of the Political Economy of Rice in West Africa, Food Research Institute, Stanford University, Stanford, June 1978.

^aPaddy share of GDP is calculated at official prices.

^bThe area is a theoretical concept which takes account of associated crops to arrive at a pure stand equivalent.

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Continuation of Table 6.

^c Considerable variation exists among different reports of the total quantity imported. For example, Ivory Coast, Government of, Ministère de l'Agriculture et de la Coopération, Bureau d'Etudes et de Réalisations Agricoles, Plan de Développement de la Riziculture, 1963-1970, Abidjan, June 1976, p. 5, reports 51,000 mt for 1961. Ivory Coast, Government of, Ministère du Plan, Département, Sous-Direction de la Planification Economique, Travaux Préparatoires au Plan 1971-1975, 2^{eme} Esquisse: Les Objectifs de Production Agricole - le Riz, Abidjan, 1969, p. 4, gives 34,000 mt for 1963, 59,000 mt for 1965, and 43,000 mt for 1967. Finally, Ivory Coast, Government of, Ministère du Commerce, Casisse Générale de Péréquation des Prix des Produits et Marchandises de Grande Consommation, "Riz d'Importation - Evolution des Prix CAF, la TM," Abidjan, 1977, gives 100,000 mt for 1970, 106,000 mt for 1971, 88,000 mt for 1972, and 80,000 mt for 1974. The authors believe the Customs' figures remain the most accurate and complete series.

^d This figure includes 9,000 mt of paddy imported at a cost of 1,145 million CFA francs. It is converted to rice equivalent using a coefficient of .63.

^e The import expenditure is positive even though there were net exports because the imports were valued much more highly than the exports.

^f These figures are gross imports, since export figures were not available. They include paddy imported from Mali, converted to rice using the actual milling outturn of .56.

^g These values are preliminary estimates.

system had been completed, and the construction of the Vridi Canal in 1951 had reduced the cost of agricultural exports and inaugurated the rapid growth of Abidjan as a major West African port. Research institutes were established to improve the export tree crops--primarily coffee and cocoa--but also coconuts, oil palm, and rubber. During this period coffee, cocoa, and timber were established as the foundations of the Ivorian economy. These three commodities accounted for most of the nine percent average annual real growth rate of exports between 1950 and 1974, with coffee the most important (36, 37).

Initial colonial objectives with respect to rice were not clearcut, but the commitment to increase production had emerged before independence. Early documents indicated a large variation in output from year to year. Unlike the production of other foodstuffs, however, rice production was not growing.²⁰ At the same time consumption habits were changing. Because rice was used increasingly as a wage good for laborers on coffee and cocoa plantations, imports became necessary to meet domestic consumption. In the decade before independence, imports steadily increased from zero to 35,000 mt (23). Toward the end of the era, the desire to replace growing imports with local production became a more definite long-term goal, and development of irrigated rice was chosen as the main policy instrument to achieve this objective. The Third Territorial Plan, dating from 1958, focussed on rice, allocating it nearly a quarter of the agricultural investment budget and virtually all of the funds devoted to foodcrops.²¹

The main legacies of the colonial period were not only its policy orientation of gradually increasing rice production, but also its institutions and instruments for implementing this increase. The Second Territorial Plan, dating from 1953, organized the first systematic action for rice.²² Research stations were established in the savannah zone and the western forest zone,

the centers of indigenous rice production. Studies were carried out in the savannah zone to locate areas that could be developed into small scale diversion irrigation projects. SATMACI,²³ the state company for agricultural modernization, was created and it introduced nitrogen fertilizer into savannah rice production in 1953 and distributed selected seeds there starting in 1954 (19). Numerous private farmers were attracted to mechanized rice production in the northwest during the 1950s only to abandon the technique as too costly, given the uncertain climate. Several cooperative mills were installed in northern towns, and in 1955 the government set an official price for hulled rice in the savannah zone. Finally, a price equalization board was formed in 1955 to compensate for price fluctuations in rice imports, and a rice commission composed of private traders was established at the same time to manage the importation of rice (2, p. 91).

Independence to 1974

Objectives--Policies instituted in the late colonial period were largely continued during the first decade after independence. Although the new government placed a greater emphasis on high rates of growth of revenue per capita, the external orientation of the economy was preserved. Foreign trade and financing remained key instruments in obtaining this fundamental growth objective. Both budgetary equilibrium (to help control inflation) and a positive trade balance (to permit unrestrained capital flows) were considered essential in preserving an environment attractive to foreign investors. This outward-oriented growth policy was focussed around the diversification of agricultural exports to reduce excessive reliance on coffee, cocoa, and wood. There was also a policy to establish an industrial sector to process agricultural production and replace manufactured imports. Except for possible investments in milling, the rice

sector was not viewed as being affected by these two policies.

The new government adopted secondary objectives which did involve the rice sector. The first was to increase the incomes of farmers, particularly those in the northern savannah zone. Rice was identified, along with sugar, cotton, and tobacco, as a vehicle for achieving this goal of regional income distribution. The second was to help maintain a positive trade balance by reducing food imports. Eventual self-sufficiency was a continuation of one colonial objective and rice, as the only domestically produced staple food which was imported, seemed a natural focus for this objective (10, 25, 26, 36). These objectives were retained during the 1971-75 Plan, which further stressed import substitution, largely because of concern over the foreign exchange cost of growing rice imports. Rice, with sugar, meat and fish, was earmarked as a commodity for which growing demand could be met by increasing domestic production (27).

As Table 7 shows, the government budgeted sizeable funds for rice compared with its share of either agriculture or GDP. These expenditures also tended to exceed targeted funds, as shown in Table 8, suggesting a continuing commitment to promote rice production. Yet expanded rice production was not critical to achieve major objectives, nor was it even a necessary policy to achieve secondary objectives. Moreover, cheap rice imports made Ivorian rice uncompetitive and should have defused concern over growing consumption. Why did the government desire to expand rice production?

First, the Ivory Coast is traditionally a rice producing and consuming country (Tables 1, 2, and 3). Planners apparently felt that natural conditions favored rice development and that rice production should be protected as an infant industry.

Second, research begun by colonial institutions and continued after

Table 7.--Investment in Rice* a

Year	Total investment budget (billions CFA francs)	Agricultural investment (billions CFA francs)	Rice investment (billions CFA francs)	Rice as a percentage of total	Rice as a percentage of agriculture
1960	8	n.a.	0.11 ^c	1	n.a.
1961	8	n.a.	0.11 ^c	1	n.a.
1962	5	n.a.	0.06 ^c	1	n.a.
1963	5	0.5	0.06 ^c	1	12
1964	12	2.2	0.71	6	32
1965	13	0.5	0.21	2	42
1966	15	1.8	0.84	6	47
1967	18	3.1	0.86	5	28
1968	20	6.2	0.99	5	16
1969	27	4.2	1.74	6	41
1970	44	11.4	2.07	5	18
1971	42	6.2	0.40	1	7
1972	35	4.5	0.45	1	10
1973	37	6.9	2.39	7	35
1974	44	8.0	2.03	5	25
1975	54	13.0	2.53	5	20
1976	60	11.6	1.78	3	15
1977 ^b	123	17.2	1.96	2	11

* Data for 1960-63 are from Ivory Coast, Government of, Conseil Economique et Social, Rapport sur l'Evolution Economique et Sociale de la Cote d'Ivoire, 1960-1964, Abidjan, 1965. Data for 1964-77 agricultural investment are from Ivory Coast, Government of, Ministère de l'Economie des Finances et du Plan, Budget Special d'Investissement de l'Equipe-ment, (BSIE), Abidjan.

^a These figures are based on "planned expenditures," not appropriations. Neither Caisse de Stabilisation et de Soutien des Prix des Produits Agricoles (CSSPPA) investments before 1974 nor investments made directly by development companies are included.

^b Figures for 1977 include CSSPPA funds invested during 1974, 1975, 1976, and 1977.

^c These figures represent foreign funds only.

Table 8.--Achievement of Rice Planning Projections *

(Expenditures are in millions CFA francs; hectares (ha) are in thousands; metric tons (mt) are in thousands)

Planning documents	1965		1970		1975		1980	1985
	Projected	Actual	Projected	Actual	Projected	Actual	Projected	Projected
1. Third 4-year plan, 1958-62								
expenditures	1482	410 ^a	-	-	-	-	-	-
ha. irrigated rice	30	8						
2. 10-year perspective, 1960-70								
expenditures	1100 ^b	1150 ^c	3286 ^{b,d}	6500 ^f	5441 ^{b,e}	7800 ^f	-	-
ha. irrigated rice	11	8	31	10 ^f	51	21 ^f	-	-
mt paddy from irrigation	28	24 ^h	78	30 ^g	128	63 ^g	-	-
total paddy production ^h	220	258	295	335	395	434	-	-
mt rice imports ^h	10	73	0	77	0	12	-	-
new mill installation (mt/hour) ⁱ	12	14	22	16	-	-	-	-
3. 5-year plan, 1971-75								
expenditures	-	-	-	- ^f	8724 ^b	7800 ^f	4910 ^b	-
ha. irrigated rice	-	-	11	10 ^f	27	21 ^f	37 ^b	-
mt paddy from irrigation	-	-	40	30 ^g	186	63 ^g	276 ^b	-
ha. total production ^h	-	-	303	286	297	345	303	-
total paddy production ^h	-	-	359	335	524	434	680	-
mt rice imports ^h	-	-	40	77	17	12	0	-
4. Draft 5-year plan, 1976-1980								
expenditures	-	-	-	-	-	-	17000	-
ha. irrigated rice	-	-	-	-	29 ^j	21 ^f	72	80
mt paddy from irrigation	-	-	-	-	85 ^j	63 ^g	250	285
total paddy production ^h	-	-	-	-	450	434	695	1030
mt rice imports ^h	-	-	-	-	-	12	66 ^k	0

* The planning projections come from Ivory Coast, Government of, Ministère du Plan, 3^e Plan Quadriennal de Développement Economique et Social, 1958-62, Abidjan, 1958, Perspectives Décennales de Développement Economique, Social, et Culturel 1960-70, Abidjan, 1976, Plan Quinquennal de Développement Economique, Social, et Culturel, 1971-75, Abidjan, 1971, and Projet du Plan Quinquennal de Développement Economique, Social, et Culturel, 1976-80, 5 volumes, Abidjan, May 1976. Data for the actual area in total production and total paddy produced, for actual area in irrigated rice, for mill installations, and for rice imports are taken from Charles P. Humphreys and Patricia L. Rader, "Background Data on the Ivorian Rice Economy," Stanford/WARDA Study of the Political Economy of Rice in West Africa, Food Research Institute, Stanford University, Stanford, June 1978. Actual expenditures under the Third 4-year plan, 1958-62, come from Ivory Coast, Government of, Conseil Economique et Social, Rapport sur l'Evolution Economique et Sociale de la Cote d'Ivoire, 1960-64, Abidjan, 1965. The actual expenditures through 1965 indicated under the 10-year perspectives, 1960-70, also include the "planned expenditures" of Ivory Coast, Government of, Ministère de l'Economie, des Finances, et du Plan, Budget Special d'Investissement et d'Equipement (BSIE), Abidjan, 1964 and 1965. The actual expenditures for 1970 and 1975 are the "planned expenditures" of the BSIE for the years 1966-70 and 1971-75, respectively.

Continuation of Table 8.

^aThis amount is grant assistance, primarily for rice, 1959-63.

^bThese projections are for the five-year period preceeding and including the year indicated.

^cThis figure is based on foreign aid only during 1961-63.

^dThis figure includes planned rice mill investment of 186 million CFA francs about 1965.

^eThis projection includes planned rice mill investment of 341 million CFA francs about 1970.

^fThese figures represent cropped hectares based on physical ha in Charles P. Humphreys and Patricia L. Rader, "Background Data on the Ivorian Rice Economy," Stanford/WARDA Study of the Political Economy of Rice in West Africa, Food Research Institute, Stanford University, Stanford, June 1978, converted from physical area by assuming 20 percent has been abandoned, 90 percent of the remaining is cultivated, and there are an average of 1.2 crop seasons per year.

^gThese figures represent production based on area in irrigated rice and assumed average yields of 3.0 mt/ha.

^hThis number is calculated from a three-year average, centered on year indicated. From Charles P. Humphreys and Patricia L. Rader, "Background Data on the Ivorian Rice Economy," Stanford/WARDA Study of the Political Economy of Rice in West Africa, Food Research Institute, Stanford University, Stanford, June 1978.

ⁱThis represents a theoretical capacity rating.

^jThis figure is based on developments to be completed by the end of 1975.

^kThis figure is calculated as a residual based on projected total paddy production and consumption and converted to rice at 0.63.

independence provided the foundation for assembling a technical package of selected seeds, fertilizers and irrigation systems.²⁴ Green Revolution technology was also imported from Asia during the late 1960s (36, p. 144).

Finally, planning documents toward the end of the period express a growing fear that excessive reliance on large imports of rice could be financially destabilizing. The ratio of the value of rice imports to the net trade surplus averaged over 12 percent, rising in some years to 20 percent. On the other hand, rice import prices--even in nominal terms--actually declined during 1960-72, and the cost of rice imports was never a large share of export earnings, averaging only 2.4 percent for the period 1960-76 and never being larger than 4.4 percent (6, 24, p. 58).

Policies--Four types of policies--research, institutional, investment, and pricing--were emphasized during the 1960-74 period. Although the last two are the more important quantitatively, they would not have been effective without research and the creation of supporting institutions.

Research policies sought ways to shift downward and outward the supply curve for rice through technological improvements. This shift was considered essential in order to increase rice production, compete efficiently with imports, and leave adequate supplies of labor and land available for use in export crop production. The most important result was the identification of investment projects. Taiwanese technical experts helped develop viable small-scale irrigation schemes and extension programs in the north starting in 1963 and in the forest after 1967. Improved seeds from Brazil, India, and the Philippines were introduced beginning in 1966 as part of a constant search for higher yields, shorter growing seasons, and greater disease resistance. Experimentation with fertilizers was pursued in the north, west, and center. Five regional studies were contracted about 1970 to identify profitable production systems

and methods of development. Out of this experience and research came four investment projects in 1971-73.

Institutional policies were designed to assure input delivery and marketing of output. Management of the rice sector was consolidated under SATMACI in 1963 and was consigned in 1970 to SODERIZ, a move which had been suggested in planning and budget documents during the previous ten years.

SODERIZ instituted a contract system for supplying subsidized modern inputs to rice production. The development company provided an input package which was paid for by the farmer at harvest in either cash or paddy. Farmers were not obligated to pay the participation fee if they failed to obtain specific minimum yields.²⁵ Partially subsidized inputs included selected and treated seeds, fertilizers, insecticides, sales of capital equipment, land development, extension services, maintenance of irrigation works, and mechanized cultivation services.²⁶ All land under contract was supposed to be uniformly fertilized regardless of its place in rotation or natural soil fertility. But because the system was based on family farms, producers retained almost full control over crop calendars, actual dosage rates, and sales. Partially as a result of SODERIZ initiatives and also owing to higher paddy prices, use of improved seeds and fertilizers grew consistently during this period

In an effort to improve paddy marketing, often viewed by government officials as a critical bottleneck, an official paddy price of 18 CFA francs/kg was introduced in 1966. After 1967, to promote sales of domestic rice, import licenses were granted only after importers had first purchased available local rice from government mills. Quality buying standards for paddy were introduced in 1968. These institutional changes facilitated future investment and the implementation of domestic price policy.

Investment policy was not important initially. Until 1971-72, major investments were limited to irrigation projects in the savannah zone and to eight industrial-scale mills located throughout the country. The early savannah zone project, financed by a 1963 German loan for 1.6 billion CFA francs, was a direct extension of previous colonial efforts. The two phases of mill investments, which began in roughly 1965 and 1970, represented easily defined projects financed by supplier credits. Both the irrigation investments and the mills seemed to exhaust the readily available investment possibilities.

For most of the period, investment in production was not a major policy instrument. As Table 8 (p. 12b) shows, actual development of irrigated land and improved production fell far below targets, often attaining only half the area planned. The government was able to obtain significant foreign financing--on fairly soft terms--only after the state rice development agency was created to centralize planning and the rice studies of the late 1960s completed project designs based on data from the previous decade (Table 9).²⁷ Of the six billion CFA francs received, less than one-sixth was allocated to rainfed rice, reflecting the government's emphasis on irrigated rice development. Irrigation, especially by the end of the period, was favored because it allowed more secure water control, provided higher yields, and made extension work easier.

Although both trade and domestic price policy were used to encourage additional production, trade protection afforded to domestic rice producers was more important. Official paddy prices were set beneath market prices, providing no incentive effect. On the other hand, during the first 13 years of independence the nominal protection coefficient averaged 1.3. Nevertheless, planning documents throughout the 1960s argued that additional

Table 9.—Foreign Investment in Rice^{*}

Year ^a	Foreign funds allocated to rice sector (billions CFA francs)	Percent foreign in total rice investment	Percent foreign in total investment budget
1960	0.09 ^b	n.a.	n.a.
1961	0.12	n.a.	n.a.
1962	0.15	n.a.	n.a.
1963	0.01	n.a.	n.a.
1964	0.56	79	50
1965	0.07	33	46
1966	0.38	45	27
1967	0.31	36	39
1968	0.35	35	40
1969	1.31	75	56
1970	1.39	67	34
1971	0.15	37	48
1972	0.03	07	51
1973	1.25	52	51
1974	1.48	73	59
1975	1.71	68	48
1976	0.85	48	37
1977	0.49	25	40

^{*} Data for 1960-63 are from Ivory Coast, Government of, Conseil Economique et Social, Rapport sur l'Evolution Economique et Sociale de la Côte d'Ivoire, 1960-1964, Abidjan, 1965. Data for 1964-77 from Ivory Coast, Government of, Ministere de l'Economie des Finance et du Plan, Budget Speciale d'Investissement et d'Equipement, (BSIE), Abidjan, yearly.

^a For 1969 and earlier, foreign funds refer only to loans.

^b This figure may include some non-rice monies.

protection was needed (19. 26).

Domestic price policy was consolidated in 1971 by the reorganization of the Caisse de Péréquation. This organization fixed retail rice prices, which it defended through imports, compensating for any fluctuations in import prices. The official paddy support price was linked to the retail rice price, which required a modest subsidy paid to government rice mills. The subsidy was financed by the Caisse de Péréquation out of revenue earned from the difference between import and higher retail prices.²⁸ Despite the subsidy, competition from small-scale private millers maintained the market price of paddy above the support price,²⁹ and amounts purchased and milled by the government mills were not very large. As a result, the total budgetary cost of the subsidy was quite low (Table 10).³⁰

Post 1974

Until 1974, the Ivory Coast followed a fairly cautious rice development strategy, which could be summarized as an effort to help its infant industry slowly mature. Domestic price support had been limited to small increases in 1972 and 1973, linked to import price rises. In 1974 several factors converged, shifting the government policy focus from technology transfer, investment, and institution building to high price supports maintained with government subsidies.

First, world rice prices suddenly began to rise in 1973. By 1974 they had quadrupled. The government reacted in 1973 by doubling imports, afraid that prices would go even higher. These large imports confirmed fears of excessive outflows of foreign exchange. In 1974 even though imports returned to previous volumes, prices had doubled from 1973 levels. Outflows of foreign exchange were almost as great as in 1973 (6, p. 12). Substitution of rice imports with domestic production suddenly gained a much higher priority than ever before.

Table 10.---Government Revenue from Rice Imports and Nominal Protection on Rice *

Year	c.i.f. rice prices ^a (CFA francs/kg)	Estimated Abidjan wholesale buying price ^b (CFA francs/kg)	Abidjan retail selling price ^c (CFA francs/kg)	Implicit tariff ^d (CFA francs/kg)	Estimated total tariff revenue ^e (millions CFA francs)	Nominal protection coefficients ^f
1960	25	41	45	15	435	1.6
1961	32	49	54	16	336	1.5
1962	32	46	51	13	455	1.4
1963	31	49	54	17	425	1.5
1964	33	41	46	7	301	1.2
1965	30	46	51	15	900	1.5
1966	38	50	56	11	572	1.3
1967	36	55	61	18	216	1.5
1968	41	52	58	10	430	1.2
1969	33	55	61	21	1134	1.6
1970	25	67	74	41	2870	1.6
1971	21	45	50	23	1587	2.1
1972	28	45	50	16	1152	1.6
1973	59	57	63	-4	-552	0.9
1974	112	107	116	-8	-496	0.9
1975	50	97	108	46	9	1.9
1976	30 ^g	87	100	56	6	2.9
1977	69	87	100	16	1472	1.2

*The prices are taken from Charles P. Humphreys and Patricia L. Rader, "Background Data on the Ivorian Rice Economy," Stanford/WARDA Study of the Political Economy of Rice in West Africa, Food Research Institute, Stanford University, Stanford, June 1978. For 1972 and earlier, the Abidjan wholesale buying price has been estimated at 90 percent of the retail price.

^aThese prices for 25-30 percent broken.

^bThese figures based on official prices for 1973 and later years.

^cPrices from 1971 and later appear to be official prices.

^dThis tariff equals the difference between the Abidjan wholesale buying price and the c.i.f. price plus landing costs (evaluated in 1975 at 2.7 percent of the c.i.f. prices).

Continuation of Table 10.

^eThese figures based on imports of 25-30 percent broken only. Actual government revenue is probably less since the series really indicates transfers from consumer to other sectors.

^fThis coefficient is defined as the sum of the c.i.f. price and implicit tariff divided by the c.i.f. price.

^gThis price may be unreliable because it is based on very low imports.

Second, during the previous period imports averaged 65,000 mt per year and were not diminished, despite a doubling of domestic production. Even though per capita consumption grew very little, total rice consumption was higher than anticipated for two major reasons: population growth had been underestimated from incomplete census information; and the real price of rice had fallen by 25 percent compared to all other food during 1960-71 (6, p. 18). Irrigated land development and production were both lagging behind projected increases, even though investments were larger than planned. The technical package was not profitable enough to allow significant expansion of the production of improved rice.

The solution for meeting high consumption demands and offsetting insufficient domestic production was to allow consumer prices to rise with the higher import prices, thereby reducing consumption and making domestic rice more competitive without excessive government subsidies. In 1974, the official price was increased by 80 percent to 125 CFA francs/kg, and the official support price of paddy was raised by 130 percent to 65 CFA francs/kg. The government reacted to the increase in world prices by first raising the retail rice price and then deriving the support price of paddy.

These policies elicited expected responses. Per capita consumption fell from nearly 50 kg of rice in 1973 to just under 30 kg in 1974 and 1975 as shown in Table 1 (p. 2a). The production of paddy rose nearly 25 percent between 1973 and 1975, with marketed supplies probably increasing even more. Imports, partly offset by large carry-overs from the huge 1973 purchases, dropped to zero in 1975 and 1976.³¹

Meanwhile, previously introduced investment and technical policies were continued. Foreign financing worth 2.2 billion CFA francs was committed in 1974 and 1975.³² Between 1973 and 1974, the use of selected seeds, fertilizers,

and insecticides doubled. Investment in irrigation progressed rapidly. Between 1973 and 1976 swamp irrigated land increased by one-third, pump irrigation grew ten-fold, and dam irrigation tripled (6, p. 8). The past investment projects were beginning to bear fruit.

Nevertheless, this new domestic price policy, adopted in a brief period of high world prices, was difficult to sustain. Government mills were suddenly confronted by the need to purchase, store, and mill a fourth of Ivorian production--ten times more than a year earlier. Although there were physical constraints in both storing and milling paddy, the past mill investments greatly alleviated them. The major bottleneck was the distribution of milled rice. In the face of high prices, total demand fell dramatically. The government found itself not only with large stocks of imported rice, but also with growing stocks of domestically milled rice. The stock buildup was aggravated by the reluctance of the influential import cartel, accustomed to importing one-third to one-fourth of rice consumption, to handle only domestic rice (1). Imported stocks were expensive to maintain, while unsold domestic stocks took up storage space and tied up funds, impeding further purchases of paddy. Self-sufficiency also put an end to the government revenue from rice imports, which was needed more than ever to pay the growing subsidies to producers.

The immediate solution was to readjust prices. The retail price of rice was lowered from 125 to 100 CFA francs/kg in 1975. Three aspects of this revised policy merit mention. First, there is no evidence that consumer pressure forced the reduction in retail prices; rather the reduction was an effort to reduce stocks held at government expense. Second, there was no corresponding reduction in paddy prices, perhaps reflecting pressures from influential producer groups as well as from the rice development company which

needed high paddy prices to maintain its new share of the market. Third, rice prices were equalized throughout the country, creating the need to control distribution and ration marketings.

By 1976, the lower consumer price of rice re-established consumption at previous levels, drawing down surplus stocks. But the stock problem was solved by creating another: the need to support highly subsidized producer prices. The government had inadvertently placed itself in a situation of subsidizing producer prices, which it had previously conscientiously avoided.

In 1978, the government was still attempting to maintain this price relationship which gave approximately a 100 percent subsidy to domestic rice.³³ But the budgetary costs were high. Producer price subsidies ran 4 to 5 billion CFA francs per year, financed out of coffee and cocoa earnings by the Caisse de Stabilization (CSSPPA).³⁴ The glut of paddy attracted by the high prices spurred large government investments in new milling and storage capacity, both financed on hard terms.³⁵ Foreign donors have postponed additional rice investments since 1975, regarding the present price policies as financially unsound. In the wake of financial problems largely spawned by the domestic price policy, the state rice development company was disbanded in 1977. Institutionally, rice had lost its equal status among important cash crops since management of the sector is no longer consolidated but has been divided among the state companies charged with coffee and cocoa, oil palm, and cotton. It is no longer clear how the extension program will function in the future.

Meanwhile, the initial success of the domestic price policy on production is eroding because of the increased producer prices of other crops. Paddy output has fallen since 1975, despite an expansion of irrigated land under cultivation and greater use of modern inputs. Consumption has also returned to the highest previous levels, in the face of increasingly expensive food

substitutes. In 1977, rice imports of 110,000 mt were the largest since 1973 (6, p. 12).

In summary, the history of Ivorian rice policy reveals a longstanding effort to find a strategy to improve productivity and increase output. Given the decision to focus on rice, a non-competitive sector, the policies were consistent from colonial times until 1974. The shift to domestic price policies in response to recent short-term world price changes, however, has required numerous ad hoc adjustments and put the future of the entire strategy into question.

EVALUATION

Since independence, two important secondary objectives--improving the trade balance and enhancing regional income distribution--have been used to justify government rice policy. Increased domestic rice production has been singled out as a major instrument for attaining these secondary objectives. To assess the success of government policies, it is first necessary to examine how government actions have affected production.

Increased Production

Since 1965, Ivorian paddy production has increased by roughly two-thirds or 182,000 mt,³⁶ which is over five percent a year. Such growth compares favorably with important industrial crops, such as cocoa and oil palm, although it lags far behind new diversification crops such as cotton. Early planning objectives were achieved, although those established by the end of the 1960s, based on a recalculation of population growth resulting in higher demand, were missed by nearly 20 percent.

The aggregate data are not very helpful in isolating the sources of this growth, but there are informative indications. Perhaps half the growth came simply from increasing inputs of labor and land, while less than half can be attributed to fertilizer, irrigation, and mechanical technologies.

Land area devoted to rice is estimated to have increased by over 100,000 ha, or 40 percent in the period between 1965 and 1976.³⁷ Until 1974, the growth of land allocated to rice was only about 1.2 percent per annum, much lower than the rural population growth rate. The real impetus for bringing additional land into rice production apparently came from the price increases in 1973 and 1974. These price rises may have augmented area planted by 50-55,000 ha, or almost half the total expansion during 1965-76.³⁸ The input of labor also increased with greater land use.

The other important factor behind production growth is an increase in yields. The average yield for the 1974-76 period is 1.27 mt/ha, 18 percent higher than for the 1964-70 period.³⁹ Several things contributed to this increase. Since 1965, irrigated land increased by over 15,000 ha. With water control, yields are on the order of 2.5 mt/ha, giving an additional output of nearly 40,000 mt paddy (Table 4).⁴⁰ Fertilizer applications also increased rapidly after independence, reaching levels of about 1,500 mt of nitrogen by 1975-76, one-third of which was used on irrigated rice. Average response rates are difficult to determine, but available agronomic results suggest that the fertilizer may have increased paddy production by about 20,000 mt during this period.⁴¹

As Table 11 summarizes, land, irrigation, and fertilizer account for roughly 150,000 mt, or over 85 percent of the increase in paddy production. The residual could be attributed to extension, improved seeds, pesticides, and better cultivation techniques. What is not measured but important is the amount of additional labor inputs needed to utilize the increased inputs of other factors.

This increase in production deriving from new technology has occurred more slowly than anticipated and has been expensive. By 1975, the projections from the early 1960s of land under irrigation were less than half realized, and the revised 1970 projections of production from irrigated projects were only one-third achieved. Moreover, expenditures during the 1960s exceeded those targeted. During 1971-76, total budgetary support of rice (investments and subsidies) far exceeded funds initially allocated, as shown in Table 12.

Three factors help to explain why the increase in rice production has been so expensive. First, contrary to earlier claims (36, p. 143), recent agronomic evidence and experience indicate that the natural conditions in the Ivory Coast are not well suited to rice production. The entire country generally suffers from irregular rainfall, high rates of evapotranspiration, and inadequate ground water. No region is naturally suited to two crops of rainfed rice and only limited areas are suited to one crop per year, making expanded rice production generally risky unless there is expensive investment in water control (3). Adverse climate is compounded by rolling topography and the absence of flood plains larger than several hundred ha. In addition, soils have been found ill-suited to irrigation in many projects (39). As a

Table 11.--Sources of Growth in Rice Production (1965-76)*

Input or change in technology	Change in input level	Increase in paddy production	Percent
Continuation of past trend of land increases	35,000 ha	35,000 mt	20
1973/74 price induced land increases	50,000 ha	50,000 mt	29
New land brought under irrigation	15,000 ha		
Production increase due to land		15,000 mt	9
Production increase due to water control		25,000 mt	14
Mechanically cleared land	2,000 ha	2,000 mt	1
Nitrogen fertilizer	1,500 mt	20,000 mt	11
SUBTOTAL	-	147,000 mt	-
Residual (extension, seeds, pesticides, etc.)	-	28,000 mt	16
TOTAL	-	175,000 mt	-

* For an explanation for these figures, see text.

Table 12.—Government Expenditure on Rice, 1971-76*

Source/use	Million CFA francs
Investment Budget	9,580
Operating Budget	138
Input and paddy marketing support	1,456
Producer price support ^a	14,708
Transport of domestic rice to Abidjan ^b	600
Total expenditure	26,482
Planned expenditure ^c	10,469
Excess expenditure	16,013

* Investment Budget figure is from yearly issues of Ivory Coast, Government of, Ministère de l'Economie des Finance et du Plan, Budget Spéciale d'Investissement et d'Equipement, (BSIE), Abidjan. Operating Budget figure is from yearly issues of Ivory Coast, Government of, Ministère de l'Economic des Finance et du Plan, Budget du Fonctionnement, Abidjan. Figure for input and paddy marketing support is from Ivory Coast, Government of, Ministère du Commerce, Département du Commerce Intérieur Caisse Générale de Péréquation des Prix des Produits et Marchandises de Grande Consommation, personal communication, Abidjan, 1978, and is for buying operations during 1971/72 - 1976/77. The figure for producer price support is from Ivory Coast Government of, Banque Nationale de Développement Agricole, personal communications, Abidjan, 1977, and represents buying operations during 1971/72 - 1976/77. The planned expenditure figure is taken from Table 4.

^aThis figure covers unpaid principal and interest.

^bRice milled by SODERIZ and sold in Abidjan is transported by the Caisse Générale de Péréquation, primarily since the 1975 law equalizing rice prices all over the country. This is estimated based on the assumption that two-thirds of SODERIZ rice is shipped to Abidjan, over an average distance of 400 km at official tariff rates.

^cThis amount is based on the 5-year plan figure, pro-rated over 6 years.

result, land development has been more expensive than expected, the number of crops per year--even under pump irrigation--has been smaller than studies predicted, and yields have not achieved planned levels.

Second, labor is costly. High demand for labor makes agricultural wage rates among the highest in West Africa, often between \$1.50 and \$2.00 per day. Labor may have become more expensive in real terms as the Ivorian economy grew and Sahelian neighbors developed. Industrial crops, such as coffee, cocoa, and cotton, give high returns to farm labor, requiring that high prices be paid for paddy to make it competitive (Table 13).

Third, technological transfers promoted by the government have been insufficient to overcome these high costs because they are relatively labor-using and land-saving, missing the basic resource constraint. Relatively few funds have been devoted to divisible small-scale labor-saving technologies, such as power tillers, oxen cultivation, and herbicides. As could have been predicted from the experiences under the French, heavy mechanization is too expensive to be privately profitable, except with large subsidies. Yield increases have been achieved at high costs as well, and price subsidies are again necessary to make improved production privately profitable. These costs do not appear to be falling: soil acidification and weed infestation may have reduced yields on rainfed rice; irrigation projects have not been properly maintained, reducing their lifetimes; and extension costs have not fallen as predicted in the 1971-75 Plan (27).

Table 13.--Some Estimated Returns to Labor for Rice and Other Crops*

Category	Rice				Selected coffee	Improved cocoa	Improved cotton	
	Improved manual rainfed		Improved manual irrigated				Manual	Animal traction
	Pre-1974 prices	Post-1974 prices	Pre-1974 prices	Post-1974 prices				
Producer price (CFA francs/kg)	28	65	28	65	150	175	70	70
Assumed yield (mt/ha)	1.5-2.2 ^a	1.5-2.2 ^a	3.5	3.5	0.65	1.0	1.0	1.2
Gross revenue (000 CFA francs/ha)	42-62 ^a	98-143 ^a	98	228	98	175	70	84
Farmer costs, non-labor (000 CFA francs/ha)	29-40 ^{a,b}	29-40 ^{a,b}	66 ^b	66 ^b	43 ^c	34 ^d	17 ^e	21 ^e
Labor days per ha	95-120 ^a	95-120 ^a	240	240	98	100	145	93
Net CFA francs/labor day	137-183 ^a	726-852 ^a	133	675	561	1,410	366	677

*The producer prices and data for rice production are taken from Charles P. Humphreys, "Analysis of Rice Production in the Ivory Coast," Stanford/WARDA Study of the Political Economy of Rice in West Africa, Food Research Institute, Stanford University, Stanford, forthcoming. Information for coffee and cocoa is contained in Ivory Coast, Government of, Ministère de l'Agriculture, Société d'Assistance Technique pour la Modernisation Agricole de la Côte d'Ivoire (SATMACI), Manuel de Caféculture, Fascicule 4, Gagnoa (Centre de Formation), 1975, "Prix de Revient du Kilogramme de Cacao," No. 157/CPFE.76, Abidjan, 9 December 1976, and Personal communication, Abidjan, 1978. Information for costs, and labor and yields, respectively, in cotton production are based on Ivory Coast, Ministère de l'Agriculture, Compagnie Ivoirienne de Développement des Textiles (CIDT), "Coût Total de la Culture d'un Hectare de Coton, Campagne 1975-1976," Ref. GE/mbj/368/76, Bouaké, 16 June 1976, and "Temps de Travaux (Région Nord)," Ref. GE/sk/111/77, Bouaké, 9 February 1977.

^aThe first figure refers to production in the savannah zone and the second to production in the forest zone.

^bThis value includes the farmer share of the annuity on land clearing or development, the farmer cost of fertilizers, seeds, pesticides, extension, and irrigation maintenance, plus tools and working capital.

Continuation of Table 13.

^cThis value covers the annuity on the plantation, the cost of tools, and the charges for hulling and sorting.

^dThis cost covers the annuity on the plantation, and the costs of fertilizer, insecticides, equipment and materials. Extension costs are excluded.

^eThis cost covers only fertilizer, tools, and the annuity on oxen and equipment in the case of animal traction. All other costs are assumed to be borne by the government.

Beneath the umbrella of temporarily high world prices and government borrowing, policies were adopted and sustained that encouraged movements along the supply function. The increased production which thus occurred by using more labor and other scarce factors was achieved at increasing costs.

The long term rice development strategy attempted to shift outward the supply curve, rather than to move along it. More importantly, because of perceived labor shortages at current wages, the strategy was meant to increase returns to labor by introducing new labor saving technology. The land use and techniques of 1965 would have given somewhat lower production in ten years than occurred after government programs had introduced new technology. As shown in Table 14, traditional rainfed production uses nearly twice the recurrent labor per metric ton of paddy compared with improved techniques. Viewed from this partial perspective of expensive labor, government policy to expand production using the new techniques appears appropriate.

However, when account is also taken of land, the other major factor in rice production, the policy followed seems inappropriate. Although output per unit of labor has increased absolutely, it has declined relative to the output per unit of land. In other words, the technological change in Ivorian rice production has been labor-using. Given that land is still relatively abundant and cheap while labor is and may be becoming increasingly expensive, the superior strategy would have been to adopt technologies that increase labor productivity, not only absolutely but also relative to land. Chart 1 illustrates these strategies. Traditional rice production occurs along isoquant I at point a, indicating a land extensive system. Past government policies have

Table 14.--Labor Input into Rice*

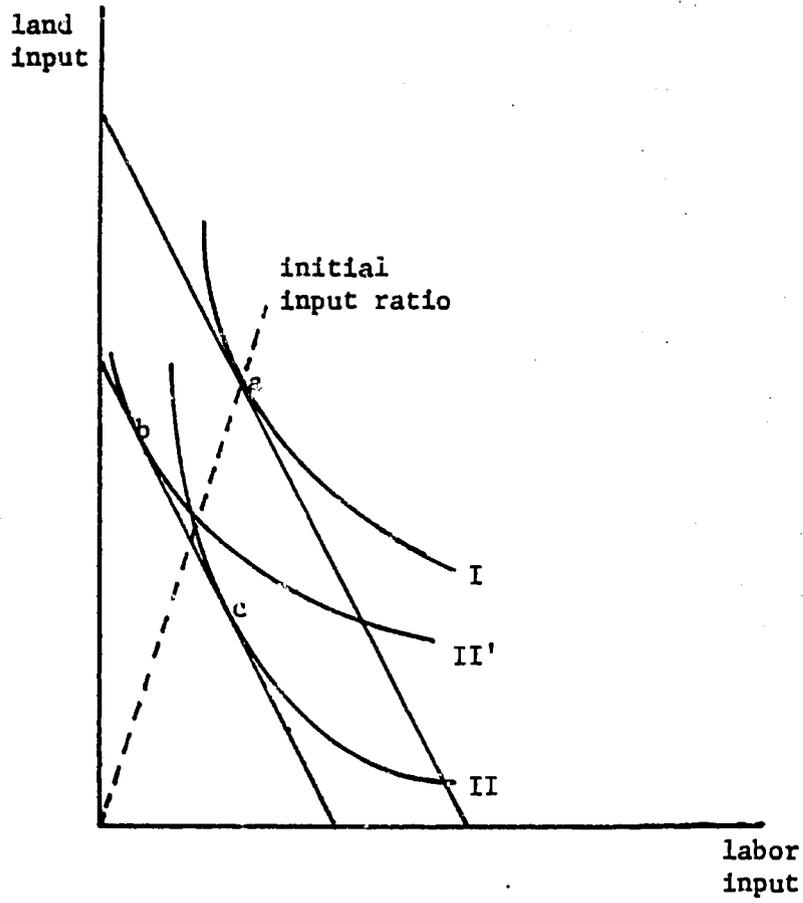
Production technique	Recurrent labor-days per ha ^a	Yield (mt paddy/ha)	Labor-days/mt paddy
Traditional rainfed ^b	85-115	0.9-1.3	88-94
Irrigated unfertilized	210	2.4	88
Rainfed, fertilized ^b	95-120	1.5-2.2	59-63
Irrigated, fertilized	240-250	3.5-4.0	63-69
Mechanized, rainfed, fertilized	30	2.0	15

*These figures are based on information in Charles P. Humphreys, "Analysis of Rice Production in the Ivory Coast," Stanford/WARDA Study of the Political Economy of Rice in West Africa, Food Research Institute, Stanford University, Stanford, July 1979.

^aLabor times do not include labor equivalents for clearing or land development.

^bThe first figure refers to savannah production, the second to forest production.

Chart 1.--Factor Bias of Technological Change



introduced technological changes, shifting production to the new isoquant II.⁴² Existing factor prices cause improved production to occur at point c. Labor input per ton of paddy has fallen less than land, and the new technique is labor-using in the Hicksian sense (4, pp. 121-122). The more appropriate policy would be the introduction of technology that uses more land relative to labor. In Chart 1, this policy is shown by isoquant II'. At the same factor prices production would occur at point b which is labor-saving and land-using.

There are at least two reasons why the Ivorian government did not adopt this strategy. First, the labor-saving technology illustrated by isoquant II' primarily requires mechanization of rice which is often very expensive under tropical conditions. Profitable, easily-adopted forms of mechanized technology were not available. On the other hand, land-saving technology in the form of fertilizer and high-yielding varieties was readily available from abroad. Second, Ivorian planners may feel that the supply of land is the fundamental long-run physical constraint.⁴³

In conclusion, production has increased rather impressively. However, this has been due more to high prices and subsidies than to introduction of socially profitable techniques. Technological transfers have occurred, but slowly, and of the wrong kind. These transfers have not really lowered production costs nor saved labor (5). A fairly high rate of nominal protection permitted rice production to expand during the 1960s, but at a slow pace. Only the high domestic price supports since 1974, including both a higher rate of nominal protection and producer subsidies, have made adoption of the new technology and expanded output privately profitable.

Import Substitution

Except for 1974 and 1975, the Ivory Coast has never consumed less rice than it has produced. 1975 and 1976 were the only years during which there have been no imports due in part to stock carry-overs from previous years. By 1977 imports were more than 100,000 mt. Despite large production increases, why was self-sufficiency not attained?

On the whole, per capita consumption changed very little between 1967 and 1977. Production increases barely exceeded population growth during the period 1967-76.⁴⁴ Hence, it is understandable that imports, on the average, changed very little over this period.⁴⁵ Basically, government policies have been oriented to maintain consumption by replacing imports with domestic production.⁴⁶ When there were shortfalls in production, demand was met by imports rather than curtailed by real price hikes.⁴⁷

Rice import substitution has been seen as a means to make a positive contribution to the balance of payments, thereby helping preserve the liberal exchange policy required to attract foreign capital. In order to increase rice production to reduce imports, domestic supplies of labor, capital, and land must be diverted from other activities. If these other activities are more efficient than rice production at earning or saving foreign exchange, the import substitution policy reduces the capacity of the country to earn foreign exchange. For the Ivory Coast, most of the agricultural export activities--coffee, cocoa, coconuts, cotton, and palm oil--are more efficient earners of foreign exchange than is rice (38). Moreover, it appears that other food crops, such as manioc, corn, and banana plantains, also save foreign exchange more efficiently than can rice production. If balance-of-payments improvement is an objective, increased rice production is a very inefficient means of achieving it (see also 5).

Even the direct savings in foreign exchange--measured as the difference between the value of the rice imports and the foreign exchange costs of imported inputs--have been small. During 1965-76, rice imports averaged 44 CFA francs per

kg, c.i.f.,⁴⁸ but techniques introduced by the government, such as small-scale irrigation and improved rainfed production, have import costs of over 15 CFA francs per kg of rice.⁴⁹ For some of the highly mechanized, irrigated methods of production, the cost of imported inputs exceeds 30 CFA francs per kg rice.

Regional Income Distribution

This distributional objective translates mainly into raising rural incomes in the savannah zone. The major instruments used to encourage paddy production--investment, trade controls, and domestic price support--have increased producer revenue, but only investment favored the savannah relative to the forest zone.

The investment policy, representing a well developed effort to shift the supply curve, has been clearly focussed on the savannah zone. Of the 18 billion CFA francs invested in paddy production projects between 1964 and 1978, 60 percent are localized in the savannah.⁵⁰

Government investment per farm family producing rice has been over four times greater in the savannah zone, indicating the government has made--initially at least--strong efforts to realize its income distribution objective.

Trade and price policies--both nominal protection and domestic price supports--have clearly not improved distribution because the forest zone produces about 70 percent of Ivorian rice. Responses to price incentives are probably also higher in the forest, given that rainfall is better, yields are higher, and the marketing infrastructure is better developed than in the north. Higher paddy prices naturally tend to benefit the forest zone relative to the savannah. Of those price subsidies paid out of government funds, southern rice farmers received half again as much as their savannah counterparts, on a per family basis. Roughly 9.5 of the 12 billion CFA francs paid out as government price support subsidies during the six buying seasons

of 1971-72 to 1976-77 were distributed in the forest zone.⁵¹

These observations suggest that investment subsidies, rather than domestic price supports and trade control, are a more effective way for the government to use the rice sector as a channel for attaining its regional income distribution objective. Yet rice production using these investments remains relatively unattractive without high, government-supported paddy prices, so that investment policy alone is insufficient. Whether rice production should be used at all to achieve this objective is a different and more important question, considered in the next subsection.

Gain or Loss from Policies

On balance, Ivorian rice policy has conflicted with the country's fundamental objective of stable, long-run economic growth. The purposes of this section are to trace the transfers of resources into the production of paddy and rice and to examine the efficiency and welfare effects of policies.

Chart 2 illustrates--heuristically--the impact of government policies. The supply curve is relatively inelastic at higher production levels, and demand is fairly elastic for staples, both reflecting Ivorian conditions. The world rice price (P_w) is set at its traditionally low level, at which the expected gap between domestic production and consumption would be quite large. As shown in Chart 2c, initial conditions, with no government intervention, would have production of Q_1 , and imports of $Q_2 - Q_1$.

The initial condition has never existed because government intervention has established the domestic price of rice at a level higher than the world price, resulting in a nominal protection coefficient greater than unity. At a higher domestic price (P_d), domestic production moves along the elastic part of the supply curve to Q_3 , total demand falls to Q_4 , and imports are

Chart 2.--Effects of Rice Policies

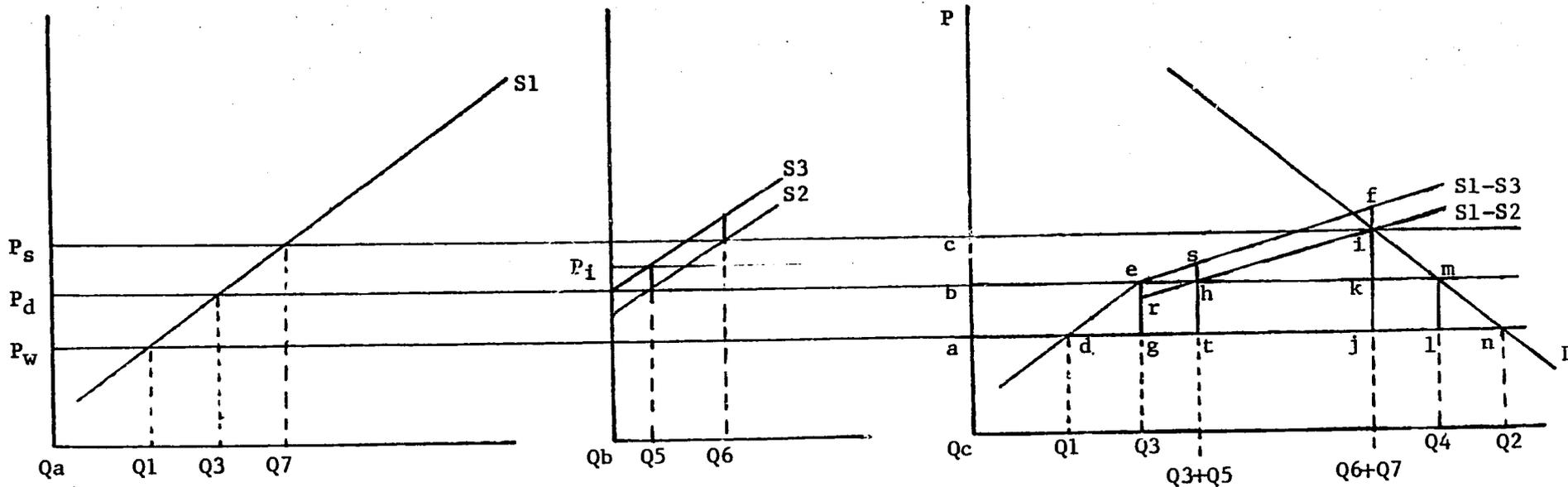


Chart 2a.--Supply Under Traditional Production and Trade Protection

Chart 2b.--Supply from Producers Receiving Subsidized Inputs

Chart 2c.--Aggregate Supply

reduced to $Q_4 - Q_3$. This policy of trade control, which maintains domestic prices above import prices, has four distributional effects: additional domestic resources are pulled into rice production; the government earns revenue from rice imports; producers receive a transfer of welfare from consumers; and the economy loses the consumers' surplus attached to the reduction in rice consumption.

Besides protecting rice, the Ivorian government has also adopted a strategy of subsidizing investments to bring about the technological change necessary to shift the supply curve outward. By subsidizing investment in irrigated land development and the distribution of modern inputs, government policies have effectively shifted the supply curve to S2 for producers who receive these production subsidies. The true shift, reflecting underlying technological transfer, has been much smaller, so that the real supply function is S3. Everything beneath this curve represents real resource costs. The vertical difference between the artificial (S2) and the real (S3) supply functions represents a transfer per kg of paddy from the government to the privileged producers enabling them to pay the higher costs of production. Under these circumstances, production increases by Q_5 (in Chart 2b), implying a real domestic price of P_1 (the price that calls forth this output on the new real supply curve S3 in Chart 2b). The per unit government subsidy is thus $P_1 - P_d$.

There are three effects of this input subsidy policy. First, more domestic resources are drawn into production, which now rises to $Q_3 + Q_5$. Traditional production may fall, however, as some traditional farmers switch to techniques using the subsidized inputs. Second, the government budget is affected. Government revenue falls as imports are replaced by the domestic production. More government financing is also needed to pay for the additional,

subsidized factors of production. Third, farmers using the subsidized inputs receive a transfer, even though part of the subsidy simply covers additional real costs.⁵² Consumer welfare remains unchanged, because consumption and price stay at Q_4 and P_d , respectively.

The 1974-75 domestic price support policy introduced further producer subsidies by maintaining artificially high paddy prices as illustrated by P_s in Chart 2.⁵³ Paddy production moved along the traditional supply function S_1 to Q_7 (Chart 2a) and along the new subsidized supply curve S_2 to Q_6 (Chart 2b). Many of the effects mirror previous ones. More domestic resources are bid into rice production. Total costs of government subsidies on inputs increase, since improved production is expanded. Imports fall further, along with government revenue. Consumer welfare remains unchanged since consumers continue to buy quantity Q_4 of rice at price P_d . In contrast to the input subsidy policy, the output price subsidy benefits a much larger number of farmers, who retain the bulk of the price support as a transfer rather than using it to pay for additional production costs. Assuming an integrated market for paddy, all producers receive the price subsidy $P_s - P_d$ on marketed output.⁵⁴ Only in the case of the additional output does the subsidy pay for real costs, that is, the area under the real supply curve.

Chart 2c summarizes the overall impact of these policies. Consumers have had a clear loss in welfare (area $abmn$), although not as much as implied by producer prices because of the government subsidies on rice output.⁵⁵ Most of this reduction in consumer welfare has been transferred either to the government as import revenue or to producers in higher prices. Producers have clearly gained, both from the transfer of consumer surplus (area $abkj$) and from output price supports (representing direct government transfers--area $bcik$ if all paddy were purchased). To the degree that the government was able to tie input subsidies to real costs, these subsidies have probably contributed

little to producer welfare, going instead to pay for the higher marginal production costs. The initial government budget gain from the tariff revenue (area *geml*) dwindled (to area *jkml*) as domestic production replaced imports. The budget also incurred substantial obligations to subsidize inputs (area *efir*) and to support producer prices above domestic market prices (area *bcik* at the maximum). On balance, government expenditures on rice since 1974 have exceeded taxes from the rice sector, requiring other sectors of the economy to finance the interventions in rice.

Deadweight losses to the economy have been large. The consumer surplus attached to the fall in consumption from Q2 to Q4 (triangle *lmn*) is a net welfare loss, worth perhaps one-half billion CFA francs.⁵⁶ This loss may be justified if the government believes that higher rice consumption has negative externalities, but planners' concerns with quality of diet indicate this is not the case. More likely, the government may believe the loss justified because benefits from increases in the income of rice producers and in its own budgetary revenue outweigh the greater losses to rice consumers.

Much more importantly, there has been a large deadweight loss of productive efficiency (area *defj*) caused by diverting resources from other uses into domestic rice production. Although rice producers have gained from the transfers, the economy as a whole has lost. It is useful here to measure this loss of efficiency, based on calculations from Humphreys (5). The measurement is based on the concept of net social profitability, defined as the difference between the value added by additional rice production--measured in world prices--and the social opportunity cost (or the value of alternative output foregone) of the domestic factors used in that production.

Given the costs prevailing in 1975-76, the average net social profitability was almost a negative 20 CFA francs per kg of rice produced.⁵⁷ To calculate the total loss caused by government interventions, it is also necessary to estimate the production increase that has been caused by the policies, which is the distance dj. A reasonable proxy for this increase is the amount produced for sale under traditional techniques plus the production using modern inputs and on land developed through government subsidies. In 1975, this probably amounted to nearly 150,000 mt of rice.⁵⁸ Assuming average costs equal marginal costs for each type of production, the estimated annual loss to the economy in productive efficiency (the area beneath this portion of the supply curve) is almost 3.0 billion CFA francs, or one-third of 1 percent of GDP in 1975.⁵⁹ It is equivalent to over 25 percent of the additional rice produced, valued at world prices.⁶⁰

The following tabulation summarizes these welfare and efficiency losses as well as the transfers in terms of the areas of Chart 2c.

	<u>Total loss of consumer surplus</u>	<u>Gain by producers</u>	<u>Government revenue</u>	<u>Deadweight consumption welfare loss</u>
Recipients of transfers from rice consumers	abmn =	abkj +	jkml +	lmn
	<u>Total gain by producers</u>	<u>Higher consumer prices</u>	<u>Government investment and input subsidies</u>	<u>Government output subsidy</u>
Sources of transfers to rice producers	acij + efir =	abkj +	efir +	bcik

	<u>Total gain by producers</u>	<u>Producer surplus</u>		<u>Deadweight efficiency loss</u>
Composition of transfers to rice producers	ac'j + efir =	acihred	+	defj

As indicated in previous sections, the budgetary share of these transfers is very important, and most of it comes from sources other than rice consumers. Foreign donors have financed over half the investment and related input subsidy programs. Domestic investment funds come from a variety of sources, but the largest are direct and indirect taxes on domestic trade and production unrelated to rice consumption or production. Government output subsidies were initially funded with revenue from rice imports--that is, by transfers from consumers. But until 1977 the largest share was financed through loans from the BNDA, postponing the ultimate budgetary impact of the policy. These debts have finally been paid by the CSSPPA from profits on coffee and cocoa exports (i.e., taxes on coffee and cocoa producers).

The magnitude of these transfers helps explain why rice in the Ivory Coast has become so politicized. Farmers, the former state-owned production company (SODERIZ), paddy assemblers, and millers (especially the large-scale government mills) all developed a strong interest in seeing the trade protection, the investment and input subsidies, and the price supports continue. The subsidized inputs and investments benefited farmers who could acquire them and the subsidized paddy price further increased their gains. The high paddy price supports attracted so much paddy to government mills that SODERIZ became the tenth largest company in the country by 1975.⁶¹

Among the losers, consumers stand out as the largest. But the group is diffuse, and incomes have grown sufficiently so there has been little

pressure to bring the domestic price in line with the import price.⁶² Other sectoral interests, mainly coffee and cocoa, which have been taxed to finance rice production and which have had to compete with rice for production factors and financing have been more assertive. Their commodity prices have recently risen relative to paddy, and they have now largely appropriated the rice production sector into their own programs after the dissolution of the rice agency. Foreign donors, losers in the sense that they have financed part of the transfers, have reacted by limiting future funding until the price policy is changed to reduce the subsidies. The import cartel, temporarily squeezed out in 1975 and 1976, has managed to regain its historical position as the country returned to a net import position. In all of this, the government budget has been the ultimate residual equilibrating agency. As the financial burden grows, the government has become increasingly reluctant to divert funds from other projects into a sector which has shown few real improvements in efficiency.

PROGNOSIS

Saddled with an expensive legacy of past domestic price supports, the Ivorian government found itself in 1978 faced with the need to revise policies aimed at the rice sector. The budget had become constrained. Past price supports had strong effects. Producers gained enormously from the transfers. The huge price subsidies made it possible for government mills to compete with the private sector and enabled the government to dominate paddy marketing. Control over the bulk of marketed paddy helped the government defend spatial and temporal equality of producer and consumer prices. Finally, large sales to the government were used to justify

significant investment in government milling and storage capacity which would probably have been idled without the price subsidies.

The interest groups

which have benefitted from past decisions may make reorientation difficult, probably delaying final decisions. But the budgetary constraint, which is now binding on both recurrent expenditures and investments, greatly impedes efforts to continue past policies designed to expand production. The grace period afforded by loans from the BNDA, by taxes on coffee and cocoa exports, and by foreign aid contracted in the early 1970s is over. A reorientation is inevitable.

In the past, Ivorian rice development was aimed at achieving the secondary objectives of maintaining a positive trade balance and of improving regional income distribution. The strategy was to increase domestic rice production by using a combination of trade protection and investment measures, supported in recent years by producer price subsidies. The basic constraint was the high cost of production, given prevailing factor and commodity prices. It is significant that planners recognized this constraint from the beginning, and much of the Ivorian rice development strategy has been an effort to overcome it.

Although government emphasis on the two objectives on which rice policies have been focussed remains unchanged, neither objective has benefitted much from these policies despite the increases in domestic rice production. What is worse, the high cost of the increased rice production may have actually depressed overall growth, the fundamental policy objective. There are two lessons here. First, producing rice is an inefficient means of improving the trade balance because the country does not enjoy a comparative advantage in rice production at prevailing world prices. Despite the original

strategy to make rice competitive by lowering production costs, the expansion resulted mainly from bringing more factors into production, not from increases in productivity. The resources pulled into additional rice production would have been more efficiently used to earn or save foreign exchange if they had been switched to export diversification or to other import-substituting activities. Second, expanded rice production brought about through high support prices has not been an effective means for improving regional income distribution. Investment and input subsidies could have been more effectively tied to specific geographic locations, thus assuring the income transfer, though high producer prices have been necessary to make investments attractive to farmers. In any event, channeling the transfer through a crop such as rice, which is not competitive with imports, was not efficient.

The failure of the rice sector to contribute to the objectives set for it stems from the inability of government policies to overcome the basic resource constraints. Expensive labor has been and remains a preoccupation of Ivorian farmers as well as planners. Despite large migrations from neighboring countries to the north, the profitability of other agricultural crops and the dynamism of the secondary and tertiary sectors have created a high demand for labor. The technological package--fertilizers, selected seeds, extension services, and irrigation development--was meant to raise labor productivity. The unspoken corollary was that costs would then fall, protection could end, and subsidies would no longer be needed. The strategy failed because costs have not fallen.

The shape of future government policy is difficult to predict, but normative aspects of several alternatives can be examined. Analytically,

the most desirable long-run solution would be consistent with the fundamental government objective of economic growth, which would simultaneously contribute to the secondary goals as well. It must also alleviate current pressures on the government budget. A movement toward free trade by reducing trade control and domestic paddy price supports would contribute both to efficient growth of the economy and reduce the burden of rice subsidies on the budget. Imports would increase and consumers would benefit as rice prices fell in line with world prices. Rice producers would tend to lose, although producers of other crops currently taxed to finance rice subsidies, would gain.

Over the long-run, economic justification for government intervention in rice production rests essentially on government ability to shift the supply function outward. Such intervention will succeed only if new techniques lower per unit production costs, rather than simply shifting costs from labor or land to capital or imported inputs that must be subsidized. The choice of technical innovations depends on the relative prices of land and labor that are expected to prevail during the next few decades.

Because labor is currently expensive relative to land, immediate improvements should focus on reducing the overall share of labor costs. Small-scale motorization suitable for small farms is one means to facilitate soil preparation, harvesting, and threshing, but tropical conditions tend to raise operating costs and reduce equipment lifetimes. The repair and service infrastructure in the Ivory Coast is still insufficient to maintain small motorized machines in good operating condition. Animal traction may be more suitable to African conditions than motorization, but trypanosomiasis impedes its use in the forest zone where the bulk of Ivorian rice is produced.

Improved planting and weeding methods and better timing could increase yields without raising labor inputs, but such improvements require an effective extension service, which in the past has been costly and limited mainly to the distribution of improved seeds and fertilizers. Herbicides could save weeding labor but currently appear only marginally cost effective (5). The range of efficient labor-saving techniques thus appears to be quite restricted at present, giving the government few options to make domestic rice production competitive at current or expected world prices.

Over the longer run land could become a major physical constraint. If the area in perennial plantations and under extensive, shifting cultivation techniques continues to grow at the rate observed between 1965 and 1975, unused arable land may disappear before the year 2000.⁶³ Costs of land development and use will increase since land will be cultivated farther from consumption centers and because more intensive cultivation may lead to erosion and weed infestation while lowering fertility. In these circumstances, land-saving technologies such as irrigation investment could become important, if certain conditions prevail. First, rice must be competitive with alternative uses of the scarce land, such as industrial crops. Current studies suggest it is not (5, 38). Second, even if rice production were an efficient use of scarce land, labor-using irrigation makes economic sense only if the value of land increases more rapidly than wages. Given the historical demand of the Ivorian economy for labor, such prospect seems unlikely in the next two to three decades.

Because land scarcity is a future problem, the economic inefficiency and large subsidies of current rice policies can be justified only if a long lead-time is necessary for investment and learning in rice production. There is little evidence that such lead-times, except in research, are required.

Future benefits must compensate for current losses, which demands that rice production become highly competitive, not marginally so. Existing irrigation investments have relied on cheap foreign funds but have been expensive and only partially utilized. Unless capital costs are kept low and irrigation efficiency is improved, savings may be insufficient to make irrigated Ivorian rice competitive with imports even if good rainfed land were scarce.

Although the ideal future reorientation of government rice policy should rely on continued research and limited investment, with imports being used to equate supply and demand at prices close to world levels, other adjustments may be required in the interim. These short-run policies depend more heavily on the price mechanism coupled with trade control to equate the demand and supply of rice. The most obvious immediate change is to raise the consumer price. By the end of 1977, the official retail price of rice had fallen in real terms to only 75 percent of its 1965 level. Relative to the food price index, the real price had fallen even lower.⁶⁴ Raising the consumer price to the level of producer price supports would shift the burden of the output subsidy from the government budget to rice consumers. There would be no further decline in economic efficiency although there would be a greater deadweight loss in consumer welfare.⁶⁵ Because rice imports would fall without further increases in efficient rice production, the policy would also save foreign exchange although these savings may be partially offset by larger wheat imports caused by increased consumption of bread. Finally, investment and input subsidies could still be used to improve regional income distribution until better alternatives are found.

The evaluation of this alternative changes if the world rice price rises. If the world price were as high as the producer support price, there

would be no deadweight losses of economic efficiency or consumer welfare from replacing imports with domestic rice production. Government revenue on rice imports would disappear, but the only budgetary obligations would be the input subsidies. Yet even if the world rice price were to be double its 1976-77 levels, it would still be below the level of the current domestic producer price support.⁶⁶ Under present technology, import substitution therefore involves a considerable loss to the economy.

The other short term change is to lower the producer price to the consumer price level, thereby eliminating the very high producer price supports introduced in 1975. Consumption levels and consumer welfare would remain unchanged, and there would be a much smaller loss of production efficiency since production would decline. In essence, such a reorientation represents a return to the policies of the second historical period, 1960-74, when import substitution was viewed as a long-term goal linked to the growth in the competitiveness of Ivorian rice production. In effect, this alternative is already being implemented. Relative to the producer prices of other export crops, the official producer price of paddy has been greatly eroded. In terms of the consumer price index, the official paddy price has fallen by one-third in real terms.⁶⁷ Moreover, the government no longer defends this official price by purchasing all paddy offered for sale.

Unless pressures on the government budget are eased in some other way, either of these alternatives, or some combination will have to be adopted. In any event, the government rice-milling sector will lose its sheltered position, and the government budget, as well as the coffee and cocoa farmers, will gain. If the world price of rice rises, import substitution becomes not only feasible but desirable, especially if foreign exchange to pay for more expensive rice imports becomes a constraint. As long as the world price is low relative to domestic production costs--which is more likely--it will be

difficult to find innovations that can make Ivorian rice competitive.

In this circumstance, lower producer prices, increased consumption, and larger imports make the most sense economically. In addition, such a short-run adjustment is consistent with the long-run solution that relies on cheaper imports while a search for more efficient production techniques continues. This strategy recalls that of the 1960s, but with a new focus on labor-saving, rather than land-saving, technical changes.

FOOTNOTES

¹See (21). Population densities for the rice-producing areas are: Man, 40 inhabitants per square kilometer; Gagnoa, 38; Daloa, 24; and Korhogo, 22.

²Data on income and urbanization are taken from Humphreys and Rader (6, pp. 2-3):

	<u>Thousands of constant CFA francs per capita</u>	<u>Urban population as percent of total</u>
1965	78	21
1975	93	32
Percent change	19	52

³There are approximately 600-650 outlets in the distribution system under Ministry of Commerce supervision (19).

⁴The supporting data are:

	<u>Food price index</u>	<u>Rice</u>	<u>Bread</u>	<u>Yams (CFA francs per kg)</u>	<u>Plantains</u>	<u>Cassava</u>	<u>Corn</u>
1964-66	123	51	42	26	17	21	38
1976-77	213	117	120	91	66	98	106
Percent increase	75	130	230	250	288	367	179

⁵The department of Bouaké is included in the savannah zone, even though it dips into the forest. Its vegetation and rainfall patterns make it similar to the rest of the savannah zone, which includes the departments of Touba, Séguéla, Katiola, Dabakaha, Bouna, Korhogo, Ferkessedougou, Odienné, Boundiali, and Bondoukou.

⁶The Ministry of Planning (27, pp. 212-13) estimated that total land in cultivation cycles was 7.6 million ha in 1965, and predicted an increase to 9.6 by

1975. The Ministry of Agriculture (17) indicated that growth of cultivated land has been even more rapid. Another planning document (30) has given lower estimates of land in cultivation cycles representing less than 50 percent of the arable land.

⁷SODERIZ, the acronym for Société pour le Développement de la Riziculture, was the state company responsible for increasing rice production from 1970 to 1977.

⁸Legal wages, at 250 CFA francs/day in 1976 for agricultural labor in coffee, cocoa, and rice, are published in a government publication (10). Local currency is the CFA (Communauté Financière Africaine) franc which is tied to the French franc. The exchange rate used in this paper is 250 CFA francs per U.S. dollar.

⁹Interest rates, including insurance fees, range from 8.5 to 10.5 percent per annum. Hungry-season loans, which comprise about one-third of the lending, carry an annualized rate of 15 percent (8).

¹⁰The improved rainfed seeds are: one-half Moroberekan, an improved local variety with a cycle of 145 days used since 1960; one-third Iguapé Cateto, a Brazilian variety with a cycle of 135 days; and one-sixth Dourado, another Brazilian variety with a cycle of 105 days (34 and 15). The seeding rate is 60 kg/ha, except for the short season rice which uses 80. Fertilizers used are 150 kg/ha of 10-18-18 and 75 kg/ha of urea.

¹¹Selected seeds for irrigated rice include the following: two-thirds IR5, an IRRI rice with a 140-day cycle; one-tenth Jaya, a rice from India with a 120-day cycle; and one-fifth CS6, an Ivorian cross being phased out. Transplanting is at the rate of 40-50 kg/ha. Recommended fertilizer dosage rates are the same as for rainfed rice. Furadan is the insecticide used against

stem borers, applied at the rate of 28 kg/ha. Herbicides are rarely used, but the most common are propanil and 2-4-D, applied at the rates of 7-8 liters and 1-1.5 liters/ha, respectively.

¹²Physical hectares are area measurements that do not take account of number of crop seasons per year.

¹³Roughly one-third of the 60,000 ha could have complete water control, enabling double cropping. The remainder are in small scale diversion irrigation schemes (12, 15). In a governmental study (13), 40,000 square kilometers were surveyed in 1966 around Korhogo, Odienné (northwest corner), and Man, locating roughly 15,000 ha of irrigable swamp land. Because these zones are relatively favorable for rice, it is difficult to generalize these results to estimate total irrigable swamp land.

¹⁴Industrial-scale mills are large, integrated units, including cleaners, hullers, whitening cones, and sorters. Capacity is usually 2-4 mt paddy per hour.

¹⁵The government pays 75 CFA francs per kg of paddy delivered mill (65 CFA francs official farmgate price) and sells white rice for 87 CFA francs/kg, ex-mill. Total production costs, including paddy and its conversion to rice, are established at 139 CFA francs/kg of rice. The subsidy is thus 52 CFA francs (139-87), which more than covers costs of collection and milling. In addition, transport costs from mills to Abidjan are fully subsidized.

¹⁶Estimates of traditional mills vary considerably. The low figure is based on information supplied by the local manufacturer and takes account of imports before 1968, local production of units since then, and exports. A government publication (17) estimated 2,900, which is probably biased upward. On the other hand, coffee hullers, of which there are some 13,000, can also be adapted to process paddy.

¹⁷Total small-scale milling capacity can be estimated at about 50,000 mt of paddy per year, based on 1,500 operating units with a 0.2 mt rice per hour capacity, 135 days of operation annually, 10-hour days, and a 63 percent milling out-turn.

¹⁸The Caisse Général de Péréquation des Prix des Produits et Marchandises de Grande Consommation (Caisse de Péréquation), which was consolidated in 1971 from several earlier price equalization boards, is charged with assuring constant prices of several commodities that are considered critical consumer goods such as rice, sugar, flour, cement, gasoline, and iron reinforcing rods. In the cases of rice, sugar, bread, and gasoline, prices are the same throughout the country. Transport differentials are paid by the Caisse de Péréquation.

¹⁹Although transport is probably efficient, real costs of collecting paddy may be higher than the official margin of 10 CFA francs/kg paddy.

²⁰During 1947-58, paddy production varied from 71,000 to 147,000 tons, with no clear trend. It averaged 105,000 tons, with a coefficient of variation of 0.23 (23, 19).

²¹See planning document (29) which reports that 1,482 million CFA francs went to rice, out of an agricultural budget of 6,466 million.

²²See (23). "Etudes de Riz" appeared for the first time, and they were allocated 5 percent of the agricultural investment budget.

²³SATMACI is the acronym for Société d'Assistance Technique pour la Modernisation Agricole de la Côte d'Ivoire. It is the state company responsible for the coffee and cocoa sector of the economy and, since 1977, all crops grown in the middle forest zone.

²⁴The share of funding devoted to research was significant. During 1961-63, 38 percent of French grant aid for rice went to studies. Of the 577 million

CFA francs allocated to rice in the 1964-65 French-guaranteed loan for agricultural development, 45 percent was concentrated on research (10).

²⁵The guaranteed yields were 2 mt paddy/ha in rainfed rice and 4 mt paddy/ha in irrigated rice. Although there was considerable variation in practice, the guarantee seemed to be applied only in cases of complete crop failure. Where average yields for a farmer were positive but below standard the guarantee was calculated by assuming that part of the field failed totally and the other part produced the guaranteed level, giving the lower average. The fee was waived only on that share of land assumed to have had no harvest.

²⁶Fertilizer and seeding rates are given above. Extension density is a function of the contracts accepted by farmers but ideally is one agent per 50-80 cropped ha; recently it has been higher. Irrigation water is not measured, so payment is a function of land area, not volume of water delivered.

²⁷Foreign financing came from the following sources (12, 15):

<u>Organization</u>	<u>Amount (billions of CFA francs)</u>	<u>Year com- mitted</u>	<u>Terms (percent)</u>
International Coffee Organization	1.468	1971	0 over 30 years
European Development Fund	2.928	1971	grant
Caisse Centrale (CCCE, France)	0.860	1972	3.5 over 10 years with 3 years grace
KFW (German)	1.013	1973	2.25 over 20 years with 8 years grace

²⁸Theoretically, during 1960-73 rice imports generated about 10 billion CFA francs in tariff revenue (see Table 10). Imports were controlled by a cartel which may have appropriated most of the implicit tariff revenue before the Caisse de Péréquation began to function.

²⁹The domestic price was about 50-75 percent higher than the official paddy price. Budgetary calculations in planning documents (32 and 30) suggest that at official rice prices paddy production could be profitable only with

very optimistic assumptions (for example, 5 mt paddy/ha per irrigated crop).

³⁰For three seasons, 1971/72 to 1973/74, the subsidy varied from 15.7 to 21 CFA francs/kg of rice. During this same three-year period, less than 30,000 mt of rice were milled in government mills. The total cost of the subsidy was only 522 million CFA francs from 1971 to 1974.

³¹In these two years, there were minor imports of 100 percent whole grain rice, which is outside government control.

³²All this additional foreign financing came from the French Caisse Centrale de Coopération Economique (CCCE), largely as extensions to existing investments.

³³The agreement between SODERIZ and the Caisse de Péréquation has established total costs of producing domestic rice by government mills at 139 CFA francs/kg rice, ex-mill. Import prices in 1977 are estimated at about 69 CFA francs, c.i.f. (6, p. 12, 7).

³⁴Caisse de Stabilisation et de Soutien des Prix des Productions Agricoles was created to be responsible for exportations of major export crops--especially coffee and cocoa--and to assure producer incomes for these crops. Proceeds from exports are used in general development projects.

³⁵Theoretical milling capacity is to be increased by 132,000 mt paddy/year or 63 percent compared to 1976 theoretical capacity (38 mt/hour multiplied by 5,500 hours/year (6, p. 11)). Storage will be increased by 125,000 mt. Total cost is estimated at 9.5 billion CFA francs (15).

³⁶See Humphreys and Rader (6, p. 4). Calculations based on the three-year average centered on 1965 (258,000 mt) and the average of 1975-76 (440,000 mt). Using 1960 as the starting point gives a more dramatic growth of 135 percent and 250,000 mt. Because the accuracy of agricultural statistics was vastly improved after the regional surveys of 1962-64, an analysis based on the 1965-76 period gives a more reliable indication.

³⁷See Humphreys and Rader (6, p. 4). The calculation uses a three-year average centered on 1965 and the average of 1975-76. The growth rate is based on 11 years.

³⁸The details of this calculation are: (a) 290,000 ha devoted to rice in 1973; (b) 7,000 ha coming into production during 1974 and 1975 because of natural growth, based on the past trend; (c) about 6,500 ha of new riceland with an overall cropping intensity of about 1.3 brought into production in 1974 and 1975 by land development projects, including mechanized clearing (6, p. 3); and (d) 361,000 ha in rice in 1975, giving an increase of 71,000 ha, of which only 15,000 are accounted for by normal growth and government projects. Since prices of paddy increased by 160 percent in 1973 and 1974, the short-run supply elasticity would be 0.12.

³⁹The 1964-66 average yield is 1.01 mt paddy/ha (6, p. 4).

⁴⁰Compared to traditional rainfed production, about three-fifths of yield increases under irrigated systems may be attributed to water control along with ancillary labor inputs.

⁴¹Fertilizer dosage rates are uniformly 50 kg N/ha, two-thirds applied as urea. In SODERIZ (14, p. 237) response rates are reported as 34 kg paddy/kg N for applications up to 35 kg N/ha under irrigated conditions in the savannah zone. IRAT (35, p. 14) reports a response rate of 9-14 paddy per kg N for applications of 200 and 100 kg N/ha, respectively, also under irrigated conditions. For rainfed rice, IRAT also reports 5-10 kg paddy per kg N in the savannah and an average of 14 kg paddy per kg N in the forest zone, both for applications of 50-60 kg N/ha. The figures presented in the text are based on the following data and assumptions:

<u>Type of rice</u>	<u>Percent of fertilizer</u>	<u>Total N (mt)</u>	<u>Assumed kg paddy per kg N</u>	<u>Total increase in paddy (mt)</u>
Forest irrigated	17	255	25	6,375
Forest rainfed	15	225	14	3,150
Savannah irrigated	16	240	25	6,000
Savannah rainfed	52	780	7.5	5,850
Total	100	1,500	14.25	21,375

⁴²Production along isoquant II and II' equals production along Isoquant I.

⁴³Planning documents consistently recognize the need to conserve forest land. One such planning document (28, Vol. II, pp. 65-67) states that usable forest reserves will disappear by about 1985 if past trends continue, largely due to pressure from agriculture. A second document (27, pp. 199, 213) argues that foodcrop production must be intensified and consolidated under modern crop rotation systems.

⁴⁴For the period 1965 to 1976-77, production of paddy grew at 5 percent per annum, while total population grew at just over 4.0 percent per annum (6, pp. 2, 4).

⁴⁵For the period 1965-70, annual imports of 25-35 percent broken rice averaged 61,000 mt rice. During the next six years, they averaged 59,000 mt, although the annual variability was much greater.

⁴⁶Two separate planning documents (26, p. 137-39, 27, pp. 143-5) argued that cereals consumption should be encouraged in order to improve nutrition. Rice production was singled out to be the major instrument for reaching this objective.

⁴⁷Despite the large increase in prices in 1974, real rice prices between 1965 and 1977 actually fell. Between 1965 and 1977 consumer prices increased 2.6 times. Nominal retail prices increased from 51 to 134 CFA francs/kg. But by 1978 the government had increased imports sufficiently to lower the retail price of rice to 100 CFA francs/kg, the official price (6, p. 18).

⁴⁸ Imports are included of 25-35 percent broken only.

⁴⁹ These costs include collection, milling by SODERIZ, and delivery to Abidjan wholesalers. See Humphreys (5).

⁵⁰ This information has been taken from the listing of projects in SODERIZ (16). The investment breaks down as follows:

<u>Region</u>	<u>Billions CFA francs</u>	<u>Percent</u>
Forest	6.250	34
Savannah	10.830	59
General	1.234	7

These figures exclude major investment in milling, which has been more concentrated in the forest zone.

⁵¹ According to estimates based on the regional distribution of paddy purchases by SODERIZ in 1975, nearly 80 percent originated in the forest zone. This compares to a share in national production of about 70 percent. Many of the beneficiaries were actually migrants from the savannah zone.

⁵² To the extent that subsidies are in the form of land investment rather than current inputs, farmers are more likely to receive a subsidy sufficient only to cover real costs, the area between S_3 and the domestic price P_d . This is true because land subsidies can be tailored to cover only marginal costs for each producer. In the Ivory Coast, most input subsidies have been channelled through land investment.

⁵³ The new consumer price was later reduced from 125 to 100 CFA francs/kg, which currently represents a constant real rice price, compared to the cost of living index (6, p. 18).

⁵⁴ In fact, not all farmers benefit equally from the subsidized paddy prices. Because prices are supported primarily at government mills, more distant farmers receive less. In addition, owing first to inadequate storage and milling capacities and later to insufficient funds, government purchases have been

rationed and not all paddy offered has been accepted. Some farmers must therefore accept lower, unsubsidized prices for paddy, which in 1975 averaged about 53 CFA francs per kg in small rural markets (5).

⁵⁵Without the government subsidy per unit of output, $P_s - P_d$, the high producer price (P_s) would have caused a total loss of consumer welfare equal to the area acin.

⁵⁶This loss can be roughly estimated by assuming a price elasticity of demand for rice of -0.5 (which is consistent with the fall in consumption from 46 to 28 kg per capita when prices rose from 70 to 125 CFA francs in 1974), a nominal protection coefficient of 1.3 (the average for 1969-73), and a c.i.f. price of 65 CFA francs per kg (a price consistent with the 1975 wholesale price of 87 CFA francs). By increasing the domestic rice price over the import price by 30 percent or about 20 CFA francs (the vertical distance lm), the trade policy suppressed consumption in the early 1970s by perhaps 50,000 mt per year (the horizontal distance ln). The deadweight loss to consumption (area lmn) is thus about 0.5 billion CFA francs in 1975.

⁵⁷This amount is the weighted average of the net social profitability in all types of rice production except traditional upland which is handpounded and consumed on-farm. The weights are the share each contributes to total output. For the range of production changes considered, it is assumed that average production costs equal marginal costs.

⁵⁸This calculation is based on the 1975 production of 465,000 mt paddy of which slightly more than 50 percent is estimated to have been produced traditionally, hand-pounded and consumed on-farm. If imported rice were sold at P_w it could also conceivably replace part of this on-farm consumption if the market price were to fall beneath costs of production.

⁵⁹The aggregate supply curve consists of several discrete steps, each representing a different and increasingly costly production technique. Aggregate net social profitability (NSP) thus equals the product of the NSP and the quantity of rice produced, summed over all the relevant production techniques.

⁶⁰World rice prices are estimated at 75 CFA francs per kg rice, c.i.f. for 25-35 percent broken. This was the price level used in Humphreys (5).

⁶¹The ranking is based on gross sales in 1975. See the government financial report (21, p. 6).

⁶²Real per capita GDP grew by 2.4 percent per year from 1965 to 1977, compared to a constant real price of rice (6, pp. 3, 18).

⁶³On the basis of information in Table 5, the amount of arable land in a cultivation cycle grew at 2.9 percent per year between 1965 and 1974. Ten million ha were estimated in a cultivation cycle in 1974, based on an estimated 5-7 ha fallow per cultivated ha (27, p. 213). At this growth rate, all arable land could be in a cultivation cycle in only 16 years.

⁶⁴In 1965, the retail price of rice was 51 CFA francs per kg, compared to an official price in 1977 of 100 CFA francs. Over the same 12 years the Abidjan African consumer price index rose from 117 to 307. The food price index rose from 122 to 365 (6, pp. 15, 18).

⁶⁵To the extent that there are insufficient government funds to purchase paddy, it is impossible for all farmers to receive the higher, support price. An increase in the retail price of rice would shift the burden of the subsidy to consumers and assure that all farmers receive equivalent prices. More farmers would probably receive the higher prices which would bid additional domestic factors into rice production causing a greater decline in economic efficiency.

⁶⁶The current official domestic producer price support (P_g) is equivalent to a c.i.f. price of about \$550 per metric ton of rice. The 1976-77 c.i.f. price is estimated at \$250 per mt (60-65 CFA francs per kg). The highest

c.i.f. price of rice with 25-35 percent broken since independence was only \$465 per metric ton in 1974 (6, p. 12). The long-run price for rice of this quality is expected to be about \$300 per mt (2a).

⁶⁷Since the official paddy price was last raised in 1974, producer prices for coffee, cocoa, and cotton have increased by 50, 64, and 78 percent, respectively (6, p. 17). Between 1974 and 1977, the Abidjan African consumer price index rose from 193 to 307. In real terms, the 1974 paddy price of 65 CFA francs per kg equaled only 41 CFA francs by the end of 1977 (6, pp. 15, 18). By 1976, increasingly stringent government buying standards for paddy had reduced the actual price received by producers by at least 5 percent (13). Policies toward quality discounts are currently in flux.

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