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WHY IS RICE AND WHEAT CONSUMPTION INCREASING IN WEST AFRICA?

by

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Policy attention in West Africa has turned to what may be a fundamental imbalance between the composition of cereals production and that of consumption. Annual per capita rice and wheat consumption rose by more than 16 kilograms from the early 1960s to the early 1980s, whereas millet and sorghum consumption fell by 22 kilograms and maize consumption increased by less than 1 kilogram over the same period (Delgado and Reardon, 1987). After bumper harvests in the Sahel in the two preceding years, coarse grain prices fell during the 1986 harvest to one-third to one-tenth their 1984 levels. History is repeating itself this year in the Sahel, following an even larger harvest in late 1988.

Once again, grain marketing parastatals in the landlocked Sahelian countries have begun to worry about disposal of large surplus stocks of millet and sorghum. However, experience in 1986 shows that rice and wheat imports are likely to continue unabated. In Mali, for example, commercial cereals imports still accounted for 8 percent of all imports in that year, despite record stocks of millet and sorghum.

Besides the growing drain on foreign exchange, policymakers are concerned about the demand constraints for domestic production of coarse grains. The latter account for roughly four-fifths of cropped area, in a Sahelian agricultural sector that continues to employ

roughly three-quarters of the overall population. Adding to this concern is the perception that prospects for decreasing unit production costs for coarse grains in West Africa appear good, but wheat production prospects remain poor, and rice production growth has consistently lagged behind consumption growth (15 percent of cereals production in the early 1980s and 21 percent of consumption -- see Delgado 1987).

It has been tempting to conclude that consumption switches can be explained by domestic cereal prices favorable to rice and wheat consumers. From 1970 to 1987, international cereals prices as a group fell about one-third relative to manufactures. However, rice prices fell almost half again as fast as coarse grain prices, implying that rice was getting relatively (if not absolutely) cheaper than both coarse grains and manufactures on international markets (Delgado 1987). Rice also became cheaper relative to wheat in world markets over the same period. Although domestic price trends are not strictly uniform across West Africa, on the whole similar trends could be observed in most countries for rice prices relative to coarse grains and manufactures. This was especially true in the CFA Franc zone (see Table 1). However, the divergence between domestic and international price ratios for wheat was quite variable across countries.

At least two major initiatives have been suggested as possible solutions to the problems associated with the rise in rice and wheat consumption in West Africa. First, quantitative restrictions on imports have been proposed. Nigeria, for example, has attempted to

Table 1 -- Relative Consumer Food Prices in the West African Franc Zone, 1966/70 - 1982/86

Country	Price of Rice/ Price of Traditional Staple (a)			Price of Wheat Bread/ Price of Traditional Staple (a)			
	5 Year Averages	1966/70	1974/78	1982/86	1966/70	1974/78	1982/86
Burkina Faso		2.8	1.9	2.0	2.7	1.8	4.0
Côte d'Ivoire		1.7	1.2	0.8	1.6	1.7	1.6
Mali		2.0	1.9	1.6	3.2	3.2	1.7
Niger		2.7	2.1	1.7	4.6	2.3	2.2
Sénégal		1.2	1.8	1.2	1.2	2.6	2.5
World Market		3.6	3.4	2.3	1.2	1.3	1.9

Sources: See Appendix

Note: (a) All prices are per kg. Traditional staples are millet for Mali, Niger and Senegal; sorghum for Burkina Faso; cassava for Côte d'Ivoire. World prices are f.o.b. export prices.

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ban all rice and wheat imports. Second, tariff policies have been proposed to protect the local cereals economies. For example, the CILSS/Club du Sahel has advocated creation of regional protected zones for cereals in West Africa, characterized by a high common external tariff for cereals imports originating from outside West Africa. While the mechanics of these policies differ, their main impact on rice and wheat consumption is through raising the domestic prices of rice and wheat -- the main importable cereals -- relative to everything else (Delgado 1989).

Consideration of policies that work through raising relative prices for rice and wheat raises three main sets of issues. First, how much must relative rice and wheat prices rise to succeed in reversing current substitution trends? Second, what will be the impact of such changes in domestic price ratios on economic efficiency and growth? Third, what will be the impact on equity and welfare of the most needy?

With respect to the first set of issues, ongoing research at IFPRI suggests that relative prices may only play a minor role in driving West African rice and wheat consumption at both the household and national levels -- with the possible exception of very high consumer subsidies to wheat in some countries -- and that nonprice factors related to such things as income distribution, the need to eat away from home, and occupation may be more important. This is less true only in the case of wheat in some interior countries where wheat consumers have been historically highly subsidized.

This is confirmed at the national level by detailed statistical examination of trends from 1966 to 1986 in Burkina Faso, Côte d'Ivoire, Mali, Niger and Sénégal. A simultaneous system of five equations and 16 variables was fitted to the national level annual data, to model the formation of domestic wheat and rice prices (relative to coarse grains prices, and cassava in Cote d'Ivoire) and the share of rice and wheat in national cereals consumption over the 1966 to 1986 period (details of the model and data are in the Appendix). The FAO estimates of annual food consumption of different commodities that were used are judged to be robust enough to permit the use of this type of procedure to discern major trends and correlations in the data, if not to "fine tune" policy recommendations.

The results in Tables 2 and 3 show that the evolution of the share of rice and wheat in total cereals consumption over years and across countries is only weakly related to movements in the prices of rice and wheat relative to the prices of millet and sorghum. The exemption would be for wheat in Niger and Mali, where the degree of consumer subsidy has been especially high. The percentage increase in the share of rice in national cereals consumption associated with a one percent decrease in the urban retail price of rice (relative to the price of the principal traditional starchy staple) ranged from a high of 0.46 percent in Niger, to a low of 0.1 percent in Côte d'Ivoire.

On the other hand, urbanization is very strongly associated with rice consumption. In Burkina Faso, for example, a one percent increase in the share of total population living in towns was associated with a

TABLE 2

**INFLUENCE OF VARIOUS FACTORS ON THE SHARE OF RICE
IN NATIONAL CEREALS CONSUMPTION, 1966-1986**

(Elasticities of the share of rice with respect to the variables indicated; t-ratios in parentheses)

VARIABLE	BURKINA FASO	COTE D'IVOIRE	MALI	NIGER	SENEGAL
Intercept	2.442 (0.449)	0.710 (0.397)	-4.829 (-0.966)	-1.295 (-0.191)	20.748 (2.136)
Consumer Prices of Rice/Millet (a)	0.0113 (0.051)	-0.105 (-1.982)	-0.249 (-0.830)	-0.458 (-1.249)	-0.354 (-2.464)
GDP per Capita 1970 CFA	-0.417 (-0.731)	0.250 (1.719)	0.456 (0.804)	0.149 (0.240)	-0.575 (-1.505)
Share of Pop. in Cities	1.338 (4.009)	0.087 (0.901)	1.169 (2.854)	0.576 (1.549)	-3.147 (-1.851)
Adj. R-Square	0.48	0.42	0.46	0.38	0.02
D. W.	1.90	1.41	2.16	0.91	2.23

Source: Two-stage least squares estimates from a simultaneous system of 5 equations for each country, using annual data, run separately by country. See the appendix for details, especially equation 2.

Note: (a) Sorghum for Burkina Faso, cassava for Côte d'Ivoire

TABLE 3
 INFLUENCE OF VARIOUS FACTORS ON THE SHARE OF WHEAT
 IN NATIONAL CEREALS CONSUMPTION, 1966-1986

(Elasticities of the share of wheat with respect to the
 variables indicated - t ratios in parentheses)

Variable	Burkina Faso	Côte d'Ivoire	Mali	Niger	Sénégal
Intercept (0.236)	1.429 (1.115)	-5.965 (-0.439)	-8.221 (-1.058)	-6.874 (-0.572)	-10.955
Consumer bread price/ Consumer price of millet (a)	-0.256 (-1.317)	-0.036 (-0.180)	-1.088 (-1.544)	0.849 (-3.846)	-0.459 (-1.244)
GDP per capita, 1970 CFA	-0.183 (-0.272)	0.627 (1.448)	1.010 (0.426)	0.515 (0.850)	-0.774 (0.732)
Share of Population in Cities	0.533 (1.243)	0.412 (1.746)	-0.016 (-0.007)	1.150 (3.007)	1.328 (0.493)
Adj. R-square	0.13	0.10	0.13	0.81	0.05
D.W.	0.90	1.56	0.74	1.33	1.52

Source: Two-stage least squares estimates from a simultaneous system of 5 equations for each country, using annual data, run separately by country. See the Appendix for details, especially equation 3.

Note: (a) Sorghum for Burkina Faso, cassava for Côte d'Ivoire.

nearly 1.3 percent increase in rice consumption, even when price and national income effects are controlled for. However, the distribution of income between town and countryside is probably a more critical determinant of rice consumption than is the level of aggregate national income. This latter hypothesis needs to be further investigated at the micro level.

The aggregate level results are confirmed at the household level. Collaborative survey work undertaken by Thomas Reardon and colleagues at both IFPRI and the University of Ouagadougou during 1984 and 1985 reveals that urban rice consumption is especially sensitive to employment patterns in the urban household, and not particularly sensitive to the ratio of rice and coarse grains prices. For example, an own-price elasticity of 0.6 for rice was reported for the middle income tercile in Ouagadougou (Reardon, Thiombiano and Delgado, 1987, 1989). As women enter the workforce, and men work farther and farther away from the home, there is strong demand for staples that can be prepared quickly at low cost and that are available in roadside restaurants. Rice meets both needs.

The low sensitivity of rice consumption to relative prices suggests that to be successful at reducing imports, price-based measures would need to raise rice prices very significantly relative to coarse grains prices. At face value, the national level price elasticity reported above for Niger suggests that, at current values, increasing the retail price of a kg. of rice 15 FCFA relative to millet

would only lead to a reduction of 4.3 percent of annual rice consumption through substitution of coarse grains for rice.

This pessimistic view is corroborated by down-to-earth evidence on the supply side, raising the second set of concerns, relating to the efficiency of resource use and economic growth generally. Major consuming areas for rice in West Africa tend to be close to coastal ports, whereas the major producing areas tend to be inland. Since intra-West African road transport costs for long-distance grain shipments currently average more than U.S.\$0.10 ton/km., domestic transport costs alone are often more expensive than total import costs at the point of consumption. A tariff high enough to prohibit imports would have to be high enough to cover these transport costs plus the difference between domestic and international (Asian) rice production costs. Rice prices in many of the large coastal consuming areas could double over current levels; the latter are frequently already at or well above world import parity prices, even allowing for overvalued exchange rates. In Senegal, for example, either the State would have to subsidize domestic rice distribution, or rice from the Fleuve region would have to be sold in Dakar for at least 250 FCFA per kg., compared to the politically sensitive current price of 130 FCFA/kg. (Delgado 1989).

The long-run effect of changes of this magnitude--even if they were politically feasible--on resource allocation within West Africa and the opportunity cost of reallocations are not well known. Generally, initiatives such as cereals import bans and prohibitive

tariffs barriers for cereals will shift public and private resources out of unprotected sectors and into rice production. The latter may be severely constrained, nevertheless, by lack of infrastructure and appropriate technologies for the West African environment. The negative impact of resource shifts is likely to be highest on cash crops and livestock, both largely produced on the same small farms as cereals. Research conducted by Joachim von Braun and colleagues at both IFPRI and the Gambian Ministry of Agriculture shows that each additional ton of irrigated rice in the Jahally-Pacharr scheme came at a sacrifice of 390 kg. of upland cereals and 400 kg. of groundnuts, simply through reallocation of land and labor.

Furthermore, if coarse grains and rice are not close substitutes for each other in consumption, as the present fragmentary evidence from West Africa seems to suggest, the stimulative impact of rice and wheat protection on coarse grain consumption will be slight. This implies that higher rice and wheat prices will not necessarily increase coarse grains prices or production greatly. In fact, anecdotal evidence suggests that the primary beneficiary would be coastal exporters (to the interior) of sweet potatoes and other rootcrops, most of which lend themselves well to commercial preparation of prepared food.

The magnitude of required changes in relative prices also raises the third set of concerns, namely who will benefit and who will lose from food price policy initiatives in this domain? In the collaborative study between the University of Ouagadougou and IFPRI, it was found that both the poorest and the richest urban income terciles

obtained about one-third of their cereal-based calories from rice. For the poor, since they bought most of their rice in prepared form outside the household, this accounted for 45 percent of their cash expenditures on cereals (see Table 4). Yet most wheat is consumed by the rich, for whom it accounted for over one-third of their cereals expenditures.

The urban poor are important consumers of rice and their consumption of rice is not especially responsive to changes in its relative price. Policies that have the effect of greatly raising urban rice prices need to include measures for decreasing the negative effect on the poor in this growing section of the West African population. On the other hand, raising the price of wheat will not hurt the poor directly, but may have the indirect effect of raising rice prices as the rich shift to rice.

Although conventional wisdom suggests that urban people in West Africa are better off than rural people, painstaking survey work shows that, in Burkina Faso at least, the richest third of the rural population in the South (where rice can be produced) has a 60 percent higher mean income per adult equivalent over the 1981-1984 period than the poorest third of the urban population in 1984 (Reardon, Thiombiano and Delgado 1987,1989; Reardon, Matlon and Delgado 1988).

Other than the case of historically highly subsidized wheat consumption in Niger and Mali, the above analysis suggests that it will be difficult to deal with rising rice and wheat consumption through commercial policy measures intended to raise rice and wheat prices relative to all other prices. While alternatives are not simple, it is

Table 4 -- Share of Different Commodities in the Cereal Consumption of the Rich and Poor in Ouagadougou, 1984/85

(in percent by value)

	Poorest 1/3 of Sample	Richest 1/3 of Sample	Entire Sample
Millet and Sorghum	32	21	28
Maize	15	12	15
Rice	45	35	41
Wheat	5	32	17

Source: Reardon, Thomas, T. Thiombiano and C. Delgado. 1989. The data are from weekly surveys of 118 households for one year.

clear that moves in this direction will require considerable care with respect to distributive issues in urban and non-cereals zones.

Furthermore, research on ways to make coarse grains better serve the needs of the urban poor will be increasingly valuable. The urban poor increasingly require a staple food that is quick to prepare and requires relatively less energy inputs. Women working outside the household and wage earners working far from home need to eat outside the household.

The PROCELOS programme of the CILSS/Club du Sahel is a worthwhile research endeavor to address the non-price determinants of rising rice and wheat consumption in West Africa. It recognizes that urban lifestyles require food staples with preparation and conservation characteristics different from those associated with millet and sorghum in grain form. Initial results, while promising, show that even the purely technical problems in millet and sorghum processing for urban use are complex (CILSS/PROCELOS, 1988). Furthermore, it is likely that to be successful, millet and sorghum - derived food products will need to be cheaper relative to rice and wheat than current domestic price ratios for grain permit. However, protectionist rice and wheat policy in isolation from other policies that recognize that the non-price components of the demand structure have changed run the risk of provoking considerable suffering, while doing little to change things for the better.

References

- Berg, E. and W. Alexander. "Niger" in "Cereals Policy Reform in the Sahel". Report to the Organisation for Economic Co-operation and Development (OECD)/Club de Sahel and the Permanent Interstate Committee for Drought Control in the Sahel (CILSS) by Elliot Berg Associates, Alexandria, VA, April 1986
- Center for Research on Economic Development (CkED). "The Dynamics of Grain Marketing in Burkina Faso". Report to the United States Agency for International Development (USAID) on contract No. AFR-0243-c-00-2063-00 by the Center for Research on Economic Development, Ann Arbor, MI, March 1986
- _____. "Marketing, Price Policy and Storage of Food Grains in the Sahel: A Survey." Report to the CILSS/Club du Sahel Working Group on Grain Marketing, Price Policy and Storage by CRED, Ann Arbor, MI, August 1977
- CILSS/Club du Sahel, Programme Regional de Promotion des Céréales Locales au Sahel (PROCELOS). Bulletin Spécial Réunion Régional, Nov. 1988
- Delgado, C. L., and T. Reardon. 1987. "Policy Issues Raised by Changing Food Patterns in the Sahel." In Cereal Policies in Sahel Countries, CILSS/Club du Sahel, Paris: OECD.
- Delgado, Christopher L. "The Role of Prices in the Shift to Rice and Wheat Consumption in Francophone West Africa", Paper presented at the IFPRI/ISRA Conference on the Dynamics of Cereals Consumption and Production Patterns in West Africa, Dakar, Senegal, July 15-17, 1987
- Delgado, Christopher L. "Questions à Propos d'un Espace Régional Protégé pour les Céréales au Sahel", Economie Rurale, Mars 1989 (forthcoming)
- Dieye, F. "Etude des Mesures pour Reduire les Importations de Riz et Definition d'un Mechanisme Fiscal pour Remplacer le Systeme de Perequation des Prix pour Riz." November 1987 (mimeo)
- Food and Agricultural Organization of the United Nations (FAO). Production Yearbook. (FAO: Rome, various issues)
- _____. Trade Yearbook. (FAO: Rome, various issues)

- _____. "Politiques et Programme Cerealiers: Senegal, Vol. 2, Annex G". (FAO: Rome, November 1985) (mimeo)
- Gabas, J.-J.. "Bilan de la Situation Alimentaire dans le Sahel--Annexe Statistique". Paper presented at the Conference on Cereals Policies in Sahel Countries, Mindelo, Republic of Cape Verde, 1-6 December 1986
- Gagnon, G. "Le Commerce Prive des Cereales au Mali: La Filiere Socio-Professionnelle." Paper presented at the Conference on Cereals Policies in Sahel Countries, Mindelo, Republic of Cape Verde, 1-6 December 1986
- Haggblade, S. "An Overview of Food Security in Upper Volta". Report prepared for USAID/Upper Volta. USAID, Ouagadougou, July 16, 1984
- Humphreys, C. "Mali" in "Cereals Policy Reform in the Sahel". Report to the Organisation for Economic Co-operation and Development (OECD)/Club de Sahel and the Permanent Interstate Committee for Drought Control in the Sahel (CILSS) by Elliot Berg Associates, Alexandria, VA, April 1986
- International Food Policy Research Institute (IFPRI). "Food Aid Tape." (IFPRI: Washington, D.C., 1981)
- International Monetary Fund (IMF). International Financial Statistics Yearbook 1986. (IMF: Washington, D.C., 1987)
- _____. International Financial Statistics Yearbook 1988. (IMF: Washington, D.C., 1987)
- Martin, F. "Le Senegal" in "Cereals Policy Reform in the Sahel". Report to the Organisation for Economic Co-operation and Development (OECD)/Club de Sahel and the Permanent Interstate Committee for Drought Control in the Sahel (CILSS) by Elliot Berg Associates, Alexandria, VA, April 1986
- Ministère de la Coopération/Club du Sahel (OECD). "Inventaire des Mesures de Maîtrise des Echanges Exterieurs Céréalières des Pays D'Afrique de L'Ouest du Cameroun et du Tchad." Study prepared for IRAM and INRA, November, 1988
- Reardon, Thomas, T. Thiombiano and C. Delgado. "L'Importance des Céréales Non-traditionnelles dans la Consommation des Riches et des Pauvres à Ouagadougou", Economie Rurale, Mars 1989

- Reardon, Thomas, P. Matlon and C. Delgado. "Coping with Household-level Food Insecurity in Drought-affected Areas of Burkina Faso", World Development, 16 (9), Sept. 1988
- Reardon, Thomas, T. Thiombiano and C. Delgado. La Substitution des Céréales Locales par les Céréales Importées: La Consommation Alimentaire des Ménages à Ouagadougou, Burkina Faso. Université de Ouagadougou, Centre d'Etude, de Documentation, de Recherches Economique et Sociale: Série de Résultats de Recherche No. 002, Juin 1988
- République de Cote d'Ivoire, Ministère de l'Agriculture, Direction des Statistiques Rurales et des Enquêtes Agricoles. "Enquêtes Marchés", various trimesters and years (mimeo)
- République Française, Ministère des Relations Extérieures, Service des Etudes et des Questions Internationales. "Facteurs d'Inflation en Cote d'Ivoire et en Haute-Volta", Rapport No. 56, August, 1983
- Savadogo, K. "An Analysis of the Economic and Socio-demographic Determinants of Household Food Consumption in Ouagadougou, Burkina Faso". Unpublished Ph.D. thesis, Purdue University, May 1986
- Von Braun, Joachim and K. Johm. "Tradeoffs in the Rapid Expansion of Smallholder Rice Production in Gambia," paper presented at the IFPRI/ISRA Conference on the Dynamics of Cereals Consumption and Production Patterns in West Africa, Dakar, Senegal, July 15-17, 1987.
- World Bank (The). Commodity Trade and Price Trends, 1985 Edition. (The World Bank: Washington, D.C., 1985)
- _____. Commodity Trade and Price Trends, 1988 Edition. (The World Bank: Washington, D.C., 1988)
- _____. World Tables. (The World Bank: Washington, D.C., 1984)
- _____. Ivory Coast: A Basic Economic Report, 'Annex 1: The Agricultural Sector.' (The World Bank: Washington, D.C., 1977)

STATISTICAL APPENDIX

Table A1: Description of variables used in regressions

Variable No.	Short Label	Item
1	PRDRICE%	Production of rice as share of production of all cereals in %
2	CONSRICE%	Consumption of rice as share of consumption of all cereals in %
3	CONSWHT%	Consumption of wheat as share of consumption of all cereals in %
4	PRC/ML	Domestic price of rice divided by price of principal staple (millet), except for Burkina Faso (sorghum) and Côte d'Ivoire (cassava)
5	PWH/ML	Domestic price of bread divided by price of principal staple
6	RICEFA/C	Rice food aid in kg. per capita
7	WHTFA/C	Wheat food aid in kg. per capita
8	RLGDP/C	Real GDP per capita, 1970 CFAF
9	URBPOP%	Share of total population in towns
10	WLDPR/S	World price of rice divided by world price of sorghum
11	WLDPR/W	World price of wheat divided by world price of sorghum
12	CIMPRT/C	Cereals imports in kg. per capita
13	MXRT	Nominal \$ exchange rate
14	RXRT	Real effective exchange rate
15	MAVGAHRC%	Three year moving average of share of rice in total cereals area harvested
16	YIELDIND	Index of annual yield of all cereals relative to mean over 1970-1983 period (mean = 100)

Table A2: Econometric Model of Relative Consumption Patterns and Price Trends

All variables (X's), except intercepts, refer to the natural logarithms of the variables listed in Table A1: i.e., $X_1 = \ln(\text{PRDRICE}\%)$.

The five equations below are a simultaneous system, estimated separately for each country. Endogenous variables are indicated by an (*).

Equation 1: Share of Rice in Cereals Production

$$X^*_1 = a_{10} = a_{11} X^*_4 + a_{12} X_{15} + a_{13} X_{16}$$

Equation 2: Share of Rice in Cereals Consumption

$$X^*_2 = a_{20} + a_{21} X^*_4 + a_{22} X_8 + a_{23} X_9$$

Equation 3: Share of Wheat in Cereals Consumption

$$X^*_3 = a_{30} + a_{31} X^*_5 + a_{32} X_8 + a_{33} X_9$$

Equation 4: Domestic Price Formation for Rice Relative to Principal Starchy Staple

$$X^*_4 = a_{40} + a_{41} X^*_1 + a_{42} X^*_2 + a_{43} X_6 + a_{44} X_{10} + a_{45} X_{12} + a_{46} X_{14} + a_{47} X_{16}$$

Equation 5: Domestic Price Formation for Wheat Relative to Principal Starchy Staple

$$X^*_5 = a_{50} + a_{51} X^*_3 + a_{52} X_7 + a_{53} X_{11} + a_{54} X_{12} + a_{55} X_{16}$$

Table A.3: Sources of data used in the regressions

(Variable labels and numbers as in Table A.1)

Label	No.	Source
PRDRICE%	1	1966-1983: Food and Agricultural Organization of the United Nations (FAO), FAO Food Supply Utilization Accounts Tape (Rome: FAO, 1986).
CONSRICE%	2	
CONSWHT%	3	
MAVGAHRC%	15	1984-1986: FAO, <u>Production Yearbook</u> and FAO, <u>Trade Yearbook</u> (various issues). Production of husked rice equals 0.66 times that of paddy rice. Consumption is estimated as 85% of prod. plus 100% of imports for rice or 85% of imports for all other cereals.
YIELDIND	16	
PRC/ML	4	<p><u>RICE</u>. BF: 66-67 Republique Francaise (1983); 68-81 Haggblade (1984); 82-83 Savadogo (1986); 84-86 Ministere de la Cooperation/Club du Sahel(OECD) (1988). Cote D'Ivoire: 66-69 World Bank (1977); 70-81 Republique Francaise (1983); 82-83 Republique de Cote D'Ivoire (various); 84-86 Ministere de la Cooperation/ Club du Sahel(OECD) (1988). Mali: 66-69 CRED (1977); 70-85 Humphreys (1986); 86 Gagnon (1986). Niger: Same as for millet, except 66,67,&69 are interpolations. Senegal: 66-69 Dieye (1987); 70-81 FAO (1985); 82-84 Martin (1986); 85-86 ISRA (unpublished, courtesy Dusseyinou Ndoye).</p> <p><u>MILLET</u>. BF: 66-81 Haggblade (1984); 82-83 Savadogo (1986); 84 CRED (1986); 85 IFPRI (unpublished); 86 Ministere de la Cooperation/Club du Sahel(OECD) (1988). Cote D'Ivoire: Same as for rice. Mali: Same as for rice. Niger: 66-69 CRED (1977); 70-83 Berg and Alexander (1986); 84-86 Ministere de la Cooperation/Club du Sahel(OECD) (1988). Senegal: Same as for rice.</p>
PWH/ML	5	<p><u>BREAD</u>. BF: 66-69,86: International Labour Office (ILO), <u>Bulletin of Labour Statistics</u>, (Geneva: ILO, various issues); 70-81 Republique Francaise (1983); 82-83 Haggblade (1984); 84-85 IFPRI (unpublished). Cote D'Ivoire: 66-69,84-86 ILO (various issues); 70-83 Republique Francaise (1983). Mali: ILO (various issues). Niger: 66-69,80-86 ILO (various issues); 70-79 personal communication from Derek Byerlee, CIMMYT. Senegal: 66-69,85-86 ILO (various issues); 70-84 Gabas (1986).</p>
WLDPR/S	10	World prices for rice, wheat, and sorghum from
WLDPR/W	11	World Bank, <u>Commodity Trade and Price Trends</u> ,

1987-88 Edition, (Washington, D.C.: World Bank, 1988).

- RICEFA/C 6
WHTFA/C 7
- FAD, Food Aid in Figures, (Rome: FAO, 1985) for disaggregated figures by commodity 1972-1986. The 1970, 1971 figures were interpolated from aggregate national figures for those years, based on the 1972-74 commodity shares for the country in question. The 1970 and 1971 national totals are from S. Jost, "Food Aid in the Sahel", Paper presented at the Conference on Cereals Policies in the Sahel Countries, Mindelo, Cape Verde, 1-6 Dec. 1986. The disaggregated figures for 1966-1969 are from "Food Aid Tape," (IFPRI, 1981).
- RLGDP/C 8
- GDP and price indices used to deflate it are from International Monetary Fund (IMF), International Financial Statistics 1986 Yearbook, (Washington, D.C.: IMF, 1987) with gaps filled in from World Bank, World Tables 1984, (Washington, D.C.: World Bank, 1984) and ILO, Year Book of Labour Statistics, (Geneva: ILO, 1970, 1977). Population figures are from United Nations Statistical Yearbook (1984 tape) and FAO, Production Yearbook (various issues).
- URBPOP% 9
- The urban population each year is estimated as a trend by interpolating from the shares of population that were urban in 1973 and 1984, as reported for each country in: World Bank, World Development Report 1986, (Washington, D.C.: World Bank, 1986). The average growth rates of urbanization from 1960 to 1970 and from 1980 to 1985 were used to extrapolate the urban shares from 1970 back to 1966 and from 1983 up to 1986, respectively. The use of this variable on the right hand side of a regression detrends the RHS variables. Total population is as in variable 8 above.
- NMXRT 13
- Country exchange rates were found in IMF, International Financial Statistics 1988 Yearbook.
- RXRT 14
- The industrial market economies' indices of U.S. dollar unit values of manufactured exports to developing countries is found in World Bank, Commodity Trade and Price Trends, 1987-88 Edition, (Washington, D.C.: World Bank, 1988). Country exchange rates and CPI as above.

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Table A.4: Summary of data for Burkina Faso regressions 1966-1986.

Variable number	Short label	Units	Average 1966/70	Average 1974/78	Average 1982/86	Percent change 1966/70-1982/86
1	PRDRICE%	%	2.8	2.8	0.9	-68.5
2	CONSRICE%	%	3.0	3.3	5.5	82.5
3	CONSWHT%	%	1.6	1.5	2.0	20.2
4	PRC/ML	ratio	2.8	1.9	2.0	-29.6
5	PWH/ML	ratio	2.7	1.8	4.0	46.7
6	RICEFA/C	kg/cap	0.0	0.2	1.4	
7	WHTFA/C	kg/cap	0.4	0.8	0.6	57.5
8	RLGDP/C	1970 CFA /cap	16268.4	22478.2	19755.3	21.4
9	URBPOP%	%	7.0	9.3	11.4	63.0
10	WLDPR/S	ratio	3.6	3.4	2.3	-35.5
11	WLDPR/W	ratio	1.2	1.3	1.9	62.3
12	CIMPRT/C	kg/cap	3.6	10.9	17.3	377.0
13	NMXRT	CFA/\$	255.2	233.2	388.4	52.2
14	RXRT	1970 CFA /US\$	250.9	347.9	362.1	44.3
15	MAVGAHRC%	%	2.0	1.8	1.2	-37.9
16	YIELDIND	base 100	95.1	98.2	114.8	20.7

Note: See Table A.1 for variable description.

Table A.5: Summary of data for Cote D'Ivoire regressions 1966-1986.

Variable number	Short label	Units	Average 1966/70	Average 1974/78	Average 1982/86	Percent change 1966/70-1982/86
1	PRDRICE%	%	48.2	53.5	34.4	-28.7
2	CONSRICE%	%	44.1	47.7	49.3	11.9
3	CONSWHT%	%	11.3	14.6	13.9	22.5
4	PRC/ML	ratio	1.7	1.2	0.8	-51.6
5	PWH/ML	ratio	1.6	1.7	1.6	0.2
6	RICEFA/C	kg/cap	40.0	0.0	0.0	-100.0
7	WHTFA/C	kg/cap	0.2	0.5	0.0	-100.0
8	RLGDP/C	1970 CFA /cap	84833.4	95223.9	76506.1	-9.8
9	URBPOP%	%	30.3	34.6	47.9	57.8
10	WLDPR/S	ratio	3.6	3.4	2.3	-35.5
11	WLDPR/W	ratio	1.2	1.3	1.9	62.3
12	CIMPRT/C	kg/cap	30.1	24.9	57.4	90.7
13	NMXRT	CFA/\$	255.2	233.2	388.4	52.2
14	RXRT	1970 CFA /US\$	267.2	262.4	279.5	4.6
15	MAVGAHRC%	%	41.3	38.6	37.0	-10.6
16	YIELDIND	base 100	97.2	88.9	116.2	19.6

Note: See Table A.1 for variable description.

Table A.6: Summary of data for Mali regressions 1966-1986.

Variable number	Short label	Units	Average 1966/70	Average 1974/78	Average 1982/86	Percent change 1966/70-1982/86
1	PRDRICE%	%	12.1	15.9	8.0	-34.0
2	CONSRICE%	%	11.2	14.3	10.4	64.0
3	CONSWHT%	%	1.1	2.9	3.8	235.5
4	FRC/ML	ratio	2.0	1.9	1.6	-16.7
5	PWH/ML	ratio	3.2	3.2	1.7	-46.6
6	RICEFA/C	kg/cap	0.0	0.2	4.5	
7	WHTFA/C	kg/cap	0.2	2.4	1.7	667.8
8	RLGDP/C	1970 CFA /cap	18257.1	18900.3	18643.4	2.1
9	URBPOP%	%	13.1	14.5	17.0	29.7
10	WLDPR/S	ratio	3.6	3.4	2.3	-35.5
11	WLDPR/W	ratio	1.2	1.3	1.9	62.3
12	CIMPRT/C	kg/cap	3.9	14.1	29.0	650.7
13	NMXRT	CFA/\$	255.2	233.2	388.4	52.2
14	RXRT	1970 CFA /US\$	279.1	270.3	343.9	23.2
15	MAVGAHRC%	%	12.8	11.9	9.4	-26.8
16	YIELDIND	base 100	110.5	101.3	97.6	-11.7

Note: See Table A.1 for variable description.

Table A.7: Summary of data for Niger regressions 1966-1986.

Variable number	Short label	Units	Average 1966/70	Average 1974/78	Average 1982/86	Percent change 1966/70-1982/86
1	PRDRICE%	%	2.3	1.9	2.2	-0.4
2	CONSRICE%	%	2.7	3.5	4.1	48.8
3	CONSWHT%	%	0.7	1.3	3.2	367.2
4	PRC/ML	ratio	2.7	2.1	1.7	-35.5
5	PWH/ML	ratio	4.6	2.3	2.2	-52.1
6	RIDEFA/C	kg/cap	0.0	0.7	1.1	
7	WHTFA/C	kg/cap	20.0	3.1	2.4	-88.1
8	RLGDP/C	1970 CFA /cap	27474.8	26560.4	28225.7	2.7
9	URBPOP%	%	7.3	10.2	14.1	92.6
10	WLDPR/S	ratio	3.6	3.4	2.3	-35.5
11	WLDPR/W	ratio	1.2	1.3	1.9	62.3
12	CIMPRT/C	kg/cap	-10.1	8.5	16.0	-258.9
13	NMXRT	CFA/\$	255.2	233.2	388.4	52.2
14	RXRT	1970 CFA /US\$	250.7	249.2	276.4	10.3
15	MAVGAHRC%	%	0.5	0.7	0.5	-1.4
16	YIELDIND	base 100	112.1	97.5	91.5	-18.4

Note: See Table A.1 for variable description.

Table A.B: Summary of data for Senegal regressions 1966-1986.

Variable number	Short label	Units	Average 1966/70	Average 1974/78	Average 1982/86	Percent change 1966/70-1982/86
1	PRDRICE%	%	13.8	11.3	11.4	-17.8
2	CONSRICE%	%	37.8	34.5	35.7	-5.5
3	CONSWHT%	%	7.9	10.3	10.2	28.5
4	PRC/ML	ratio	1.2	1.8	1.2	-3.1
5	PWH/ML	ratio	1.2	2.6	2.5	113.5
6	RICEFA/C	kg/cap	0.0	0.5	5.0	
7	WHTFA/C	kg/cap	8.5	3.6	5.0	-41.0
8	RLGDP/C	1970 CFA /cap	60230.8	42962.8	39905.9	-33.7
9	URBPOP%	%	30.1	31.5	33.3	10.6
10	WLDPR/S	ratio	3.6	3.4	2.5	-35.5
11	WLDPR/W	ratio	1.2	1.3	1.9	62.3
12	CIMFRT/C	kg/cap	61.4	73.1	80.7	31.5
13	NMXRT	CFA/\$	255.2	233.2	388.4	52.2
14	RXRT	1970 CFA /US\$	247.4	225.6	270.2	9.2
15	MAVGAHRC%	%	7.4	7.1	5.4	-27.0
16	YIELDIND	base 100	88.7	111.3	108.9	22.8

Note: See Table A.1 for variable description.

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