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The Impact of Export Crop Production on Nutritional Status in Côte d'Ivoire

David E. Sahn

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THE IMPACT OF EXPORT CROP PRODUCTION ON NUTRITIONAL STATUS IN CÔTE D'IVOIRE

David E. Sahn*

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FOREWORD

A mainstay of structural adjustment programs is shifting incentives to favor exportables through a combination of policies such as devaluation and trade liberalization. It has been argued, however, that these policies have deleterious nutritional consequences: a decline in food production and availability at both market and household levels; a shift in income distribution favoring larger, more prosperous farmers rather than small-scale farmers; and a change in income control to men who will be less concerned with child nutrition. To the extent that these points can be verified, they detract from the positive features of growth-oriented adjustment schemes.

In order to gain insight into these issues, this paper examines the impact of households shifting from food to export crop production in Côte d'Ivoire. The case study provides compelling evidence that incomes would be increased among the poor if export crop prices increased and that allocating land to export crops rather than to food crops will not result in harmful nutritional effects. While the results are of considerable importance in the context of Côte d'Ivoire, they also contribute to a larger CFNPP research program to determine the impacts of adjustment on the poor. This effort, being funded by a Cooperative Agreement with the US Agency for International Development (AID) has a number of components, of which studies such as this on the characteristics and behavior of the poor, and how they will be affected by policy reform measures, are a significant part. Additional financing for the study on Côte d'Ivoire was provided by the World Bank Social Dimensions of Adjustment Unit.

Ithaca, New York
December 1990

David E. Sahn
Deputy Director, CFNPP

EXECUTIVE SUMMARY

In exploring the implications of the commercialization of agriculture on nutrition in Côte d'Ivoire, this paper found that sales of export crops, combined with the domestic marketing of food crops, represent the most import sources of incomes for rural households, rich and poor alike. Increasing the price of the heavily taxed export crops, cocoa and coffee, will raise rural incomes throughout the income distribution. Increasing the profitability and productivity of cotton will not only raise rural incomes but will also have positive distributional consequences. A reduced-form nutrition model was estimated in order to examine the impact of income, as well as the allocation of land to the production of the major export crops rather than to food crops, on nutritional status. Results indicate that higher incomes improve long-term nutritional status, and that the share of land allocated to export crops does not affect the nutritional status of preschool-aged children, even when controlling for income. In combination, these facts suggest that raising incomes through exploiting comparative advantage in export crops, such as coffee, cocoa, and cotton, will have positive nutritional outcomes in Côte d'Ivoire.

1. INTRODUCTION

This paper explores the impact of the commercialization of agriculture on the nutritional status of preschool-aged children in the West African country of Côte d'Ivoire. The major purpose of the research is to test the hypothesis that shifting from the production of food for the household's own consumption to the production of agricultural products to be sold commercially for cash, and in particular export crops, represents a nutritional risk factor.

It is important to clarify at the outset that commercialized agriculture, or cash cropping, in Côte d'Ivoire is not limited to the production and sale of export crops, such as cocoa, coffee, and cotton. Rather, when cash crops are defined in a broader sense, they encompass the entire marketed surplus, including the production of other tradable food crops, and even import substitutes, that are sold in domestic or international markets. To avoid confusion, all further references to "cash crops" and "commercialized agriculture" will apply to the entirety of the marketed surplus, including food crops; and the term "export crops" will be employed when referring to the commodities being produced primarily to earn foreign exchange, particularly coffee, cocoa, and cotton, whose production is virtually all sold in international markets.

Given that the commercialization of agriculture in general, and export-oriented agriculture in particular, have been argued to be key elements of economic growth, the recent discussion of the potential negative impact of cash cropping (Pinstrup-Andersen 1985, von Braun and Kennedy 1986) presents a potential dilemma to policy makers. The hypothesis that the shift to cash cropping causes malnutrition revolves around two sets of propositions. The first is that income is an important determinant of nutritional status as mediated through increased food consumption and health status; and, that the incomes of poor households will not increase (and may even fall) as a consequence of increased commercialization of agriculture. This concern over the benefits of increased commercialization not accruing to the poor arises because of the experiences in Africa and Asia in which the marketed surplus is primarily generated by the large landholders. Surveys from many countries indicate that wealthier farm households are generally more extensively engaged in commercialized agriculture, with a large share of poor farmers producing primarily for their own consumption and being net purchasers of food (see, for example, Sahn 1988, Weber et al. 1988, Pinstrup-Andersen 1989). Given that smaller farmers, and where they exist, the landless, are generally net purchasers of food crops and are often presumed not to be engaged as export producers, it follows that they will not share directly in the

benefits of commercialized agriculture, and are at risk of being hurt in the short run if policies induce increases in the price of food crops. In particular, policy that directly raises producer prices of commercially produced food crops, or indirectly contributes to higher food prices through shifting incentives toward export crops, will likely cause a decline in real incomes of net purchasers of food in the short term.

The second proposition, which is the focus of this paper, is the suggestion that even if cash cropping raises household incomes, the nutritional status of children will decline because of the change in the source of income. In other words, the hypothesis is that the income derived from cash cropping in general, and export cropping in particular, confers fewer nutritional benefits on children than does the imputed value of the earned income represented by consumption of own production. This latter point follows from the related contention that households perceive and spend income differently when it takes different forms, as well as when it is earned by different household members. Specifically, it is often argued that there is a higher marginal propensity to consume food from income in the form of home-produced food than income earned from the sale of cash crops (Massel 1969, Kumar 1977, Alderman 1989). In addition, it has been suggested that cash cropping, especially the production of export crops, often involves a shift in income control from women, who are traditionally responsible for subsistence agricultural production, to men, who often have direct control over income generated from cash cropping (von Braun, de Haen, and Blanken 1988, von Braun, Puetz, and Webb 1989, Kennedy and Cogill 1987). As a consequence of the different structure of preferences according to gender, a shift of income control to men is asserted to imply a lower marginal propensity to consume nutrients and vital health services for preschool-aged children (Tinker 1979, Guyer 1980, von Braun and Kennedy 1986, Thomas 1989).

In order to explore the nutritional implications of promoting the development of export-oriented agriculture, we begin with a discussion of the macroeconomic importance of export crops in Côte d'Ivoire in Section 2. This is followed by a brief description of the household data, in Section 3, that is used to examine the characteristics of rural producers and the role of cash crops in generating household incomes in Section 4. It will be shown that commercialized agriculture in general and export crop production in particular is not only essential to the health of the macroeconomy but also to the microeconomy of low-income households in Côte d'Ivoire as well. Section 5 then answers the important question of the nutritional implications of households earning their livelihood from export crop production, rather than from a more subsistence-oriented mode in which a larger share of their land, imputed income, and perforce consumption, is derived from production of foodstuffs for the household's own consumption.

2. THE ROLE OF CASH AND EXPORT CROPS IN CÔTE D'IVOIRE

Côte d'Ivoire can be divided into two broad agroecological zones, the forest and savannah regions. While the land area of the former is approximately 25 percent less than the latter, the land under cultivation in the forest region is approximately 3.9 million hectares, as compared to only 0.9 million hectares in the savannah. Moreover, there are approximately 500,000 families in the forest region, with only 300,000 families living in the savannah.

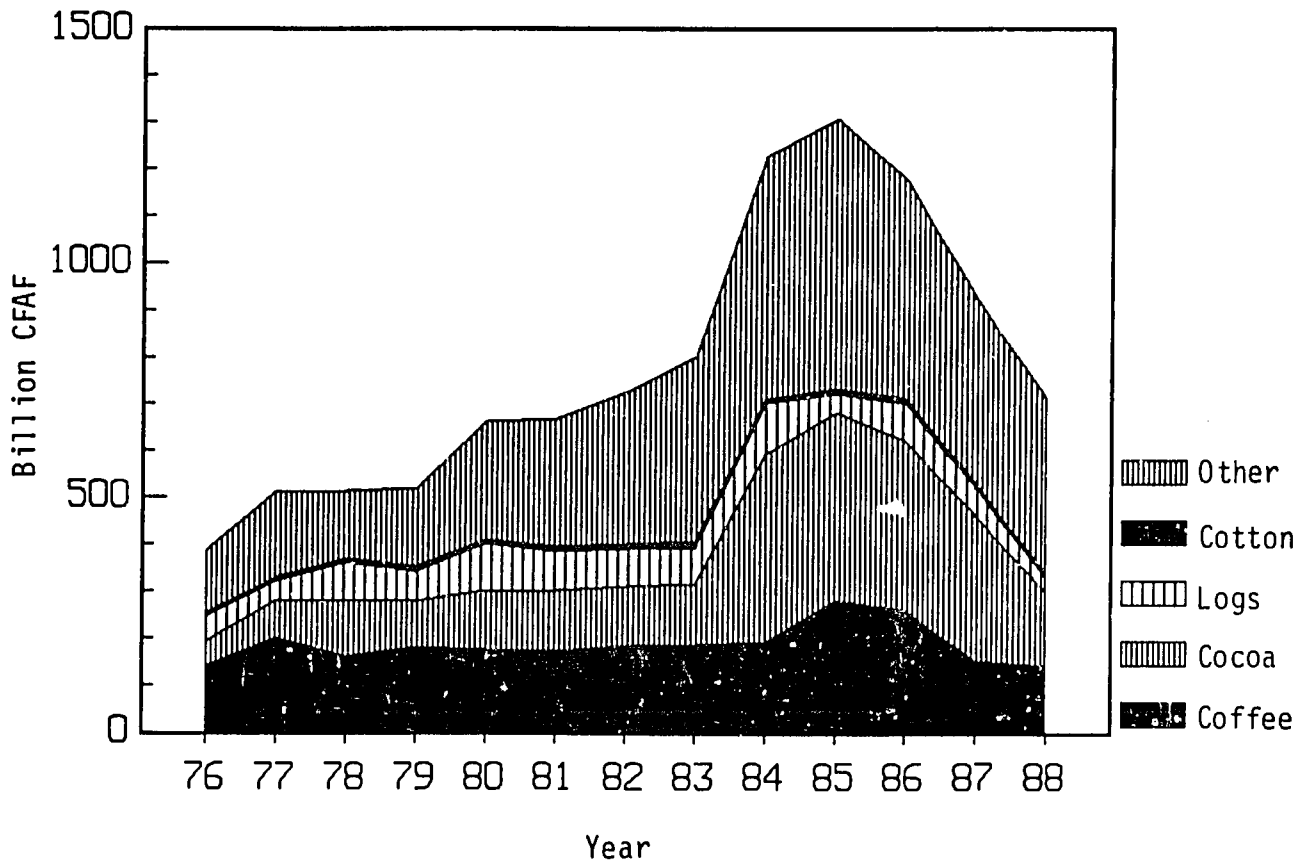
The predominant crops produced in the forest region, with its better rainfalls and resource base, are cocoa and coffee. In the east forest, cocoa is the relatively more important crop, while in the west forest it is coffee. Dominating the economy of the east and west forest regions, these two export crops account for around two-thirds of the land use. The food crops—plantains, cocoyams, rice, maize, yams, and cassava—collectively account for around 25 percent of the land under cultivation in the region (World Bank 1985).

In contrast, the savannah region's low and unreliable rainfall largely precludes growing coffee and cocoa. Maize is the dominant crop, followed by yams. The third most important crop produced in the region is an export crop, cotton, which was introduced during the 1960s. It has shown sustained growth during the past 20 years.

The significance of coffee and cocoa, and to a lesser extent cotton, extends beyond their areas of cultivation. Not only do coffee and cocoa cover 60 percent of Côte d'Ivoire's cropped areas, and engage around 40 percent of Ivorian households as farmers, but these export crops are also a major source of foreign exchange earnings. This point is well illustrated by Figure 1, showing that coffee and cocoa alone averaged 50 percent of the value of export earnings between 1976 and 1988.

During this period, noticeable fluctuations occurred. For example, the soaring coffee and cocoa prices of 1976-77 gave way to a marked deterioration in the terms of trade between 1977 and 1981 (see Table 1). Export shares to coffee and cocoa fell from 56 to 46 percent. Similarly, the drop in world cocoa and coffee prices in 1987 and 1988 resulted in a precipitous decline in their export shares to only 40 percent. In fact, the value of total exports plummeted between 1985 and 1988 due to lower world prices and reduced demand for cocoa and coffee. This contributed to a current account deficit equal to 13.2 percent of GDP in 1988, in contrast to the surplus of 0.7 percent recorded in 1985.

Figure 1 - Total Value of Exports by Major Commodities (billion CFAF)[a]



Sources: International Monetary Fund (various years). Cotton prices 1976-86 from Food and Agriculture Organization of the United Nations (various years).

[a] US$ value converted to CFAF at the official exchange rate.

Table 1 - Stabilization Fund Surplus and World and Domestic Export Crop Prices

	Nominal Exchange Rate	Stabilization Fund Surplus	Cocoa Producer Price	Coffee Producer Price	Cotton Producer Price	World Cocoa[a]	World Coffee[a]	World Cotton[a]
	(CFAF/US$)	(CFAF billions)	(CFAF/kg)	(CFAF/kg)	(CFAF/kg)	(CFAF/kg)	(CFAF/kg)	(CFAF/kg)
1974	240.50	14.3	110.00	120.00	45.00	374.43	348.97	354.26
1975	214.32	19.6	175.00	150.00	70.00	266.44	307.98	283.97
1976	238.98	52.1	175.00	150.00	70.00	491.34	752.79	403.88
1977	245.67	243.8	180.00	180.00	80.00	931.09	1,270.11	380.79
1978	225.64	173.3	250.00	250.00	80.00	767.85	810.05	354.25
1979	212.72	162.5	250.00	250.00	80.00	700.49	812.59	359.50
1980	211.30	89.0	300.00	300.00	80.00	550.23	726.87	433.17
1981	271.73	35.0	300.00	300.00	80.00	564.93	766.28	502.70
1982	328.62	69.6	300.00	300.00	80.00	570.48	1,015.44	525.79
1983	381.06	99.7	300.00	300.00	80.00	807.85	1,105.84	706.49
1984	436.96	194.9	350.00	350.00	100.00	1,046.96	1,389.53	779.97
1985	449.26	264.1	375.00	380.00	115.00	1,012.63	1,441.68	592.12
1986	346.30	-135.1	400.00	400.00	115.00	716.84	1,486.67	365.69
1987	300.54	-58.2	400.00	400.00	115.00	599.28	752.85	495.29
1988	297.85	-103.5	400.00	400.00	114.00	472.09	903.68	416.69

Sources: Exchange rate data from International Monetary Fund (June 1983), as presented in World Bank (1987, p. 184); producer prices from World Bank (1986), Annex 4.4. 1987 data from Ministry of Agriculture; cocoa, coffee, and cotton data from World Bank (various years), *Commodity Price Data*; some figures from World Bank (1986); coffee 1974-75 figures from FAO (1979), Vol. 3.

[a] Cocoa = daily price, average, New York and London, nearest three future trading months; coffee = other mild Arabicas, ex-dock, N.Y. for prompt shipment (variety listed for Côte d'Ivoire in World Bank 1986); cotton = "Cotton Outlook" "A" Index, Middling (1-3/32") c.i.f. Europe.

While the world prices of cocoa and coffee have been paramount in determining the performance of Côte d'Ivoire's external sector, these commodities have also played a key role in generating government revenues. This objective has historically been achieved through heavily taxing producers, with the surplus accruing to the *Caisse de Stabilisation et de Soutier de Prix des Produits Agricoles* (CSSPPA), the parastatal that regulates the marketing of major export crops.

To amplify, the CSSPPA issues licenses to exporters and obligates them to sell at approved f.o.b. prices determined on the basis of a producer price plus the costs of internal transport and handling. The difference between this guaranteed price and the actual price on the international market is retained by the fund or, alternatively, paid out to exporters if the latter is lower. Historically, the fund has earned a sizable surplus, although its magnitude has varied considerably over the years (see Table 1). The CSSPPA earnings were particularly high in the boom years 1977-1979, when the unusually high world coffee and cocoa prices far exceeded domestic producer prices (see Table 1), even accounting for the costs of transport and marketing that would have to be subtracted from the former to derive a price that would be offered to the farmer in the absence of export taxes and the surpluses earned by CSSPPA.

While the difference between the world market price and the domestic producer price for cocoa and coffee decreased in the early 1980s, once again reflecting the considerable fluctuations in world prices, nonetheless, the level of direct and indirect taxation of the cocoa and coffee producer remained quite significant until 1987. This fact is well illustrated by Table 2, which shows that in 1985 farmers got only 40 percent of the price they would have been offered for their coffee in the absence of export taxes, while for cocoa they received only 56 percent. Other crops, including cotton, whose producer price relative to world price had converged temporarily in 1985, had nominal protection coefficients close to one.

The effective protection coefficient found in Table 2 goes one step further in accounting for the implicit taxation in the form of the pricing of inputs, processing, and marketing. Accounting for such implicit effects shows that taxation on all export crops rises considerably. This situation becomes even more acute when taking into account the overvalued exchange rate, which is another form of implicit taxation. The net effective protection coefficient, which accounts for direct and indirect taxation, as well as the overvalued exchange rate, was as low as 0.15 for coffee, although it remained above 1.0 for rice. Clearly, there was considerable scope in 1985 and the preceding years for raising production incentives for export crops in particular, at least based on border pricing criteria.

Reducing the rates of taxation on export crops, however, would have been at the cost of declining revenues for the Treasury. Reaching any

Table 2 - Levels of Crop Taxation/Protection (1985)

	Nominal Protection Coefficient (NPC)	Effective Protection Coefficient (EPC)	Net Effective Protection Coefficient (NEPC)	Domestic Resource Cost (DRC)
Cash Crops				
Cocoa	0.56	0.48	0.29	0.17
Coffee	0.39	0.34	0.15	0.23
Oil palm (smallholder ffb)	0.78	0.64	0.45	0.36
Cotton: Manual	0.99	0.70	0.51	0.63
Cotton: Oxen	0.99	0.64	0.45	0.58
Cotton: Tractor	0.99	0.58	0.39	0.58
Food Crops				
Rice: Savannah rainfed[a]	1.12	1.29	1.10	1.02[b]
Rice: Irrigated manual	1.12	1.46	1.27	0.99
Rice: Irrigated power tiller	1.12	1.50	1.50	0.83
Maize: Manual savannah[a]	0.61	0.54	0.35	1.15
Groundnuts: Manual savannah	0.98	0.66	0.47	0.85
Groundnuts: Oxen savannah	0.99	0.54	0.35	0.55

Source: World Bank (1987).

[a] Results for other production techniques or regions are very similar.

[b] The mean DRC for manual improved, oxen improved and tractor improved production techniques.

firm conclusion on the merits of reducing indirect taxation of export crops in lieu of more direct forms of taxation, and the related arguments as to whether there are efficiency losses and/or welfare gains from government expenditures, instead of private expenditures, is beyond the scope of this paper. However, the argument in favor of addressing the distortions in price policy by reducing the level of taxation on export crops was reinforced by the available estimates of comparative advantage, employing domestic resource cost (DRC) calculations. They show that export crops—in particular cocoa, coffee, oil palm, and coconut in the forest regions, and cotton in the savannah—were clearly more attractive than food crops (Table 2). These DRCs, therefore, imply higher returns and higher incomes from production of major export crops than rice and maize (Table 2).

Since 1986, the declining world price for cocoa and, to a lesser extent, coffee has temporarily preempted further discussion of reducing the level of direct taxation of export crops[1] (although indirect taxation, as mediated by the overvalued exchange rate, remains an important policy issue). Nonetheless, one question relevant to price policy under the conditions that prevailed prior to 1987, when the major export crops with their higher comparative advantage were being much more heavily taxed than other agricultural products, is whether such a policy was justified on nutritional and food security grounds. In order to answer that question, following a description of the data, the characteristics of households that are engaged in export cropping are explored in order to gain insight into the direct impact on incomes of raising export crop prices. This is then followed by an analysis of the nutritional impact of higher incomes in general, and more specifically, the nutritional consequences of households earning their income from producing export crops, instead of domestically consumed food crops.

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[1] In fact, in 1987 and 1988 the export crop price stabilization fund ran a large deficit on the cocoa account, and in 1988 on the coffee account as well.

3. DATA

The household-level data used in this research are from the Côte d'Ivoire Living Standards Survey (CILSS). The survey was conducted by the Côte d'Ivoire Direction de la Statistique with support from the World Bank Living Standards Measurement Study. The data are described in detail elsewhere by Grootaert (1986) and Ainsworth and Muñoz (1986). The survey was comprised of a number of sections, including those on household demographics, education, assets, income, expenditure, anthropometry, and agricultural production and marketing. The descriptive data on agricultural production and marketing practices presented in Section 4 of this paper are only from the first round of the survey, conducted between February 1985 and February 1986. The agricultural and marketing data from the second round conducted in the following years were not available for analysis. Section 5, however, which involves estimating reduced-form nutritional status functions, employs data from rounds one and two because it relies on sections of the survey, other than agricultural production and marketing, which were available for analysis. The data from the two rounds were pooled and analyzed as a cross section.[2]

The use of data from two rounds in Section 5 has the distinct advantage of raising the degrees of freedom for the econometric models. This outweighs the drawback that the household sample in Section 4 was not identical to the household sample in Section 5. This potential sampling problem is of limited consequence, especially because the unit of analysis is the household in Section 4, and the preschool-aged child in Section 5.

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[2] The households included in the first round of the survey were selected on the basis of a national probability sample that was designed to be representative of the general population. In the second round of the survey, approximately one-half of the households were drawn randomly from the set of households that were sampled during the first round; the remainder were drawn randomly from the larger national probability sample.

4. CHARACTERISTICS OF FARM HOUSEHOLDS

In Côte d'Ivoire, rural farm households are more heavily concentrated in the lower end of the national income distribution (Sahn 1988).[3] For example, rural farm households comprise nearly 60 percent of the sampled households but only around 25 percent of the upper quintile, and nearly 90 percent of the lowest quintile of the expenditure distribution. Virtually all rural households, regardless of their position in the income distribution, report income derived from their own agricultural production in Côte d'Ivoire. Across all regions, 73 percent of the incomes of rural households are earned in the form of agriculture production. Of that, 35 percent represents the imputed value of commodities for home consumption, with 38 percent being earnings from market transactions (see Table 3). The remainder of the household income is from pensions, transfers, imputed rents, business profits, and other nonlabor sources.

It is also noteworthy that the ratio of income from agricultural sales to the imputed income value of home consumption, is lower in the savannah than in either the east or west forest regions. Furthermore, in both the forest regions, the value of income for cash-cropping activities exceeds the imputed value of home consumption in all the quintiles of the expenditure distribution. The opposite pattern holds for all groups in the savannah.

The data on the share of marketings in total income, which represents a measure of the level of commercialization of farm households, need to be further broken down in terms of the composition and level of production of individual crops and by the relative contribution of those crops to farm earnings.

Cocoa and coffee play a predominant role in the commercial sales of farmers in Côte d'Ivoire (Table 4). Together, these export crops represent more than 50 percent of the value share of agricultural sales, and consequently of earned agricultural incomes.

Examining the share of each crop in total sales indicates that there are some significant regional differences in the relative importance of certain crops. For example, in the east forest, cocoa contributes roughly twice as much to the total value of marketed output as coffee, and in the

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[3] The income distribution is based on the distribution of consumption expenditures, including the imputed value of home consumption. Consumption expenditures are assumed to be a good proxy measure of permanent income.

Table 3 - Percentage of Income from Agricultural Sales and the Imputed Value of Consumption of Own Production[a]

Per Capita Expenditure Quintile	West Forest		East Forest		Savannah		All	
	Agricultural Sales	Own Consumption	Agricultural Sales	Own Consumption	Agricultural Sales	Own Consumption	Agricultural Sales	Own Consumption
1	44	29	43	41	35	37	40	37
2	38	35	41	32	24	48	36	37
3	43	33	41	30	28	41	37	34
4	40	25	42	25	25	37	36	29
5	45	14	34	30	22	38	36	26
All	42	31	42	34	30	41	38	35

Source: Calculated from the CILSS data tapes.

[a] Per capita expenditure quintiles in this and Tables 4 and 6 were determined by ranking all households living in the forest regions and the savannah, as well as urban areas, according to their per capita expenditures, deflated by a price index based on food prices (Sahn 1988). Therefore, approximately 20 percent of all households nationally fall in each quintile.

Table 4 - Mean Value Share of Marketed Crops, by Region and Expenditure Group, 1985

Commodity	West Forest	East Forest	Savannah	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
				(percent)				
Cocoa	23.6	38.1	1.6	22.2	25.8	27.2	30.7	24.5
Coffee	49.2	22.7	9.6	25.0	26.9	26.3	29.4	26.1
Oil palm	0.8	2.3	0.3	1.7	1.2	2.0	3.1	1.6
Banana	2.1	2.5	1.7	1.9	1.9	2.8	3.0	2.3
Fruit trees	0.5	1.1	3.2	0.7	1.8	1.6	1.4	1.6
Cola nut	6.5	1.6	0.1	2.9	3.7	2.7	1.7	2.4
Cotton	0.2	0.3	24.3	7.8	3.9	3.8	2.0	6.5
Groundnuts	0.7	4.2	16.0	6.3	5.7	4.0	4.1	6.3
Cassava	3.7	5.0	7.9	6.9	7.4	5.4	5.3	5.6
Yams	1.1	3.3	10.4	4.0	4.2	7.1	4.5	5.1
Taro	0.2	0.5	0.2	0.3	0.3	0.1	0.1	0.3
Maize	2.6	7.1	9.2	6.2	7.2	5.2	3.7	6.0
Rice	6.0	5.7	5.6	6.7	4.2	5.9	6.6	5.8
Millet	0.0	0.0	2.8	0.8	1.4	0.6	0.0	0.8
Vegetables	1.9	3.7	4.1	4.4	2.2	4.1	3.6	3.4
Other	0.9	1.9	3.0	2.2	2.2	1.2	1.8	1.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Calculated from the CILSS data tapes.

west forest, the situation is the reverse: coffee is twice as important as cocoa. In the poorer savannah, cotton is the predominant cash crop, with a value share of nearly one-quarter of all agricultural sales.

Among the food crops that are primarily traded, ground nuts, maize, rice, cassava, and yam contribute between 5 and 7 percent to the value share of marketings, and thus to earnings from agricultural sales, among farmers engaged in commercialized agriculture. In the savannah, food crops make up a considerably greater proportion of agricultural sales, with maize, rice, yams, and cassava comprising 33.1 percent of the value of agricultural sales.

When the value share of marketings is analyzed by expenditure group, it is noteworthy that coffee is the most important crop for the lowest quintile, with cocoa and cotton falling closely behind. Cocoa and coffee are slightly more important commercial crops for wealthier farmers than for those at the bottom of the income distribution. However, these better-off farmers, predominantly from the forest regions, do not market any cotton, and maize and groundnuts represent much smaller shares of their agricultural sales, in contrast to the lowest expenditure group.

Given the importance of the export crops (cocoa, coffee, and cotton) and to a lesser extent the food crops (groundnuts, maize, rice, yams, and cassava) as sources of income for households in various expenditure groups, we can next examine the percent of households producing each of the crops and the mean value share of total output by per capital expenditure group. By examining the distribution of producers and their value share across expenditure quintiles, it is possible to infer the first round implications for income distribution of changing producer prices on earning.[4]

For coffee and cocoa, the two most important agricultural crops, 21 and 23 percent of the producers are in the lowest expenditure quintile, with an additional 27 and 29 percent in the second quintile (Table 5). Less than 10 percent of cocoa and coffee producers are in the highest expenditure groups. At the same time, the value shares of sales of the cocoa and coffee are most heavily concentrated in the middle expenditure group, accounting for 31 and 25 percent of the total value, respectively. The value shares of the second and fourth expenditure groups are nearly the same for these commodities, while they are relatively lower for both the lowest and highest expenditure groups. These figures, in combination, suggest that any increase in producer prices for commodities, such as cocoa and coffee, will raise the incomes of the individual farmers across

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[4] Of course, the second round effects, as mediated through changes in output, employment, wages, and so forth, are much more difficult to capture. In addition, to the extent that farmgate price changes are transmitted through the market to consumers, the difficulty of measuring the impact of price changes on food crops is compounded.

Table 5 - Percentage of All Farm Households in Each Quintile Producing Different Crops and Their Percentage of Sales[a]

Commodity	1st Quintile		2nd Quintile		3rd Quintile		4th Quintile		5th Quintile	
	% of Households Producing	% of Sales Value	% of Households Producing	% of Sales Value	% of Households Producing	% of Sales Value	% of Households Producing	% of Sales Value	% of Households Producing	% of Sales Value
Cocoa	20.93	14.01	27.09	18.83	25.99	31.42	16.08	18.71	9.69	17.66
Coffee	22.96	15.70	28.65	24.40	24.29	25.37	17.08	24.56	7.02	12.28
Oil palm	21.82	3.78	26.82	27.04	24.55	22.61	15.45	16.42	10.00	28.79
Banana	20.67	12.23	27.56	26.38	25.14	27.68	18.06	18.78	8.38	14.75
Fruit tree	23.21	20.76	27.38	20.07	25.00	27.78	18.15	23.81	5.36	6.74
Cola nut	20.11	7.73	29.46	39.44	24.93	29.89	18.70	17.92	6.23	4.44
Cotton	45.60	51.14	26.40	19.84	17.60	18.29	10.40	10.73	0.00	0.00
Groundnut	37.34	35.59	29.82	23.95	18.30	31.13	10.53	10.43	3.01	2.59
Cassava	25.37	14.00	27.38	27.11	23.09	17.98	15.84	20.57	7.52	10.38
Yam	29.55	24.89	27.22	27.33	19.80	21.40	16.89	18.16	5.68	7.35
Taro	26.87	0.17	29.74	31.35	20.93	22.88	16.74	17.26	5.51	8.84
Maize	30.34	18.47	26.29	16.38	21.99	33.67	15.11	11.46	5.53	19.35
Rice	25.53	15.80	28.06	26.60	23.42	25.14	16.46	24.00	6.33	8.35
Millet	47.06	37.33	22.35	27.97	16.47	16.85	12.94	11.34	1.18	6.52
Vegetables	29.09	18.64	28.21	38.77	21.60	19.76	14.36	14.96	5.99	7.09

[a] All rows add to 100.

the entire income distribution, although most of the increased income will accrue to households in the middle of the distribution range. At the same time, by virtue of the fact that nearly half the producers of both coffee and cocoa are concentrated in the bottom two quintiles, a greater number of poor households will gain from higher coffee and cocoa prices than will better-off households.

In contrast is the case of cotton. Nearly half the producers are found in the lowest expenditure quintile. They account for over half of the value of the cotton production. The upper 40 percent of the expenditure distribution receives only 11 percent of the profits from cotton. A similar story, although not as dramatic, is found in the case of groundnuts, where both the percentage of households and the value shares of production are concentrated in the lower expenditure groups.

The above discussion highlights six important points that set the stage for further analysis of the specific nutritional consequences of cash cropping. First, export crops are vital to the macroeconomic climate in Côte d'Ivoire due to their role as earners of foreign exchange and as a source of government revenues.

Second, sales of export crops, combined with the domestic marketing of food crops, represent the most important source of income for farm households throughout the expenditure distribution, including the poor. The value of cash crop income, which is primarily derived from export crops, exceeds the value of consumption of own production, as well as income from other sources such as wages and transfers.

Third, households that are engaged in commercialized agriculture in general, and export crop production specifically, are concentrated in the bottom three quintiles of the expenditure distribution. Thus, an increase in the sale price of food crops, and more importantly as export crops, will directly benefit more poor than wealthy households.

Fourth, raising (or lowering) prices of the most important export crops—cocoa and coffee—will not have major impacts on the share of incomes controlled by each of the expenditure quintiles. This reflects the fact that value shares of production of these crops are concentrated among households in the middle expenditure quintiles.

Fifth, cotton production is more heavily concentrated among farmers in the lower end of the income distribution in the savannah, the most economically disadvantaged region of Côte d'Ivoire. Raising the incentives for the production of cotton, as well as groundnuts, is not only advised on the basis of its relatively low domestic resources costs, but doing so will have positive short-term distributional effects.

Sixth, while export crops comprise more than 50 percent of the value of farm sales, food crops—including roots and tubers—are also important cash crops, especially for poor farmers living in the savannah. Among the

food cash crops, sales of groundnuts are of particular importance among the poor, especially those residing in the savannah.

In sum, cash cropping in general and export cropping in particular dominate the macroeconomy. The key export crops have also been shown to have a high comparative advantage and potential for income generation for the rural sector, where incomes lag far behind urban areas. An important question, however, remains. Does pursuing policies that favor export crops represent a nutritional risk for farm households if it encourages switching land use and income source from the production of food that can be consumed by the household to export cropping?

5. NUTRITIONAL IMPLICATIONS OF EXPORT CROPPING

PREVALENCE AND CHARACTERISTICS OF MALNUTRITION

The percentage of children that are stunted is 23.2 percent in the savannah, and 18.7 and 17.1 percent in the west and east forest regions, respectively (Table 6).[5] The retardation of their linear growth is due to combination of poor health and inadequate nutrient intake, and reflects previous chronic malnutrition.

In contrast to stunting, which measures long-term nutritional status, wasting, assessed on the basis of the child's weight-for-height, is an indicator of current malnutrition and physiological stress. Among the three agricultural regions of Côte d'Ivoire, the prevalence of wasting, or current acute malnutrition, is 3.4, 9.2, and 7.1 percent in the west forest, east forest, and savannah, respectively (Table 6).[6]

When these data are disaggregated by expenditure groups, the simple two-way table does not indicate that children from poorer families are more malnourished. This is the case for all three regions where the figures on percentage stunted and wasted jump considerably from one expenditure quintile to the next.

Next, it is interesting to examine the descriptive statistics on levels of malnutrition by landholding size and the share of the land that is devoted to the major export crops—cocoa, coffee, and cotton (Table 7). The data do not suggest any relationship between malnutrition and the share of land in export crops. For example, 22.4 percent of the children are malnourished who come from rural farm households that devote less than 5.6 percent of their land to producing the major export crops, while the comparable figure among households with more than 58.3 percent of their land in cash crops is 20.5 percent. Likewise, the data suggest that children from families with large per capita landholdings (greater than 1.33 hectares per capita) show the same probability of being malnourished as do those from households with small landholdings (less than 0.384

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[5] Stunting, alternatively referred to as chronic or long-term malnutrition, is defined, in accordance with the convention adapted by the World Health Organization, as a height relative to age that is less than -2 standard deviations below the reference National Center for Health Statistics growth standard (WHO 1983).

[6] Wasting is likewise defined as weight-for-height of less than -2 standard deviations below the reference growth standard (WHO 1983).

Table 6 - Percentage of Preschool-aged Children Malnourished by Per Capita Expenditure Category and Region

Per Capita Expenditure Quintile			Rural Areas		
			West Forest	East Forest	Savannah
1	Stunted	%	14.6	17.5	31.3
	Wasted	%	2.9	18.2	6.9
	N		103	137	160
2	Stunted	%	23.9	16.4	19.1
	Wasted	%	1.1	8.6	8.6
	N		88	152	162
3	Stunted	%	12.4	16.9	17.6
	Wasted	%	1.0	9.6	5.9
	N		105	177	119
4	Stunted	%	21.4	15.2	22.1
	Wasted	%	5.4	7.6	4.8
	N		112	184	104
5	Stunted	%	22.2	19.4	24.4
	Wasted	%	6.7	4.2	8.4
	N		90	191	119
ALL	**Stunted**	**%**	**18.7**	**17.1**	**23.2**
	Wasted	**%**	**3.4**	**9.2**	**7.1**
	N		**498**	**841**	**664**

Source: Calculated from the CILSS data tapes.

Table 7 - Percent Malnourished by Share of Land Devoted to Cash Crops[a]

Per Capita Land Category[b]			Percentage of Land Cultivated Devoted to Export Crops					
			<5.6	5.7-25.91	25.92-42.02	42.03-58.30	>58.3	ALL
1	Stunted	%	21.4	17.9	20.3	11.8	30.0	**20.2**
	Wasted	%	7.5	9.0	7.2	8.8	15.0	**8.3**
	N		187	67	69	34	20	**377**
2	Stunted	%	22.1	25.8	19.5	14.6	18.7	**20.6**
	Wasted	%	9.1	7.7	8.3	6.1	10.4	**8.1**
	N		77	105	72	82	48	**384**
3	Stunted	%	25.6	10.9	20.2	17.8	20.5	**18.9**
	Wasted	%	2.3	7.3	4.0	5.6	9.0	**5.8**
	N		43	55	99	107	78	**382**
4	Stunted	%	25.0	21.0	17.9	10.7	15.6	**17.2**
	Wasted	%	8.4	7.4	10.2	4.0	8.2	**7.7**
	N		36	81	78	75	109	**379**
5	Stunted	%	22.5	25.3	12.7	25.3	23.5	**22.2**
	Wasted	%	7.5	4.2	8.4	6.6	7.3	**6.9**
	N		40	71	71	75	136	**393**
ALL	**Stunted**	%	**22.4**	**21.1**	**18.3**	**16.6**	**20.5**	**19.8**
	Wasted	%	**7.3**	**7.1**	**7.5**	**5.9**	**8.7**	**7.3**
	N		**383**	**379**	**389**	**373**	**391**	**1,915**

Source: Calculated from the CILSS data tapes.

[a] Cash crops refer to the traditional export crops of coffee, cocoa, and cotton.
[b] Per capita land category corresponds to the following size landholdings (HA): (1) 0.010-0.384; (2) 0.385-0.599; (3) 0.600-0.874; (4) 0.875-1.329; (5) > 1.330.

hectare per capita). Even when the data on the share of land in export crops are further disaggregated by the household's total landholdings per capita, no pattern is observed to suggest that children from households that use more of their land to cultivate export crops have a higher or lower probability of being malnourished.

Interpreting the descriptive results presented above is difficult. In particular, the associations observed between variables, or lack thereof, should not be construed as proving or refuting causation. Simply, too many other factors affect nutrition that are not controlled for in the descriptive statistics. It is necessary to use econometric analysis to sort out the determinants of malnutrition in general, and the role of export cropping in particular.

NUTRITION FUNCTIONS

Long-term (or chronic) and current (or acute) reduced-form nutritional status functions were estimated for preschool-aged children. The models took the following forms:

$$L_i = L\ (A_i,\ Z_i,\ M_i,\ C,\ e_i) \tag{1}$$

$$W_i = W\ (A_i,\ Z_i,\ M_i,\ C,\ e_i) \tag{2}$$

where L_i is the child's height-for-age Z-score, W_i is the child's weight-for-age Z-score, A_i is the vector of the individual's personal attributes that may influence nutrition, Z_i is the vector of observable household-level characteristics that may influence a child's nutrition, M_i is the vector of community-level variables, C is per capita consumption expenditures of the household in which individual i resides, and e_i is a random disturbance term.

Among the individual attributes in the models are the child's age, sex, and birth order. The most important household-level determinants are the per capita landholdings of the household and the share of that land devoted to the production of the major export crops, including coffee, cocoa, and cotton. The landholding and land use variables are largely fixed from one year to the next, and are consequently exogenous to this short-term model. Unlike planting decisions among field crops, the land allocated to these export crops, especially coffee and cocoa, is not subject to major adjustment by the farmer from one year to the next in response to market signals.[7]

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[7] It should be noted that no models are presented that include the share of income from home consumption as a regressor because this measure of subsistence represents an observed behavior of households that is an endogenous choice variable. In addition, there is a simultaneity in the

(continued...)

In order to control for the household's general level of welfare, the role of income as a determinant of nutritional status is also a key issue to be addressed. In that regard, it was necessary to deal with the problem that consumption expenditures, a good proxy for permanent income, are endogenous to the model, being a function of many of the same characteristics that simultaneously determine child growth and nutrition. Therefore, instrumental-variables estimation was employed in which a linear combination of variables was used to predict consumption expenditures.[8] This was done using a two-stage least squares procedure in which the expenditures variable used in the nutrition models was the fitted value of the first-stage expenditure regression. This procedure insured that the parameter and standard error estimates were unbiased in the nutritional status models.

Other variables in the vector of household-level attributes included in the model are household size and composition,[9] the mother's age, height and education of the mother and father, and season. Among the community-level variables, the presence of a nurse in the village, the proximity to a doctor, and the reporting of malaria, dysentery, and smallpox/chicken pox/measles as serious health problems are included. The models do not, however, include commodity prices due to the poor reliability and limited

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[7](...continued)
choice that governs the share of food crops that are marketed (and consequently the share that is consumed at home), and the choice of other "inputs" into child nutrition. As a consequence of the simultaneous joint determination of the subsistence ratio and malnutrition by exogenous variables, the econometric models that follow are limited to the issue of the impact of the share of land devoted to export crops on nutritional status, since in the short term, it is arguably exogenous.

[8] Instrumental-variables estimation is discussed in Pindyek and Rubinfeld (1981). The technique is used in this paper in order to address the fact that, as mentioned above, expenditures are an endogenous variable that would result in its being correlated with the error term, which leads, in general, to inconsistent ordinary least squares estimates.

[9] It is acknowledged that family size may be endogenous, as the literature on the tradeoffs between the quality and quantity of children has shown (Becker 1975). The failure to account for such endogeneity is that the estimates will be biased. However, the finding of suitable instruments for household size is considerably more difficult than for income. Given that there is considerable question over the extent to which women have the knowledge and technology to control their fertility, that the coefficients on instrumented and reported income were nearly identical, and that the exclusion of demographic variables will result in the income effects including household composition effects to the extent that they are correlated, suggests that it is preferable to include rather than leave out the demographic variables in the model.

number of prices that were actually collected.[10] The consequence of omitting prices on other parameters is expected to be negligible since differences in relative prices will be reflected in different patterns of expenditures. Furthermore, given that rural and urban models are estimated separately, and each includes seasonal, regional, community-level, and round dummy variables, a good portion of the relative price differences has likely been captured.[11]

RESULTS

Table 8 presents the results of the reduced-form models that examine the determinants of child malnutrition. The reduced-form consumption expenditure function is reported in Appendix Table A.1, and the means and standard deviations are found in Appendix Table A.2.

Long-term/Chronic Malnutrition

The most important finding of the model is that neither the landholding per capita nor the share of the household's land devoted to the production of the major export crops (i.e., coffee, cocoa, cotton, cola nut, and tobacco) are significant in the long-term nutrition functions. This supports the descriptive data presented above indicating that the use of land for producing export crops, rather than food crops, will not affect the long-term nutritional status of preschool-aged children.[12]

It is equally noteworthy that the income variable is positive and significant, indicating that raising household income will bring about

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[10] The prices were collected in the community questionnaire that was administered separately from the household interviews in the communities sampled. Since only expenditure data was collected at the household level, it was not even possible to try to impute prices from the household questionnaires.

[11] The price of leisure, or the imputed wage rate, is also not included in the models, even though the community-level questionnaire administered at the time of the survey asked a village leader to report the prevailing village wage. However, it was felt that asking one person in a village, at one season, for the prevailing agricultural wage results in a suspected representation of the opportunity cost of time. Furthermore, only a couple percent of the rural working age population reported performing wage labor, precluding estimating a wage function, and suggesting that rural wage labor markets, if they exist, are extremely thin.

[12] A similar model was estimated including an interaction term between the share of land devoted to export crops and per capita expenditures. The variable proved insignificant.

Table 8 - Long-term and Current Nutritional Status Functions, Rural

Independent Variables	Height-for-Age Z-Score Parameter Estimate	Height-for-Age Z-Score Standard Error	Weight-for-Height Z-Score Parameter Estimate	Weight-for-Height Z-Score Standard Error
Intercept	-8.440	2.377	1.693	1.701
Mother's height	3.157	0.921	-0.153	0.660
Father's height	0.494	0.842	-1.013	0.603
Child 0-6 month dummy	0.724	0.216	0.795	0.157
Child 7-12 month dummy	0.406	0.217	-0.144	0.155
Child 25-36 month dummy	-0.441	0.188	0.586	0.135
Child 37-48 month dummy	-0.170	0.191	0.569	0.137
Child 49-60 month dummy	-0.027	0.175	0.497	0.125
Jan-Mar dummy	-0.353	0.169	-0.019	0.121
April-June dummy	-0.069	0.177	0.048	0.127
July-Sept dummy	0.045	0.159	0.079	0.114
No. children 0-5 years	0.158	0.051	0.023	0.036
No. children 6-14 years	0.115	0.059	0.114	0.042
No. female > 14 years	0.008	0.055	0.075	0.039
Ln per capita expenditures	0.220	0.122	0.025	0.087
Child gender dummy variable	-0.142	0.104	-0.125	0.074
1985 dummy variable	-0.164	0.139	0.321	0.100
Household size	0.015	0.038	-0.034	0.027
Mother's age	-0.004	0.004	0.003	0.003
Birth order	-0.070	0.047	-0.072	0.034
West Forest dummy variable	-0.211	0.137	-0.412	0.098
East Forest dummy variable	-0.151	0.160	-0.284	0.115
Mother's education	-0.413	0.806	0.431	0.593
Father's education	0.572	0.395	-0.383	0.284
Mother's ed x Ln pc exp	0.021	0.067	-0.021	0.049
Father's ed x Ln pc exp	-0.059	0.034	0.029	0.025
$(\text{Mother's ed})^2$	0.030	0.019	-0.023	0.013
$(\text{Father's ed})^2$	0.011	0.005	0.005	0.004
Malaria	-0.350	0.228	-0.569	0.164
Dysentery	-0.551	0.239	0.238	0.171
Chicken-smallpox/measles	0.406	0.152	-0.285	0.109
Distance to doctor	-0.221	0.080	-0.149	0.057
Nurse dummy	4.856	2.832	1.136	2.041
Nurse x ln per capita exp.	-0.368	0.246	-0.082	0.177
Land per capita	0.037	0.077	-0.120	0.055
Export crop share	-0.002	0.003	0.002	0.002
R^2	0.107		0.144	
N	1,327		1,322	

improvements in long-term child nutrition. This implies that to the extent that shifting land into the production of remunerative export crops with their high comparative advantage is an effective approach to raising rural incomes, especially of poor households, positive nutritional consequences are expected.

A number of other findings from these models are worth mentioning. First is that mother's schooling appears to have no independent effect on nutrition, once one controls for other variables. Even searching for nonlinearities in the impact of education, as indicated by the mother's education quadratic term and the interaction with income, did not yield any significant coefficients. In fact, F-tests revealed a lack of joint significance of these variables at standard levels. As for father's education, the quadratic of father's education and the interaction term between father's education and expenditures can be interpreted by taking the total derivative of long-term nutrition (i.e., the height-for-age Z-score) with respect to education.[13] Doing so shows that over much of the relevant range of incomes and schooling, fathers' education will have a negative impact on long-term nutritional status of their children.[14] The negative impact, however, decreases as the father's education increases. The mechanisms through which fathers' education exerts a negative effect on nutrition can only be sources of conjecture. One hypothesis is that income control is related to levels of education and that there is a difference in how males and females allocate income, both in terms of the choice of purchases and the intrahousehold allocation of goods and services (with female choices favoring the preschool-aged children). Clearly, this is an area in need of further research.

Also interesting is the finding that the dummy variable for male children is not significant, suggesting that there is no discrimination against female children.[15] The higher the birth order, the lower the

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[13] The father's education variables have an F-value of 2.29 and are jointly significant at a p-value < 0.1.

[14] This being said, the evidence does indicate that there are positive effects of the father's (and mother's) education as mediated through income. In addition, the observation that paternal education is not beneficial to nutrition when controlling for expenditure levels must be tempered by the fact that the gross returns to education among men are higher than for women (see Appendix Table A.1). Therefore, the vital role of raising the education of men in order to increase household income levels must not be overlooked.

[15] This corresponds to the recent findings of Haddad (1987), Kennedy and Cogill (1987), Horton (1988), Alderman (1990), and the recent review of Svedberg (1988). To the extent that the NCHS standards are wrong (i.e., if there is a systematic gender bias in the reference population but not

(continued...)

nutritional status of the child, a finding that can be explained by biological (e.g., less maternal depletion), cultural (e.g., the oldest son is important in funeral rites), and socioeconomic (e.g., parents are more dependent upon first-born children for their security in old age) factors (Horton 1988).

In addition, only the mother's height is found to be an important determinant of long-term malnutrition, suggesting that the intergeneration link of stature is stronger for the mother than the father. This could be attributed to the fact that the maternal influence incorporates factors relating to phenotype (e.g., the environment within the womb before birth), as well as genotype, while only the father's genotype has any influence on his offspring.

Finally, the negative and significant dysentery variable and the marginally significant malaria variable indicate that children are likely to suffer less stunting in villages where these diseases were not reported to be serious health problems.[16] The surprising positive coefficient for the smallpox/chickenpox/measles variable is difficult to explain. One potential reason may revolve around the fact that since the variable included smallpox, it may be that those villages with greater health awareness are cognizant of the potential threat that smallpox used to represent. An alternative explanation is that if chickenpox/smallpox/ measles are among the most serious health problems, by implication, others are not. Compared with the chronic episodes of dysentery and malaria, single episodes of smallpox/chickenpox/measles may be less likely to affect the long-term nutritional status of preschool-aged children.

Also, in keeping with expectations, the negative and significant result for the distance to the doctor variable indicates that the more distant such medical services, the lower the height-for-age Z-score. Similarly, the dummy variable for whether there is a nurse in the village has a positive coefficient, indicating that a nurse's presence might be expected to improve long-term child nutrition. Interestingly, the negative interaction term between nurse and expenditures also suggests that for wealthier households, the presence of a nurse in the village is not as

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[15](...continued)
in the observations), this finding would not be valid. However, the evidence as put forth in Habicht (1974) and Martorell and Habicht (1986) provide some confidence in the use of the NCHS standards for comparisons across ethnic groups.

[16] The community-level questionnaire asked for a listing of the four major health problems. If malaria was given as the most serious, or second most serious health problem in the village, it was coded as a 1, and otherwise 0. The same procedure was employed for dysentery and smallpox/chickenpox/ measles, the latter group of diseases that were coded together.

important as for households in the lower end of the income distribution. The nurse and nurse multiplicative interaction term with expenditures are jointly significant with a p-value less than 0.0001, as are all the community-level variables combined.

The addition of the quadratic schooling and interaction terms with education resulted in the quadratic term for mother's education being positive and significant at the 0.05 level. This suggests a nonlinear relationship between mother's education and long-term malnutrition in rural areas, where there is an increasingly positive return to mother's schooling with more education. However, the education and education interaction terms for both mother and father were not jointly significant at standard levels.

Current/Acute Malnutrition

A similar model was run in order to determine the impact on current nutritional status of households devoting their landholdings to export cropping. The results once again, as indicated by the insignificant parameter estimate, do not show that the share of cash crops in total hectarage cultivated will have any impact on nutritional status. This model of current malnutrition, however, diverges from the long-term nutrition functions in a couple of important ways. First is that the per capita landholding variable was significant and negative. This suggests that among households with comparable income, the more land under cultivation, the worse the current nutritional status of the child. At first glance, this may be considered counterintuitive. One reasonable hypothesis explaining the negative parameter estimate is that a larger amount of land under cultivation undoubtedly involves more time spent in agricultural activities, especially among women, and perforce, less time for child nurturing and related household production activities such as food preparation. This may result in less, or poorer quality child care, thereby leading to more current malnutrition. An alternative explanation for this finding is that, controlling for income, households with a higher share from agriculture may be at greater nutritional risk as a consequence of the lumpy nature of agricultural incomes and the difficulties in intertemporal savings.

A second important characteristic of this model is that income does not prove to be a significant determinant of current malnutrition. This is not altogether surprising given that current nutritional status, as measured by weight-for-height, is more likely to be affected by stochastic events such as illness. Among the other significant coefficients, the quadratic term for mother's education is negative and significant. In

combination with the positive parameter estimate for mother's education,[17] this implies that there are diminishing marginal returns of more schooling to improved current nutrition.[18] None of the father's education variables were significant at standard levels,[19] and as with the long-term nutrition functions, male children have lower Z scores than female children and the higher the birth order, the worse the child's nutrition.

Finally, the community-level variables indicate once again the importance of malaria in the village as a determinant of preschool-aged malnutrition. The chickenpox/smallpox/measles indicator takes on the expected statistically significant negative sign, reflecting how the occurrence of chickenpox and measles in the community may have deleterious short-term nutritional impacts. The insignificant dysentery variable is difficult to explain. Once again, the distance to the doctor is negative and significant, indicating the importance of access to medical care as a determinant of current nutritional status. The nurse dummy variable and interaction term with income, although not significant, have the same signs as they did for the height-for-age equation. In total, the community-level variables are jointly significant at the 0.0001 level with an F-statistic equal to 6.93.

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[17] The insignificance of this parameter estimate can be explained by multicollinearity with the quadratic term, which, when removed, lowered the standard error on the education variable.

[18] The mother's education, quadratic and interaction term with expenditures were jointly significant at the 0.1 level, with an F-value equal to 2.02.

[19] In addition, the male education variables were not jointly significant at standard levels.

6. CONCLUSIONS

Agricultural development is the key to further and sustained economic growth in Côte d'Ivoire. This is especially true of a country in which export crops account for a sizable share of agricultural GDP and represent the dominant source of income and employment. According priority to raising productivity of existing crops with a high level of comparative advantage and promoting diversification of exports represent essential ingredients of a sound strategy for short- and medium-term economic growth in Côte d'Ivoire.

As Côte d'Ivoire enters the 1990s, however, it is beginning to face constraints on the availability of land, which, coupled with other natural and financial resource constraints, implies that allocative decisions in terms of the use of land will be increasingly important. The choices made in terms of how land is allocated among crops will be conditioned by price policy as well as a plethora of other factors such as the direction of agricultural research and extension and the nature of input and output marketing arrangements. But what is quite clear is that the tradeoffs between producing food and export crops will likely become more important in the years ahead.

In an attempt to better understand the nutritional implications of a strategy of agricultural development based on exploiting comparative advantage through increasing incentives for producing the dominant export crops, this paper began by examining their importance as income sources. Thereafter, econometric models explored whether allocating land to export crops, rather than food crops that may either be marketing or consumed at home, has a deleterious impact on nutritional status of preschool-aged children.

The results indicated that the poor, along with the rich, will benefit in the short term from an increase in domestic producer prices for coffee and cocoa. With regard to cotton, the data presented implied that raising cotton prices and promoting growth of cotton production will play a key role in the development of the savannah, a region characterized by low levels of per capita income and a predominance of poor households. Measures to increase cotton production are also clearly commended on the grounds of improving equity. Despite that only the direct (i.e., first round) distributional impacts of price changes were examined, the findings nonetheless suggest following a policy that reduces the level of taxation of coffee and cocoa, although the recent fall in world prices has perhaps only temporarily reduced the scope for such a strategy. Results of the models of nutritional status indicate that controlling for the total value of household income in cash and in kind, there was no indication that the

farm household's decision to allocate land to the production of major export crops, as an alternative to producing food crops for domestic consumption, represents a short-term nutritional risk factor. This suggests that liberalizing prices and removing distortions that will encourage agricultural growth will improve nutritional status, even though such a move implies favoring the production of export rather than food crops. While the objective of food self-sufficiency is still within the grasp of Côte d'Ivoire, any effort to achieve that objective must be carefully weighed against the economic costs of the suboptimal use of valuable resources. Given that households that choose to grow export crops do not manifest a higher probability of their children being malnourished, there is a strong argument for Côte d'Ivoire's following a development strategy that focuses on growth in incomes and improving returns to factors, even if it be at the cost of food self-sufficiency. However, caution is required in following such a strategy. First, there is the possibility that higher prices will call forth greater supplies; since Côte d'Ivoire is not truly a price taker, especially for cocoa, there is a risk that increased output will further depress already soft world market prices. Second, efforts are required to identify alternative revenue sources to taxes on export crops in order to preclude deepening Côte d'Ivoire's fiscal crisis.

Appendix Table A.1 - Second Stage Reduced-Form Consumption Expenditure Function, Rural[a]

Independent Variables	Parameter Estimate	Standard Error
Intercept	11.848	0.103
Mother's age	-0.002	0.001
Father's age	-0.000	0.001
Household size	0.068	0.059
Ivorian dummy	-0.073	0.046
Abidjan dummy	...	...
East Forest dummy	-0.019	0.039
West Forest dummy	-0.080	0.048
Mother's education	0.004	0.032
Father's education	-0.029	0.015
(Mother's ed)^2	0.000	0.005
(Father's ed)^2	0.004	0.001
Log of value of housing	...	...
Log of value of tools	-0.057	0.014
Log of business assets	0.026	0.003
Log of value of eqpmnt	0.017	0.003
Log of value of land	0.045	0.010
No. children 0-5 years	-0.130	0.058
No. children 6-14 years	-0.078	0.059
No. males > 15 years	-0.086	0.061
No. females > 15 years	-0.079	0.062
1985 dummy	-0.051	0.037
	R^2 = 0.1633	

[a] Dependent variable: Log of per capita consumption expenditures.

Appendix Table A.2 - Variable Means and Standard Deviation, Rural

Independent Variables	Mean	Standard Deviation
Weight-for-height	-0.22	1.31
Height-for-age	-0.51	1.83
Ln per capita expenditure	11.60	0.59
Father's education	2.45	4.08
Mother's education	1.13	2.53
Father's height (meters)	1.68	0.07
Mother's height (meters)	1.59	0.06
Household size	11.79	5.39
No. children 0-5 years	3.29	1.73
No. children 6-14 years	3.14	2.22
No. females > 14 years	3.15	1.86
Birth order	5.99	3.29
Mother's age	29.29	13.39
Father's age	35.61	15.54
Log of value of housing (CFAF)	...	...
Log of business assets (CFAF)	3.13	5.07
Log of value of land (CFAF)	13.52	3.21
Log of value of tools (CFAF)	10.40	2.12
Log of value of equipment (CFAF)	2.98	4.88
Malaria	0.07	0.27
Dysentery	0.05	0.22
Chicken-smallpox/measles	0.19	0.22
Ln distance to doctor	3.08	0.74
Nurse	0.26	0.44

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