4 Consumption Effects of Commercialization of Agriculture

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Introduction

The commercialization of agriculture has, in many diverse circumstances, led both to an increase in household income and to changes in the way household resources are organized to earn that income. Have these changes meant that food intakes are more nutritious and that health and sanitation conditions are improved? This chapter addresses three central questions: (1) to what extent are increments in income spent on nonfood items, in particular, health-related items; (2) to what extent are increments in income spent on food, and (controlling income) does the switch to commercial production alter the marginal propensities to spend on food; and (3) to what extent do increments in food expenditures lead to greater calorie intakes, both at the household level and at the individual preschooler level?

To answer these questions thoroughly requires collecting household survey information on incomes by family member, on expenditures by type of item, and on food intakes by family member. This is a time-consuming and expensive process, with the most effective methods varying by cultural setting.

While it was not feasible to collect all the desired information in all the study areas, in all case studies, expenditure surveys were undertaken that recorded food and nonfood expenditures over varying time periods for a disaggregate list of items.[1] Per capita total expenditures are used as a proxy for income because it is difficult to measure income directly and because expenditure data are thought to be a better reflection of "perma-

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1. Information was collected on food items consumed out of own production, earned as in-kind wages, or borrowed. The value of this nonmarket food consumption was added to market purchases of food and nonfood items to estimate total expenditures.

nent" income. In most case studies, a direct measure of income was also derived.[2]

Table 4.1 provides a summary of the detailed findings of all eleven case studies with respect to the effect of commercialization on total food expenditures, calorie consumption, and income control at the margin as it affects food-acquisition behavior. These topics are discussed in more detail below.

It was in the collection of calorie-consumption information that the greatest divergence in survey methods occurred. In part, this divergence was dictated by cultural factors related to eating habits. In some case studies, for instance, in Rwanda and The Gambia, a seven-day recall of foods cooked (divided by persons present for these meals) was conducted to give an estimate of household calorie intake.[3] In other case studies, for example, in Guatemala, Kenya, and the Philippines, food quantities from the expenditure information were converted to calories to give household calorie availability.[4] In Kenya, the Philippines, Papua New Guinea, and Sierra Leone, in addition, a 24-hour recall of foods consumed by the household was administered. This not only produced an estimate of household calorie intake as a cross-check of the household calorie availability information, it also gave estimates of calorie intakes of individuals within the household. Furthermore, it provided an estimate of family food consumption that was surveyed independently of total expenditures. This separation of surveyed information means that a potential source of upward bias is avoided when using regression techniques to measure the effect of income on food intakes (Bouis and Haddad 1992).

Among the six study sites reviewed below, the highest per capita total expenditures are found in The Gambia. Average expenditures are somewhat lower, but roughly comparable, in Guatemala, Kenya, and the Philippines, lower still in Rwanda, and lowest by far in Malawi. The largest difference between the more commercialized and less commercialized farmers is found in the Philippines; this large difference is partly

2. Farm profits were computed from detailed farm production information and were then added to wages and salaries earned off the farm, profits from off-farm business activities, and income transfers. In some instances, it was possible to compute the share of total household income that was earned by the wife or that was earned from commercial production. These variables are used to test for changes in the marginal propensity to buy food while controlling for changes in total household income.

3. During this seven-day recall, information was also collected on snack foods, food prices, and expenditures in order to compute household food expenditures used in the total household expenditure calculation described above.

4. An estimate of calories from meals taken by nonfamily members was subtracted from this total.

TABLE 4.1 Overview for case study settings of food expenditure and consumption effects

Country	Commercialization Scheme	Was More Spent on Food?	Did Calorie Consumption Improve?	Did the Source of Income (Women's/Cash Crop) Affect Food Expenditure?
Guatemala	Export-producing cooperative of Cuatro Pinos	Yes, about 18 percent more per capita on average. More expensive calories were acquired. The budget share to food was slightly lower.	Yes, significantly with income, but the effect was decreasing at the margin. No significant changes in diet composition.	Scheme participation and women's off-farm income share did not affect food budget share. Increases in male nonagricultural income decreased food budget share. Less of the marginal income was spent on food, perhaps because export crop income is male controlled.
Philippines	Bukidnon Sugar Company	Yes, especially on meat whose consumption increased dramatically as incomes rose. More expensive calories were purchased. Food budget share declined.	Yes, for both households and household members, since, at the margin, calories were distributed fairly equally. greater variety in diets.	Information not available.
Papua New Guinea	Karimui Spice Company cardamom plantation (in adverse times)	No, in fact, slightly less was spent. More expensive calories were bought. Food budget share increased as employment opportunities dwindled.	No, there was slightly less food energy available, especially when employment dried up and access to purchased foods diminished.	The share of wage income had a negative but insignificant effect on energy availability, whereas the share of cash income to females positively and significantly affected food availability.

TABLE 4.1 Overview for case study settings of food expenditure and consumption effects (Continued)

Country	Commercialization Scheme	Was More Spent on Food?	Did Calorie Consumption Improve?	Did the Source of Income (Women's/Cash Crop) Affect Food Expenditure?
India	Karnataka Dairy Development Project	Information not available.	Energy consumption slightly increased, but there was a highly significant decrease in consumption of dairy products.	Information not available.
Kenya	South Nyanza Sugar Company	Yes, more expensive calories were acquired, particularly from meat and fruits.	Yes, not only did new scheme entrants consume significantly more calories, but a smaller proportion of the group consumed less than 80 percent of requirements.	Nonfarm income has a negative effect on household calorie consumption, whereas women's income has a beneficial effect. These effects are related to control of income within the household.
Kenya	Two rice schemes: Ahero Irrigation Scheme and West Kano Irrigation Scheme	Information not available.	For the resident tenants, it did not. For nonresident tenants, to some extent it did, but calorie consumption of individual rice growers was highest. No changes in the staple diet.	Women's income from casual labor and local sales of paddy and bund crops increased per capita food expenditures.

Rwanda	Potato production in the Gishwati forest area	Yes, more expensive calories were acquired, both from meat and more preferred food staples, such as potatoes.	Yes, significantly. On average, potato production in Gishwati provided an additional 40 percent calorie production, making these households surplus-calorie producers.	Among poor households, female-headed households consume more staple foods per capita.
Zambia	Technological change in maize	Information not available.	Yes, per capita calorie consumption is higher for both small and large farms in high-adoption areas.	Information not available.
Malawi	Commercialization of maize and tobacco	In absolute terms, no. But the higher income is spent on more expensive food such as meat and fruits than on grains and vegetables.	Yes, especially for those in the top third of the income distribution.	More of women's expenditures go to food purchases than men's, 25 percent versus 13 percent, respectively for maize, for instance.
Sierra Leone	Bo-Pujehun Rural Development Project-Tree crop promotion	No. In fact, less was spent absolutely and relatively by new adopters who suffered from a cash flow problem.	Yes, slightly, despite temporary income reduction for the new adopters.	No, an increased share of tree crop income in total income has no significant impact on calorie intake.
The Gambia	Jahally-Pacharr Smallholder Rice Project	Yes, more expensive calories were acquired, particularly from meat and fruits.	Mixed. As women lose control over rice production, calorie consumption is reduced. At the same time, an increase in total household income favorably affects calorie consumption.	A reduced share of cereals from women's production significantly reduces calorie consumption.

due to the larger landholdings of the commercialized farmers there, who are more likely to adopt sugar.

Nonfood Expenditures

What nonfood items do households purchase at the margin when incomes increase? Comparable information from six case studies on expenditures for health, housing, clothing, education, and transportation indicate that, in general, expenditure elasticities (as suggested by the ratios of expenditures of the top and bottom terciles) are highest for housing and lowest for education and clothing (table 4.2). Nonfood budget shares tend to be higher in Guatemala and the Philippines for almost all categories, particularly health and transportation. Education expenditures stand out as particularly important for the Philippines, and clothing expenditures as relatively important for the African countries. The relatively low budget shares for health and housing suggest that such expenditures do not yet constitute a major link in any observed improvement of nutritional status as income increases. In fact, such low expenditures may be important constraints to the realization of improved weights and heights of preschoolers at higher incomes. If more and better health facilities were made available in rural areas and if rural populations were provided with health and nutrition education, this could result in significant household budget reallocations.

TABLE 4.2 Expenditure elasticities and budget shares for selected nonfood items

	Country					
Item	The Gambia	Guatemala	Kenya	Malawi	Philippines	Rwanda
		(ratio between top and bottom tercile)				
Health	3.0	24.9	1.6	2.1	6.3	4.2
Education	1.5	2.3	1.4	3.8	5.0	1.6
Housing	9.3	—	14.1	4.0	22.8	7.7
Clothing	2.3	4.6	4.1	3.6	5.0	2.5
Transportation	3.4	7.9	5.9	10.7	12.5	1.2
Total expenditure budget share (average)			(percent)			
Health	0.9	2.9	0.3	1.4	2.1	1.3
Education	0.3	0.3	0.9	0.3	2.3	0.9
Housing	1.0	2.3	1.0	0.4	2.0	2.8
Clothing	5.8	4.5	2.7	10.1	4.3	7.5
Transportation	2.5	5.3	2.7	0.9	3.5	0.5

SOURCE: Data sets of respective case studies.

Food Expenditures

In many of the case studies, food budget shares are well above 50 percent and are close to 80 percent in Rwanda and Kenya. Food budget shares generally decline with rising incomes, although more money is spent on food. In several instances, more expensive foods such as meat were consumed. This is especially the case in the Philippines. Comparable information from The Gambia, Guatemala, Kenya, Malawi, the Philippines, and Rwanda suggests that, controlling for income, the four African countries tend to have higher food budget shares than Guatemala and the Philippines. For example, food budget shares in Kenya exceed 75 percent, whereas at similar income levels in the Philippines, food budget shares are about 65 percent. Food expenditures did increase rapidly with income in all six countries, but much more so in the African countries. This difference in expenditure behavior may be due to the relatively easy access to consumer goods in Guatemala and the Philippines compared with Africa.

As incomes more than double in Africa, the food budget share declines only slightly, especially in The Gambia and Rwanda. This contrasts with the much more rapid decline in Guatemala and the Philippines. These patterns indicate that households in the four African study countries spend a much higher proportion of their incremental income on food. Direct estimation of food expenditure elasticities with respect to total expenditures gave values of 0.94 and 1.00, respectively, for The Gambia and Rwanda, but a lower value of 0.84 for the Philippines.[5] These elasticities are evaluated at the mean of the data. Estimations for Guatemala and the Philippines (not shown) indicated that these elasticities are not constant across income groups but decline at higher income levels.

Differences in the Marginal Propensity to Spend Cash Crop Income

The discussion thus far has centered on how increases in income, from any source, were spent. But when income is controlled, do marginal propensities to spend for food differ across groups that are more or less commercialized? These marginal propensities could differ for several reasons. For instance, production and consumption decisions may not be separable; a household's decision to produce a subsistence crop may well affect the implicit price it pays for that subsistence crop if marketing margins are substantial. Or certain household members (for example,

5. An alternative estimate for the Philippines, obtained with predicted income (using two-stage least squares) in place of total expenditures, gave a lower estimate of 0.65. A value of 0.84 probably overestimates the relationship because of common errors in measuring food expenditures and total expenditures.

women) may participate strongly in subsistence production but not in commercial crop production, which may alter their control over income earned or change household energy requirements by transforming time allocation patterns, or both. In The Gambia, Kenya, and the Philippines, for instance, the share of income from cash crops did not significantly affect the marginal propensity to spend on food.[6] In Guatemala, on the other hand, it was estimated that an increase in the share of cash crop income from 0 to 50 percent led to a 1.2 percent decrease in the share of expenditures on food. Although statistically significant, this effect, in practical terms, is small. These results may be contrasted with those from Rwanda, where a 10 percent increase in the share of cash crop income led to a 4.8 percent decrease in the food budget share, suggesting that cash crop income was treated quite differently from other forms of income in the intrahousehold allocation process.

Food expenditure effects of income earned specifically by women were positive in most of the case studies where such information was available (table 4.1). In The Gambia, a shift away from production of the traditional women's crop led to reduced calorie consumption, holding income constant; however, the increased income due to commercialization more than compensated for this effect. In Rwanda, after controlling for income, female-headed households in the bottom income quartile consumed 17 percent more calories than male-headed households. Likewise, in Kenya (in both case study areas), Malawi, and Papua New Guinea, income going to women increased calorie intake significantly. Only in Guatemala was the effect of female income share on food expenditures not found to be statistically significant. With the possible exception of Rwanda, cash crop income generally had little effect on food expenditures, controlling total household income.

Household Calorie Availability

To what extent do higher food expenditures lead to higher calorie consumption at the household level? It is widely observed that, as incomes increase, more expensive calories are purchased so that a given percentage increase in food expenditures will lead to a lower percentage increase in calorie availability at the household level.

Cost per Calorie

It is evident from available data from The Gambia, Guatemala, the Philippines, and Rwanda that cost per calorie increases between the

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6. For Kenya, the dependent variable was household calorie intakes instead of food expenditures. The effect of income from sugar was insignificant for the subsample that excluded nonagricultural households.

TABLE 4.3 Calories purchased per U.S. dollar

Country	Average		Ratio Between Top and Bottom Terciles[a]	
	Participants	Nonparticipants (thousands)	Participants	Nonparticipants
The Gambia	9.55	10.37	1.53	1.56
Guatemala	12.16	15.07	1.66	1.66
Philippines	7.76	8.64	1.48	1.41
Rwanda	10.25	11.28	1.17	1.20

SOURCE: Data sets of respective case studies.

[a]Food expenditures roughly double from bottom to top tercile, except in Guatemala and Rwanda, where food expenditures increase by somewhat more, 150 percent.

bottom and top expenditure terciles (table 4.3). The smallest increase is observed for Rwandan sample households, whose incomes are the lowest of the four countries in table 4.3, but the largest increase in cost per calorie from the bottom to the top expenditure tercile is observed in Guatemala, where average household expenditures are lower than in The Gambia but where there is a wider variation in expenditures. After controlling for income, costs per calorie hardly differ between scheme participants and nonparticipants.

Direct estimation of household calorie consumption with respect to total expenditure (which combines the effects of "leakages" due to lower food budget shares and more expensive calorie sources) resulted in elasticity estimates of 0.48 and 0.50 at the high end of the scale for The Gambia and Rwanda, respectively, and 0.31 and 0.34 for Guatemala and the Philippines, respectively, at the low end of the scale. These results suggest that a doubling of income results in a 50 percent increase in household calorie consumption in The Gambia and Rwanda (and that the divergence from a calorie increase of 100 percent is almost entirely due to the purchase of more expensive calorie sources), but only a 30–35 percent increase in Guatemala and the Philippines. Although there is reason to believe that all of these elasticities are upwardly biased, their relative magnitudes indicate significant differences in food consumption behavior, again between the African and non-African study sites.[7]

7. A similar relationship was estimated for Kenya and the Philippines, using household-level calorie intake data derived from a 24-hour recall of foods consumed. These resulted in much lower elasticity estimates, 0.17 and 0.11 for Kenya and the Philippines, respectively. Use of calorie and food expenditure data (to construct total expenditures) from the same survey information can lead to upwardly biased estimates. Also, if there is a strong correlation between total expenditure, meals taken in other people's homes (low-income households), and meals provided to guests and hired workers (high-income households), and care is not taken to record these meals for nonfamily members accurately, there will be an additional upward bias (Bouis and Haddad 1992).

How do diets change as incomes increase? What types of food do higher-income households purchase that are expensive calorie sources? In Guatemala and the Philippines, meat, which is one of the most expensive sources of calories, accounts for at least 20 percent of food expenditures, even for the lowest expenditure tercile. The budget share for meat increases with income especially in the Philippines, with a consequent decline in the budget share of staple foods, which are the least expensive calorie sources. In the African countries, by contrast, the budget share for meat does not reach 20 percent even for the highest total expenditure tercile — although it should be noted that the share of fish in the Malawian food budget is quite high. The extreme case is that of Rwanda, where the budget share of staple foods is 70 percent and of meat only 6 percent, even for the highest total expenditure tercile. However, in Rwanda, as incomes increase, there is a shift away from sweet potatoes, a cheap calorie source, to potatoes and sorghum, which are more expensive calorie sources. The tendency for the budget share of meat to increase and of staples to decrease with increases in income is observed in the four African countries, but it is much less pronounced than in Guatemala and the Philippines.

It is apparent, then, that "leakage" (that is, income increases that are not generating commensurate increases in calorie consumption) is greatest where markets for nonfood items are better developed, and where there are stronger preferences for meat. To the extent that meat and other nonstaple foods improve dietary quality and provide necessary micronutrients, it may be that expenditures on such items are as important in improving nutrition as are further increases in calories.

Other Determinants of Demand for Calories

The calorie income elasticities (evaluated at mean expenditures) are estimated for five countries that have available data (table 4.4). Besides income, the price of the primary food staple, years of formal education of the mother, and household size are three additional variables in the demand for calories. The elasticity with respect to staple price is consistently negative or statistically not significant across the various studies. There is no evidence that formal education of the mother is a significant determinant of demand for calories. The effect of household size is mixed; in some cases, it positively affects calorie consumption and, in others, it has a negative effect.

Market Dependency and Household Food Security

It is often argued that calorie costs may rise with commercialization and that household food security may deteriorate because households may rely less on own-produced food and more on food purchases in the

TABLE 4.4 Selected determinants of household demand for calories

	Variable			
Country	Income Elasticity	Staple Price	Mother's Education	Household Size
The Gambia	0.37–0.48	—	NI	—
Guatemala	0.31	—	NI	+
Kenya	0.17	NI	0	+
Philippines	0.11	0	0	—
Rwanda	0.47	—	NI	—

NOTES: A minus (−) indicates that variable was negative and statistically significant; a plus (+) indicates that variable was positive and statistically significant; a zero indicates that the variable was not statistically significant; and NI indicates that variable was not included in regression estimations. Calorie intake is the dependent variable for Kenya and the Philippines; calorie availability is the dependent variable for The Gambia, Guatemala, and Rwanda. Income elasticities are evaluated at the mean of the data.

retail market. For example, Philippine farmers who grew and consumed their own corn saved a premium of 25 percent on the retail price by avoiding marketing costs. Or, food prices may rise locally if a region shifts from being a net exporter to a net importer (the rise may be even higher if government policy constrained interregional trade of food), which would offset the income gains from commercialization.

Did participation in commercialization schemes significantly affect dependency on market purchases of food? Data from six case studies suggest that, in general, there was not a significant change in sources of food acquisition (table 4.5). At one end of the spectrum, Guatemalan farmers, whether engaged in commercial agriculture or not, were almost totally dependent on market purchases of food. At the other end, the

TABLE 4.5 Sources of food acquisition (in value terms)

	Own-Farm Production		Purchases	
Country	Participants	Nonparticipants	Participants	Nonparticipants
		(percent)		
The Gambia	51	55	49	48
Guatemala	17	14	83	86
Kenya	58	60	42	40
Malawi	55	50	45	50
Philippines	35	48	65	52
Rwanda	62	61	38	39

SOURCE: Data sets of respective case studies.

more commercialized farmers in the four African countries continued to produce more than half of their food (in value terms) on their own farms. In Malawi, tobacco farmers actually depended less on market purchases of food than did farmers who did not grow tobacco; tobacco farmers had larger farms and, thus, were not as dependent on off-farm employment. Hybrid-maize growers in Zambia relied much less on purchased maize meal than households that did not grow hybrid maize (table 4.1).

Households/Individuals Below Calorie Requirements

In general, the calorie consumption of households in the lowest expenditure tercile is deficient, while that of households in the highest tercile is either well above recommended allowances or approaching recommended levels (table 4.6). Where food expenditure survey information was used to compute household calories, increases in income appear to have a strong influence on nutrient consumption. The 24-hour recall data indicate that the influence of income is still positive, but the magnitude of the effect appears to be much smaller. This dichotomy in patterns is reflected in the substantial differences in the calorie-income elasticities cited earlier, which were generated using the various methods for collecting calorie consumption information and total expenditures.

Average adequacy ratios give only a partial indication of the variance in calorie consumption within the survey populations. It is also important to know what proportion of households or individuals fall

TABLE 4.6 Household-level calorie adequacy ratios, by total expenditure tercile

| Country | Calorie Adequacy Ratio | | | |
| | Total Expenditure Tercile | | | |
	Bottom	Middle	Top	Average
The Gambia[a,b]	0.88	1.07	1.25	1.08
Guatemala[a,c]	0.85	1.08	1.22	1.05
Kenya[d,e]	0.80	0.95	1.04	0.92
Preschoolers	0.58	0.56	0.62	0.58
Philippines[e,f]	0.83	0.92	0.97	0.91
Preschoolers	0.71	0.74	0.81	0.75
Rwanda[a,f]	0.72	0.91	1.16	0.93

SOURCE: Data sets of respective case studies.
[a]Recommended intake = 2,800 calories.
[b]Based on food consumption surveys (7-day recalls).
[c]Based on food acquisition survey.
[d]Recommended intake = 2,850 calories.
[e]Based on calorie intake surveys (24-hour recalls).
[f]Recommended intake = 2,580 calories.

below a threshold of calorie requirements, say, 80 percent. A group average that is above the recommended daily allowance (RDA) may mask a substantial number of households that are consuming below the RDA, while, conversely, some low-income households associated with a low group average may be consuming well above the average. In addition, there may be substantial variance across seasons and across individuals within households. For example, in The Gambia, there is considerable seasonal variation in the percentage of households that fall below 80 percent or 60 percent of their caloric requirements. Nevertheless, the decline in the percentage of households that are consuming less than 80 percent of caloric requirements across expenditure groups is much more precipitous than the increase in average calorie-adequacy ratios.

Even if calorie-adequacy levels are above the RDA at the household level, this does not necessarily mean that all household members are consuming their recommended intakes, because calories may not be equally distributed among family members. Data from Kenya and the Philippines show that even though household calorie-adequacy ratios are close to 1 for the highest income terciles, calorie-adequacy ratios for preschoolers are well below 1. The apparent inequitable distribution of calories among household members, however, requires a closer look at recommended calorie intakes vis-à-vis actual requirements due to energy expenditures (activity patterns) and reduced weights and heights as a result of long-run malnutrition. Regression estimations, with preschooler calorie intake as the dependent variable, indicate, for both Kenya and the Philippines, that marginal increases in household calorie intakes are shared equitably with preschoolers. For the Philippines, calorie intake is negatively associated with morbidity, while for Kenya it is positively associated with the number of meals per day that the preschooler is fed.

Conclusion

Preferences for nonfood items and higher-priced calories at the margin as incomes increase result in calorie consumption at the household level increasing much more slowly than income. As incomes increase, food purchases at the margin are directed toward more expensive sources of calories, which may improve the quality of the diet and increase the intake of micronutrients. Calorie intake data from 24-hour recall surveys for Kenya and the Philippines indicate that household-level calorie adequacy does not translate into adequate calorie intakes for preschoolers, although calorie adequacy figures obviously are sensitive to the RDA used to assess adequacy.

In general, commercialization has increased incomes, which, in turn, has led to higher calorie intakes. There is little evidence that

commercialization per se has altered behavior patterns in a manner that is detrimental to nutrition. Any negative tendencies to spend less for food, because of loss of income control by women or because of increased involvement in market (cash) transactions, are generally small and are more than compensated for by increased incomes due to commercialization. Greater dependence on the market for food purchases has not led to noticeably higher food costs per calorie consumed, nor has this market dependency resulted in a decline in household food security. However, there appears to be much scope for improvement in terms of redirecting expenditure behavior and intrahousehold allocational decisions toward placing more emphasis on improved nutritional outcomes.