3 Production, Employment, and Income Effects of Commercialization of Agriculture

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The Policy Issues

The three chapters in Part III report synthesis findings from the microlevel IFPRI research in The Gambia, Guatemala, Kenya, the Philippines, and Rwanda, as well as from the other case studies presented in Part V. Any attempt to synthesize and generalize on the basis of the detailed case studies runs the risk of excessively extrapolating from special circumstances and of losing insights gained from these case studies, whose strengths are the detailed assessments of the commercialization-production-income-consumption-nutrition chain and the important feedbacks from these elements. This chapter, on the first elements of the commercialization chain, is therefore to be seen in the context of the following two chapters, and all the three synthesis chapters together are to be seen in the context of the rich insights from the individual studies discussed later. Furthermore, the microlevel experiences are also to be seen in an economy-wide context that is addressed in Part IV.

Many of the theoretically possible problems of commercialization for household-level food security and nutrition derive from "if statements," such as: if food crops are replaced by nonfood cash crops in the production program, and, if markets are not well integrated, and, if landless farm laborers are replaced by less labor-intensive production, then the resulting employment and price effects may have adverse impacts on the food security of this population group. Or, if more gross sales of food crops are induced by improved market access, and, if the resulting cash returns are controlled by male heads of households, and, if their propensities to consume are inclined toward nonfoods, and, if women lack income-generating alternatives, and, if these households were close to food insecurity to begin with, then the changes induced by the increased commercialization may have negative impacts on household food security (or on selected subgroups in the households). Empirical analysis is required to address at least the more relevant *if*s.

Following the subsets of the conceptual framework laid out in chapter 2, this chapter addresses the production, income, and employment effects of commercialization, and their food security implications. It specifically focuses on the following policy questions relating to increased commercialization:

1. To what extent are resources for market production drawn from subsistence food production under different real-world circumstances?
2. Is there a major reduction in subsistence food availability at the household level?
3. Is there a reduction in the real incomes of the poor (or of selected subgroups of the poor) temporarily or over the long term?
4. Is there an increase in seasonal or irregular fluctuations in food availability, prices, and income?
5. Is there a reduction in labor demand for landless laborers?
6. Is there a change, in disfavor of the poor, in access to land?

Obviously, the answers to these questions as well as the resulting policy implications are quite determined by the nature of the commercialization process and by the economic, sociocultural, and structural characteristics of the affected area. Moreover, commercialization effects at the household level cannot be comprehensively assessed in a vacuum of time and space: the historical context matters.

Generalizations from this comparative look at specific cases must, therefore, be fairly broad and need to be reassessed in the context of the specific comprehensive case studies. This chapter and the following two comparative chapters capture, only to a small extent, the rich policy-relevant findings from the case studies that prove that commercialization-production-income-consumption-nutrition linkages are often quite location and program-design specific. Table 3.1 gives an overview of the case study settings and synthesizes, in broad terms, findings regarding production, employment, and income effects of commercialization.

Research Design and Survey Protocol

The survey protocols used for the various studies, although similar, were not identical. The survey design and data collection protocols were guided by the conceptualization outlined in figure 2.1. Since a synthesis of results from the various IFPRI studies was envisioned from their inception, the studies were designed so that certain key pieces of information would be available from the individual surveys. This information included household income by source, household expenditure patterns, household energy consumption and/or preschooler caloric consumption,

TABLE 3.1 Overview for case study settings of commercialization features and production, employment, and income effects

Country	Commercialization Scheme	Main Subsistence Crops/Commercial Crops	Did Subsistence Food Production Decline?	Did Employment Increase?	Did Income Increase?
Guatemala	Export vegetable-producing cooperative of Cuatro Pinos	Maize, beans/snow peas, cauliflower	No, despite decline in area cultivated, higher yields meant greater per capita maize production.	Yes, overall increase of 21 percent in agricultural employment. Labor input up by 45 percent on commercial farms.	Yes, substantially, especially among recent participants and smallest farmers. Farm incomes up more than enough to offset reduced off-farm incomes.
Philippines	Bukidnon Sugar Company	Maize/sugarcane	Yes, substantially, by about 50 percent compared to nonparticipants.	Not much, about 10 percent. Labor input on corn and sugar farms similar; but use of hired labor on sugar farms doubled and, of family labor, women's employment fell sharply.	Yes, substantially, except for laborers.
Papua New Guinea	Karimui Spice Company cardamom plantation	Root crops, sago, bananas/cardamom	Perhaps, wage households produced considerably less food than nonwage households.	Yes, when KSC was set up, but as it declined, most laborers were laid off.	No; in fact, wage rates of male laborers were reduced. Total income similar in wage and nonwage households.

continued

TABLE 3.1 Overview for case study settings of commercialization features and production, employment, and income effects (Continued)

Country	Commercialization Scheme	Main Subsistence Crops/Commercial Crops	Did Subsistence Food Production Decline?	Did Employment Increase?	Did Income Increase?
India	Karnataka Dairy Development Project	Milk	Information not available.	Information not available.	Yes, to some extent. Average expenditures up by 8 percent in villages with dairy co-ops.
Kenya	South Nyanza Sugar Company	Maize/sugarcane	No. Participants devoted as much land to food crops as sugar farmers. New entrants even increased subsistence income.	Information not available.	Yes, significantly, for both new entrants and sugar farmers.
Kenya	Two rice schemes: Ahero Irrigation Scheme and West Kano Irrigation Scheme	Maize, sorghum/rice, sugarcane	Yes, for those tenants who reside at the schemes, but not for nonresident tenants who have access to much more land.	Information not available.	Yes, for individual rice growers and nonresident tenants, but not for nonrice growers and residents. Controlling for household size, there were barely any differences among the four groups.
Rwanda	Potato production in the Gishwati forest area	Peas, beans, sweet potatoes, maize, sorghum/potatoes, tea	No, no change in crop composition as modern potato production exclusively	Yes, significantly. Sixty-four man-days of wage labor hired per hectare per season	Yes, to some extent. But income control within the household affected as men's greater

			on the Gishwati land. The increased potato production raised food availability.	to help in potato production.	participation in potato production leads to their greater control over that output.
Zambia	Technological change in maize	Maize, sorghum, finger millet/hybrid maize	Information not available. Note, though, that only those farmers who could expand cultivated area beyond subsistence food requirements adopted hybrid maize.	Yes, household labor input up by 46 percent in high-adopting areas, for both males and females.	Yes, significantly. Per capita income about 25 percent higher in adopting households.
Malawi	Commercialization of maize and tobacco	Maize, legumes/maize, tobacco	No, strong desire to produce as much maize as possible for food-security reasons. On average, tobacco did not displace maize.	Information not available.	Yes, but with wide variations. Income of tobacco specialists much higher but that of small tobacco households slightly less than of nontobacco households.
Sierra Leone	Bo-Pujehun Rural Development Project-Tree Crop Promotion	Upland rice, vegetables, roots/coffee, cocoa, oil palm	Not clear, less food crop area is cultivated but land productivity is much higher, which may offset the area substitution effects.	Information not available.	No, in fact, it was about 12 percent lower among new adopters, and about the same for established plantation farmers and subsistence farmers.
The Gambia	Jahally-Pacharr Smallholder Rice Project	Millet, sorghum, rice/rice under modern irrigation, groundnuts	No, new rice technology increased rice yields substantially.	Yes, a 56 percent increase.	Yes, for households as a whole, but women generally benefited less than men.

NOTE: For details, see chapters in Part V.

weaning and child-feeding patterns, and preschooler morbidity and nutritional status. The other case studies contained in this volume were also guided, in large part, by the conceptualization outlined in figure 2.1.

A variety of techniques were used to collect data from the community, household, and individual levels, with the approaches tailored to the context. In each study site attention was given to choosing a representative sample of participant and nonparticipant households and applying the same survey methods to the two groups. Thus, appropriate comparisons could be made between participant and nonparticipant households, using the same survey techniques. The question of determinants of participation is addressed at the level of the case studies (Part V), as local circumstances play an important role.

Characteristics of the Study Areas

The nature and source of agricultural commercialization differ among the study settings. For example, in Guatemala, the introduction of export vegetable crops spurred commercial production. In The Gambia, fully water-controlled double-crop rice production provided a new income-earning opportunity. In Rwanda, potato and, to a lesser extent, tea production led to increased commercialization. In both Kenya and the Philippines, sugarcane production was the source of agricultural commercialization; both regions are similar in that they were primarily engaged in maize production before the construction of sugar mills permitted extensive sugarcane production.

In most of the study settings, commercialization of agriculture occurs jointly on the output and input sides of agricultural production (see definitions in chapter 2). An aggregate measure of "commercialization of the farm household" would be the ratio of net-marketed surplus over income. The emphases, however, vary in the different study settings. While commercialization occurs more in terms of sales over total production value, that is, on the output side, in the Philippine and Kenya sugarcane cases, commercialization on the input side is particularly pronounced in the Gambian case of double-cropped rice. On the other hand, the overall degree of commercialization of the rural economy is particularly far advanced in the Guatemalan setting because of much off-farm employment. That is also the case in Rwanda, but here in-kind transactions are still considerable, and thus the degree of integration into the cash economy is lower, although the overall degree of commercialization of the rural economy is substantial due to off-farm employment.

This chapter carries the comparative analysis along the lines of the conceptual framework, tracing the commercialization effects up to in-

come and employment, from where the effects on consumption, health, and nutrition are picked up by chapters 4 and 5. The relationships between income and nutritional improvement are certainly complex. Although we later actually disentangle these complexities, there may be a risk of losing the broad perspective. Therefore, before studying the processes and interactions outlined in the conceptual framework, an aggregate analysis of commercialization-nutrition links is presented first.

The Aggregate Commercialization-Nutrition Relationship

Increased household income theoretically permits households to respond in a number of ways that may favor nutritional improvement: more food may be acquired; workloads may be reduced and, thereby, child care improved; household sanitation and housing environments may be enhanced and, thereby, exposure to infectious diseases reduced; water availability, both quantity and quality, may be improved; and effective demand for health care, both preventive and curative, may be strengthened. Furthermore, when household resources are less constrained, the ability of households to respond to existing or new knowledge for nutritional improvement may be increased.

For an income-based aggregate model to explain nutritional status, all other potentially income-related determinants of nutritional status, such as food consumption, diet composition, health and sanitation, and so forth, are excluded, since we hypothesize that these determinants may also be driven, at least partially, by household income. The model, therefore, includes only income, income composition-related variables, and child demographic variables (age, sex, birth order, and, where applicable, duration of breast-feeding of the child). The reduced form model is thus:

$$\text{Nutritional status of child} = f(\text{Per Capita Income, Per Capita Income squared, Income Share from Cash Crops, Child Demographics}).$$

The results of this analysis for six of the study environments, taking weight-for-age Z-score values for children as the dependent variable, are presented in table 3.2. In all study areas, except Kenya, a positive and significant effect of increased income on nutritional improvement is identified. The income effect on nutritional improvement is decreasing at the margin, which is captured by the negative parameter for the income-squared variable in the model, and is significant in all cases except Kenya (chapter 16) and Papua New Guinea (chapter 14).

In none of the study areas is there a significant negative effect of an increased share of cash crop income on children's nutrition. A separate

TABLE 3.2 Regression analysis of effects of income on nutrition of children for six study areas undergoing commercialization

	Guatemala		The Gambia		The Philippines	
Explanatory Variable	Parameter	*t*-Value	Parameter	*t*-Value	Parameter	*t*-Value
Income[a]	8.231E-04	3.20	0.0749	2.91	5.853E-03	5.76
Income squared[a]	−3.930E-07	−2.74	−1.487E-05	−2.00	−1.391E-05	−3.87
Income share from cash crops	0.1569	1.88	0.267	1.62	0.0214	0.20
Male off-farm income share	0.1613	2.00	−0.4649	−2.59	—	—
Female income share	0.4953	2.20	−0.5762	−0.99	—	—
Age (months)	−3.489E-03	−0.85	2.3634	6.16	8.1101E-03	1.33
Age squared	3.497E-05	1.14	−0.01151	−3.57	−3.355E-05	−0.40
Sex (1 = male, 2 = female)[b]	7.083E-03	0.12	8.8169	1.57	−0.3938[b]	−11.55
Birth order	1.706E-04	0.01	—	—	3.241E-03	0.40
Breast-feeding (months)	9.663E-05	2.03	—	—	5.421E-03	2.45
Constant	−2.1165		−282.409		−1.8614	
$\bar{R}^2$	0.032		0.111		0.086	
F-value	3.59		20.23		25.26	
Degrees of freedom	785		1,227		2,065	

Explanatory Variable	Kenya		Malawi		Rwanda	
	Parameter	*t*-Value	Parameter	*t*-Value	Parameter	*t*-Value
Income[a]	8.224E-05	0.67	9.03-03	3.85	4.9602E-05	2.13
Income squared[a]	−1.357E-08	−0.75	−1.63-05	−2.78	−1.539E-09	−2.16
Income share from cash crops	9.741E-03	2.63	−0.211	−0.58	0.4573	1.42
Male off-farm income share	—	—	−0.115	−0.59	—	—
Female income share	—	—	0.283	1.39	−0.3439	−1.67
Age (months)	0.01185	1.56	8.27-04	0.09	−0.0116	−1.20
Age squared	−1.0184E-04	−1.08	4.41-05	0.43	1.0994E-04	1.18
Sex (1 = male, 2 = female)[b]	0.08643	1.22	2.98	2.92	0.2464	3.43
Birth order	7.6203E-03	0.53	—	—	−0.0452	−2.16
Breast-feeding (months)	—	—	—	—	0.0165	3.68
Constant	−1.6025		−2.27		−1.1940	
$\bar{R}^2$	0.009		0.089		0.054	
F-value	2.15		4.47		5.249	
Degrees of freedom	941		374		662	

NOTE: Dependent variable is weight-for-age Z-score values of children. The age range of child population covered differs in the study settings: Guatemala, 6–120 months; The Gambia, 6–120 months; Philippines, 6–60 months; Kenya, 7–80 months; Rwanda, 6–72 months. Dependent variable in The Gambia is the Z-score value multiplied by 100.

[a]Annual total expenditure per capita (in national currencies) is used as an income proxy.

[b]In the Philippine and Kenya surveys, male = 1, female = 0.

exercise on Sierra Leone (chapter 21), however, found a significant negative effect on children's nutrition of a higher income share from cash crops, controlling for income level. This would perhaps be explained by the source of the cash crop income, which is tree crops that for the first five to seven years do not yield a cash return and hence cause a net income loss. In three of the study areas—The Gambia, the Philippines, and Rwanda—the effect of cash crop share is positive but statistically not significant. In Guatemala, and even more so in Kenya, a positive significant effect results from an increased share in total income from cash crops on children's weight-for-age. In the Guatemala study setting, this cash crop income share variable may be capturing some of the social programs associated with commercialization in the export vegetable cooperative described in chapter 12. The positive effect in Kenya, in the context of commercialization, remains somewhat puzzling. It may be that households with more entrepreneurial attitudes who may use household resources more efficiently, including for child welfare, joined the sugarcane outgrowers' scheme. In another commercialization project in West Kenya, this time, rice (chapter 17), the composition of income appeared to be much more important than the level of income for determining household nutrition—nutritional indicators generally improved when incomes were more diversified. An important point of this analysis is that there is generally no evidence for an adverse effect on child nutrition from increased commercialization, even when income is held constant.

In table 3.3, parameter estimates are used to evaluate the effect of a

TABLE 3.3 Effect on children's nutritional status (weight-for-age) of a 10 percent increase in income of the poor (at US$100 per capita)

	Effect of a 10-Percent Increase in Income	
Country	Level of Z-Score	Percentage Change of Z-Score
Guatemala	+0.019	+1.06
Philippines	+0.017	+1.13
Kenya	n.s.	n.s.
Rwanda	+0.015	+2.46
Malawi	+0.068	+4.90
The Gambia	+0.023	+1.92

SOURCE: Derived from table 3.2.
NOTE: n.s. = not statistically significant.
[a]Holding income constant.

10 percent increase in income on children's nutrition, measured in terms of weight-for-age, at a uniform income of US$100 per capita (thus moving households from $100 to $110) in some study settings. The elasticity of nutritional improvement with respect to income ranges between 0.1 and 0.49, which translates to between 1.0 and 4.9 percent for a 10.0 percent increase in income. It is highest in Malawi and Rwanda, followed by The Gambia, and is substantially lower in Guatemala and the Philippines. The level of these elasticities suggests that major increases are required in the income levels of rural poor households to actually have a major nutritional improvement effect. Also, the long-term effect of increased income for nutrition is likely to be higher.

Commercialization of Agriculture and Staple Food Production

The nature and extent of competition versus complementarity between substance crops for own consumption and crops for sale in the market are central elements of the forces that drive the food security effects of commercialization. The discussion that follows centers on the reallocation of land and labor resources that occurs with commercialization, as well as the profitability and productivity of the commercialized crops as compared with the subsistence food crops.

Commercialization of agriculture, as noted earlier, takes a variety of forms. Therefore, any classification of households and farms into commercialized or noncommercialized has its shortcomings. Households are therefore separated in each study setting (within farm-size classes) into two groups, according to their participation or nonparticipation (or very little participation) in the commercialization scheme. A broad grouping of this nature does not, of course, satisfactorily capture indirect participation in commercialization schemes—for instance, through labor market effects. We therefore augment the presentation of results in various parts of the analysis beyond the participant/nonparticipant categories. The detailed case studies in Part V look at production relationships in a more disaggregated way.

Commercialization and Changes in Production Patterns

PARTICIPATION OF THE SMALLEST FARMS. A pertinent question is, "Did the small farmers effectively get equal access to commercialization schemes?"[1] Sampling was basically done randomly among participant and nonparticipant households in and around the respective schemes,

1. It should be noted, however, that the overlap of "small farms" with "poor farm families" is rather bad (Lipton 1989), and therefore the above question addresses only a segment of the poverty-commercialization relationship.

which permitted an assessment of the relationship between scheme participation and farm size. While the smallest farms in each study setting do participate in the commercialization schemes, it is only in The Gambia that their representation is more than proportional (table 3.4). In the other four settings, particularly the Philippines, the smallest farms participate disproportionately less (proportional participation would mean a 33.3 percent figure in column 3, table 3.4).

While there is an element of choice in adopting new crops or technologies in the scheme, it is noteworthy that scheme participation in all study settings is not just a matter of choice by farm households. There are cases in which farmers, one way or another, were provided rationed access for cash crops: a major attempt at providing women and poor people access to land in the rice scheme was made in the Gambian case, and access to the new potato-growing area in Rwanda was a matter of bureaucratic procedure apparently not resulting in equal access.

STAPLE FOOD PRODUCTION BY COMMERCIALIZED FARMS. With the exception of Guatemala, the average-size farms in the respective survey areas (using location-specific mean values) are self-sufficient in staple food supplies if a rule-of-thumb figure of 170 kilograms of cereal equivalents per capita per annum is applied. In the case of Rwanda, this is, however, only barely met, and only for the average, leaving many below this level.

Participants in commercialization schemes maintained a considerable part of their area allotment for staple food production (that is, of subsistence crops) (table 3.5). Comparisons are made for the middle tercile of farm size in each of these study areas in an effort to control for differences in the respective distributions. Scheme participants in the Philippines and Guatemala allocated the highest proportion of their crop area to new cash crops or crops using new technology, 52 percent and 44 percent, respectively, whereas participants in The Gambia allocated the lowest production to these crops.

TABLE 3.4 Average farm size and food production in study areas

Country	Average Farm Size (hectares)	Staple Food Production (kilogram/capita cereal equivalents)	Share of Participants in Commercialization Schemes Among Bottom Farm-Size Tercile[a] (percent)
Guatemala	0.8	110	19.4
Philippines	4.3	324	15.7
Kenya	4.5	233	22.3
Rwanda	0.7	172	29.0
The Gambia	3.9	344	41.3

[a]33.3 percent would be equal participation.

TABLE 3.5 Change in cropping pattern with adoption of new cash crops and crops under new crop technology (averages for the middle tercile farm-size groups)

Country	Degree of Participation in Schemes	Area with New Cash Crops or Crops Under New Technology in Schemes	Area with Staple Food Crops (Subsistence Crops) (percent of) total farm area)	Area with Other Crops (Including Fallow, Traditional Cash Crops)
Guatemala	Participating	43.9	48.2	7.9
	Not participating	0.0	88.4	11.6
Philippines	Participating	52.0	32.4	15.6
	Not participating	0.0	66.1	33.9
Kenya	Participating	37.6	49.7	12.7
	Not participating	2.6	45.3	52.1
Rwanda	Participating	17.0	75.9	7.1
	Not participating	1.9	85.4	12.7
The Gambia	Much participation	14.3	55.0	30.7
	Little participation	2.5	58.2	39.3

NOTE: The middle farm-size tercile of each sample was chosen to exclude farm-size effects.

The difference between participants and nonparticipants in crop area allocated to subsistence crops is large in the Philippines and Guatemala; nonparticipants in these study settings did not allocate any land to cash crops. A large difference is also observed in Sierra Leone, where farmers who have adopted tree crops have an area under food crops that is just half the area cultivated by subsistence farmers; this is surprising, considering the long gestation period for tree crops before they yield cash returns. In Kenya, however, participants in the sugar scheme use an even higher share of their land to grow subsistence crops (mainly maize) than do nonparticipants: sugarcane cultivation has cut mainly into fallow land held by participants (table 3.5, col. 3). The long-term implications of this practice on soil fertility, unless mitigated by fertilizer use and erosion control, may be of concern.

While it was observed earlier that the smaller farms were less represented among the scheme participants (table 3.4), it is also true that the smallest farmers who actually did join the schemes allocated a larger share of their land resources to scheme participation than did the larger farmers in the participant group. An interesting adoption pattern is observed: the smallest farm-size terciles in each of the schemes' partici-

pant groups, except Guatemala, adopted the new crop the most, that is, they converted the largest proportion of their land to the new crops (table 3.6). In Guatemala, a rather equal distribution across farm-size terciles is found.

A key question is how implementation of the commercialization schemes and participation in these schemes affected staple food production. Despite the reallocation of land to the new cash crops, which was substantial in some cases, staple food production per capita is maintained or even increased. The exception again is in Sierra Leone, where tree crop farmers reduced the area under food crops. This high level of staple food production is not surprising in the Gambian or Rwandan cases, since the commercialization projects focus on rice and potatoes, respectively. The Guatemalan case is, however, surprising: the difference in staple food production between the participant and nonparticipant groups is small, despite the large reallocation of land to the new cash crops by participants (table 3.7). The drop in staple food production by participants in the Philippine study case is substantial, about 50 percent compared with the nonparticipant group. Note that the gross marketed surplus of staples by the Philippine farmers is largest in this comparison across study sites, showing them to be the most market-integrated farmers in staple foods. We thus have here a case of shifting from production of maize for the market and home consumption to production or sugarcane for the market, and not simply a shift from "subsistence" to "cash cropping."

The expansion of food crop area (where fallow land is available) or increases in yields of staple foods (where technology is available) permits either a generally high level of staple food production to be maintained or a less than expected decline in that production. Yield increases were particularly important in Guatemala, where participants' yields increased by 34 percent, and in the Philippines, where there was a 28 percent increase in yields (table 3.8). The lack of such a tendency in

TABLE 3.6 Degree of participation of scheme participants in commercialization schemes by farm-size terciles

	Percent of Land Use for Selected Commercialization Crops		
Country	Bottom Tercile	Middle Tercile	Top Tercile
Guatemala	38.0	43.9	38.5
Philippines	68.1	52.0	53.8
Kenya	45.3	37.6	18.8
Rwanda	30.8	17.0	22.5
The Gambia	31.8	14.3	9.7

TABLE 3.7 Staple food production per capita with new cash crops and crops under new crop technology (averages for the middle tercile farm-size groups)

Country	Staple Food Production	
	Participants	Nonparticipants
	(kilogram/capita)	
Guatemala	87	108
Philippines	193	306
Kenya	238	225
Rwanda	153	132
The Gambia	469	179

NOTE: The middle farm-size tercile of each sample was chosen to exclude farm-size effects.

Rwanda is disturbing and may be attributed to the absence of a yield-increasing technology in cereals, which stimulates farmers who are under land pressure to seek increased calorie output per unit of land by shifting toward roots and tubers, for example, sweet potatoes. The situation appears different in Kenya, where excess land permitted staple food production through area expansion. Yield increases are critical in the land-scarce study settings, and their existence points at opportunities for joint growth in cash crops and staple food production for home consumption.

TABLE 3.8 Yields of major cereal crops of farms participating and not participating in commercialization schemes

Country/Crop	Participation in Commercialization Schemes	
	Much	Little or None
	(tons/hectare)	
Guatemala		
Maize	2.19	1.63
Philippines		
Maize	0.97	0.76
Kenya		
Local maize	1.33	1.31
Hybrid maize	1.33	1.42
Rwanda		
Average maize[a]	1.03	1.06
The Gambia		
Fully water-controlled rice	5.33	1.21
Swamp rice	1.36	1.21
Millet, sorghum	0.38	0.73

[a]In maize (grain) equivalent basis in maize monoculture and maize mixed cropping.

Generally, but not always (Sierra Leone being an exception), farm households, where possible, expanded staple food production *with* cash crop production, at least on a per-unit-of-land basis. This microlevel finding coincides with observations from 78 developing countries (von Braun and Kennedy 1986).

Why do farm households respond the way they do with their food production in the context of commercialization? Where there are no technical or contractual constraints on expanding the production of cash crops and where these crops are more profitable, such a food production response by farmers relates to market risks and production risks, as discussed in chapter 2.

The potential gains from specialization are certainly not fully exploited by the small farmers. Actually, farmers are willing to pay a price to maintain household food security based on own production of food crops. This insurance approach, for instance, cost small farmers in Guatemala 6 cents per kilogram of corn produced on the farm, because of deviation from profit-maximizing resource allocation. Yet this deviation from full specialization makes sense from a social security perspective, when insurance markets are largely absent. Such substitutes for insurance markets can be effectively supported as a second-best policy option by rapid technological change in staple food production: yield-increasing technology, which reduces cost of production per unit of output, brings down the "insurance cost" paid by small farmers for their own food security, permits more rapid adoption of crops with higher payoffs that would be economically desirable and thereby permits enhancement of household food security because of resulting increased income.

Profitability and Productivity

Small farmers tend to allocate their resources efficiently and to respond to incentives, but they are conscious about taking production and price risks into account. This general pattern, however, does not preclude small farmers from making management mistakes, especially when they are in the early stages of adopting new production technologies or new crops, of whose market and price risks they are not yet fully aware. For households operating close to the borderline of food insecurity and hunger, management mistakes can be disastrous. Again, most small farmers seem conscious of this and therefore adopt new crops and technologies only if the margin of increased profitability against that from the old systems and subsistence crops is large and there is insurance against additional risks.

The returns to land and labor are, in general, substantially higher for

TABLE 3.9 Net returns to land and family labor (gross margins) of new cash crops or crops under new technology and of staple foods (subsistence crops), in 1984–85 U.S. dollars

Country	Cash Crops or Crops Under New Technology/ Subsistence Crops	Returns to Land		Returns to Family Labor	
		Cash Crops and Crops Under New Technology (US$/hectare/year)	Subsistence Crops[a]	Cash Crops and Crops Under New Technology (US$/labor-day)	Subsistence Crops
Guatemala	Snow peas/maize	736	52	2.19	1.04
Philippines	Sugarcane/maize	246	124	(3.45)[b]	2.08
Kenya	Sugarcane/maize	181	190	3.53	1.05
Rwanda	Potatoes/maize	226	115	0.36	0.46
The Gambia	Fully water-controlled rice/ swamp rice	593	207	2.46	1.12

[a]The respective subsistence crop returns are adjusted to the multiyear land use situation of sugarcane in the cases of the Philippines and Kenya. (Two maize harvests per year compete with 12 months of sugarcane on the field.)
[b]Returns to total labor are US$3.45. Only 36 percent of labor input in sugarcane is from family labor in the Philippine case, the rest being from hired labor.

the new crops or the crops grown under new technology.[2] The returns to land at least doubled in all cases, except Kenya, and, in some cases, increased severalfold (table 3.9). The most dramatic case was that of export vegetables in Guatemala.

Furthermore, labor productivity in the new crops is substantially higher than in the subsistence crops, in general, except in Rwanda, which should not come as a surprise. In Rwanda's labor-surplus environment, returns per day of work are roughly equal in both the new crops and the traditional subsistence crops.

Government market interventions have a major impact on farm-level profitability of crops in some study settings. For instance, rice producers in The Gambia and sugarcane producers in the Philippines and Kenya are protected by government price and trade policies and benefit from substantial subsidies. Under an agricultural price policy that was oriented more towards long-term international price ratios and their changes, the competitiveness of sugarcane production in the Philippines and in Kenya would be less significant and returns would be more unstable. Similarly, labor productivity in fully water-controlled rice pro-

2. The profitability of crops is expressed here in terms of private returns at farm level.

duction in The Gambia would come close to labor productivity in upland cereal production. Farmers producing commercial crops do not always benefit from government policy actions; for instance, export vegetable production in the Guatemala case was taxed due to exchange rate regulations.

Employment Effects and Women's Work

Commercialization and diversification of agriculture can affect the structure and level of employment. Changes may take place in the use of hired labor versus family labor, the distribution of family labor by gender, and the level of labor input for field operations and for processing.

Increased field-labor demand stimulated employment creation on a particularly large scale in the Guatemalan export vegetable case; employment expanded by 45 percent on participants' farms. Employment expansion was also large in the Gambian case of technological change in rice—56 percent. However, in the case of sugarcane production in the Philippines, employment expanded by only 10 percent. Similarly, the increased processing of crops in rural areas substantially increased employment in the case of export vegetables in Guatemala, but not in the case of sugarcane, whose processing is more capital intensive.

An assessment of the income and employment benefits of commercialization of agriculture is not complete if only the farm household situation is evaluated. The increased income stream for hired labor is an indirect benefit that goes beyond the effects on directly participating farms. In almost all case studies, there was a large expansion in the use of hired labor, which is indicative of a form of commercialization of the rural economy, that of the labor market. In The Gambia, this increase in hired labor use is particularly significant, but it started from a very low base. In the Philippines and Guatemala, the share of hired labor in total labor was already quite high, and there was a large increase from 36 percent to 63 percent in the Philippines, and from 21 percent to 26 percent in Guatemala. Increases in the use of hired labor in these settings create employment for the rural poor.

Not only can labor input patterns in terms of family versus hired labor change in the context of agricultural commercialization, but so can labor input by gender within households (table 3.10). There is great heterogeneity relating to gender-specific crops, work tasks, and seasonal work distribution, not only between study areas but also within them.[3] Changes in cropping patterns and crop technology may affect any of

3. Details on these issues are described in the specific case study reports in Part V.

TABLE 3.10 Change in women's labor use when agriculture is more commercialized

Country	Women's Family Labor in Percent of Total Labor[a]			
	Cash Crops/ Crops Under New Technology		Staple Food (Subsistence Crops)	
Guatemala	Export vegetables	21.5	Maize	6.1
	Traditional vegetables	19.5	Beans	18.0
Philippines	Sugarcane	2.5	Maize	9.1
Kenya	Sugarcane	1.2	Maize	50.5
Rwanda	Potatoes	29.5	Maize intercrop	69.9
			Sorghum intercrop	56.5
			Beans	63.6
The Gambia	Groundnuts	21.9	Millet, sorghum	2.1
	Fully water-controlled rice	31.2	Swamp rice	64.5

[a]The labor share of women's family labor reported refers to the observed mean values in the scheme participant groups in the first column and in the nonparticipant groups in the second column, respectively.

these elements. It was found that, in general, women work less on the more commercialized crops than do men or hired laborers, who are also mostly men. Women generally work much more on subsistence crops than they do on commercialized crops, with the possible exception of women in Guatemala. Thus, at least in terms of direct labor input, the cash crops and cash-intensive new technologies have largely become "men's crops."

It is expected that favorable wage rate effects from increased employment would spread the benefits of the increased labor demand in agriculture across a broad spectrum of the rural economy. While these general equilibrium effects may be substantial, they are not traced here.

Marketed Surplus and Price Risks

It could be hypothesized that while the switch to cash crops leads to an overall increase in commercialization of the farm in terms of aggregate output sold, less of the remaining food crops is sold, both in relative and absolute terms. Contrary to this hypothesis, we find that the proportion of total staple food production that is sold (that is, the gross marketed surplus) tends to be higher among scheme participants than among nonparticipants (table 3.11). Even in farms where per capita production of food declined, the marketed share did not decline. The farms that have joined the commercialization schemes are apparently more integrated into the exchange economy, in general, as sellers and buyers of

TABLE 3.11 Marketed surplus (gross) of staple foods when agriculture becomes more commercialized

Country	Crops	Participants (percent sales out of production)	Nonparticipants
Guatemala	All staple foods	6.1	3.9
Philippines	All staple foods	68.0	70.0
Kenya	Maize	15.0	12.6
Rwanda	All staple foods	14.7	3.7
The Gambia	All cereals	32.1	25.0

NOTE: The middle tercile farm-size groups of each sample are presented here to exclude farm-size effects.

commodities, or they have developed greater market participation in staple foods in the context of scheme participation.

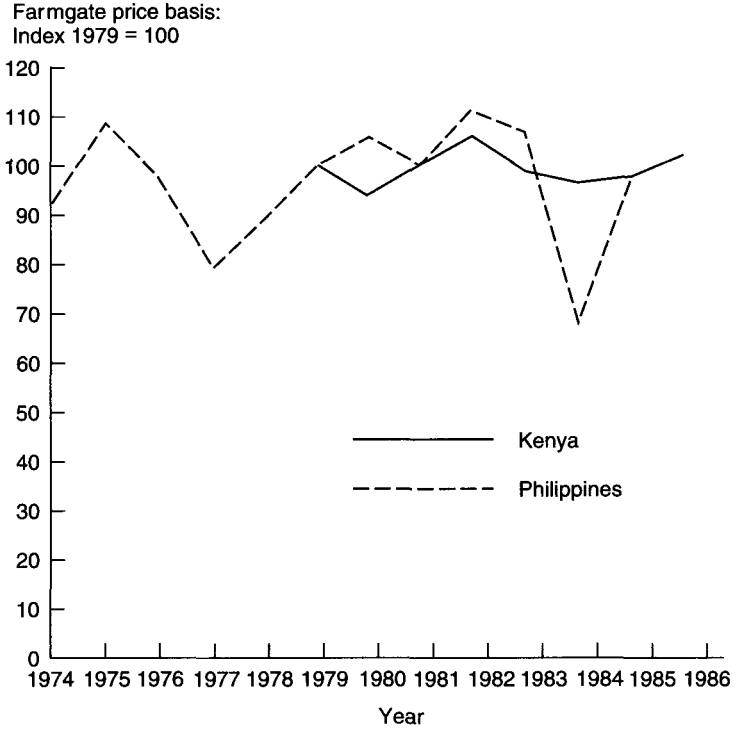
Note that marketed surplus in the two study areas with the smallest farms and highest population densities, Guatemala and Rwanda, is very low—only 4 percent of staple food output was sold by nonparticipants (table 3.11). In these locations, it could be hypothesized that even small changes in marketable surplus affect local food prices a lot. Yet, two very different situations apply here and determine potential price effects of changes in local marketable surplus. In Guatemala, the cereal trade functions rather freely interregionally and, despite various government interferences, the local cereal market is reasonably tied to the international one. In Rwanda, on the other hand, the situation is quite different due to the country's landlocked position and deficiencies in local infrastructure and transportation. Here, price fluctuations, due to local supply variations, can be very large—in 1985, for instance, staple food prices were up to three times higher than in 1986 in the study area. The low and cautious adoption of nonfood cash crops such as tea by smallholders in the study area can partly be explained by this situation.

The technical characteristics of crops impinge on the ability of farm households to respond to changing price ratios in the short run. The characteristics of sugarcane, for instance, give it a much less short-term ability to respond to price changes—even if contractual arrangements would allow it—than do, for instance, potatoes, export vegetables, or rice in the other study environments. Sugarcane, with its potentials for harvesting ratoon crops, represents a semifixed factor situation to a farmer who has switched to it. If, after the switch and investments are made, the terms of trade between sugarcane and a competing crop (say, maize, in the Philippines and Kenya) shifts in favor of the competing crop, then moving out of sugarcane is constrained in the short run. Production will continue as long as variable costs are covered. It is

therefore of interest to look into the evolution of the terms of trade to assess if farmers who opted for sugarcane production got trapped in a disadvantaged situation because of adverse terms of trade developments. Figure 3.1 suggests that this was not the case, in general, in the Kenyan and Philippine situations. In the Philippine case, however, terms of trade were far from stable. Quota regulations and protection-cum-stabilization of the domestic sugar price played an important role in stabilizing favorable returns from sugar for farmers for some time. The sustainability of such a policy in the long run is, however, questionable.

Price risk is a key consideration for farmers who adopt more commercial crop mixes. However, while a careful consideration of price risk is called for in the commercialization schemes, the existence of alternative income risks to small farmers, if they do not choose to reallocate labor and land resources into more commercialized agriculture, should also be taken into account. Frequently it is not a steady in-kind income

FIGURE 3.1 Local terms of trade of sugarcane/maize in the Kenyan and Philippine study areas, 1974–86



stream from subsistence food production, but rather an uncertain and risky income stream from off-farm work, that is the appropriate point of reference for comparing with the risks of cash cropping. In Guatemala, for instance, the main income alternative to export vegetable production is more off-farm work in urban services and the large-scale plantation sector (seasonal work). The income flow from off-farm employment may hardly fluctuate less and may even be riskier than that from export vegetable production.

Households that adopt more commercial agricultural production are pressed to constantly solve new intertemporal cash management problems. Thus, extension services and savings facilities are important in the commercialization programs to facilitate adjustment to new situations, especially in the short run. Moreover, information acquisition, among other dimensions, may be important to farmers' perceptions of risks and their attitudes toward it (Nerlove 1988). Market information for the small farmer may be of critical importance, especially when interregional trade and specialized crops become more of an option for production.

Income Effects and Implications

With few exceptions, commercialization of agriculture in the study settings has directly generated employment or increased agricultural labor productivity or both. The direct beneficiaries are farm households participating in the schemes and, to some extent, hired laborers. The direct income effects, expected to be generally positive, are further complemented by indirect income effects through forward and backward linkages that are generated by the increased demand for goods and services by the direct income beneficiaries as well as by increased demand for inputs for commercialized agriculture.

The wage rate and employment effects from commercialization are not restricted to the schemes; benefits can be spread across regions and far away from the schemes when family labor from participating households is withdrawn from the off-farm labor market or when hired labor migrates into the scheme areas. The more mobile the labor force, the less a wage rate effect is to be expected locally and the more it is spread across the economy. For instance, both effects appear important in the Guatemalan case, where much of the additional hired labor came from other communities outside the export vegetable cooperative and family labor reduced seasonal outmigration to the large-scale farm sector. The second effect, the spread of the wage rate effect across the economy, played a role, for instance, in The Gambia, especially during the drought year of

1984, when the scheme attracted labor even from neighboring countries such as Senegal and Guinea.

Aggregate Income Effects and Multiple Income Sources

Total per capita income in all study cases—holding farm size constant—is higher among participants than nonparticipants, except in Papua New Guinea and Sierra Leone (table 3.1). However, the relative differences are much less than might have been expected, given the large increases in land and agricultural labor productivity noted before. The incrementally employed labor and land had, of course, opportunity costs. The cash crop share in total income among participants ranges between 11 and 35 percent. If total expenditure (including value of home-produced food) is taken as a reliable proxy for income, the participants of commercialization schemes in the five IFPRI case studies (Guatemala, The Gambia, Rwanda, the Philippines, and Kenya) emerge with increases in income of 17 to 25 percent,[4] while returns per day to family labor in the new crops about doubled in most cases (Rwanda being the exception).

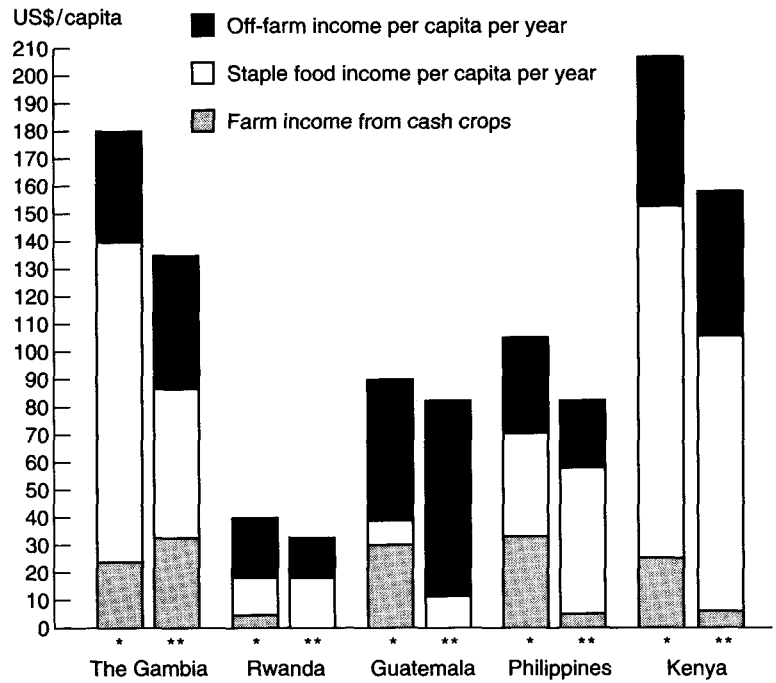
The aggregate income effect is much lower than the agricultural income effect because of the limited share of income from crops in total income and because of substitution between on-farm and off-farm work. The change in agricultural income due to commercialization is much greater than the change in overall income because in all study settings farm households depend on a wide range of multiple income sources, both farm and nonfarm (see figure 3.2). In relative terms, off-farm income is highest in the most land-scarce settings (Guatemala and Rwanda), as should be expected. Staple food income, even among project participants in all settings except Guatemala, remains higher than cash crop income (figure 3.2).

Specific Gainer-Loser Situations

It would probably be idealistic to assume that an agricultural development and growth process that fosters the transition from semisubsistence to commercial agriculture could be designed without any relative losers in the process. However, program and project design has to take the complex gainer-loser patterns into account and consider appropriate ways of short-term compensation and long-term income generation for the potential losers. At the household level, losers certainly include those farmers who are displaced by the introduction of commercialization

4. More refined model analyses than these comparisons of mean values in similar farm-size classes confirm this range of net income gains due to scheme participation.

FIGURE 3.2 Income and income sources of scheme participants and nonparticipants



Note: Only the middle tercile farm-size groups are represented in the figure to exclude farm-size differences.

* Participants
** Nonparticipants

schemes and not fully compensated. Particular attention has to be paid to those households that may lose not only relatively but also absolutely, to the extent that commercialization poses a food security problem and nutritional risk. Frequently the losers are only small groups but, nevertheless, they require attention.

The gainer-loser patterns in each study setting are complex, and the following examples may shed light on the diversity of the pattern.

THE GAMBIA. Pastoralists lost grazing grounds in the area that was taken over by the fully water-controlled rice scheme. Individual women farmers lost rice land, most of which became a communally farmed area for the compound as a whole, under the control of male household heads. Women, in general, lost out to men in terms of production and income.

GUATEMALA. The increased returns to land from export vegetable production may have put upward pressure on land rental values and thereby made more costly the provision of food security for those households that obtain most of their cash income from off-farm sources and want to maintain a certain level of "food insurance" on the basis of own production on rented land.

KENYA. Some households were displaced by the sugar factory. The relocated households own substantially less land than before the creation of the scheme, and even less than that owned by the nonsugar producers. The income per capita of the relocated households is slightly lower than the non-sugar-producing comparison group, but more striking is the significantly lower calorie intake per adult equivalent in the relocated households. Also, the incidence of calorie-deficient households is significantly higher in the relocated group. However, there are no differences, in general, in the average nutritional status of children and the total amount of time ill for children from the two groups.

RWANDA. Households that adopted smallholder tea production experienced returns to tea that were not competitive with crops such as potatoes and cereals. Legal regulations did not permit them to completely abandon the tea fields and convert them back to subsistance crops.

Some farm households were displaced by tea factories. Seventy-two percent of the surveyed displaced households reported smaller farm sizes than before. These households also worked much more for income from off-farm sources. On average, however, the relocated households were not found to consume less food (calories) on an adult-equivalent basis than other sample households. Entitlements to food were maintained, despite the reduced farm resource base, via off-farm employment opportunities.

PHILIPPINES. Fifty percent of the households that were primarily engaged in sugar production were landless. A large proportion of these landless households identified themselves as corn tenants before the establishment of the sugar mill. Some were even former corn landowners. Thus, a substantial number of former corn farmers experienced a decline in tenancy status as a result of the introduction of sugar.

Conclusions

Commercialization of agriculture is a reality in many developing countries and an important part of their development strategies. Frequently, however, countries adopt a mix of policies that combines direct and indirect promotion of cash crops with discrimination against commercialization, the net outcome of which may vary a lot. There is

considerable evidence from several developing countries that export crop producers are heavily taxed, mainly through marketing boards and overvalued exchange rates (see, for example, Bautista 1987; Tshibaka 1986; Oyejide 1986; Krueger, Schiff, and Valdés 1988).

The more specific policy findings from the comparative analyses of the case studies highlight the program-level challenges of a balanced strategy for promotion of agricultural commercialization. They suggest that considerable potentials exist to address the food security problems of the poor with promotion of commercialization of agriculture. The following conclusions relate to program-level issues, acknowledging that appropriate trade policies are a precondition for tapping the long-term benefits from commercialization.

- Smallholder producers make a conscious effort to maintain subsistence food production alongside the new cash crops. They do this despite higher returns to land and labor from the cash crops in the schemes studied. This reliance on food from own production under household control is a response to market, employment, and production risks and can be viewed as an insurance policy by farm households in a risky income environment. Theoretically, this strategy is a second-best option compared to full market integration, since related benefits of specialization are forgone. However, in risky economic environments, maintenance of own food supplies is certainly a sensible strategy. Agricultural policy can effectively support this strategy by promoting technological change in staple (subsistence) foods. This also provides further room for specialization at farm levels and thereby permits capturing of further gains by the economy from commercialization and market integration of smallholders. Rapid technological change in food production that increases yields per unit of land and output per unit of labor must play a parallel role in agricultural and rural commercialization, especially in African settings.
- The smallest farm households participate less than proportionately in the commercialization schemes, but when they participate, they tend to be the more radical adopters of the new cash crops. Scheme design and management can enhance integration of the smallest farms into the schemes, especially where access is rationed.
- The employment effects for the poor that result from commercialization are generally large but are very crop specific and a function of the local labor market and the new technologies introduced. Choice of crop and technology, therefore, has a major implication for the actual outcome of the employment effects. This applies not only to on-field employment creation, as exemplified by the substantial

employment increases in vegetable production in Guatemala and potato production in Rwanda, but also to the processing and trading employment that results from commercialization. The commercialization of agriculture generally entails a substantial expansion of the demand for hired labor. To the extent that hired-labor households rank among the malnourished poor, this employment effect is expected to be of particular benefit.

- Positive income effects of commercialization programs and projects were generally observed for scheme participants, but not necessarily for all households or for all components of the commercialization process. Although substantial, the net income gains were generally much less than the gross income from the new cash crops because of major substitution effects within agricultural production and between agricultural and off-farm employment. The latter was particularly notable in the Guatemalan case: off-farm income earnings were reduced when the labor-intensive export vegetable production drew family labor to the farm fields. In The Gambia, double-cropped irrigated rice production gained to a large extent at the cost of upland crops such as groundnuts and millet.
- In the short run, some households lost income because of the commercialization schemes. This group of losers is rather small and heterogeneous across the study settings. In the Philippines, the rapid expansion of sugarcane production contributed to the creation of a landless class of households that used to be tenants growing corn on rented land before the introduction of the sugarcane. An important contributing factor to the consolidation of landholdings was a long-run decline in corn productivity, which discouraged smallholders, tenants, and landowners from continuing to produce corn, and which resulted in declining incomes of the poor before the introduction of sugarcane. Careful ex ante assessment of possible creation of absolute losers is required. General employment expansion cannot be relied upon to reach out to these groups in the short run.
- It is common for women's work in cash crops and new crop technologies and for women's direct control over income from the new cash crops to be much less than that of men and frequently even to be disproportional to their labor input into these crops.

In none of the commercialization schemes studied did women play a significant role as decision makers and operators of the more commercialized crop production line, not even where typical "women's crops" were promoted (rice in The Gambia) or where the agricultural production environment was largely female dominated (potato with modern inputs in Rwanda). These findings, however, should not be interpreted as if women did not benefit indirectly

from the income and employment gains provided through commercialization and technological change in agriculture. Judging distribution of benefits only from the production and labor side may be misleading. This becomes clear when spending patterns of income in the study settings are reviewed.

In sum, there is not much supportive evidence for a pessimistic position vis-à-vis commercialization of smallholder agriculture, given the production, employment, and income effects found in the large majority of the researched real-world examples. Where adverse effects emerged, these were due largely to policy and program design. The positive aggregate income effects for nutritional improvement were highlighted up front; further insights on process and on cause and effect linkages are addressed in the following two synthesis chapters.