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COMPARATIVE ANALYSES OF THE EFFECTS OF INCREASED COMMERCIALIZATION OF SUBSISTENCE AGRICULTURE ON PRODUCTION, CONSUMPTION, AND NUTRITION

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1. THE POLICY ISSUES AND RESEARCH OBJECTIVES

Integration of traditional smallholder agriculture into the exchange economy is part of a successful development strategy. Specialization and commercialization of the farm production unit is part of the process. The current foreign exchange crisis and debt burdens of many developing countries provide further impetus for greater export orientation of agriculture. Expansion and improved efficiency of the agricultural export sector is a cornerstone of many structural adjustment programs for low-income countries. Many would argue that the process of commercialization, by raising incomes, actually improves a nutritional situation which might have been worse otherwise. Specialization, the development of markets and trade, which characterize commercialization, are fundamental to economic growth.

But how are higher *average* incomes distributed among various economic and social groups as commercialization takes place? Does a higher household income necessarily mean better nutrition for all household members? Could a different approach to agricultural development, one of regional, or village, or household food security, better alleviate the particular problem of malnutrition and still meet the objectives of economic growth and higher incomes?

Because there are so many possible policy variations within the competing paradigms of specialization and self-sufficiency, because economic and social conditions vary so much across countries and

regions, and finally because there are inevitably winners and losers at least in a relative sense in any process of change, it may be impossible to answer such crucial questions in any definitive way. In order to provide guidance for policy formulation in this area, however, what is possible is to study the *process* of commercialization in specific contexts and to identify key factors that lead either to beneficial or detrimental outcomes in terms of nutrition. In designing and implementing future projects and policies, then, our goal would be for policymakers to find ways to enhance the beneficial factors, while minimizing the harmful ones.

Toward this end, IFPRI, in collaboration with other institutions, has conducted microlevel studies in five countries--The Gambia, Guatemala, Kenya, the Philippines, and Rwanda--at carefully selected program or project sites where farm households have recently undergone a change from semisubsistence staple food production with low levels of external inputs to more production of crops for sale in the market and/or production with new inputs and technology. The Harvard Institute for International Development (HIID) conducted a parallel study in Malawi, comparing smallholder tobacco producers with smallholders growing (and selling) food crops only. This monograph reports the findings of a synthesis of the research results for these six case study countries.[1]

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[1] The individual studies are documented in von Braun, Puetz, and Webb (1989) for The Gambia; von Braun, Hotchkiss, and Immink (1989) for Guatemala; Kennedy (1988) and Kennedy and Cogill (1987) for Kenya; Bouis and Haddad (1988) for the Philippines; von Braun, de Haen, and Blanken (1988) for Rwanda; and Peters and Herrera (1989) for Malawi.

While it would be expected that nutrition improves in the economic growth process, there are many possible reasons why the nutrition impact of increased commercialization may be negative or less than expected, at least in phases of early and rapid change of traditional agriculture. While these are discussed in more detail in Chapter 2, two are mentioned here. First, the rural poor and malnourished may not in fact capture a significant share of the economic gains from increased commercialization. Second, apparent economic gains may be partially or totally offset by nutritionally adverse factors, such as increasing local food prices brought about by expanded cash cropping when this comes at the cost of local food production, especially in areas with poor infrastructure, increased availability and lower relative prices of nonfoods, or changes in the income control within the household.

In essence, this research thus deals with problems of structural or temporary market failures, the short- and long-term remedies of which can entail a range of alternative policy instruments. Reported negative nutrition effects may be of a temporary nature, reflecting problems of transition from semisubsistence to more market-integrated agriculture. Unless remedied or avoided, however, such temporary effects may have serious immediate and long-term consequences. The selection of studies for this research was especially directed toward sites that were undergoing a recent process of change and transition to more commercialized agriculture in order to capture potential adjustment problems and identify appropriate corrective measures.

Unintended negative nutrition effects may be avoided and positive effects enhanced either by a more appropriate design of projects and policies or by the introduction of compensatory policy measures. Ideally, nutritional goals would be considered explicitly alongside other goals in the choice and design of future projects and policies and modifications of existing ones. However, this can be effectively done only if more is known about the processes by which expanded commercialization affects food consumption and nutrition and the likely importance of each of the principal process components in a particular situation. Consequently, the objectives of the research reported on here are:

1. To assess the effects of increasing commercialization in semisubsistence agriculture on household real incomes, family food consumption, expenditures for nonfood goods and services, and the nutritional and health status in various settings.

2. To describe the process by which income, consumption, and nutritional status are affected by such a transition, to identify the most important elements of this process, and to estimate how each of these elements is influenced by the transition in various settings.

3. To evaluate alternative options for the design of policies and programs to cope with possible income, consumption, and nutrition problems in the process of transition from semisubsistence to more commercialized agriculture.

PREVIOUS STUDIES

After reviewing the literature on the nutritional status of the commercialization of agriculture (von Braun and Kennedy 1986), two major improvements over previous analyses were incorporated into the research design for the six country case studies.

First, it was clear that the optimal research strategy would consist in surveying semisubsistence households before and at several intervals after the change toward commercialization. The practical considerations of identifying an area which could be surveyed just before the change and the length of time involved in undertaking panel surveys precluded following this optimal strategy. Also, much of the commercialization process in developing countries does not merely result from specific projects, but results from changed infrastructure and market conditions or, more broadly, from the availability of inputs and new technology. An alternative strategy is the cross-sectional comparison of two groups, one that had moved to more commercialized agriculture and another group which had remained in semisubsistence food production. This strategy depends on choosing two groups as similar as possible in terms of resource bases and other factors which might determine the decision to adopt the change. All previous studies had either looked only at the nutritional status of a single cash crop-adopting group without reference to their income, consumption, and nutritional status before adoption, or had compared two groups as suggested above, but living under different economic and social conditions (for a review, see von Braun and Kennedy 1986).

Second, previous studies had looked only at outcomes without looking at the process that had generated those outcomes, without identifying the key factors mentioned above that changes in the production system had wrought to either improve or worsen nutrition ("black-box" approaches). Thus, it was necessary to develop a conceptual framework for looking at the process at the household level (described in Chapter 2), and design data collection for the various components of this framework accordingly.

ORGANIZATION OF THE REPORT

The research findings are organized around three broad topics of concern: the effects of increased commercialization on:

- food production, employment, and income (Chapters 4 and 5);
- food and nonfood expenditure behavior (Chapters 6 and 7); and
- the nutritional and health status of individual household members as outcomes of changes in income, organization of resources, and food and nonfood expenditure behavior (Chapters 8 and 9).

Chapter 2 presents the common conceptual framework used in all six case studies as a basis for determining what data were collected and how these data were analyzed. Chapter 3 provides summaries of the specific study setting in each case study country and the characteristics of and procedures used for selecting respondent households.

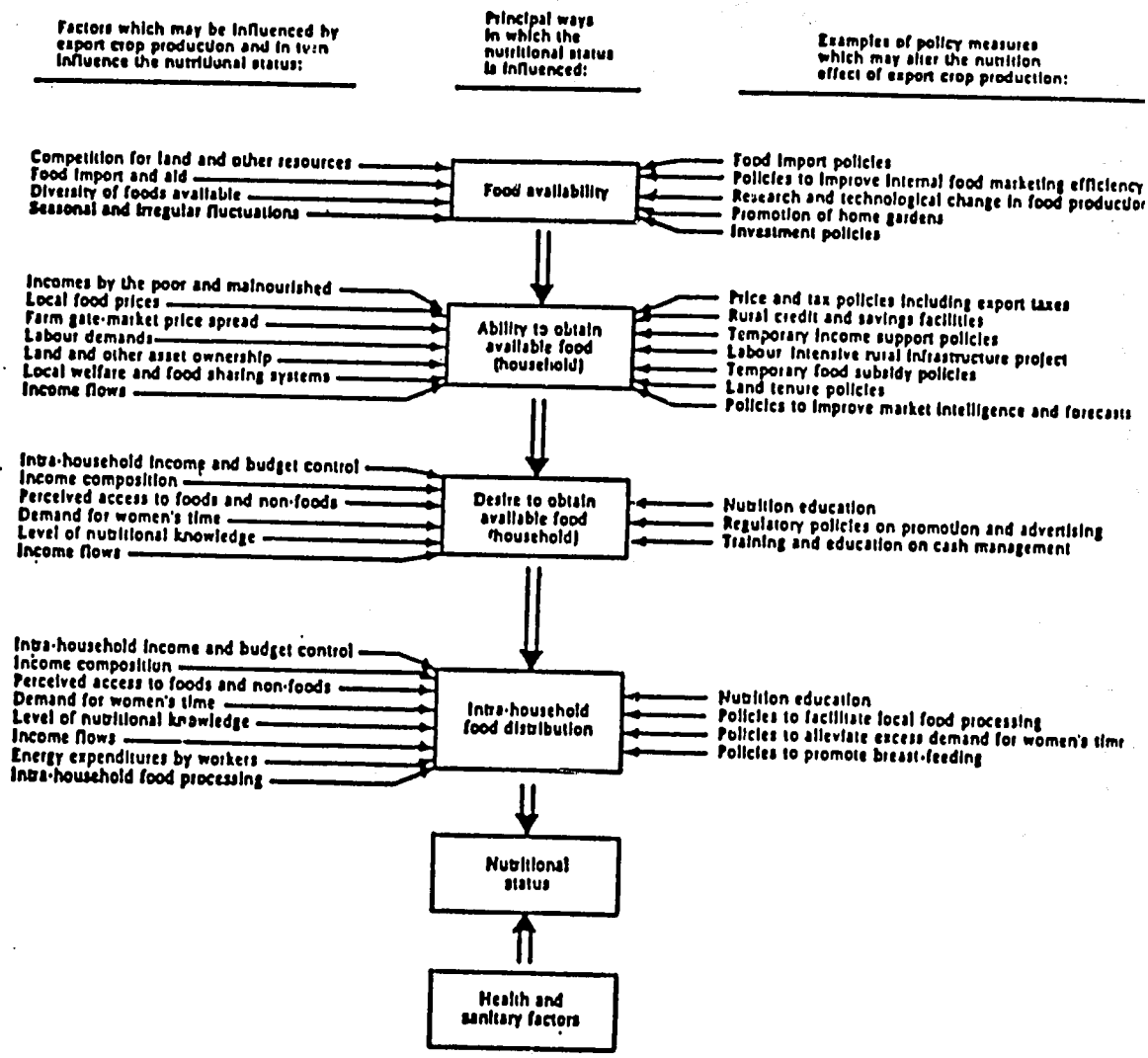
Chapter 10 integrates the analysis of the production, consumption, and nutrition effects of commercialization and draws the final policy conclusions.

2. CONCEPTUAL FRAMEWORK

The nutritional status of an individual is affected by the amount and kinds of food available in the market or on the farm, the ability of the individual's household to obtain the food that is available, the desire of the leading members of the household to obtain food to which they have access, the use of the obtained food by the household and by the individual to meet nutritional needs, and the health status of the individual. The latter two--nutritional status and health status--are tied together in a particularly complex interdependent relationship. Figure 1 lists some of the principal determinants of each of the five previously mentioned factors and some possible programs and policies that influence each of these factors.

Malnutrition may be a result of deficiencies in any one or more of these five factors. Thus, efforts to alleviate malnutrition or avoid its future occurrence should include an analysis to determine which of these five factors is the direct cause of malnutrition. Is it a general shortage of food? Is it lack of access on the part of the malnourished to the available food? Is it a problem of poor use of the food obtained by the household or consumed by the malnourished? Or is it a health problem? The five factors are interrelated. Changes in one may be ineffective unless others are changed simultaneously. Efforts to expand the availability of food will have no

Figure 1--A schematic overview: the relationship between cash cropping and nutritional status



Source: Per Pinstrup-Andersen (1985), The impact of export crop production on human nutrition, in Nutrition and development, ed. Margaret Biswas and Per Pinstrup-Andersen, 56, New York: Oxford University Press.

nutritional effect if the additional food is not made accessible to malnourished people. Similarly, efforts to improve the ability to obtain food may be of little use if its availability is strictly limited or if heads of households having malnourished family members do not desire to take advantage of greater ability to obtain food, but translate this ability into the purchase of nonfood commodities instead.

Before going into a more detailed discussion of Figure 1, it is important to point out that an important set of questions related to the economic effects of commercialization is beyond the scope of our research. Our analysis focuses on those who are directly affected by the commercialization process in particular areas or regions. However, households outside of those areas or regions are likely to be *indirectly* affected by the commercialization process because of linkages between various sectors of the economy. For example, foreign exchange earnings from agricultural exports make possible investments in entirely different regions and sectors of the economy, which can raise the incomes of urban-based households. Any complete evaluation of the income and nutrition effects of the commercialization process would require construction of economy-wide models disaggregated by employment and income groups. Future research needs to shed light on such possible effects.

EFFECTS OF COMMERCIALIZATION ON AGRICULTURAL PRODUCTION AND PRICES

Expanded export crop production is one form of increased commercialization of agriculture, yet its impact on food availability is not

clear cut. Expanded export crop production is likely to influence local food and ultimately household food availability in two ways. First, to the extent that land and other factors of production are shifted from food for local consumption to crops exported out of the region or country, the food supply from local production to the local market will decrease. At the same time, farmers and agricultural workers make more money from export crop production, and part of this additional increase will be spent on food. Thus at the community and farm household level, food supplies will decrease while food demand increases. The result will be an increase in food prices unless an effective marketing system responds by moving more commodities into the community and/or elasticities of supply are high. Rural poor who do not share in the benefits but purchase food in the market will experience negative food consumption effects through food price increases. However, land for cash crops does not necessarily compete with food crops. In a scenario where more land is put into production and/or yield-increasing technological change in staple foods can be phased in jointly with export cropping, local food production need not decline. Available evidence from prior studies on cash cropping are inconclusive on these relationships.[2] The six case studies shed new light on this issue.

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[2] A review of the large body of literature on this and on related issues of commercialization and its effects on production, income, consumption, and nutrition is provided in von Braun and Kennedy (1986) and not reported here.

COMPETITION BETWEEN BASIC STAPLE FOOD CROPS AND CASH CROPS

Cash crops and subsistence crops compete for scarce farm resources--labor, land, water, and capital (including, for example, transportation facilities). Farmers in low-income countries with risky markets select the crop mix that provides for both their own food security and for the maximum return on scarce resources. Crop-specific risks (production and price risks) are important variables that farmers consider in making production decisions. Cash crops and export crops in particular are frequently risky for farmers as they depend on a proper functioning of input supply and output marketing systems.

Lele (1975, 27) illustrates for Africa that labor availability in smallholder agriculture is also closely related to the desire of subsistence producers to ensure domestic food needs and points out that "the food constraint can be attributed to ...: a) the generally high risk and low profitability of food technology, which ties up a substantial amount of labor in food crop production; and b) the fragmented market systems for food crops, which necessitate priority on food production to ensure supply for domestic consumption."

In virtually all developing countries food and nonfood cash crops are important to generate income for even the smallest farmers. But cash crops do not always compete for *all* resources with subsistence crops. They may be grown in a different season or in locations with soils or altitudes inappropriate for subsistence food crops. Thus, cash crops and subsistence crops may be complementary for some resour-

ces, land and labor use, for example, but they may compete with each other for some other scarce resources, such as capital. However, competition in production does not imply that expanding cash cropping necessarily reduces national food availability. If agricultural exports conform to existing comparative advantages, the foreign exchange generated could enable the country to import more food than could have been produced if the resources used had been directed to basic food crops. Foreign exchange generated from export crops could also be spent to improve the productivity of domestically consumed food crops, thus inducing more balanced growth in agriculture.

Much research has been devoted to the supply-side determinants of comparative advantage (production possibilities and terms of trade). Less attention has been paid to the demand-side consequences of making use of comparative advantage (preference structures) and its determinants. This is particularly relevant to the effects of export production on income distribution and nutrition. A key issue at the national level is what is actually done with the foreign exchange generated from agricultural exports? The extent to which foreign exchange, whether generated by agricultural exports or not, is actually used for food imports depends on a number of factors, including food demand, the development strategy, relevant government policies, and the demand for foreign exchange from other sources.

The extent to which scarce foreign exchange is allocated to food imports is a political question, which at least in the short run may not be dictated by economic considerations. The malnourished frequently exercise little political power. As a consequence, the nutri-

tion effects of foreign trade policies may be of little concern to the policymaker. This tends to be particularly pronounced in countries where malnutrition is found primarily in rural areas, because the rural poor generally possess less political power than the urban poor. The effects on nutrition of an adverse political environment should not be interpreted as a negative effect of export crop production per se. Equally, policy decisions can produce positive effects on income that should be distinguished from the effects of export crop production per se. For example, in Kenya, the subsidies to the price for sugar and to labor use effectively provide a higher income for producers than would otherwise be the case. Confusing the causes of the problem is likely to lead to inappropriate and economically inefficient solutions.

The relationships between fiscal policy and cash cropping can induce some peculiar effects, especially when fiscal resources are particularly scarce. There is considerable evidence in several developing countries that export crop producers are heavily taxed, mainly through marketing boards and overvalued exchange rates. When farmers attempt to shift away from export crops under the direction of the incentive structure, governments frequently force them to continue to grow export crops in order to maintain a taxation source. Attempts to enforce cash or export cropping are probably increasing, considering the severity of the fiscal and foreign exchange problems in many developing countries at this time. Area allocation restrictions and

fines for not adhering to them are standard measures of enforcement.[3] On the other hand, the Malawi case is a reverse example, where smallholder access to tobacco production is severely limited by government registration and quotas.

From this general discussion, it is evident that increased cash cropping may have positive, negative, or neutral effects on national food availability. The outcome depends, first, on whether government policies are directed toward improving productivity in the subsistence foods, as well as toward promoting cash crops. Second, it depends on the trade policies of the countries themselves.

INCOME AND FOOD SECURITY EFFECTS OF COMMERCIALIZATION

In societies where farmers are free to make their own production decisions, cash crops/export crops will be introduced, expanded, or maintained only if the crops are seen as profitable by the farmer. Thus, although higher incomes are only one of a set of possible goals, it is unlikely that a farmer would produce a cash crop unless he/she expects it to yield higher economic gains than any other production options available. If expected real income gains materialize, the ability of the farmer to acquire food should be higher under cash crop production. Thus, the effect of cash cropping on nutrition would be expected to be positive.

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[3] In one of the study sites (Rwanda), a case of forced export cropping (tea) is observed and analyzed.

However, the income/food consumption relationship is influenced by more than simply absolute household income. The form of the income (lump sum versus periodic, cash versus other) and control of income within the household are factors which are important in determining income effects for food consumption. Semisubsistence agriculture frequently produces a rather constant flow of income in the form of food and some cash, whereas incomes from cash crops, such as sugarcane, often come in one lump sum payment. In the absence of well-integrated rural financial markets, income in the form of lump sum payments may be used differently than a smaller, more continuous flow of income. Lump sum payments typically are associated with the purchase of consumer durables, whereas continual forms of income are more likely to be spent on food. Part of the explanation as to why lump sum payments are typically used differently from some periodic forms of income may lie in who controls the income within the households.

The concept of a household being one homogeneous decisionmaking unit, maximizing one utility function and pooling income, may be inappropriate in many developing countries. In many cultures, men control cash income and women control food income. This is especially true in parts of Africa where cash crops are often viewed as men's income. For example, Guyer (1980) points out that men and women in West Africa have different systems of economic activity; not only do they control different types of income but they also have different expenditure responsibilities. In some areas, women tend to be responsible for the food needs of the household, while men are expected to

provide for school fees, housing, etc., whereas among other groups (such as the Yoruba), men produce much of the staple food crop

Finally, even if a disproportionate share of the incremental income is spent on food, household caloric intake may not increase dramatically. Alderman (1986), in a review of 15 studies, found that even at very low levels of income, people tend to diversify into a more varied, higher cost diet rather than simply using the income to increase energy intake. Therefore, although the marginal propensity to *spend on food* may be significant, the propensity to *consume calories* out of additional income may be quite low.

Given the complex nature of these factors, a certain absolute level of income may be a necessary but not a sufficient condition for nutritional improvement. Factors, such as source of income, control of income, and expenditure patterns, are important to understand in predicting the effects of increased income on household food consumption.

EFFECTS ON NONAGRICULTURAL HOUSEHOLDS

The discussion thus far has concentrated on the effects of commercial agriculture on farm households. However, the commercialization of agriculture may have a substantial effect on the demand for labor in a given area. If the production of cash crops increases, the need for hired labor and incomes of laborers, particularly landless laborers, may increase. However, if the cash crop is less labor-intensive than the food crop it replaces (a case, for instance, found

in the Philippine study below), then the demand for hired labor will decrease and the incomes of this group may decline. Increased production of labor-intensive crops is an attractive way of reaching the landless poor who are often not reached by other development activities. The Guatemala case study sheds light on this issue.

INTRAHOUSEHOLD AND HEALTH-RELATED FACTORS

The discussion thus far has centered on income-mediated pathways, such as agricultural production and demand for labor, that cash crop production take in influencing consumption and nutritional status. However, cash crop production can also affect nutrition significantly by altering the internal dynamics within the household: time and other resources could be reallocated, food shares could be redistributed among the family, and the health and sanitation environment could be changed.

Time Constraints of Women

Commercialization of agriculture may affect not only women's income but also the allocation of women's time. In many cultures, particularly in Africa, men and women have different responsibilities for crops, labor, and support obligations of the household (Garfield 1979). Men are frequently responsible for land preparation and women for the other aspects of crop cultivation. The manner in which commercial agriculture is implemented may affect this intrafamilial distribution of labor (von Braun and Webb 1989).

The effect of commercial agriculture on reallocation of women's time is of concern because of its potential effect on women's household activities, such as food preparation, child care, and other nurturing activities (Popkin 1983, 157-176).

Research is needed to explain how agricultural strategies, including cash crop production, affect the demand for women's time, including time available for child care. The contention that the commercialization of agriculture in general decreases the time women have available at home is based more on speculation than empirical evidence.

Health and Sanitary Factors

Finally, the health and sanitation implications of cash cropping schemes have rarely been considered in most project evaluations. Yet this may be the mechanism through which rural development strategies, including the commercialization of agriculture, may have the greatest effect on nutrition. A positive relationship between demand for health services and income should be expected in general. To the extent that increased cash cropping increases real income, a positive effect via the demand for health services may occur.

It is well established that nutrition and infection are synergistic. Poorly nourished individuals are more susceptible to disease and conversely, infections adversely affect nutritional status. Weaning diarrhea is one of the major causes of moderate and severe malnutrition in children under three in developing countries. Diarrhea is twice as prevalent in the malnourished and takes longer to cure.

Any effort to improve the income and in turn the diet of the household may have a limited effect on the health of household members without simultaneously hygienic improvements (Payne 1987).

The quantity of water has a prime influence on nutritional status. An insufficient supply can precipitate intestinal, skin, or eye infections because people are unable to wash their food and utensils or to bath. In addition the quality of the water is important; infections can be spread through a water supply that is polluted with fecal material (Hitchings 1982).

The relationships among disease, nutrition, and health are important. They highlight the fact that water and sanitation cannot be overlooked in anticipating the potential effects of cash cropping schemes on nutritional status. Agricultural projects and health projects should not be seen as separate entities but, where possible, should be integrated into a single community development strategy.

In summary, not all of the linkages depicted in Figure 1 are equally important in understanding the process though which cash crop production influences nutritional status. The relative importance of each of these factors may be mediated by the sociocultural environment. For example, the issue of budget control appears to be more critical in Africa than in Asia. Conversely, sex disparities in allocation of food and other resources may be more important in Asia than in Africa. Numerous studies have focused on selected linkages. The studies presented here, however, are innovative in that they assess the complete chain of linkages between commercialization and consumption and nutritional status in the six settings. Nevertheless, it is

clear that broad generalizations about the nutritional consequences of cash crop production are meaningless.

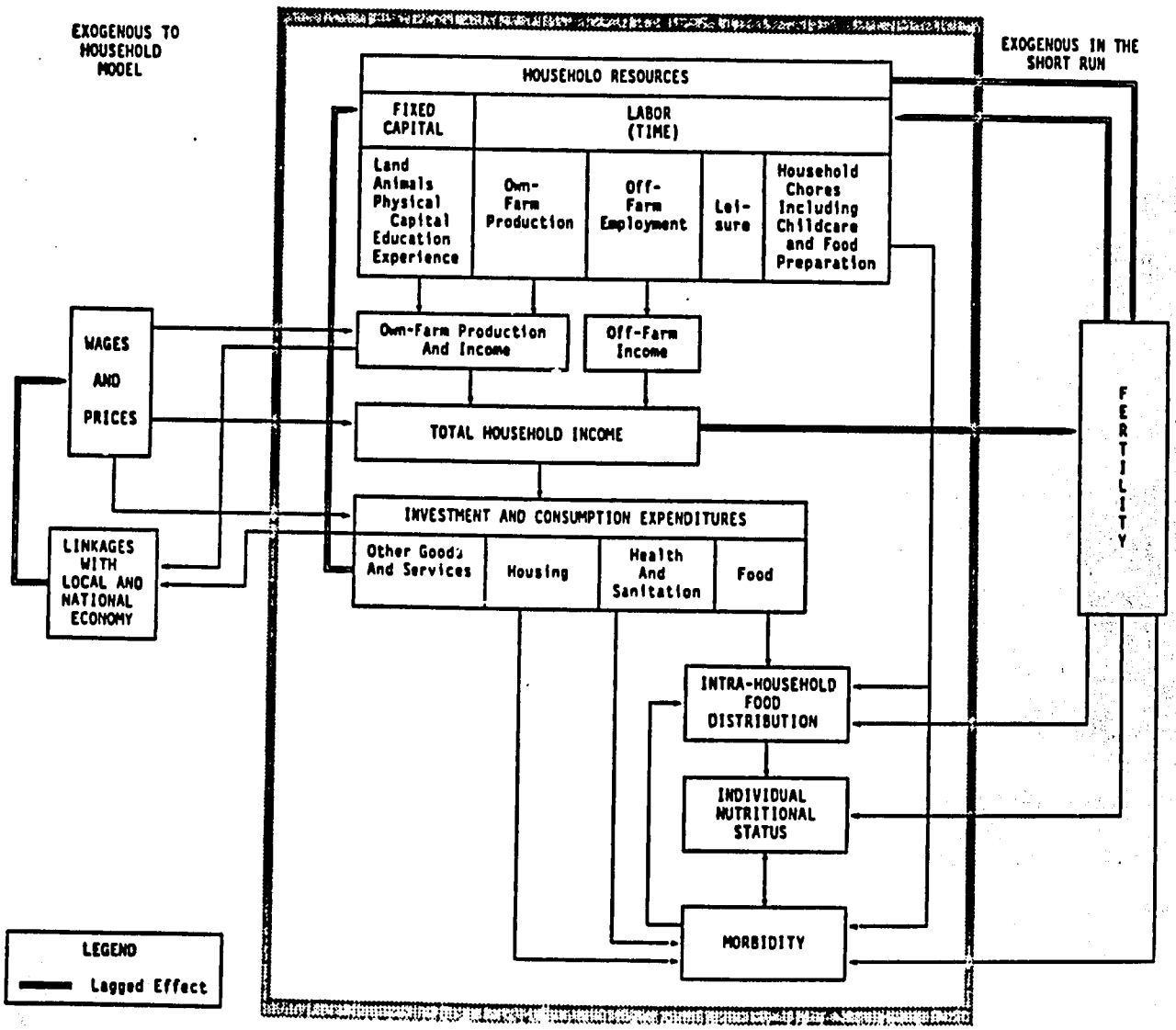
DATA COLLECTION FOR THE HOUSEHOLD-LEVEL ANALYSIS

Given the above discussed linkages between increased commercialization, production, consumption, and nutrition, it is necessary to collect household-level and individual-level data on a wide range of topics, outlined in Figure 2. The theoretical underpinnings for the intuitive diagram in Figure 2 are provided by the literature on the new household economics.[4]

At the top of the diagram, the household has a fixed amount of time and capital that it must decide to allocate among various income-generating activities; given exogenous prices for consumer goods and production inputs and outputs, with the objective of maximizing utility from consumption expenditures, leisure time, and better nutrition. Depending on how those resources are allocated to own-farm production activities and off-farm employment, a certain amount of cash and in-kind income is generated which can then be spent on various consumption items. Because we are especially interested here in nutritional outcomes, we will focus on food expenditures: how they increase with higher incomes, how many more calories these extra food expenditures generate at the household level, and how these calories are distributed among various household members. Finally, as shown at

[4] See Singh et al. (1986), for a general treatment of agricultural household modeling; and Pitt and Rosenzweig (1985, 212-223) for an application that focuses on nutritional outcomes.

Figure 2--Household resource allocation and nutrition



the bottom of Figure 2, calorie intakes are an important determinant of nutritional status.

However, as is evident from the richness and complexity of the household model, nutrient intakes are not the only link through which household allocational decisions affect nutrition. Morbidity is an important determinant of appetite and of how well nutrients are absorbed by the body. The household that earns less income because it allocated more time to food preparation and child care could, conceivably at least, enjoy better nutrition because of reduced morbidity, than if it had earned the extra income and spent more for food.

Other more indirect links between production and nutrition could be added to the diagram and analyzed. The purpose of this discussion, however, is to limit the focus of research to those links just identified above. Our research strategy, then, is to collect detailed household- and individual-level information on production, income, consumption, time allocation, morbidity, and nutritional status for household groups that shift toward more commercialized agriculture and for household groups insignificantly, or not at all, affected by the change, to identify to what extent (if at all, controlling for income) these households allocate their resources differently, and to determine how these allocation decisions affect consumption and nutritional status.

No existing data sets provided the type of information to fill the conceptual framework described in Figure 2. IFPRI and HIID, in collaboration with partners from the respective study countries, therefore, embarked on an intensive effort to build the respective

data base in structured surveys especially designed for this research.[5] The design, field testing, and survey supervision required long-term outposting of staff into the study areas. The multidisciplinary research approach also included special study components following an anthropological research approach that addressed intra-household questions in the settings.

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[5] IFPRI's and HIID's partners in the respective study countries for this research are:

Kenya	:	Ministry of Planning and Kenyatta University
Rwanda	:	Ministry of Agriculture
The Gambia	:	PPMU of the Ministry of Agriculture
Philippines	:	Research Institute for Mindanao Culture, Xavier University
Guatemala	:	Institute of Nutrition in Central America and Panama, INCAP
Malawi	:	Center for Social Research, University of Malawi

3. CHARACTERISTICS OF THE SIX STUDY AREAS, SAMPLING PROCEDURES, AND SCOPE AND FREQUENCY OF SURVEYS

This chapter describes the six study areas chosen for analysis and the sample households that were selected. In selecting the IFPRI study sites, care was taken to identify situations where the transition from semisubsistence to more commercialized agriculture was just underway due to implementation of programs or policies. In Malawi, the study site was selected specifically by HIID to be a land-short area where there were both smallholder tobacco growers and smallholders growing only food crops.

In four countries--The Gambia, the Philippines, Malawi, and Rwanda--comparisons between the more commercialized and less commercialized households are cross-sectional in nature, with multiple surveys being conducted within a single cropping cycle. For Guatemala and Kenya, households were surveyed over more extended periods as described below.

The nature and sources of agricultural commercialization are different in most of the study settings: only Kenya and the Philippine samples are similar in that both regions were primarily engaged in maize production before the construction of sugar mills that permitted extensive sugarcane production. In Guatemala, export vegetable crop production was introduced. In The Gambia, new 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.

THE STUDY AREAS

Guatemala

The focus of this study is the recent introduction of labor intensive vegetable production for export into the traditional small-farm sector in the Western Highlands. The study area is well known for its problem of land shortage, poverty, and malnutrition. The population in the area is mostly of indigenous origin.

Export vegetable production did not end up in the small farms as a planned undertaking but moved there in several steps. In the late 1970s, a multinational company started to grow the crops on large-scale units managed by the company itself. It moved then to medium-sized farms (20-30 hectares) in the form of contract growing, and from there to the smallest farmers (average 0.7 hectares) in the Highlands. The crops' characteristics which apparently have negative returns to scale in production and management led to this trial-and-error development path in which various actors and institutions interacted and responded to economic incentives.

The study areas are the villages of the cooperative *Cuatro Pinos*, specializing in export vegetables. By 1987, the cooperative *Cuatro Pinos* had expanded to 1,150 members, compared to 177 members in 1979. The coop farmers were growing nearly 300 hectares of export vegetables

in 1985. More than half of it was devoted to snowpeas. The area under these crops quadrupled since 1980/81.

The Gambia

The study area is located 300 kilometers east of Banjul on the south bank of the River Gambia. The research was undertaken around the Jahally-Pacharr smallholder rice project. The Jahally-Pacharr project was developed and brought into operation during the period 1983-1986. In the 1986 rainy season, it covered 560 hectares of centrally pump-irrigated, 188 hectares of tidal-irrigated, and 432 hectares of rainfed land. Two crops per annum are harvested from the centrally pump-irrigated plots, as well as from some of the fully water-controlled, tidal-irrigated land. Only one annual crop is harvested from the partly water-controlled land, which is partly tidal-irrigated and partly improved rainfed rice, or a mix of the two. Rice production with modern inputs replaced traditional swamp rice production (a women's crop). In this case, commercialization of a (subsistence) food crop are thus dealt with in a land-surplus, labor-scarce situation.

Kenya

The research for this study was conducted in a project area located in Nyanza province, South Nyanza district, in the southwest part of Kenya. Nyanza province has historically been a grain-producing area supplying basic staples for other parts of Kenya but since

the early 1970s has become part of the area known as the sugar belt of Kenya.

In 1977, the newest of the sugar factories in Kenya was established--the South Nyanza Sugar Factory (Sony). The Sony factory obtained approximately 2,500 hectares of land from local landowners to establish the factory and nucleus estate. The majority of sugar, however, is produced by smallholders under contract to Sony. The outgrowers' program includes 6,000 contract farmers and approximately 6,000 hectares of land.

Agriculture in the area is dominated by smallholder agriculture with maize being the major crop. Farmers mostly use a low input technology, relying heavily on household labor.

Malawi

The area selected for research in Zomba district in the densely populated southern region is one of the few areas outside the Central Region where there is a relatively high proportion of smallholder tobacco producers. Tobacco had been grown in this area by both smallholders and by tenants and laborers on European-owned estates during the colonial period. Around Independence, some of the former estate land was sold and some was reallocated to customary landholders.

Today, smallholders have to be registered with ADMARC, the state marketing board, in order to grow and sell dark-fired tobacco; they are not permitted to grow burley tobacco, which is reserved for leaseholders (technically "estates").

The area has a relatively high rainfall and is densely populated. The average landholding in the sample, which overrepresents the better-off farmers, is 1.5 hectares. The area is within reach of a major urban and market center, Zomba, and, on the western edge, is about one hour's bus ride from Blantyre, the largest commercial center in the country. Farmers grow a wide variety of vegetables, root crops, and pulses, as well as maize, the staple food of this area. Most farmers use mainly family labor and no fertilizer in their farm production. The bigger farms employ laborers at peak seasons or throughout the season. Most farmers sell some of their crops to ADMARC, local traders, and at both Zomba market and the smaller periodic markets in the area. All farm households earn income from off-farm employment and transfers.

Philippines

This case study focuses on an area in the southern island of Mindanao in Bukidnon province that switched from semi-subsistence maize production to sugarcane production.

By the mid-1970s, smallholder agriculture was almost exclusively devoted to maize and some upland rice farming, except for small areas of irrigated rice production. Maize exports flow north to the heavy maize-eating areas of the central Philippines.

The Bukidnon Sugar Company (BUSCO) began operations in 1977, established in response to the high world sugar prices of a few years before. From the beginning, BUSCO was supplied primarily by sugarcane production from a few large *haciendas* located near the mill. The

mill's capacity was expanded in 1981. Contracts for as little as one and two hectares were given out. The number of members of the Sugar Planters Association is now nearly 2,000, dominated by smallholders in terms of absolute members but not in terms of area planted or cane produced. Voting power in the association is proportional to contracted hectares and so is dominated by a relatively few large *hacienda* owners, many of whom also have business interests in the mill.

Rwanda

This research was undertaken in an area in the high altitude zones of the Zaire-Nile-Divide in northwest Rwanda. The study site was selected because of a recent and ongoing agricultural commercialization process induced especially by introduction of tea production and expanded potato production with modern inputs for the market in a subsistence-oriented rural economy.

Smallholder tea, once promoted in the mid-1970s in the study area, has diminished since then. To use established processing capacities, factories in the study area expanded tea plantations under their own management. This was partly at the cost of smallholder farms that were expropriated in favor of this expansion of factory plantations.

Commercial potato production in the area is done in a former natural forest area (Gishwati forest) partly on licensed plots obtained from a reforestation project on a temporary basis, partly without such entitlements in an uncontrolled form. This potato pro-

duction is more concentrated in larger holdings--that is, in the context of this smallholder system farms with more than 1.5 hectares

SAMPLE SELECTION, SURVEY FREQUENCY, AND SPACING

Summarized Overview

Table 1 summarizes some of the characteristics of the sample surveys for the six case study areas. Comparisons of such things as household size, average landholdings, and so on, across the six samples may be made from information provided in the tables of the chapters that follow.

Guatemala

The household-level data of this research are based on representative surveys undertaken in the six villages where the cooperative *Cuatro Pinos* was active in 1985. The sample is based on a census in the villages done in 1983 by INCAP. A roughly equal number of members of the cooperative (n=195)--that is, growers of the new export crops--and nonmembers (n=204) were drawn at random by village from the census information. To assure a reasonable coverage of the situation in the smaller villages, the sample was biased toward the four small communities among the six villages. The proportional adjustments of the sample by village size led to a coverage of 38 to 75 percent of the coop members in each community (average, 47 percent) and 8 to 17 percent of noncoop member households (average, 11 percent) in these communities.

Table 1--Selected characteristics of survey samples

Country	Main Subsistence Crops	Commercial Crops	Sample Size (Households)	Number of Survey Rounds	Survey Intervals
The Gambia	Millets, sorghum, rice	Rice under modern irrigation, groundnuts	214	2	5 months
Guatemala	Maize, beans	Snowpeas, cauliflower	399	2	2 years
Kenya	Maize	Sugarcane	504 617[a]	4 4	2 months, 2 years between the first and second surveys
Malawi	Maize, root crops, pulses, vegetables	Tobacco, maize, root crops, pulses, vegetables	210	20 3 nutrition surveys 2 diet surveys	2 weeks (agroeconomic)
Philippines	Maize	Sugarcane	448	4	4 months
Rwanda	Peas, beans, sweet potatoes, maize, sorghum	Potatoes, tea	191	3	4 months

[a] Second survey.

The identical households were surveyed in 1983 and 1985. The households were visited between November and January 1983/84 and 1985/86, respectively. The fact that the surveys were done during the same time of the year avoids the seasonality effects that might disturb comparisons between the two surveys.

The sample is spread over early and late adopters. Forty-two percent of the sampled households of the coop members are in the scheme as long as five to seven years. Newcomers are spread over all the six communities while the early adopters are all in the four founding villages of the cooperative.

The field data collection for the 1983 and 1985 survey was done by experienced INCAP survey staff.

The Gambia

The main objectives of the sample selection were to identify households who are, firstly, representative of the farm participants of the rice scheme and nonparticipants; and, secondly, in case of the participants, involved in different degrees and at different stages (early access, very recent access) in the scheme to provide the opportunity for a cross-sectional analysis of the project's impact on income and nutritional status.

In the project area itself, eight villages were identified in a two-stage random sample selection. The Project Management Unit provided lists of information about village size and project rice land allocated to each village. Eight villages were chosen from this complete list by stratified random sample. Stratification criteria were:

(1) number of households in the village, (2) distance from the swamp (upland, lowland), and (3) ethnic group.

Two additional villages located outside the project area were chosen randomly from other rice-growing villages to broaden the variability of observations and to represent the situation in the project area before the project started. Both villages are involved in traditional rice production. The small number of villages outside the scheme was felt sufficient because of high degree of variability of scheme participation between and in the villages of the scheme area. In some of the participating villages, traditional swamp rice cultivation also continued, thus permitting intra-village comparison of participants and nonparticipants.

In the second stage of sample selection, a baseline survey of all households in the selected villages was used to provide basic information about household demography and project involvement. Roughly, three out of four households in each village were chosen randomly from this survey for interviewing.

The household survey was executed during the rainy season of 1985 (August-October) and during the dry season of 1986 (January-March). The data collection was carried out by a carefully trained enumerator team, closely supervised by IFPRI staff, which lived in the villages throughout the surveys. Half of the enumerator team were women who generally interviewed women.

Kenya

In the initial 1984/85 survey, a list of all farmers in the outgrowers' scheme was obtained from the sugar company (SONY). From this list, a random sample of sugar farmers was chosen.

Once a sugar farmer was chosen for the sample, field staff identified the next nearest nonsugar farmers who met the same selection criteria. This approach ensured geographic similarity of sugar and nonsugar farmers. For each sugar contractor, mapping was performed on comparable households of up to three neighbors, of which one or two were randomly selected.

Of the 181 sugar farmers in the study sample, 77 percent had received at least one payment for a sugar crop. This group is called the sugar farmers. Twenty-three percent of the farmers had not yet had a first harvest and had therefore not yet received payment for any sugar harvest. This group is called new entrants.

Landless households were randomly selected by doing a restricted area census of all families without land living in the eight small villages of the project area. Two groups emerged from the general category of "landless." First, there was the group of households who owned no land and who had no permanent source of income. These are the types of households who are generally thought of as landless, and for the purpose of this study are called "landless." The second group of landless were those households who did not own land but who did have a regular source of income. It includes professionals as well as salaried workers. This group was reclassified as "wage earners."

Finally, a mapping was done of all businesses in the main township--Awendo--and the eight villages in the project area. From these lists, a random sample of local merchants was selected.

A total of 504 households were surveyed bimonthly over an eight month period beginning in June 1984 and ending in February 1985.

The composition for the 1985/87 sample changed somewhat. First of all, the classification of households that were in the earlier study changed between the two time periods for some households. For example, some of the households who were nonsugar farmers in the first study became new entrants by the time of the 1985/87 study. In addition, households relocated by the Sony scheme and Sony employee households were added.

A total of 617 households were surveyed consisting of 462 households included in the 1984/85 surveys and 155 new households.

Malawi

The innovative aspect of this research is its being based on three different but complementary and integrated methods of data collection. The research design set up three complementary systems of data collection: (1) the agroeconomic survey based on fortnightly visits by six enumerators to approximately 36 households each; (2) nutrition surveys of the same sample as the agroeconomic survey: three anthropometric and morbidity surveys conducted at the beginning (October 1986), middle (February 1987), and end (July 1987); and two dietary intake and food preparation surveys conducted in the deficit period (December 1986-January 1987) and the postharvest season (May-

June 1987); and (3) ethnographic studies in two of the six village clusters, based on groups of contiguous households/compounds--that is, a nonrandom sample.

The study area stretches east-west across the northern part of Zomba South. Six villages were selected within a geographical band encompassing an area of approximately 16 miles from east to west and 6 miles from north to south. A sampling frame was developed based on a list of all farm "households" with at least one preschooler. Then, households without preschoolers were eliminated from the village lists. The remaining households were separated into three groups: (1) those that grew tobacco, (2) those that did not grow tobacco and had relatively small landholdings, and (3) those that did not grow tobacco and had relatively large landholdings. For each village, the households of the village headman and the party chairman were first selected purposely to be included in the sample. The remaining households were then selected randomly from the three lists (using a standard random number table method), such that each of the three groups was represented by 12 households in each village.

The *agroeconomic survey* was conducted in six cluster areas. Each enumerator was responsible for 36 units of analysis--that is, households or compounds--which he visited twice a month to conduct questionnaire-guided interviews. Supervision was carried out by a graduate of the Agricultural College, who also lived full time in the survey area, and the field agricultural economist.

The *nutrition surveys* were carried out by a separate team of six enumerators and two supervisors.

For the *ethnographic study*, two villages were selected from the eight in the sample. In each, there was a resident female Malawian graduate of Bunda College of Agriculture.

Philippines

In the Philippine context, it was necessary to compare and contrast the situations of landowners, tenants, and landless laborers, both within and across more commercialized and less commercialized groups. This complicated the sample selection process.

For the detailed household surveys, a decision was reached to choose 17 households in each of 30 barrios (barrios ranged in size from roughly 100 to 1,000 households) to give a total sample of 510 households. From informal interviews, it was clear that distance from the mill was a main determinant of the profitability of sugar production and its prevalence in a particular barrio. The survey area was extended to include households that did not have the opportunity to adopt sugar simply because their farms were too far away from the mill, but that shared a common growing environment and cultural heritage with sugar-adopting households, in order to obtain roughly comparable adopting and non-adopting groups, while minimizing the problem of bias due to adopter self-selection. Three lists for the selection of the 30 barrios were drawn up: (1) barrios close to the mill, (2) barrios at an intermediate distance, and (3) barrios far away from the mill.

Ten barrios were selected from each list at random, but with the probability of selection being proportionate to the number of house-

holds in that barrio. In each of the 30 barrios selected, a short questionnaire was administered to 68 households selected at random. This presurvey, which asked primarily about present and previous occupations, crops being grown, and landholdings, served two purposes. First, it gave a picture of present employment and land tenure patterns in the survey area and how these patterns had changed since the sugar mill had been built. Second, it provided a frame for choosing a sample of 510 households consisting of landowner, tenant, and landless labor households within each crop group.

Only households with at least one child less than 60 months of age that farmed less than 15 hectares were eligible for selection. Likewise, only households that characterized the primary occupation of the head of household as being employed in either maize or sugar production (including wage income) were eligible for selection, except for a small target group of households that indicated that although the head of household received income from either sugar or maize production, this was not their primary source of income. Later analysis of the detailed survey data indicated that the respondent characterizations of themselves as either landowner, tenant, or landless labor households, primarily engaged either in maize or sugar production, were quite accurate.

Four detailed surveys were undertaken in these households at four-month intervals, beginning in August of 1984 and ending in August of 1985. 448 households remained by the end of round four. Outmigration was the primary cause for the reduced number of observations, which consisted for the most part of landless or nearly-landless households.

Only one household refused to cooperate after participating in round one.

Rwanda

The sample households were selected in a stratified way and a systematic attempt was made to arrive at a sample that would cover a significant range of the form and degree of commercialization in an area fairly homogeneous in agroecological terms in this very heterogenous region. To obtain a fair degree of agroecological homogeneity, the sample was limited to the high altitude zone above 2,000 meters. As no census-type information is available for the communities, an alternative way of selecting the sample households following location-specific stratification had to be chosen.

The seven high-altitude *secteurs* of Giciye *commune* were divided into two groups based on their different population densities (population density being related to importance of pasture land, livestock, and other factors). At the same time, this stratification guaranteed that for both groups of *secteurs*, the distance to the Gishwati potato production area as a major source of commercialization was different. From each of these two groups of *secteurs*, two *secteurs* were chosen at random.

In each of the *secteurs*, two *cellules* were then selected for a total of eight *cellules*. For this selection, meetings were organized with community leadership of the respective *secteur* and representatives of its *cellules*, in which the latter were asked to indicate, according to their subjective judgments, the importance of certain

agricultural products (tea, potatoes, livestock, etc.) in each *cellule* of the *secteur*. An attempt was made on the basis of these judgments to choose in each *secteur* one *cellule* with a relatively high degree and one with a relatively low degree of commercialization.

Upon the identification of these eight *cellules*, the leaders of the *cellules* were requested to provide lists of the names of the heads of households. There was a range of about 85 to 175 households per *cellule* among these eight *cellules*. From these lists, approximately 22 households were chosen at random per *cellule*, resulting in about 176 households.

To permit better assessment of the role of tea, the number of teaholders in the sample was increased. At random households in smallholder tea production (*thé villageois*) were chosen from the lists of the Rubaya tea factory, bringing the total sample size to about 198, which was reduced to 192 households because of dropouts.

Finally, a group of households affected by the expropriation of property conducted as part of the expansion of the plantation tea at Nyabihu was included. Sampling of these households proceeded as follows: A list of the heads of approximately 58 households affected by the expropriation and still residing in the area was provided by the representatives of the *cellule*. Twenty-one of these households were chosen at random and interviewed. Together with a group of displaced farmers who were captured by the main sample in the surroundings of the Rubaya tea factory, a total of 32 such displaced farm households are included in the survey.

The actual survey work of the main sample was structured by three separate survey rounds: first round in January-March 1986; second round in May-June 1986; and a third round in August-September 1986.

4. COMMERCIALIZATION OF AGRICULTURE AND STAPLE FOOD PRODUCTION

In this chapter, the issue of competition and complementarity between subsistence crops and crops for the market are discussed. The discussion centers on the reallocation of land and labor resources as well as the profitability and productivity of the commercialized crops as compared to the subsistence food crops. Thereafter, the implications of commercialization of agricultural production on marketed surplus of staple food crops and potential price effects are evaluated in the six study environments.

Before turning to the detailed case studies, an overview is presented on the relationships between cash crop and food crop production in a large number of low-income developing countries to provide a broader perspective for the case studies.[6]

CASH CROP-FOOD CROP RELATIONSHIPS IN LDCS: AN OVERVIEW

Cash cropping maintains an important position in many developing countries' agriculture. Using a simple crop-specific classification (from which we, of course, deviate in the detailed case studies where the data situation does not impose this constraint), it was found that of 78 developing countries analyzed, only 16 devote less than 10 per-

[6] This overview draws on von Braun and Kennedy (1986).

cent of their cultivated area to major cash crops (excluding basic staple foods). Twenty-eight countries have more than 30 percent of their cropped areas devoted to cash crops (Table 2). It should be noted that this represents an underestimation of cash cropping because for statistical reasons cash crops could only be identified by types of crops in this aggregate analysis at country level: sugar; oil seeds; fiber and tobacco; vegetables; coffee, tea, and cacao; and other tree crops, such as fruit trees, oil palms, and rubber. In practice, however, staple foods are often sold for cash too. The case study results shed light on this in the section below.

The ratios of cash crop area to basic food crop area reveal that 32 of the 78 countries allocate an area to cash crops that corresponds to more than 50 percent of the staple food crop area. The staple food crops included are cereals, pulses, and roots and tubers. Of the 35 African countries, 20 are producing cash crops in an area equal to more than 30 percent of their area for basic food staples (Table 3)

The agricultural production patterns in developing countries for cash crops change over time. Whereas about a quarter of the 78 countries show considerable increases in land used for cash cropping during the period 1968-82, another quarter show a considerable decrease (about a 15 percent change in the area share during the period). The position of cash cropping in agricultural production is much more stable in middle-income than in low-income countries. In addition, there are more countries in the low-income group that show *decreased* production of cash crops. Most of the countries that have been moving away from cash cropping, thus resorting to staple foods,

Table 2--Shares of total cash and export crops in total cropland, by region and income group, 1982

Share of Cash Cropland in Total Cropland	Income			Region			
	Low	Lower-Middle	Upper-Middle	Asia, Pacific	Africa	Latin America, Caribbean	Total
	(number of countries)						
Total cash crops							
Less than 10 percent	10	6	0	5	10	1	16[a]
10 - 30 percent	15	12	7	12	15	7	34[b]
More than 30 percent	8	16	4	6	10	12	28[c]
Total	33	34	11	23	35	20	78
Nonfood cash crops (export crops)							
Less than 10 percent	27	21	10	20	27	11	58
10 - 30 percent	5	11	1	2	6	9	17
More than 30 percent	1	2	0	1	2	0	3
Total	33	34	11	23	35	20	78

Source: Food and Agriculture Organization of the United Nations, Production Yearbook 1982 (Rome: FAO, 1983).

Notes: Income classification follows the World Bank, World Development Report 1984 (New York: Oxford University Press, 1984).

[a] Countries with less than 10 percent of cropland in cash crops are: Afghanistan, Bolivia, the Congo, Ethiopia, Kampuchea, Laos, Mauritania, Morocco, Nepal, Niger, Sierra Leone, Somalia, Togo, Upper Volta, Yemen Arab Republic, and Zambia.

[b] Countries with 10 to 30 percent of cropland in cash crops include: Angola, Bangladesh, Burma, Burundi, Cameroon, Central African Republic, Chad, Democratic Korea, Democratic Yemen, Guinea, Honduras, India, Jordan, Madagascar, Malawi, Mali, Mexico, Mozambique, Nicaragua, Nigeria, Pakistan, Panama, Peru, Republic of Korea, Senegal, Sudan, Syria, Thailand, Turkey, Uruguay, Venezuela, Vietnam, Zaire, and Zimbabwe.

[c] Countries with more than 30 percent of cropland in cash crops include: Benin, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Egypt, El Salvador, Ghana, Guatemala, Haiti, Indonesia, the Ivory Coast, Jamaica, Kenya, Lebanon, Liberia, Malaysia, Papua New Guinea, Paraguay, the Philippines, Rwanda, Sri Lanka, Tanzania, Trinidad Tobago, Tunisia, and Uganda.

Table 3--Land used for cash and export crops compared with land used for basic staple food production, 1982

Land in Cash Crops in Proportion to Land in Basic Staple Foods	Income			Region			
	Low	Lower-Middle	Upper-Middle	Asia, Pacific	Africa	Latin America, Caribbean	Total
	(number of countries)						
Total cash crops							
Less than 10 percent	7	2	0	5	4	0	9[a]
10 - 30 percent	11	6	0	6	11	0	17[b]
30 - 50 percent	10	5	5	6	10	4	20[c]
50 - 100 percent	2	12	2	2	7	7	16[d]
More than 100 percent	3	9	4	4	3	9	16[e]
Total	33	34	11	23	35	20	78
Nonfood cash crops (export crops)							
Less than 10 percent	19	16	5	18	18	4	40
10 - 30 percent	12	6	3	4	13	4	21
30 - 50 percent	1	4	2	0	2	5	7
50 - 100 percent	1	6	0	1	2	4	7
More than 100 percent	0	2	1	0	0	3	3
Total	33	34	11	23	35	20	78

Source: Food and Agriculture Organization of the United Nations, Production Yearbook 1982 (Rome: FAO, 1983).

Notes: Basic staple foods included are grains, pulses, and roots and tubers. Income classification follows the World Bank World Development Report 1984 (New York: Oxford University Press, 1984).

[a] Countries with less than 10 percent of cropland in cash crops are: Afghanistan, Kampuchea, Laos, Mauritania, Nepal, Niger, Somalia, Upper Volta, Yemen Arab Republic.

[b] Countries with 10 to 30 percent cropland in cash crops include: Bangladesh, Burma, Burundi, Chad, Democratic Korea, Ethiopia, India, Malawi, Mali, Morocco, Nigeria, Sudan, Thailand, Togo, Vietnam, Zambia, and Zimbabwe.

[c] Countries with 30 - 50 percent of cropland in cash crops include: Bolivia, Central African Republic, the Congo, Democratic Yemen, Guinea, Jordan, Kenya, Madagascar, Mexico, Mozambique, Pakistan, Peru, Republic of Korea, Rwanda, Sierra Leone, Syria, Tanzania, Turkey, Uruguay, and Zaire.

[d] Countries with 50 - 100 percent of cropland in cash crops are: Angola, Benin, Brazil, Cameroon, Egypt, El Salvador, Guatemala, Haiti, Honduras, Indonesia, the Ivory Coast, Liberia, Nicaragua, the Philippines, Senegal, and Venezuela.

[e] Countries with more than 100 percent of cropland in cash crops include: Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Ghana, Jamaica, Lebanon, Malaysia, Uganda, Panama, Papua New Guinea, Paraguay, Sri Lanka, Trinidad Tobago, and Tunisia.

are in Africa, whereas a majority of Asian and Latin American countries show stable or increased shares of land used for cash crops. The share of land used for traditional nonfood crops that are usually also export crops (cotton, other fibers, tobacco, coffee, tea, and cacao) decreased rapidly in 24 countries, mostly low-income countries in Africa, and increased rapidly in 12 countries.

Rapid growth in cash cropping does not automatically exclude growth in per capita food production. In fact, the majority of countries with positive growth in per capita food production of basic staples have simultaneously expanded their area devoted to cash crops (von Braun and Kennedy 1986, 26-29). Unfortunately, this relationship also seems to prevail in the opposite direction in low-income countries especially in Africa: constant or shrinking per capita food production is combined with constant or shrinking allocation of land shares to cash crops with obvious implications for foreign exchange earnings by the agricultural sector.

The general message from these aggregate analyses is that an appropriate agricultural policy permits joint growth in both cash crops and staple foods and failures of agricultural policy affect both. The critical role of policy should be kept in mind when the program and project level insights are discussed below.

COMMERCIALIZATION AND CHANGES IN PRODUCTION PATTERNS IN THE CASE STUDY SETTINGS

The overview in the previous section could only give some broad indications of the structures and development of commercialization of

Third World agriculture because of data limitations. The case studies now permit a much more in-depth look into the commercialization process at the micro level.

Defining "Commercialization"

Commercialization of agriculture can actually take very different forms and there is considerable confusion in definitions and measurements in the literature on the issue. Commercialization, for instance, can occur *on the output side* with increased marketed surplus, but it also can occur *on the input side* by increased use of purchased inputs. The so-called traditional food crops are frequently marketed to a considerable extent, often being a significant source of cash income for smallholder families. On the other hand the so-called cash crops may be retained to a substantial extent on the farm for home consumption. The latter is, for instance, the case with groundnuts in West Africa, and sugarcane stalks are eaten as snack food in cane-growing areas.

Also, increased commercialization is not necessarily identical with *expansion of the cash economy* when there exists considerable transactions in kind, for instance, for payments of land use or laborers in food.

Finally, commercialization of agriculture is not identical with *commercialization of the rural economy.* The deviation between these two processes becomes all the more obvious when off-farm nonagricultural employment does already exist to a large extent in a certain setting. At the household level, we may thus specify forms of commer-

cialization and integration into the cash economy from at least three different angles and measure their prevailing extent at household level with the following ratios:

(1a) Commercialization of agriculture (output side) = $\frac{\text{Agricultural sales on markets}}{\text{Agricultural production value}}$

(1b) Commercialization of agriculture (input side) = $\frac{\text{Inputs acquired from market}}{\text{Agricultural production value}}$

(2) Commercialization of rural economy = $\frac{\text{Value of goods and services acquired through market transactions}}{\text{Total income}}$

(3) Degree of integration into the cash economy = $\frac{\text{Value of goods and services acquired by cash transactions}}{\text{Total income}}$

In most of our study settings, commercialization of agriculture occurs jointly on the output and input side of agricultural production--that is to say, the ratios of (1a) and (1b) increase jointly. When income rises and as the income elasticity of staple food consumption is positive and sizeable at low-income levels. these joint commercialization effects on the output and input side and their consumption effects leave the ratio of net-marketed surplus over income rather stable. This is to say that quite different degrees and forms of commercialization can be covered by stable marketed surplus/income ratios. The emphasis, however, is different in the various study settings. While in the Philippine, Malawi, and Kenya cases, the change occurs more in terms of sales over total production value (1a), in The Gambia setting, the change in ratio (1b) is particularly pronounced. On the other hand, the overall degree of commercialization of the

rural economy (2) is particularly far advanced in the Guatemalan setting because of much off-farm employment. This is also the case in Rwanda but in this case, in-kind transactions still play a considerable role, thus the degree of integration into the cash economy (3) is less, although the overall degree of commercialization of the rural economy (2) is substantial.

What is evident in all the six study environments is that on all accounts, agriculture in the study areas is "commercialized" to a considerable degree (even among the so-called subsistence farm households) as is also the rural economy, and that most transactions of agricultural commodities and goods and services involve cash.[7]

Commercialization of agriculture may evolve with dual structures, for instance, when large-scale plantation agriculture with wage labor derived from subsistence-oriented smallholder farms coexist. Little spillover effects of new technology from specialized large commercial farming to smallholder agriculture can be expected in general Zimbabwe's experience in the 1980s, however, suggests that opening up input and output marketing channels designed for the large farms to smallholders had a very stimulating effect for marketed surplus and output growth. The role of agribusiness and large-scale farm commercialization is much debated (Dinham and Hines 1984). This study is concentrated on smallholder commercialization, which is much more widespread, yet frequently tied in through contract farming with large business operations. This is, for instance, the case with the sugar-

[7] For details, see the respective study reports on Kenya, The Gambia, Rwanda, Guatemala, Malawi, and the Philippines.

cane outgrowers' schemes in Kenya and the Philippines, and the tea scheme in Rwanda and had been the case with the export vegetable production cooperative in Guatemala at an earlier stage.

Participation of Smallest Farms

Average farm sizes of the sample households in the six study cases range between 0.7 hectare in Rwanda and 4.5 hectares in Kenya; of course, there are land quality differences and this means that farm sizes in the study areas are not strictly comparable (Table 4). In the Philippine study setting, large-scale farming enterprises exist, but these farms were not included in the survey.

As described in Chapter 3, sampling was basically done at random among participant and nonparticipant households in and around the respective schemes. This also permits assessment of the relationship between participation and farm size. We find that while the smallest farms in most of the study settings do participate in the schemes, it was only in the case of The Gambia that their participation is more than proportional. In the other settings, the smallest farms' participation is disproportionally low. This is particularly so in the Philippine case, where proportional participation would mean a 33.3 percent figure (in col. 3, Table 4), and in Malawi, where smallholder entry to tobacco growing is highly regulated.

It is noteworthy that scheme participation in all study settings is not just a matter of choice by farm households. While there is an element of choice in adopting new crops or technologies in the scheme, there is also the case that farmers are "adopted" by the schemes,

Table 4--Farm size and per capita food production in the study areas

Country	Farm Size Averages	Staple Food Production	Share of Participants in Schemes Among Bottom Tercile of Farm Size
	(hectares)	(kilogram/capita cereal equivalents)	(percent)[a]
The Gambia	3.9	344	41.3
Rwanda	0.7	172	29.0
Guatemala	0.8	110	19.4
Philippines	4.3	324	15.7
Kenya	4.5	233	22.3
Malawi	1.5	145	11.6

[a] 33.3 percent would be equal participation.

which, one way or the other, provide rationed access. Some examples highlight this: A major attempt at providing poverty-oriented access to land in the rice scheme was made in The Gambian case. Access to the new potato-growing area in Rwanda was a matter of bureaucratic procedure, and being a tea grower was not a matter of free choice in most instances. Regulations of the Guatemalan export cropping scheme entailed certain criteria to target the small farmers, as do--in an opposite direction--the government restrictions on tobacco growing in Malawi.

Staple Food Production by Commercialized Farms

In all the study settings, substantial production of staple foods takes place in the small farms. With the exception of Guatemala and Malawi, the average farms in the survey areas are self-sufficient in staple food supplies if a rule-of-thumb figure of 170 kilograms of staple foods per capita is applied. In the case of Rwanda, this is, however, only barely so and only for the average leaving many below this level. These three sites also have the lowest average farm size.

As noted earlier, commercialization of agriculture takes a variety of different forms. Any classification of households and farms into "commercialized" or not has its shortcomings. As the focus is particularly on the adjustment consequences, which relate to the introduction of new production technology or new crops as a consequence of opening up new marketing and processing channels, we separate the households for this comparative study into two groups in each of the study settings according to their participation/nonparticipa-

tion (or very little participation) in the respective schemes. This broad grouping does not, of course, satisfactorily capture *indirect* participation in schemes, i.e., through labor market effects. We, therefore, augment the presentation of results in various parts of the report beyond the participant/nonparticipant categories. The detailed case study reports look at differences and relationships in a more disaggregated way, and also address the issue of indirect benefits and costs to households of commercialization in greater detail.[8]

Table 5 gives an overview on the area allocation within each of the study settings and underscores that both participants and nonparticipants in schemes maintained a considerable area allotment for staple food production (subsistence crops). The crop area allocated for the respective crop or technology in schemes is highest in the Philippines and Guatemala (52 percent and 43 percent, respectively), followed by Kenya (38 percent), Malawi (20 percent), Rwanda (17 percent), and The Gambia (14 percent). But these comparisons based on area allocation do not give a complete picture, especially in the case of The Gambia where the crop area in the scheme is irrigated, double-cropped rice land which cannot be properly compared to the overall land use in the rainfed upland areas of that study setting.

The difference in area allocated to subsistence crops in the participant versus nonparticipant groups is large in the Philippines and Guatemala. In Kenya, however, participants in the sugar scheme even use a higher share of their land for growing subsistence crops

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[8] The background documents and research reports are listed in the bibliography.

Table 5--Change in cropping pattern with new cash crops and crops under new crop technology (averages for the middle tercile farm size groups)[a]

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)	Area with Other Crops (Including Fallow, Traditional Cash Crops)
		.....(percent of total area of farms).....		
The Gambia	Much participation	14.3	55.0	30.7
	Little participation	2.5	58.2	39.3
Rwanda	Participating	17.0	75.9	7.1
	Not participating	1.9	85.4	12.7
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
Malawi	Participating	19.7	72.8[b]	n.a.
	Not participating	0.0	85.5	n.a.

[a] Note that the middle farm size tercile of each respective sample was chosen for this table to exclude farm size effects.

[b] Includes all crops interplanted with maize.

(mainly maize) than nonparticipants. In Kenya, the sugarcane has cut mainly into fallow land (Table 5, col. 3). The long-term implications of this on soil fertility may be an issue of concern, unless mitigated by fertilizer use and erosion control.

While it was observed earlier that the smaller farms were less represented among the scheme participants (Table 4), it is also true that the smallest farmers who actually did join the schemes allocate a larger share of their land resources to scheme participation than do somewhat larger farms in the participant group. An interesting adoption pattern exists (see Table 6): relatively speaking, the smallest farm size terciles in each of the schemes' participant groups adopted the new crop or the new technology the most, that is to say, converted the largest proportion of their land to the new crops. It is only in Guatemala where a rather equal distribution across farm size terciles is found. In The Gambia, the decline in the degree of participation across farm size is particularly pronounced; this is not surprising because in that scheme a conscious effort for small farmers' participation was followed. Thus, while we find in general that the smallest farmers in the study areas are represented to a disproportionally *low* extent in the schemes, this group--once adopting--does change its production program to a disproportionally *high* extent (except in Malawi).

A key question is how the implementation of the schemes and the farmers' participation in these schemes affected the production of staple food. We find that despite the reallocation of land to the new cash crops, staple food production per capita is maintained at a high

Table 6--Degree of participation in schemes for commercialization by farm size terciles in the groups of scheme participants

Country	Mode of Commercialization	Bottom Tercile	Middle Tercile	Top Tercile
		(percent of land use for selected commercialized crops)		
The Gambia	Fully water-controlled rice	31.8	14.3	9.7
Rwanda	Potatoes, tea	30.8	17.0	22.5
Guatemala	Export vegetables	38.0	43.9	38.5
Philippines	Sugarcane	68.1	52.0	53.8
Kenya	Sugarcane	45.3	37.6	18.8
Malawi	Tobacco	17.5	19.7	21.3

level or even increased in the scheme's participant groups versus the nonparticipant farms of similar farm size (Table 7). This is not surprising in The Gambian case since the project focuses on technological change in food production (rice), and in Rwanda where potato production was part of the commercialization scheme. Surprising, however, is the Guatemalan case where there is a small difference in staple food production between the participant versus the nonparticipant groups despite the large reallocation of land to the new cash crops by the participants. Although there is little difference between the two groups in Malawi, there is a larger difference *within* the tobacco-growing group. The tobacco growers who derive a larger proportion of their income from tobacco have a substantially higher per capita production of maize (154 kilograms) than the households deriving less than one-third of their income from tobacco (117 kilograms). The higher level of staple food production in the participant group in Kenya similarly indicates a greater propensity to produce staple foods among commercialized farmers. A contrary situation is found in the Philippine case, where there is a substantial drop in staple food supply (by about 50 percent in the participant groups versus the nonparticipant groups). It should be mentioned, however, that the gross marketed surplus of *staples* of the Philippine farmers is largest in this comparison across study sites showing them as the most market integrated in the staple foods (see next section). We thus have there, as in most cases, a case of shifting from production of maize for the market *and* home consumption to production of sugar-

Table 7--Staple food production per capita with new cash crops and crops under new crop technology (averages for the middle tercile farm size groups)[a]

Country	Degree of Participation in Schemes	Staple Food Production
		(kilogram/capita)
The Gambia	Much participation	469
	Little participation	179
Rwanda	Participating	153
	Not participating	132
Guatemala	Participating	87
	Not participating	108
Philippines	Participating	193
	Not participating	306
Kenya	Participating	238
	Not participating	225
Malawi	Participating	140
	Not participating	144

[a] Note that the middle farm size tercile of each respective sample was chosen for this table to exclude farm size effects.

cane for the market and not simply a shift from "subsistence" to "cash cropping".

Such drops in local food production may have local price effects if a local area through a local supply change shifts from a net exporter to a net importer position. This was not the case in the Philippine study area. Also in such a situation, farm households become increasingly vulnerable to the terms of trade changes between the new cash crops and the food crop. These potential price effects will be considered further below.

One cause for this generally high level of maintained staple food production, or the less than expected decline, is the expansion of food crop production *area* where there was fallow land available and/or *yield* increases in staple foods. The latter was particularly important in Guatemala (where participants' yields increased by 34 percent), in the Philippines (28 percent yield increase), and in The Gambia (Table 8). The lack of such tendency in Rwanda is disturbing and may be attributed to the lack of yield-increasing technology in cereals in the study setting, which stimulates farmers under land pressure to seek increased calorie output per unit of land by shifting toward roots and tubers (that is, sweet potatoes, potatoes). The situation looks different in Kenya where the excess supply of land permitted staple food supply simply through area expansion. Yield increases are critical in the land-short study settings and their existence points to the chances for joint growth in cash crops and staple food production for home consumption. More detailed analysis in the Guatemalan case shows that the differences in yields observed

Table 8--Yields of major cereal crops in tons/hectare, by farms participating and not participating in schemes with commercialization

Commercialization	Participating	Little or No Participation
The Gambia		
Fully water-controlled rice	5.33 (97)[a]	1.21 (117)
Swamp rice	1.36 (151)	1.21 (117)
Millet, sorghum	0.38 (57)	0.73 (72)
Rwanda		
Average maize[b]	1.03 (29)	1.06 (31)
Guatemala		
Maize	2.19 (195)	1.63 (141)
Philippines		
Maize	0.97 (64)	0.76 (167)
Kenya		
Local maize	1.33 (92)	1.31 (93)
Hybrid maize	1.33 (41)	1.42 (32)
Malawi		
Maize (intercropped)	0.86 (62)	0.81 (148)

[a] Numbers in parentheses represent number of observations.

[b] In tons of maize (calorie) equivalent basis in maize monoculture and maize mixed cropping.

in the two groups are genuine and not the result of a self selection bias (von Braun, Hotchkiss, and Immink 1989).

In any case, it was generally found in the study areas that, where possible, farm households expanded the staple food production *with* the cash crop production at least on a per-unit-of-land basis. This microlevel finding coincides with the observation from the cross-country comparison of 78 developing countries discussed earlier.

Why would farm households respond in this way--maintaining or increasing their food production *pari passu* with cash crop production --in the context of commercialization? Where there are no technical or contractual constraints on expanding the production of typical cash crops and where these new crops are more profitable (as shown in the next section), this response by farmers relates to market risks and production risks. To the extent that it relates to market risks, it also may characterize market failure.

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. This insurance approach, for instance, caused small farmers in Guatemala, by deviating from profit-maximizing resource allocation cost, to incur a premium of six cents per kilogram of maize produced on the farm. This deviation from full specialization makes sense from a social security perspective. It can be effectively supported as a second-best policy option, given the market realities, by rapid technological change in staple food crop production. Yield-increasing technology, which reduces cost of production per unit of output,

brings down the "insurance premium" 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 food security at household level because of resulting increased income. Spillover effects from new cash crops to staple food production, however, are not developing automatically without policy support, at least not to the desired extent. A conscious policy effort towards promoting staple food production growth is required.

PROFITABILITY AND PRODUCTIVITY

In general, small farmers tend to allocate their resources efficiently and respond to incentives, but are conscious in taking production and price risks into account. This general pattern, however, does not exclude the fact that among small farmers--as in business in general--management mistakes may occur, especially when they are in the process of early adoption of new production technologies or new crops, whose market and price risks they are not yet fully aware of. For households operating close to the borderline of food insecurity and hunger, management mistakes can be detrimental. Again, most small farmers are conscious of this and, therefore, they adopt new crops and technology only if the margin of increased profitability compared with old systems and subsistence crops is large. However, there are also existing cases where small farmers were "talked" into rapid adoption of new crops or techniques not comprehensively tested on the field or

where market infrastructure was not set up simultaneously with the expanded outgrowers' schemes.

It was found in five of the study settings that the returns to land and labor are in general substantially higher for the new crops or the crops grown under new technology.[9] The returns to land are at least doubled in all cases, except Kenya, and in some cases increased severalfold. Most dramatic is the case of the export vegetables in Guatemala as compared to the subsistence crop (Table 9).

Also, labor productivity in the new crops is substantially higher than in the subsistence crops in general. This is not the case, however, in Rwanda and should not come as a surprise. In this land-scarce, labor-surplus environment, returns per day of work are roughly equal in both the new crops and the more traditional subsistence crops. But the employment benefits are large in this case.

It should be emphasized that this study looks into the microlevel effects of commercialization at household level. However, government market interventions have a major impact on the farm-level profitability of the crops in some of the case study settings. In three of the six cases studied, the new crops are substantially protected by government price and trade policy. Producers of rice in The Gambia, of sugarcane in the Philippines and in Kenya, benefit from substantial subsidies. Under circumstances of an agricultural price policy, which would be oriented more to international price ratios and their changes, the competitiveness of sugarcane production in the Philip-

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[9] It should be noted that the profitability of the new crops is expressed here in terms of private returns at farm level.

Table 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)

Country	Cash Crops or Crops Under New Technology/ Subsistence Crops	Returns to Land		Returns to Family Labor	
		Cash Crops and Crops Under New Technology	Subsistence Crops[a]	Cash Crops and Crops Under New Technology	Subsistence Crops
		(U.S. $/hectare/year)		(U.S. $/labor day)	
The Gambia	Fully water-controlled rice/swamp rice	593	207	2.46	1.12
Rwanda	Potatoes/maize	226	115	0.36	0.46
Guatemala	Snowpeas/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

[a] The respective subsistence crop returns are adjusted to the multi-year land use situation of sugarcane in case of the Philippines and Kenya. (Two maize harvests per annum compete with 12 months of sugarcane on the field.)

[b] Returns to total labor are $3.45. Only 36 percent of labor input in sugarcane is from family labor in the Philippine case, the rest being hired labor.

pines and in Kenya would be less significant and more unstable, and labor productivity in fully water-controlled rice in The Gambia would come close to labor productivity in upland cereal production (von Braun, Puetz, and Webb 1987).

EMPLOYMENT EFFECTS AND WOMEN'S WORK

Commercialization and diversification of agriculture has employment effects in terms of structure and level of employment. The use of hired labor versus family labor and the distribution of family labor by gender may change. The level of labor input both for field operations and in processing may change as well. The effects of increased processing of crops in rural areas can be substantial as is the case with the export vegetables in Guatemala, but not in case of sugarcane processing which is more capital intensive.

Employment expansion because of increased field labor demand was particularly large in the Guatemalan example (plus 153 percent) and in The Gambian example with the technological change in rice (plus 56 percent), but small in case of sugarcane in the Philippines (plus 10 percent, Table 10).

In most cases, a large expansion of hired labor use is found. In Malawi, it is only those tobacco growers who produce tobacco on a proportionately large scale, who have higher expenditures on agricultural labor than other farmers. Other tobacco growers, in fact, have lower expenditures on hired labor, in the mean, than do the non-tobacco growers, who include quite large-scale maize producers.

Table 10--Effects of new cash crops and crops under new technology for levels of family and hired labor use per hectare[a]

Country/Crops Switched to ...	Degree of Participation	All-Family Labor	Hired Labor	Total Labor	Increase in Labor Input Per Unit of Land
		(in person days per hectare)			(percent)
The Gambia (fully water-controlled rice)	Participating	221	40	261	+ 56.3
	Little or not participating	158	9	167	
Guatemala (export vegetables)	Participating	256	91	347	+153.3
	Not participating	108	29	137	
Philippines (sugarcane)	Participating	40	66	106	+ 10.4
	Not participating	61	35	96	

[a] Weighted average of labor use per hectare based on cropping pattern (area shares) and crop-specific labor use for average farm.

[b] In the Philippines, the comparison is just between maize and sugarcane per unit of land.

This can be considered a form of commercialization of the rura economy (the labor market), and in the case of The Gambia this chang was particularly significant starting from a very low base (Table 10 col. 2). The share of hired labor and its increase is found to b high in the Philippine sugarcane case (an increase from 36 percent t 63 percent) and in Guatemala (from 21 percent to 26 percent) startin from a rather high bases in both cases. This expansion of hired labo use in these settings creates employment for the rural poor. Assessment of the income and employment benefits of commercialization certainly cannot be completely done if just the farm household situation is evaluated. On the other hand, new forms of commercial production tend to increase the value of land and, in some cases, displace small farmers and/or tenants. In the Philippine case, many of the sugar laborers used to be maize-growing tenants before.

Not only do the patterns of family versus hired labor input change in the context of the schemes but also the labor input by gender within households (Table 11). Yet there is a great heterogeneity not only between study areas but also within them. This relates to gender-specific crops, tasks of work, and seasonal work distribution.[10] Change in cropping pattern and crop technology may affect any of these and may even be a function of existing work patterns before the introduction of new crops or new technologies.

In general, it was found that women work less in the more commercialized crops than do men and hired laborers who are also mostly men

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[10] Details on these issues are found in the specific case study reports.

Table 11--Change in women's labor use when agriculture is more commercialized

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

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

in the study settings. Yet there are many other situations too: for instance, in The Gambia, women contribute only 2 percent of labor in traditional upland cereals production (millet) but 27 percent in groundnuts (the traditional cash crops) and 65 percent in swamp rice production (a traditional women's crop), while only 31 percent of women labor input is found in the new fully water-controlled rice. Comparing across study settings, it was found that women's labor input in agriculture is lowest in the Philippines but highest in Rwanda and Malawi. In Malawi, women's agricultural work, both in terms of hours per day and as a percentage of total work time, increases with tobacco production. Men in tobacco-growing households provide more of the labor on the tobacco crop, but women have the primary responsibility for food crops (grown for both consumption and sale). In addition, women in these households help with the tobacco crop and, among the larger producers, with overseeing the hired laborers. In Rwanda, women contribute between 60 and 70 percent to staple food production but, consistent with the general finding, much less labor input (30 percent) to the new cash crop, which is potato production with modern inputs.

From increased employment, it is expected that favorable wage rate effects would spread the benefits of the increased labor demand in agriculture across a broad spectrum of the rural economy. These general equilibrium effects may be substantial but are not analyzed in detail in our case studies. Average wage rates computed in a comparable way across the six study areas range between $0.35 and $1.25 per labor day (Table 12). They are found to be lowest in Malawi and

Table 12--Daily wage rates[a] in 1985/86 in study areas

Country	Wage Rate
	(in U.S. $)[b]
The Gambia	0.88
Guatemala	1.08
Rwanda	0.79
Philippines	1.25
Kenya	1.25
Malawi	0.35

Source: Survey averages and in case of The Gambia, Kenya, and Malawi secondary local data.

[a] Unskilled males.

[b] National currency converted at following exchange rates, which reflect parallel market situation, where applicable:

The Gambia : 1 Dalasi = U.S. $0.28 (1985), U.S. $0.167 (1986)
Rwanda : 1 Franc Rw = U.S. $0.0105 (1985), U.S. $0.0083 (1986)
Guatemala : 1 Quetzal = U.S. $0.40 (1985), U.S. $0.27 (1986)
Kenya : 1 K. Shilling = U.S. $0.063
Malawi : 1 Kwacha = U.S. $0.45 (1986-87)
Philippines : 1 Peso = U.S. $0.050

Rwanda. This is consistent with the population density and excess labor supply situation in those study areas that was also revealed for Rwanda in the lowest level of average labor productivity in agriculture (Table 9).[11]

An issue of concern in the context of the commercialization process is the potential generation of landlessness and the new labor class in rural areas. Such developments occur to some extent in three of the study settings. In Rwanda, the establishment of new tea factories has led to displacement of family farms in the area of the tea factories and their surrounding tea plantations in the study area. In the Philippines, maize farmers have become sugarcane laborers on a large scale and in the Kenya setting, some farm households were displaced by the sugarcane factory. These cases are described in more detail in the respective case study reports. The overall gain in employment due to diversification and commercialization of agriculture does not assure that those farm households who lose their resource base actually participate in the gains from employment. In the cases of Rwanda and Kenya, compensation was paid to farmers losing their land but these payments generally did not cover fully the income stream foregone due to the loss of land.

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[11] It should be noted that wages are for agricultural production activities (average for cultivation, harvesting, and partly peak season activities, thus may exceed seasonal average returns to family labor stated in Table 9).

MARKETED SURPLUS AND PRICES

One might hypothesize that the switch to specialized cash crops leads to an overall commercialization of the farm in terms of aggregate output sold, but that less is sold after the change from the remaining food crops, both in relative and in absolute terms. As shown above, total per capita production of staple food does not necessarily decrease, because area expansion (into fallow land) and yield increases facilitate its production parallel to expanded cash cropping. We find that contrary to the above hypothesis, the portion of staple food sold out of total staple food production tends to be higher in the scheme participant farms than in the nonparticipant groups (Table 13). Thus even in cases where per capita production of food on the farms declined, the marketed share did *not* decline. These farms joining the schemes are apparently more integrated into the exchange economy in general as sellers and buyers of commodities.

It is noteworthy that the marketed surplus in the two study areas with the smallest farms and highest population density is very low (Guatemala and Rwanda)--only 4 percent of staple food output sold by nonparticipants (Table 13). In these locations, one might hypothesize that even small changes in marketable surplus affect local food prices a lot. Yet, two very different situations apply and determine price effects of changes in local marketable surplus. In Guatemala cereal trade functions rather free interregionally and despite various government interferences in the cereal market, the local cereal market is tied in with the international one to a substantial extent. Infra-

Table 13--Marketed surplus (gross) of staple foods when agriculture becomes more commercialized (middle tercile of farm size in respective samples)[a]

Country	Crops	Participants in Schemes	Nonparticipants
		(percent sales out of production)	
The Gambia	All cereals	32.1	25.0
Guatemala	All staple foods	6.1	3.9
Rwanda	All staple foods	14.7	3.7
Philippines	All staple foods	68.0	70.0
Kenya	Maize	15.0	12.6
Malawi	Maize	7.5	8.3

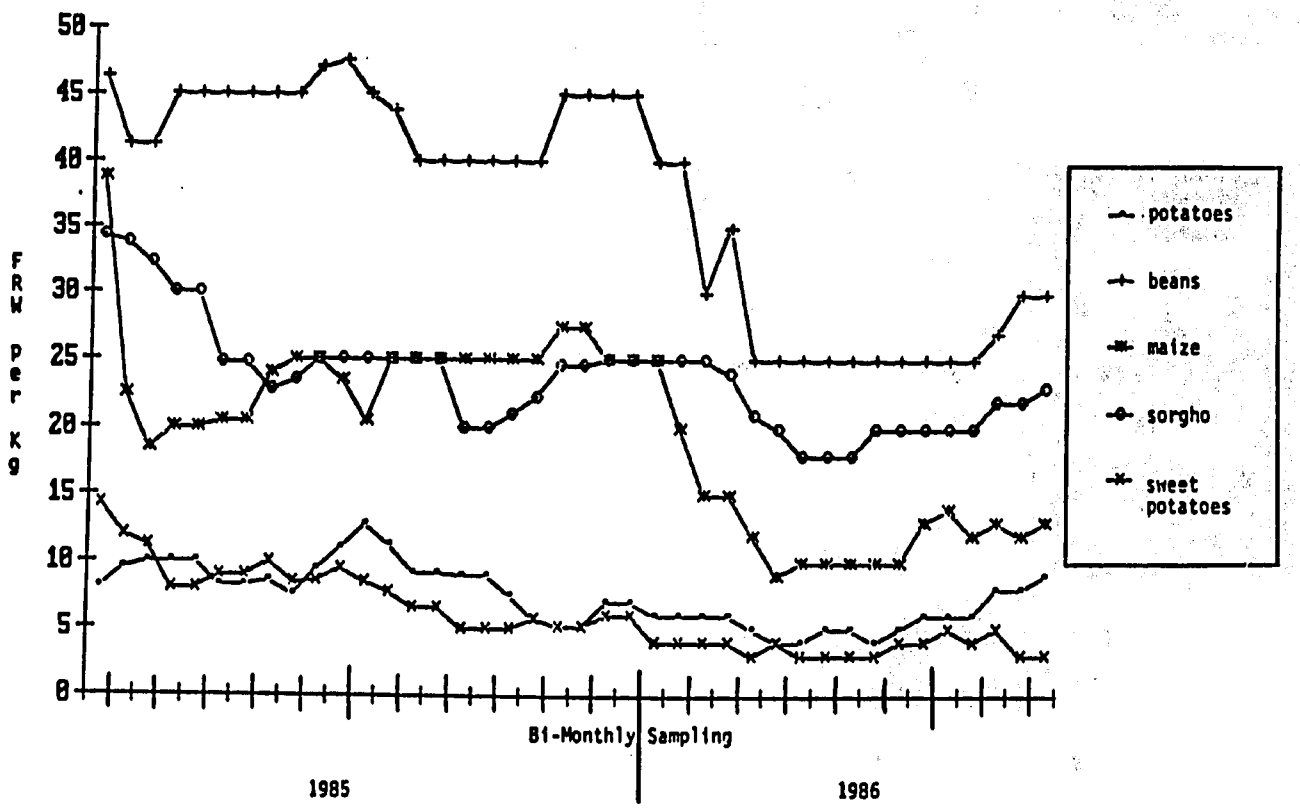
[a] The middle tercile farm size groups of respective samples are presented here to exclude farm size effects.

structure and trade regime allow for not very large differentials between border and local prices, though in particularly remote areas--not in the study site--and due to exchange rate manipulations, discrepancies may evolve locally and at certain times.

In Rwanda, on the other hand, the situation is quite different due to the landlocked position of the country and deficiencies in local infrastructure. Here, price fluctuations due to local supply variations can be considerable. The low and cautious adoption of nonfood cash crops (tea) by the smallholders in the study area may partly be explained by this situation. The food price risk is considerable there. This also means that rapid supply expansion of staple food would have price-depressing effects. This was in fact observable in the case of potatoes, the main cash crop in the study setting, during early 1986 (Figure 3). The rapid expansion of potato supplies also pulled down the prices of other staple foods in the local area. It should be noted that the reduced food prices parallel to expanded employment in agriculture because of expanded potato production is a favorable combination for the rural poor.

The relatively low proportions of maize marketed by households in the Malawi case study reflect the situation of a rural population comparable to those in Rwanda and Guatemala--land short and poor. The mean harvests are not large so that people aspire to retaining as much as possible. This is particularly so for the middle tercile, whereas both total harvests and share marketed are higher for the top tercile. The price control and subsidy by the government marketing agency (ADMARC) has kept prices relatively low and relatively smooth for

Figure 3--Prices of crops in local market in Rwanda study area, 1985-86 (January 1985-August 1986)



consumers. On the other hand, many rural consumers have long distances to walk to reach the marketing depots, and often experience long waits and shortages in supply. If they turn to the few sellers in the local markets, they face prices that fluctuate much more widely. For all these reasons, the proportion of maize marketed by producers remains relatively low, and, furthermore, declines in the middle terciles (of land and income) before rising for the top tercile. In addition to the incentives of a more secure food supply, the bigger producers have the further incentive to retain maize which they use to compensate laborers in the peak agricultural season (November to January), which is also the deficit food season.

The technical characteristics of crops impinge on the ability of farm households to respond to changing price ratios in the short run. Sugarcane in this respect permits a much less short-term ability to respond to price changes than do, for instance, potatoes, export vegetables or the rice crop in the other study environments. Sugarcane, with its potentials for harvesting ratoon crops, represents a semi-fixed factor situation for a farmer who switched to sugarcane. If, then, after the switch and after the investment made, the terms of trade between sugarcane and a competing crop (say, maize in the Philippines and Kenya) shift in favor of the competing crop, the moving out of sugarcane is constrained in the short run even if contractual arrangements would permit it. For loss minimization, cane production will be continued in the current production cycle as long as variable costs are covered. A similar switch has been seen in

Malawi from groundnuts to maize when there was an increase in the (then government-controlled) price of the latter.

It is, therefore, of interest to look into the evolution of the terms of trade to assess if farmers who opted for sugarcane production then got trapped in a disadvantaged situation because of adverse shifts in the terms of trade. Table 14 suggests that this was generally not the case in either Kenya or the Philippines. In the Philippine case, however, terms of trade were far from stable. The sugar mill in the study area opened in 1977 and expanded its capacity substantially in 1982. Two years during the period of observation (1977 and 1984) show substantially reduced terms of trade disfavoring sugarcane. In 1984 the much overvalued domestic currency led to the deterioration of the sugarcane prices compared to the maize price. Nevertheless, the general stability of the sugarcane price in Kenya and in the Philippines expressed in terms of trade versus maize prices at farm level is surprising given the large fluctuations of international sugar prices during the 1970s and 1980s. Quota regulations (with the United States in case of the Philippines) and protection cum stabilization of the domestic sugar price played an important role in stabilizing favorable returns from sugar for farmers over some time. The sustainability of such a policy in the longer run, however, is open to question.

Crop prices certainly do matter much more for more commercialized farmers, both as sellers and buyers, and so do input-output price ratios. Price risk is a key consideration for farmers who adopt more commercial crop mixes. The case of export vegetable production in the

Table 14--Local terms of trade of sugarcane/maize in Kenya and the Philippine study areas, 1974-1986 (farmgate price basis)

Year	Kenya	Philippines
	(Index 1979 = 100)	
1974	n.a.	91.2
1975	n.a.	108.1
1976	n.a.	97.1
1977	n.a.	78.6
1978	n.a.	88.8
1979	100.0	100.0
1980	93.2	104.9
1981	100.3	100.0
1982	105.4	110.8
1983	98.6	106.3
1984	95.5	67.9
1985	96.5	96.6
1986	101.3	n.a.

Guatemalan example is particularly extreme (Figure 4). Snowpea prices, the key export vegetable in the study area, fluctuate extremely even from week to week and these price fluctuations are directly transmitted to farmers from the main market places in the U.S. and Western Europe. It should be noted, however, that the technical characteristics of snowpeas permit harvesting from the same field over a period of about 12 weeks. That means the moving average price over 12-week period reflects the actual returns to the crop rather than the short-term price depicted in Figure 4). Long-term average prices over the period 1984-87 do not show a significant increase or decrease in real prices of snowpeas at farmgate level and the respective terms of trade of the export vegetable crops versus the main staple crop (maize) in the Guatemalan case, did not change substantially over this period since the rapid expansion of the vegetable crop.[12]

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 be taken into account. In Guatemala, for instance, the main income alternative to export vegetable production is searching for more off-farm work in urban services and for seasonal work in the large-scale plantation sector. The income flow from off-farm employment is no less fluctuating and risky than that from export vegetable production. Nevertheless, households that adopt more commercial agricultural production

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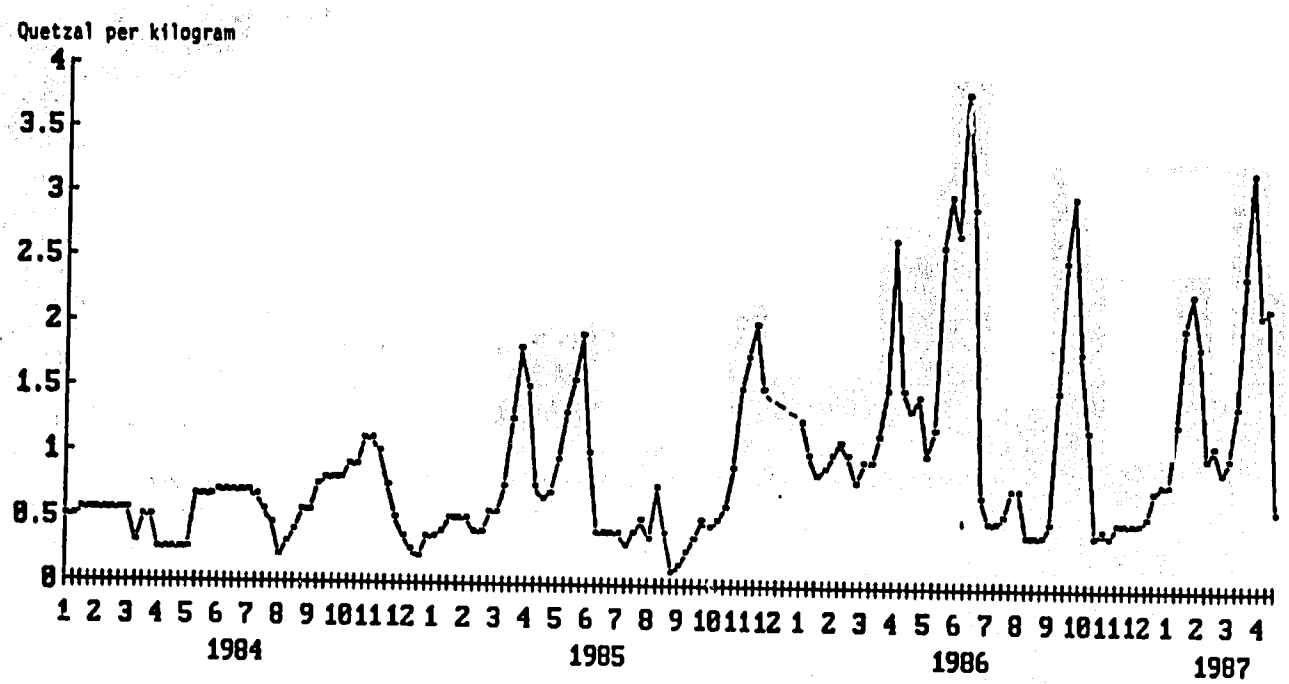
[12] For further details, see von Braun, Hotchkiss, and Immink (1987, 3.13).

Figure 4--Monthly snowpea prices, Guatemala



are pressed constantly to solve difficult cash management problems. Thus, extension services and savings facilities should play a role in the commercialization programs in order to facilitate farmers' adjustment to new situations, especially in the short run.

5. INCOME EFFECTS AND IMPLICATIONS FOR INCOME USE AND CONSUMPTION IN FARM HOUSEHOLDS

In general, commercialization in the study settings has generated employment, except in the Philippine case, and/or increased labor productivity in agriculture. The direct income effects, therefore, should be expected to be generally positive. These direct income effects are further complemented by indirect income effects through forward and backward linkages generated by the increased demand of the direct income beneficiaries for goods and services as well as the input demand for the specific schemes. Direct beneficiaries are those farm households who participate in the schemes and hired laborers, the latter especially in the Guatemalan and in the Philippine cases. On the other hand, it should be emphasized that not everyone in the cases gained from the particular form of commercialization and technological change in a relative or even absolute sense.

GAINER-LOSER SITUATIONS

The gainer-loser patterns in each of the study settings are quite complex. At the household level, losers certainly include those farm households who were displaced by the introduction of commercialization schemes and who were not fully compensated. More complex are the effects at the intrahousehold level. The detailed assessment of the intrahousehold effects of commercialization in each of the study areas

showed a general pattern of reduced direct income control by women farmers and women in the household in the process of commercialization. This does not mean that women do not necessarily capture a fair share in the benefits from commercialization on the consumption side, but their direct control over income flows has been certainly reduced in the study settings of The Gambia, Guatemala, Kenya, Malawi, and Rwanda.

Even in the study environments where women provide a dominant share of labor input in agriculture, such as the case in Rwanda or Malawi, the new crops (tea or tobacco) or new technologies for crops (in case of potato) are largely operated by men. Women's labor input in these crops is substantially less than in the subsistence crops in the same study settings. The reasons are complex and frequently the modes of implementation of programs are blamed for this disadvantageous outcome for women farmers. In Guatemala, for instance, it is simply not customary that women get involved in contractual arrangements concerning the export vegetable production. In The Gambia, the land allocation process at the village level in most ethnic groups is mainly channeled through the male compound heads by the village and project authorities, despite major efforts by project funders in that setting to have women directly involved. Similarly, the contractual arrangements concerning tea and potato production in Rwanda was largely channeled through the male heads of households. In Malawi, extension advice on tobacco growing during the colonial period and both extension and credit since Independence have been directed dis-

proportionately to men. This is a pattern well known from other parts of Africa.

It would probably be over idealistic to assume that an agricultural development and growth process fostering the transition from semisubsistence to commercial agriculture could be designed without any 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. Particular focus in this respect has to be placed on those households that may lose not only relatively but may actually lose absolutely to an extent that poses a food security problem and nutritional risk. Frequently, these are only small groups that nevertheless require policy attention. The following examples may shed light on the diversity of the problem:

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 previously cultivated on their own account, when it became redefined as communal for the compound as a whole.

Guatemala

The increased returns to land because of export vegetable production put upward pressure on land rental values, and thereby has made provision of household-level food security more costly for those

households that obtain most of their cash income off-farm and maintain a certain level of food supply on the basis of rented land.

Kenya

Some households were displaced by the sugar factory. The stability and security of their long-term income flows are uncertain. The Kenya study was able to include a randomly chosen group of these households in the 1985/86 portion of the study. The majority of these relocated households would be classified as nonsugar-growing households. Table 15 presents some comparisons of the relocated and nonsugar households. Clearly for the relocated households, the amount of land now owned is substantially less than what they had prior to the creation of the scheme. They also own less land than the nonsugar producers. About 13 percent of the relocated sample is classified as landless.

While the income per capita of the relocated group is slightly lower than the nonsugar comparison group, there is a significantly lower caloric intake per adult equivalent in the relocated households. Not only are the absolute amounts of calories in the relocated households lower than the nonsugar-growing households but the percentage of caloric deficient households is also significantly higher in the relocated group.

There also appear to be differences in the caloric adequacy of the diets of the preschoolers from the different groups. Preschoolers from the nonsugar-growing households have a diet that provides, on

Table 15--Socioeconomic and nutritional situation of households relocated due to sugarcane scheme establishment in Kenya

	Relocated	Nonsugar Farmers
Area of land owned prior to sugarcane scheme (in hectares)	5.1	...
Area of land owned after scheme (in hectares)	1.17	3.4
Percentage of households who are now landless	13.3	...
Income/capita (Kenyan Shillings)	2,598	2,691
Caloric intake per adult equivalent unit	2,465	2,587
Percentage of households less than 100 percent of caloric adequacy	42.0	33.0
Percentage of households less than 80 percent of caloric adequacy	35.0	30.0
Average caloric adequacy of preschoolers from households	51	61
Preschoolers total percentage of time ill	30.8	29.8
Average Z-score		
Height/age	-1.51	-1.69
Weight/height	+0.06	-0.06

average, 61 percent of requirements compared to 51 percent for preschoolers from the relocated households.

However, there are no differences, on average, in the average nutritional status of children from the two groups, and the total amount of time ill for children is similar for the relocated and non-sugar-producing groups.

These data would suggest that at the household level, the relocated households' income has been negatively affected by the sugarcane scheme, but that the health and nutritional status of preschoolers from the relocated households have not been adversely affected in a similar way, at least in the time period covered.

Rwanda

Some farm households were displaced by tea factories in the area and not fully compensated. Also, households that were stimulated to adopt smallholder tea production in the area came to realize that returns to tea were not competitive with crops such as potato and cereals, given the price ratios and labor demand. Legal uncertainties did not permit them to completely abandon the tea fields and reconvert them to subsistence crops.

A specific subsample of displaced farm households was surveyed to evaluate short- and medium-term effects of the severe disruption experienced by these households. Only those households that remained in the area could be tracked down and included in the survey. Seventy-two percent of the surveyed households reported that they have now a smaller farm than before, thus land purchased and rented after the

expropriation did not make up for the loss. These households now earn much more income off-farm and, accordingly, their off-farm income is 31 percent higher than in the other farm households.

On average, the relocated households were not found to consume less food (calories) on an adult equivalent basis than other sample households. Despite the reduced farm resource base, entitlements to food were maintained through the off-farm employment opportunities. However, compensation was given only for the loss of houses and not for the loss of land, since land ownership is legally vested in the state.

Philippines

In the Philippine growing areas, which were too far away from the mill for farmers to switch to sugarcane because of prohibitive transportation costs, only one in ten households primarily engaged in maize production were landless. The remaining 90 percent of households were fairly evenly divided between landowners and tenants. Among households primarily engaged in sugar production, 50 percent were landless. A large proportion of this landless 50 percent identified themselves as former maize tenants before the establishment of the sugar mill, and some were former maize landowners. Thus, a substantial number of former maize farmers experienced a decline in tenancy status as a result of the introduction of sugar, as well as a decline in income

MULTIPLE INCOME SOURCES

Although the income from the new cash crops or technological change in existing food crops is important, its share in total income

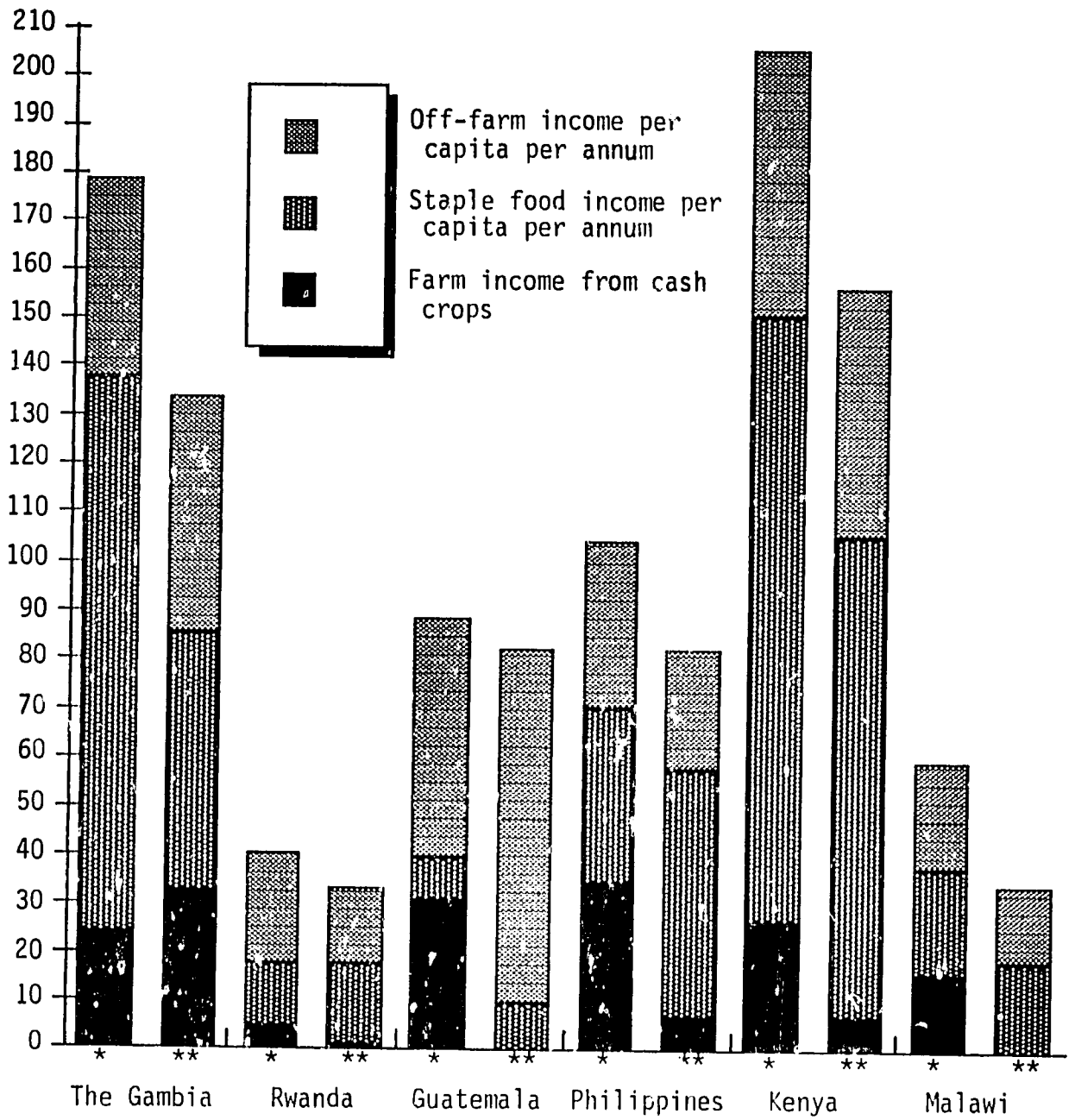
in the study settings should not be overemphasized. Actually, the cash crop share in total income ranges between 11 and 35 percent. The change in agricultural income sources due to commercialization is much more substantial than the change in overall income source patterns.

This is so because in all the six study settings, farm households depend on a wide range of multiple income sources, farm and nonfarm (see Figure 5). In relative terms, off-farm income is highest in the particularly land-short settings of Guatemala, Malawi, and Rwanda; while in absolute terms, a fair degree of similarity prevails across the six study settings (see Figure 5 and Table 16). Staple food income is higher than cash crop income (Figure 5) even among project participants in settings, except Malawi and Guatemala. In Malawi, staple food income is lower than cash crop income for tobacco growers (equivalent to project participants) but not for other producers.

IMPLICATIONS FOR CONSUMPTION OF FARM HOUSEHOLDS

Participants in the schemes have higher income per capita, controlling for farm size, than nonparticipants in general, and this is reflected in the value of total expenditure (Table 17). Consequently, calorie consumption is up by a significant amount on a per capita basis, with the exception of the study setting in Kenya. The relationships between income, expenditure, and food consumption are analyzed in more detail in the following section. A rough overview by farm size is provided here only (see Table 17, col. 6).

Figure 5--Income and income sources of scheme participants and nonparticipants[a]



[a]Only the middle tercile farm size groups are represented in the graph to exclude farm size differences.

* Participants.
** Nonparticipants.

Table 16--The importance of income from selected cash crops[a] for total income of farm households participating and not participating in schemes for "cash crops"

Country	Share of Income from "Cash Crops"	
	Participants	Nonparticipants
Rwanda	11.4	2.8
Guatemala	35.0	0.0
Philippines	33.3	8.4
Kenya	13.1	4.5
Malawi	15.7	0.1

[a] Cash crops in the respective samples are:

Rwanda : tea and potatoes with modern inputs
Guatemala : export vegetables
Philippines : sugarcane
Kenya : sugarcane
Malawi : tobacco

Table 17--Differences in expenditure and consumption levels and patterns when agriculture is more commercialized[a]

Country	Change in Total Food and Non-food Expenditures (Including Value of Food From Own Production)	Share of Value of Food Consumption from Own Production in Total Expenditures		Share of Food in Total Expenditures (Including Value of Food From Own Production)		Difference in Calorie Consumption per Capita
		Participant	Nonparticipant	Participant	Nonparticipant	
	(percent)					
The Gambia	+17.0[b]	32	35	62	68	+ 4.9
Rwanda	+24.4	50	49	80	79	+10.3
Guatemala	+21.9	11	12	64	67	+ 5.3
Philippines	+17.9	25	35	68	72	+ 4.0
Kenya	+17.3	48	50	80	80	+ 0.5
Malawi	+26.0	32	32	62	64	+13.7

[a] To exclude farm size effects only results of the respective middle tercile farm size classes are presented in this table.

[b] It should be noted that in the case of The Gambia sample, the income effects of scheme participation were more concentrated in the smaller farms than in the middle tercile where in the period of observation, total expenditures turned out to be less for the participant group in the middle tercile (-6.1 percent). The more detailed income analysis for The Gambia shows a 17 percent increase in real per capita income due to the new technology in the average farm.

It is frequently hypothesized that when households shift from semisubsistence agriculture to more commercial production, they also shift their consumption patterns away from food and toward nonfood item more rapidly (at same income levels), and thereby create nutritional problems for themselves or for vulnerable groups in the household (preschoolers, women, and the aged).

From the broad overview in Table 17, two observations are noteworthy in this respect: In most study settings, with the exception of the Philippines, the share of value of food from own production in total expenditures is roughly maintained, that is to say, production for own food security is largely maintained in the mean. It will be particularly important to look in the analysis below into what the implications of the most substantial change in the Philippine case are for household food consumption and nutrition.

The general stability of food income implies that farm households, even with increased real income (and cash income), maintained their food income in these study settings. Secondly, it is important to note that the share of food and total expenditures in participant versus nonparticipant farms of similar size does not differ very much (Table 17, cols. 4 and 5). In the cases of Rwanda and Kenya, they are practically the same despite the income differences noted earlier. Quite significant is the lower budget share to food in The Gambia and the Philippines in participant farm households of similar farm size (by 6 and 4 percent, respectively). The following analysis will shed further light on changes in consumption and diet, which, of course, may occur at constant budget shares to food.

6. THE EFFECTS OF COMMERCIALIZATION ON FOOD AND NONFOOD EXPENDITURES

How do households spend the higher income generated by the increased commercialization? The two broad classifications of expenditures that we will explore in this chapter are food and nonfood expenditures. To the extent that malnutrition is caused by low calorie intakes, an obvious avenue for improvement in nutritional status is for a high proportion of incremental incomes to be spent on food (the issue of what foods are purchased--their relative cost per calorie--will be addressed in the following chapter). However, because morbidity has such a strong influence on nutritional status (as will be discussed in Chapter 8), certain nonfood expenditures may also go a long way toward improving nutritional status, such as expenditures for better health care, improved sanitation facilities, and better housing.

FOOD EXPENDITURES

Table 18 shows per capita annual expenditures broken down by food and nonfood expenditures, and household calorie availability and calorie intakes per adult equivalent. Incomes and expenditures are expressed in U.S. dollars. All food expenditure data include valuations for food consumption from own-farm production.

Table 18--Per capita annual expenditures, and household calorie availability per adult equivalent (sample averages)

Study Sites/Units	Per Capita Annual Total Expenditures[a]	Per Capita Annual Nonfood Expenditures	Per Capita Annual Food Expenditures[b]	Food Budget Share	Calorie Availability per Adult Equivalent	Calorie Intake per Adult Equivalent
	.....(U.S. dollars).....			(ratio)	.....(calorie/day).....	
The Gambia						
Participants	208	78	131	0.63	2929	...
Little or no participation	188	67	121	0.65	2882	...
Guatemala						
Participants	126	48	78	0.67	2974	...
Nonparticipants	101	35	65	0.71	2914	...
Kenya						
Participants	143	31	112	0.78	...	2740
Nonparticipants	128	25	103	0.80	...	2654
Landless	135	32	103	0.76	...	2778
Philippines						
Participants	170	69	101	0.59	2707	2399
Nonparticipants	114	35	79	0.69	2406	2385
Landless	82	18	64	0.78	2236	2280
Rwanda						
Participants	93	20	74	0.80	2756	...
Nonparticipants	82	17	64	0.80	2478	...
Malawi						
Participants	38	16	22	0.62	...	1761
Nonparticipants	38	14	23	0.64	...	1563

[a] Based on 10-month figure for Malawi.

[b] Including consumption of own-produced food.

Highest average total expenditures are found in The Gambia, followed by the Philippine sample, and lowest expenditures in Rwanda and Malawi. In all cases, except Malawi, total expenditures are higher for the more commercialized farmers than for the less commercialized farmers. The largest difference between the more commercialized and less commercialized farmers is found in the Philippine case. This larger difference is partly due to the larger landholdings of the commercialized farmers, who were more likely to adopt sugar.

In general, food budget shares decline with rising income. The Gambia sample, with the highest total expenditures, has the lowest food budget shares. The Rwanda case, with the lowest total expenditures, has the highest food budget shares. The landless group for the Philippines, among the poorest groups of any identified in Table 18, has a total expenditure level similar to that of the less commercialized Rwanda farmers and a similar food budget share as well, about 80 percent. As income (total expenditure) increases for the other two Philippine groups, food budget shares decline rapidly.

Table 19 disaggregates the food budget share data by expenditure tercile. Note, especially for The Gambia and Rwanda, how little the food budget share declines as incomes more than double, in contrast with the data for Guatemala and the Philippines. These patterns indicate that households from the three African countries spend a much higher proportion of their incremental income on food.

Direct estimation of the food expenditure elasticities with respect to total expenditures gave values of 0.94 and 1.00, respectively,

Table 19--Total expenditures and food budget shares, by total expenditure tercile

Country	Food Budget Share			
	Total Expenditure Tercile			
	1	2	3	Total
The Gambia	0.66	0.65	0.62	0.64
Guatemala	0.76	0.71	0.60	0.69
Kenya	0.84	0.83	0.72	0.78
Philippines	0.79	0.75	0.60	0.68
Rwanda	0.81	0.80	0.79	0.80
Malawi	0.68	0.62	0.59	0.63

	Annual Total Expenditures Per Capita			
	Total Expenditure Tercile			
	1	2	3	Total
	(U.S. dollars)			
The Gambia	131.7	180.7	294.9	200.4
Guatemala	56.3	93.9	190.6	114.5
Kenya	84.0	125.8	201.7	137.0
Philippines	63.6	101.5	199.3	119.3
Rwanda	51.0	76.3	132.6	87.1
Malawi	17.7	30.8	64.4	37.6

for The Gambia and Rwanda, but a lower value of 0.84 for the Philippines.[13]

All of the elasticities cited above are evaluated at the mean of the data. Estimations for Guatemala (which used food budget shares as the dependent variable) and the Philippines, both indicated that these elasticities are not constant across income groups, but decline with increasing income.

In summary, while food expenditures increased rapidly with income for all six countries, they rose most rapidly for the African countries. This difference in expenditure behavior may be due to the relatively easy access to consumer goods markets in Guatemala and the Philippines, as compared with the other situations. Or, as noted, it could be that in Guatemala and in Philippines, the top tercile has a much higher absolute income/expenditures--that is, that the difference is relative *within* a case rather than differences *across* the cases.

DIFFERENCES IN THE MARGINAL PROPENSITY TO SPEND

The foregoing discussion has centered on how increases in income, generated from any source, were spent. Controlling for income, do

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[13] A second estimate for the Philippines, obtained using "predicted" income data (using two-stage least squares) in place of total expenditures, gave a much lower estimate of 0.34. It is thought that the first value of 0.84 overestimates the "true" relationship because of a positive correlation between errors in measuring food expenditures and total expenditures, while the second estimate may underestimate the "true" relationship, because of the difficulty of measuring income.

marginal propensities to spend, in particular for food, differ across more and less commercialized groups?

Four studies found that the percentage of income coming from cash crops either did not significantly affect the overall marginal propensities to spend on food, or that the effect, while statistically significant, was small. In The Gambia, Kenya, and the Philippines, regression estimations indicated that the difference in marginal propensities to spend out of cash income versus income in general were not statistically different from zero.[14] For Guatemala, 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 going to food. While this difference was statistically significant, in practical terms, the effect is small. These results may be contrasted with Rwanda, where it was found that while holding income constant, 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 much differently in the intrahousehold decisionmaking process than other forms of income.

NONFOOD EXPENDITURES

What types of nonfood items do households purchase at the margin when incomes increase? Table 20 shows annual per capita expenditures

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[14] For Kenya, the dependent variable was household calorie intakes. The effect of income from sugar was insignificant for the subsample where nonagricultural households were excluded.

Table 20--Annual per capita expenditures for selected nonfood items, by expenditure tercile

Item/Country	Total Expenditure Tercile 1	2	3	Ratio Tercile 3/1	Total Expenditure Budget Share (Average)
	.....(U.S. dollars).....				(percent)
Health Expenditures					
The Gambia	1.17	1.90	3.53	3.0	0.9
Guatemala	0.34	1.09	8.42	24.9	2.9
Kenya	0.42	0.52	0.65	1.6	0.3
Philippines	0.81	1.43	5.07	6.3	2.1
Rwanda	0.53	0.84	2.23	4.2	1.3
Malawi	0.33	0.45	0.70	2.1	1.4
Education Expenditures					
The Gambia	0.68	0.61	1.04	1.53	0.3
Guatemala	0.48	0.81	1.09	2.27	0.3
Kenya	1.07	1.14	1.53	1.44	0.9
Philippines	1.12	1.74	5.59	5.00	2.3
Rwanda	0.68	0.86	1.06	1.56	0.9
Malawi	0.03	0.13	0.10	3.8	0.3
Housing Expenditures					
The Gambia	0.52	2.19	4.86	9.3	1.0
Guatemala	0.01	0.01	7.74	..	2.3
Kenya	0.23	0.57	3.30	14.1	1.0
Philippines	0.29	0.83	6.53	22.8	2.0
Rwanda	0.72	1.46	5.48	7.7	2.8
Malawi	0.08	0.11	0.32	4.0	0.4
Clothing Expenditures					
The Gambia	9.04	12.18	20.70	2.29	5.8
Guatemala	1.96	4.29	6.58	4.58	4.5
Kenya	0.91	1.48	3.69	4.05	2.7
Philippines	2.00	3.41	10.06	5.02	4.3
Rwanda	4.18	6.45	10.42	2.49	7.5
Malawi[a]	1.69	3.38	6.04	3.60	10.1
Transportation Expenditures					
The Gambia	3.00	4.83	10.31	3.44	2.5
Guatemala	1.70	2.71	13.54	7.95	5.3
Kenya	0.68	1.40	4.00	5.92	2.7
Philippines	0.91	1.56	11.34	12.46	3.5
Rwanda	0.42	0.60	0.50	1.19	0.5
Malawi	0.09	0.22	0.95	10.70	0.9

[a] "Clothing" includes items for personal care (vaseline, comb, toothpaste, etc.)

for health, education, housing, clothing, and transportation, disaggregated by total expenditure tercile.

For all six cases, the highest expenditure elasticities are indicated for housing, as suggested by the high ratios of expenditures for the third tercile over first tercile. Lowest expenditure elasticities are indicated for education and clothing.

Because of the relatively low food budget shares for Guatemala and the Philippines, nonfood budget shares tend to be higher for these two cases for almost all categories, but in particular for health expenditures and transportation expenditures. Education expenditures stand out as particularly important for the Philippines, and clothing expenditures as relatively important for the African countries.

Overall, the relatively low budget shares for the various nonfood categories presented in Table 20 do not suggest that such expenditures constitute a major link in the improvement of nutritional status. This is not to say, however, that more medical care and better housing and sanitation facilities (for example) would do little to improve health, if proper facilities were made available and rural populations were provided with nutrition education, which could result in significant budget reallocations and more efficient use of household resources.

7. THE EFFECT OF INCREASES IN INCOME ON CALORIE AVAILABILITY AT THE HOUSEHOLD LEVEL AND INDIVIDUAL CALORIE INTAKES

To what extent do higher food expenditures lead to higher calorie consumption at the household level? It has been widely observed that as income increases, more expensive calorie sources are purchased so that a certain percentage increase in food expenditures usually leads to a much lower percentage increase in calorie availability at the household level. We will see below that this is indeed the case in all six study countries.

COST PER CALORIE

Table 21 shows the number of calories purchased (in thousands) per U.S. $1.00. A pattern of increasing cost per calorie is clearly evident. For the four cases for which data are available, the largest increase in cost per calorie from the first to the third total expenditure tercile occurs for Guatemala and the lowest increase is for Rwanda. After controlling for income, costs per calorie do not vary much between scheme participants and nonparticipants (with the possible exception of Guatemala).

Direct estimation of the elasticity of household calorie availability with respect to total expenditure (which combines the effects of "leakage" due to lower food budget shares *and* more expensive calo-

Table 21--Thousands of calories purchased per U.S.$1.00, by total expenditure tercil

Country[a]	Total Expenditure Tercile 1	2	3	Total	Ratio 1/3[b]
The Gambia	12.12	9.71	7.83	9.89	1.55
Participants	11.68	9.53	7.64	9.55	1.53
Nonparticipants	12.74	9.89	8.18	10.37	1.56
Guatemala	17.30	12.98	10.15	13.44	.70
Participants	16.19	11.90	9.78	12.16	1.66
Nonparticipants	18.26	14.10	11.02	15.07	1.66
Philippines	10.06	8.60	6.90	8.56	1.46
Participants	9.97	8.34	6.74	7.76	1.48
Nonparticipants	10.09	8.75	7.15	8.64	1.41
Landless	10.26	8.90	7.57	9.45	1.36
Rwanda	11.78	10.89	9.79	10.78	1.20
Participants	11.25	10.49	9.64	10.25	1.17
Nonparticipants	11.98	11.25	9.97	11.28	1.20

[a] Data unavailable for Kenya and Malawi.

[b] Food expenditures roughly double from 1st to 3rd tercile, except for Guatemala and Rwanda where food expenditures increase by somewhat more, 150 percent.

rie sources) resulted in 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. That is, a doubling of income results in a 50 percent increase in household calorie availability for The Gambia and Rwanda (the divergence from a value of 1.00 almost entirely due to purchase of more expensive calorie sources), but only a 30-35 percent increase in Guatemala and the Philippines (due both to declining food budget shares and to purchase of more expensive calories).[15]

How do diets change as income increases? What types of foods do higher-income households purchase which are expensive calorie sources? Table 22 breaks down food expenditures by broad food group and by total expenditure tercile. Once again, we see a dichotomy between the three African cases and Guatemala and the Philippines. In Guatemala and the Philippines, meats, which are among the most expensive sources of calories, account for at least 20 percent of food expenditures even for the lowest total expenditure tercile. Especially for the Philippines, the budget share for meats increases with income, with a consequent decline in the budget share of staple foods, which are the least expensive calorie sources.

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[15] A similar relationship was estimated for Kenya and the Philippines using household-level calorie intake data derived from a 24-hour recall of foods actually consumed. These resulted in much lower elasticity estimates, specifically 0.17 and 0.08 for Kenya and the Philippines, respectively. As argued in the previous chapter, these constitute lower-bound estimates of the "true" value, while the alternative estimates using calorie availability data are probably upper-bound estimates.

Table 22--Percentage distribution of food expenditures, by broad food group and by total expenditure tercile

Country/Food Items	Total Expenditure Tercile 1	2	3	All
The Gambia				
Staples	0.57	0.53	0.49	0.53
Rice	0.42	0.38	0.32	0.37
Millet	0.07	0.07	0.07	0.07
Maize	0.00	0.01	0.01	0.01
Groundnuts	0.07	0.07	0.08	0.07
Meat	0.10	0.12	0.13	0.12
Vegetables	0.05	0.05	0.05	0.05
Fruits/snacks	0.17	0.18	0.20	0.19
Others	0.10	0.11	0.13	0.11
Guatemala				
Staples	0.50	0.47	0.39	0.45
Maize	0.23	0.18	0.13	0.18
Other cereals	0.12	0.14	0.14	0.13
Pulses	0.11	0.10	0.07	0.09
Roots/bananas	0.03	0.04	0.04	0.04
Meat	0.25	0.27	0.31	0.28
Vegetables/fruits	0.11	0.12	0.14	0.12
Snacks	0.13	0.12	0.13	0.13
Others	0.02	0.02	0.02	0.02
Kenya				
Staples	0.55	0.50	0.49	0.51
Maize/maize flour	0.38	0.38	0.33	0.36
Rice	0.01	0.01	0.01	0.01
Roots/tubers	0.07	0.07	0.08	0.07
Meat/eggs/fish	0.16	0.16	0.18	0.17
Pulses/vegetables	0.11	0.11	0.11	0.11
Fruits/snacks	0.15	0.19	0.19	0.18
Others	0.04	0.04	0.05	0.04
Malawi				
Staples	0.51	0.45	0.37	0.44
Grains, grain products	0.47	0.42	0.33	0.41
Roots and tubers	0.01	0.01	0.01	0.01
Pulses	0.04	0.02	0.03	0.03
Meat	0.01	0.03	0.05	0.03
Fish[a]	0.22	0.25	0.29	0.25
Vegetables	0.05	0.05	0.05	0.05
Fruits, cakes, scones	0.02	0.03	0.03	0.03
Others	0.19	0.18	0.21	0.19
Philippines				
Staples	0.60	0.52	0.42	0.51
Rice	0.13	0.17	0.19	0.16
Corn	0.36	0.26	0.14	0.25
Meat	0.21	0.26	0.35	0.27
Vegetables	0.05	0.05	0.05	0.05
Fruits/snacks	0.07	0.09	0.11	0.09
Others	0.07	0.07	0.07	0.07
Rwanda				
Staples	0.75	0.72	0.70	0.72
Potatoes	0.13	0.17	0.18	0.16
Legumes	0.34	0.31	0.31	0.32
Maize	0.10	0.09	0.08	0.09
Sweet potatoes	0.16	0.12	0.07	0.11
Sorghum	0.02	0.04	0.06	0.04
Meat	0.02	0.03	0.06	0.04
Vegetables	0.05	0.05	0.05	0.05
Snacks/desserts	0.16	0.17	0.17	0.17
Others	0.02	0.02	0.02	0.02

[a] Fish expenditures include fish bought for resale.

By contrast for the African countries, the budget share for meats does not reach 20 percent even for the highest total expenditure terciles. There is the same tendency for the budget share of meats to increase and for staples to decline with income, but the tendency is much less pronounced than for Guatemala and the Philippines. The extreme case is Rwanda where the staple budget share is 70 percent and meats only 6 percent, even for the highest total expenditure tercile. For Rwanda, however, note the substitution away from sweet potatoes, a cheap calorie source, to potatoes and sorghum, which are more expensive, as income increases. We see, then, that "leakage" is greatest in terms of increases in income not generating commensurate increases in calorie availability at the household level, in Guatemala and the Philippines, where markets for nonfood items are better developed, and where there are stronger preferences for meats, which are relatively expensive sources of calories.

MARKET DEPENDENCY

An additional reason that calorie costs may rise with commercialization and increases in income is that households may rely less on own-produced food, making more food purchases in retail market, and thus incurring the costs of marketing margins between retail and farm-gate prices. For example, analysis of the Philippine data showed that farmers who grew and consumed their own maize saved a premium of 25 percent off the retail price. An additional potential drawback to greater market dependency, some have argued, is that food prices may

rise locally if a region shifts from being a net exporter to a net importer, which would offset the income gains earned from commercialization.

Table 23 shows the percentage breakdown of food expenditures between food consumed, which was produced on the household's own farm and retail market purchases. In line with the agricultural and food production changes in the context of increased commercialization--that is, the largely maintained subsistence food production (Chapter 4)--the consumption data show that, with the exception of the Philippines, dependency on market purchases of foods was not significantly affected by scheme participants. At one extreme, Guatemalan farmers, whether engaged in commercial agriculture or not, were almost totally dependent on market purchases of food. At the other extreme, the more commercialized farmers in the four African countries continued to produce more than half of their food on their own farms.

CALORIE ADEQUACY

Table 24 shows household-level calorie adequacy ratios broken down by total expenditure tercile, which gives some indication of how rapidly household calorie availability increases with income. Recall from Table 19 that incomes increase by 100-200 percent between the lowest and highest total expenditure tercile, depending on the country. The calorie availability data indicate that increases in income have a strong influence on nutrient consumption. For the calorie intake data, the influence of income is still positive and signif-

Table 23--Sources of food acquisition (in value terms)

Country	Percent Produced on Own-Farm	Percent Purchased
The Gambia		
Participants	51	49
Nonparticipants	52	48
Guatemala		
Participants	17	83
Nonparticipants	14	86
Kenya		
Participants	58	42
Nonparticipants	60	40
Philippines		
Participants	35	65
Nonparticipants	48	52
Rwanda		
Participants	62	38
Nonparticipants	61	39
Malawi		
Participants	55	45
Nonparticipants	50	50

Table 24--Household-level calorie adequacy ratios, by total expenditure tercile

Country	Calorie Availability				Calorie Intake			
	Total Expenditure Tercile				Total Expenditure Tercile			
	1	2	3	All	1	2	3	All
The Gambia[a]	0.88	1.07	1.25	1.08	...	...	...	...
Guatemala[a]	0.85	1.08	1.22	1.05	...	...	...	...
Kenya[b]	...	...	...	...	0.80	0.95	1.04	0.92
Philippines[c]	0.72	0.93	1.16	0.94	0.83	0.92	0.97	0.91
Rwanda[a]	0.72	0.91	1.16	0.93	...	...	...	...

Note: Data not available for Malawi.

[a] Recommended intake = 2,800 calories.

[b] Recommended intake = 2,850 calories.

[c] Recommended intake = 2,480 calories.

icant, but the magnitude of the effect appears to be much smaller. This dichotomy in patterns is reflected by the substantial differences in the calorie income elasticities cited earlier, generated using the two different types of data sources. Data were collected in Kenya and the Philippines on individual calorie intakes. Because calories may not be equally distributed among family members, even if household adequacy levels are above one, this does not necessarily mean that all household members are consuming their recommended intakes. Table 25 indicates that this is indeed the case for preschoolers in these two countries. Even though calorie adequacy ratios are close to one for the highest income tercile, calorie adequacy ratios for preschoolers are well below one.

SUMMARY ON CONSUMPTION EFFECTS

Because of preferences for purchases of nonfood items and higher-priced calories at the margin as incomes increase, calorie availability at the household level increases much more slowly than income, although more rapidly in the African countries than in Guatemala and the Philippines. Nevertheless, calorie availability at the household level rises well above one for the highest income tercile for the four countries where data are available. Calorie intake data for Kenya and the Philippines indicate, first, that nutrient intake may not increase as quickly with income as the calorie availability data indicate, and second, that household-level calorie adequacy does not translate into adequate calorie intakes for preschoolers.

Table 25--Preschooler calorie adequacy ratios, by total expenditure tercile using calorie intake data (24-hour recall)

Country	Total Expenditure Tercile			All
	1	2	3	
Kenya	0.58	0.56	0.62	0.58
Philippines	0.71	0.74	0.81	0.75

In general, the increased incomes from commercialization leads to higher calorie intakes. However, in two of the study cases, a small but statistically significant (Guatemala) and a large and statistically significant change (Rwanda) in the marginal propensity to spend on food was identified as a result of increased commercialization. Still, there is little evidence that commercialization per se has altered such behavior patterns to an extent that is detrimental to nutrition. For most cases, the overall increase in income and its resulting positive effects on food expenditures by far exceeded the changes at the margin.

8. EFFECTS OF COMMERCIALIZATION OF AGRICULTURE ON HEALTH OF WOMEN AND PRESCHOOLERS

Data in Chapter 5 indicated that in all case studies, incomes of farmers who are more commercialized are significantly higher and the food expenditures and calorie intakes of these households have increased also. The next two chapters examine the effects of this increased income and consumption on the health (Chapter 8) and nutritional status (Chapter 9) of women and preschoolers.

Commercialization of agriculture is one type of income-generating schemes that attempts, in part, to reach smallholders. It is assumed that by increasing household income, health and nutritional benefits will eventually accrue to individual household members. These income-mediated effects operate through two main pathways. First, increased incomes can be used to purchase either a different mix of goods and services or more of the current market basket, increasing access to health care, better housing, improved housing, etc., thus producing a health effect. Second, the income/household food consumption linkages, by improving individual household member's energy intake, will improve nutritional status which in turn will improve health. Each of these pathways will be examined.

DESCRIPTIVE ANALYSES

Table 26 shows the incidence of total illness for preschoolers from cash crop and noncash crop households.

There are no significant differences in incidence rates for preschoolers from scheme participant and nonparticipant households in The Gambia, Kenya, the Philippines, and Rwanda. The high incidence rates for preschoolers in The Gambia and Kenya are due largely to malaria.

However, the coop member's (cash crop growing) children in Guatemala have a noticeably lower incidence rate of illness than noncoop member's children. This is, in part, due to a package of social/health services provided as part of the smallholder export vegetable scheme. This issue will be explored later in the multivariate analyses.

Table 27 looks at the total prevalence of illness and prevalence of diarrhea alone for preschoolers and women from participant and nonparticipant households. There is no definite pattern in prevalence rates between the two groups for either children or women.

Table 28 presents the morbidity prevalence rates stratified for scheme participant/nonparticipant households by terciles of income.

Here again, there is no definite pattern in either the total percent time ill or time ill with diarrhea for either women or preschoolers. This analysis was done also by expenditure terciles and the results were similar. From these results, it appears that preschoolers and women from the highest income category are as likely to be sick, on average, as individuals from the lowest income category.

Table 26--Incidence of illness for preschoolers[a] in participant and nonparticipant households

Country	Incidence of Illness	
	Participants	Nonparticipants
	(percent)	
The Gambia[b]	78.8	80.3
Guatemala[c]	10.6[e]	16.1
Kenya[d]	89.6	87.7
Philippines[d]	31.5	28.0
Rwanda[b]	33.6	28.3

Note: Data not available for Malawi.

[a] Includes all-round average for each child.

[b] Based on one-month recall.

[c] Based on 72-hour recall.

[d] Based on two-week recall.

[e] Significantly different at $p < 0.05$.

Table 27--Percentage of time ill with any illness and with diarrhea, preschoolers and women, participant and nonparticipant groups[a]

	Preschoolers			Women		
	Sample Size	Total Illness	Diarrhea	Sample Size	Total Illness	Diarrhea
The Gambia[b]						
Participants	209	15.2	3.9	299	15.7	0.32
Nonparticipants	174	15.9	6.0	222	13.8	0.56
Kenya[b]						
Participants	291	28.2	4.8	207	21.6	1.3
Nonparticipants	446	28.5	3.8	323	21.9	1.2
Malawi[c]						
Participants	148	17.7	1.9	...	...	...
Nonparticipants	294	21.4	2.1	...	...	...
Philippines[b]						
Participants	543	12.9	0.5	408	6.9	0.4
Nonparticipants	1,016	12.5	0.8	724	5.8	0.3
Rwanda[b]						
Participants	311	12.4	5.6	91	30.5	0.7
Nonparticipants	279	12.3	5.7	98	30.1	1.2

Note: The difference in favor of tobacco-growing households was accounted for by lower prevalence in "other" category of symptoms. Differences in the incidence of fiarrhea, fever, and cough were not significant.

[a] The Guatemala case study had data only on the incidence of morbidity, not the prevalence rates.

[b] Recall period for The Gambia and Rwanda is past month; recall period for the Philippines and Kenya is past two weeks.

[c] Recall period for Malawi is two weeks for ten months; significant $p < 0.05$.

Table 28--Percentage of time ill with any illness and with diarrhea, preschoolers and women, by per capita income tercile

	Income Tercile	Preschoolers			Women		
		Sample Size	Total Illness	Diarrhea	Sample Size	Total Illness	Diarrhea
The Gambia	1	120	16.9	5.4	161	11.6	0.2
	2	145	16.0	5.0	204	17.0	0.7
	3	118	13.3	4.1	156	15.5	0.3
Kenya	1	531	27.7	4.0	379	19.9	1.0
	2	427	28.7	4.0	322	23.5	1.0
	3	456	29.5	4.3	318	23.3	1.1
Malawi	1	152	20.4	1.4	...	...	...
	2	152	19.6	2.3	...	...	...
	3	138	20.6	2.5	...	...	...
Philippines	1	512	12.6	0.8	376	3.1	0.2
	2	520	13.0	0.8	376	7.5	0.4
	3	527	12.2	0.6	380	7.9	0.3
Rwanda	1	213	13.9	7.1	62	23.8	2.8
	2	199	9.9	4.8	62	20.4	0.2
	3	178	13.3	4.7	64	29.2	0.2

The research also examined the effect of wealth on health. Since all communities studied are involved overwhelmingly in agriculture landholding/capita was used as a proxy for wealth. The results are shown in Table 29. The pattern is not as clearcut as was the income/morbidity stratification. In The Gambia, preschoolers in the third tercile of landholdings/capita--whether more or less commercialized--are less likely to be sick. In Malawi, a similar trend of reduced morbidity with land tenure increments was evident but only among tobacco growers. However, the same pattern does not exist in the other case studies. For Kenya, the Philippines, and Rwanda, increasing landholdings/capita is not associated with a decrease in total morbidity. Unlike children in The Gambia, for women (Table 30), there is no association between landholdings/capita and illness. In each country case study, women in the highest landholding group are as likely to be sick as women in the smallest landholding category.

The morbidity data for preschoolers were disaggregated into age categories (Table 31). The children in the 7- to 24-month old category are the most likely to be sick. Several reasons account for this. First, this period corresponds to the weaning period when children are first partially and then totally weaned. Even if breastmilk substitutes were nutritionally comparable to breastmilk, additional steps involved in preparing them often introduce pathogens. This is coupled with the fact that preschoolers also become much more mobile during this period and this also exposes them to a wider range of pathogens.

Table 29--Preschoolers' total percent time ill with any illness and with diarrhea (all-round average), by landholding per capita tercile

Country	Per Capita Tercile	Percent Time Ill with Any Illness		Percent Time Ill with Diarrhea	
		Participants	Nonparticipants	Participants	Nonparticipants
The Gambia	1	13.5	17.9	2.4	7.0
	2	20.3	22.2	5.9	7.8
	3	8.1	9.2	3.9	2.1
Kenya	1	28.7	29.7	5.2	4.0
	2	27.6	28.4	3.8	4.2
	3	28.5	27.4	5.7	2.2
Malawi	1	23.5	20.3	2.1	2.2
	2	17.4	20.5	2.2	2.1
	3	16.8	24.3	1.8	2.0
Philippines	1	13.3	12.6	0.5	0.8
	2	12.7	12.4	0.8	0.8
	3	13.0	13.2	0.3	1.0
Rwanda	1	12.0	13.9	6.0	6.6
	2	10.6	8.1	4.9	3.7
	3	13.6	15.3	5.3	6.5

Table 30--Women's total percent time ill with any illness and with diarrhea (all-round average), by landholding per capita tercile

Country	Landholdings Per Capita Tercile	Percent Time Ill with Any Illness		Percent Time Ill with Diarrhea	
		Participants	Nonparticipants	Participants	Nonparticipants
The Gambia	1	14.6	15.9	0.5	0.7
	2	16.3	15.2	0.2	0.8
	3	17.9	9.1	0.0	0.0
Kenya	1	20.9	21.5	1.2	0.8
	2	21.1	23.5	1.3	1.6
	3	22.9	20.7	1.3	1.6
Philippines	1	5.1	6.2	0.2	0.3
	2	2.3	4.5	0.1	0.3
	3	9.8	6.5	0.5	0.3
Rwanda	1	31.5	25.2	1.4	1.2
	2	31.6	30.1	0.0	0.2
	3	28.6	35.5	0.1	0.5

Table 31--Percentage of preschoolers' time ill with any illness, by age of child: scheme participants and nonparticipants

Country	0-6 Months	Sample Size	7-24 Months	Sample Size	25-36 Months	Sample Size	37-48 Months	Sample Size	49-72 Months	Sample Size
The Gambia										
Participants	14.4	35	20.9	85	16.7	59	12.5	54	12.1	54
Nonparticipants	15.1	25	27.0	78	17.0	51	9.1	42	8.8	46
Kenya										
Participants	28.6	36	31.7	92	26.5	63	27.3	36	26.3	89
Nonparticipants	25.5	63	35.6	121	26.8	92	24.5	90	26.3	122
Malawi										
Participants	17.2	29	23.6	33	19.4	9	16.5	22	13.9	37
Nonparticipants	28.0	48	25.8	65	22.8	37	18.9	41	13.9	71
Philippines										
Participants	23.3	15	16.8	140	13.0	101	11.8	142	9.1	137
Nonparticipants	6.1	28	19.1	247	12.9	221	9.3	243	10.00	249
Rwanda										
Participants	...		19.2	104	11.7	60	7.8	64	8.0	83
Nonparticipants	...		15.6	63	12.2	61	13.6	57	9.6	98

The preschoolers' morbidity data were also stratified by nutritional status indicators (Table 32). For Rwanda and Kenya, in each income tercile, there was a clear pattern of increased illness found in children who were more malnourished--regardless of which nutritional status indicator was used. For the Philippines, Malawi, and The Gambia, there was not a consistent pattern with any of the nutritional status categories.

MULTIVARIATE ANALYSES

The results so far have been purely descriptive. Multivariate analysis conducted on the case studies reinforces the descriptive results. Table 33 presents the morbidity model for all preschoolers in The Gambia, Kenya, Malawi, the Philippines, and Rwanda. The data indicate that current income is not significantly associated with total illness in any of the six country studies. The same finding is true for morbidity for children less than 36 months of age. This is consistent with the lack of an income/morbidity relationship shown in the descriptive statistics in Table 28.

Age, however, is a significant determinant of illness in all countries except Guatemala (Table 33). As children get older, they are less likely to be sick. This again is consistent with the descriptive analyses presented earlier. However, it should also be pointed out that many of the very sick children have died.

Mother's schooling was not a significant predictor of preschooler morbidity in any of the case studies where data were available. How-

Table 32--Percentage of time ill with any illness for preschoolers, aged 6 to 72 months, by indicators of nutritional status and income tercile

Country	Income Per Capita Tercile	Weight-for-Age				Weight-for-Height				Height-for-Age			
		Less than 80 Percent	N	More than 80 Percent	N	Less than 90 Percent	N	More than 90 Percent	N	Less than 90 Percent	N	More than 90 Percent	N
The Gambia	1	16.8	67	15.9	161	17.5	63	15.7	165	17.0	47	16.0	181
	2	15.9	104	13.2	163	15.4	85	13.7	182	22.1	40	12.9	227
	3	16.9	58	12.6	139	16.0	61	13.0	136	15.1	26	13.7	171
Kenya	1	32.8	127	26.3	399	28.3	81	27.6	432	31.3	141	26.2	375
	2	34.1	81	27.6	342	33.2	56	27.6	352	31.6	88	27.5	320
	3	34.9	96	28.1	355	40.5	46	28.4	391	34.4	101	28.2	337
Malawi	1	21.7	67	19.2	70	23.1	38	19.4	99	19.5	77	21.5	60
	2	19.6	72	19.5	70	20.3	37	19.3	105	19.5	86	19.6	56
	3	20.2	44	20.8	82	21.9	29	20.2	97	19.1	50	21.6	76
Philippines	1	12.7	244	13.3	210	18.4	139	10.0	337	9.7	152	14.5	291
	2	12.4	225	13.8	230	11.5	122	13.7	368	17.2	154	11.1	290
	3	10.0	200	16.4	232	12.4	117	12.6	373	8.9	152	16.4	272
Rwanda	1	18.9	27	13.1	186	30.5	7	13.3	206	17.9	57	12.4	156
	2	17.7	22	9.0	177	26.9	13	8.8	186	9.5	32	10.0	167
	3	29.3	18	11.5	160	43.3	5	12.5	173	16.1	36	12.6	142

Table 33--Selected coefficients for relationship between program participation, socioeconomic variables, and preschooler's morbidity (all preschoolers)[a]

Independent Variable	Preschoolers' Total Prevalence of Illness					
	The Gambia	Guatemala	Kenya	Malawi	Philippines	Rwanda
Household income[b]	-6.06-05 (-0.899)	-0.00025 (-0.87)	-1.60-05 (-0.20)	6.89-03 (0.50)	7.10-04 (1.67)	1.18-03 (1.60)
Mother's schooling			-0.25 (-1.18)	-8.84-04 (-0.04)	-2.28-03 (-0.99)	-0.59 (-1.27)
Age of child (in months)	-2.54-03 (-6.42)	-0.00051 (-0.073)	-0.16 (-4.52)	-0.20 (-5.41)	-2.43 (-7.21)	-0.21 (-4.00)
Household size			-0.36 (2.35)	5.88-05 (0.0)	-2.05 (-0.98)	... ...
Participation dummy (1=participants)	5.31-03 (0.33)	-0.432 (-2.86)	0.29 (0.20)	1.80 (1.33)	3.22 (0.29)	4.1 (1.73)
Sample size	561	477	994	425		585

[a] Equals all-round average for total time ill, except for Guatemala where analysis is based on a probit analysis of incidence of illness.

[b] Total household expenditures used as a proxy for income for The Gambia, Guatemala, the Philippines, and Rwanda.

ever, the average level of education for women in all study areas was low (3 to 6 years) with many women having no formal education. More of a variation in schooling may be needed in order to begin to see a beneficial effect on child health.

A separate scheme participation dummy was included in the morbidity model (Table 33). There was no negative effect of participation in the commercialization-oriented schemes on child health. In fact, the opposite is true in Guatemala. In the Guatemala study (Table 33), the dummy is defined as membership in the export crop-producing cooperative. Interestingly, membership in the cooperative has a beneficial effect on child health. This finding reinforces the data on incidence rates presented in Table 26. Planners of the cooperative in Guatemala attempted to maximize the welfare effects of commercialization partly funded out of coop profits and instituted a number of social programs. Data from Table 33 suggest that the health status of children of cooperative members households have benefited and this positive effect is partially due to the package of health/social services implemented as part of the plan.

CONCLUSIONS ON HEALTH EFFECTS

None of the case studies reported here show a negative effect of the commercial agriculture schemes on child health. This is observed not only in the rather food-oriented commercialization in the cases of The Gambia and Rwanda but also in the non-food, crop-oriented Kenyan, Malawian, the Philippine, and Guatemalan cases. This is worth

emphasizing since there exists the belief that cash cropping tends to have adverse effect on child illness.

However, increases in income associated with participation in various agriculture schemes did not decrease child morbidity at least in the period of time covered by the studies. It seems counter-intuitive that significant increases in income do not translate into decreased levels of illness. However, as already discussed in an earlier chapter, there is a tendency, in some of the case areas, for more commercialized households to spend a slightly higher proportion of income on nonfood items. The impact of this change in expenditure patterns will depend on the items purchased. Nonfood expenditures fall into two broad categories: first, those without expected health or nutrition effect, such as certain consumer goods like jewelry or radios, alcohol, etc. The second category of expenditures are those with potential health impact which can be further subdivided into two--those with short-term effects and those with long-term effects. Expenditures on deworming or other preventive health items, might be expected to have immediate impact which could be observed even in the very short term.

It is worthwhile to reiterate that the lowest health spending, average and marginal, was found in Kenya, while the highest in Guatemala's case (Table 20); these spending patterns coincide with the highest (Kenya) and the lowest (Guatemala) prevalence of illness.

As was shown in Chapter 6, increased income in scheme participant households is also spent on items, like improved housing and education. While these expenditure categories may produce health benefits

in the long term, in the short term these are not associated with changes in morbidity patterns. One could envision a scenario where increased expenditures on education--particularly education of girls--in the longer term would likely result in changes in fertility patterns which, in turn, would influence neonatal outcome and ultimately result in improved infant health. Because of the relatively short time frame of all the studies, these sorts of linkages could not be identified.

It is worth repeating that in each of the study sites, the health/sanitation environment is poor, and infant mortality and malnutrition rates are high. While in the longer term, increases in income would be expected to bring about an improvement in overall health and welfare, in the short term it appears that increases in income must be combined with an improvement in the health environment in order to have a significant effect on preschooler morbidity. This is not to argue that income is not important, but rather that in planning agricultural policies and programs attention should be given simultaneously to health/sanitation conditions in rural areas. The complementarities between increased income and an improved health/sanitation environment should be stressed so that the potential effects of commercial agriculture schemes on overall welfare can be enhanced.

9. EFFECTS OF THE COMMERCIALIZATION OF AGRICULTURE ON THE NUTRITIONAL STATUS OF PRESCHOOLERS AND WOMEN

DESCRIPTIVE ANALYSES

There are a number of pathways through which commercialization can potentially influence preschooler nutritional status. One of these is the impact on child feeding patterns. Critics of cash cropping have argued that if increased demands are put on a mother's time to provide agricultural labor for the specific cash crop, early weaning and/or the early introduction of solid foods for preschoolers could occur. Table 34 presents data on age of weaning for preschoolers from scheme participant and nonparticipant households There are no significant differences in the weaning age between the household groups. In all case studies, breastfeeding occurs for an extended period.

The age of introduction of the first solid foods also does not differ between the groups (Table 35). Normally four to six months is the period when it is recommended that breastmilk complements be added to the infant's diet. With the exception of Rwanda, children in the study countries receive solids within the four- to six-month time period. Children in Rwanda receive solids later than in the other countries. The results from Tables 34 and 35 suggest that entry of

Table 34--Age in months weaned[a]

Country	Participants	Nonparticipants
Guatemala	16.2	16.2
Kenya	19.1	20.2
Philippines	14.2	13.7
Rwanda	23.5	21.2

[a] Age in months weaned refers to the age when mother stopped breastfeeding completely. If child never breastfed, age in months weaned equals 0. Data not available for The Gambia.

Table 35--Age of introduction of solid foods (in months)[a]

Country	Participants	Nonparticipants
The Gambia	4.5	4.7
Kenya	5.6	6.0
Philippines	5.5	4.8
Rwanda	7.2	6.6

[a] Age in months at which child was given anything other than breast milk. Data not available for Guatemala.

households into the schemes have not had detrimental effects on child feeding patterns.

Table 36 presents the nutritional status indicators (Z-Scores)[16] for height/age, weight/age and weight/height for preschoolers from participant and nonparticipant households. In general, the nutritional status indicators signal a better situation in the more commercialized participant groups. The only exception is the weight-for-age indicator in the Kenyan case. However, these differences are not significant within each country between the household groups.

Z-Scores for the two groups were stratified by income terciles/capita (Tables 37 to 39). For each of the three indicators, on average, there is no significant difference between children in the lowest and highest income groups. This is true for both participant and nonparticipant households.[17]

Prevalence rates for stunting (less than 90 percent height/age). wasting (less than 90 percent weight/height) and weight-for-age less than 80 percent are shown in Table 40. With the exception of The Gambia, there are no significant differences between participant and nonparticipant households. In The Gambia, preschoolers from the

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[16] Z-Score calculated as:

$$\text{Z-Score} = \frac{\text{(actual measurement - 50 percentile standard)}}{\text{standard deviation of the standard}}$$

Based on National Center for Health Statistics Growth Standards.

[17] In Malawi, total income was significantly correlated with height/age and weight/age; differences between the first and third terciles were significant for weight/age and weight/height during post-harvest survey.

Table 36--Z-scores for preschooler height/age, weight/age, and weight/height (all-round average)

Country	All-Round Average		
	Height-for-Age	Weight-for-Age	Weight-for-Height
The Gambia			
Participants	-1.11	-1.16	-0.60
Nonparticipants	-1.30	-1.33	-0.68
Guatemala			
Participants	-2.84	-1.66	0.21
Nonparticipants	-3.00	-1.74	0.22
Kenya			
Participants	-1.65	-1.13	-0.16
Nonparticipants	-1.73	-1.11	-0.09
Malawi[a]			
Participants	-2.25	-1.45	-0.06
Nonparticipants	-2.24	-1.43	-0.05
Philippines			
Participants	-2.01	-1.51	-0.63
Nonparticipants	-2.12	-1.55	-0.61
Rwanda			
Participants	-1.33	-0.58	0.25
Nonparticipants	-1.66	-0.72	0.27

[a] These are means of two surveys, one conducted during season of scarcity (February), the other after the harvest (July).

Table 37--Z-scores (preschooler height-for-age) by income tercile: participant and nonparticipant households

Country	Income Per Capita Tercile	Participants Mean Z-Score	Participants N	Nonparticipants Mean Z-Score	Nonparticipants N
The Gambia	1	-1.05	35	-1.64	43
	2	-1.31	61	-1.23	36
	3	-0.86	42	-0.98	36
Guatemala	1	-2.93	178	-3.02	130
	2	-2.88	178	-3.15	131
	3	-2.68	146	-2.75	92
Kenya	1	-1.46	95	-1.73	194
	2	-1.54	83	-1.58	156
	3	-1.63	107	-1.87	81
Malawi	1	-2.29	35	-2.26	117
	2	-2.62	56	-2.45	96
	3	-1.90	57	-1.96	81
Philippines	1	-2.23	125	-2.18	377
	2	-2.22	157	-2.11	356
	3	-1.77	255	-2.06	257
Rwanda	1	-1.59	90	-1.61	150
	2	-1.26	126	-1.54	117
	3	-1.23	138	-1.47	69

Table 38--Z-scores (preschooler weight-for-age) by income tercile: participant and nonparticipant households

Country	Income Per Capita Tercile	Participants Mean Z-Score	Participants N	Nonparticipants Mean Z-Score	Nonparticipants N
The Gambia	1	-1.07	35	-1.53	43
	2	-1.32	61	-1.23	36
	3	-1.02	42	-1.20	36
Guatemala	1	-1.67	178	-1.81	130
	2	-1.70	178	-1.85	131
	3	-1.61	146	-1.50	92
Kenya	1	-1.11	96	-1.11	196
	2	-1.07	86	-1.02	164
	3	-1.03	108	-1.07	88
Malawi	1	-1.44	35	-1.50	117
	2	-1.80	56	-1.44	96
	3	-1.12	57	-1.30	81
Philippines	1	-1.61	125	-1.60	377
	2	-1.66	157	-1.49	356
	3	-1.36	255	-1.55	257
Rwanda	1	-0.74	90	-0.81	150
	2	-0.53	126	-0.69	117
	3	-0.47	138	-0.85	69

Table 39--Z-scores (preschooler weight-for-height) by income tercile: participant and nonparticipant households

Country	Income Per Capita Tercile	Participants Mean Z-Score	Participants N	Nonparticipants Mean Z-Score	Nonparticipants N
The Gambia	1	-0.52	35	-0.68	43
	2	-0.65	61	-0.58	36
	3	-0.59	42	-0.77	36
Guatemala	1	-0.29	178	-0.15	130
	2	-0.21	178	-0.21	131
	3	-0.11	146	-0.33	92
Kenya	1	-0.31	93	-0.09	194
	2	-0.14	83	-0.05	156
	3	-0.05	107	0.02	81
Malawi	1	0.11	35	-0.11	117
	2	-0.28	56	0.09	96
	3	0.05	57	-0.12	81
Philippines	1	-0.63	125	-0.61	377
	2	-0.70	157	-0.54	356
	3	-0.58	255	-0.71	257
Rwanda	1	0.06	90	0.27	150
	2	0.29	126	0.22	117
	3	0.34	138	0.36	69

Table 40--Prevalence of malnutrition, stunting, and wasting among preschoolers: participant/nonparticipant households

Country	Percent Preschoolers <90 Percent Height/Age		Percent Preschoolers <80 Percent Weight/Age		Percent Preschoolers <90 Percent Weight/Height	
	Participants	Nonparticipants	Participants	Nonparticipants	Participants	Nonparticipants
The Gambia	9.4	17.4	27.5	27.0	29.0	28.7
Guatemala	66.7	72.8	47.2	49.8	6.3	6.9
Kenya	24.3	25.3	20.1	23.3	12.3	16.3
Malawi	55.2	52.7	52.4	46.6	16.6	19.7
Philippines	32.2	36.3	45.7	51.8	22.4	27.1
Rwanda	18.6	24.0	11.3	11.5	4.5	3.9

participant households are less stunted. In addition, unlike in othe countries, in The Gambia, there is more wasting than stunting. Thi is true for preschoolers from participant as well as nonparticipan households.

Z-scores for each of the nutritional status indicators were stra tified by landholdings/capita for participant and nonparticipan households (Table 41). For The Gambia, Guatemala, Kenya, and Rwanda there is no consistent pattern. Similar to the income terciles stra tification, there is no significant difference in the nutritiona status of children from the lowest and highest landholding tercile.

In Malawi and the Philippines, however, children from the highesi landholding tercile--whether sugar-cropping or nonsugar-cropping households--have better Z-scores on all three nutritional status indicators when compared to children from the lowest landholding tercile.[18]

The nutritional status of women was assessed using weight (in kilograms), height (in centimeters), and a Body Mass Index (BMI = weight/height^2). Women's weight and height for participant and non-participant households stratified by income capita are given in Table 42. For women, there are no significant differences in average weight or height across income terciles. The results are similar to those presented for preschoolers in Tables 37 to 39.

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[18] In the case of Malawi, differences in height/age and weight/age between the highest and lowest landholding tercile were significant among nontobacco households. The same trend was present among tobacco growers but perhaps because the sample size was smaller, the differences were not significant.

Table 41--All-round average, Z-scores for preschoolers, by landholdings per capita tercile: participant and nonparticipant households

Country	Landholdings Per Capita Tercile	Participants			Nonparticipants		
		Height/Age	Weight/Age	Weight/Height	Height/Age	Weight/Age	Weight/Height
The Gambia	1	-1.23	-1.26	-0.62	-1.93	-1.64	-0.60
	2	-1.39	-1.38	-0.61	-1.11	-1.35	-0.80
	3	-1.60	-1.51	-0.65	-1.23	-1.29	-0.66
Guatemala	1	-2.93	-1.72	0.19	-3.14	-1.82	0.25
	2	-2.92	-1.71	0.23	-2.65	-1.47	0.30
	3	-2.66	-1.55	0.21	-2.59	-1.58	0.18
Kenya	1	-1.55	-0.99	-0.10	-1.80	-1.21	-0.16
	2	-1.70	-1.21	-0.21	-1.65	-1.07	-0.11
	3	-1.49	-0.98	-0.10	-1.69	-0.96	0.10
Malawi	1	-2.23	-1.67	-0.39	-2.31	-1.51	-0.13
	2	-2.70	-1.63	0.07	-2.35	-1.48	0.12
	3	-1.98	-1.29	-0.07	-1.97	-1.23	-0.01
Philippines	1	-2.38	-1.88	-0.87	-2.18	-1.63	-0.65
	2	-2.10	-1.52	-0.60	-2.15	-1.55	-0.64
	3	-1.70	-1.26	-0.50	-1.98	-1.40	-0.49
Rwanda	1	-1.46	-0.60	0.29	-1.67	-0.69	0.34
	2	-1.16	-0.53	0.17	-1.67	-0.85	0.03
	3	-1.31	-0.58	0.25	-1.62	-0.65	0.40

Table 42--Women's weight and height, by income tercile, by participant and nonparticipant households[a]

Country	Income Tercile	Weight by Income Tercile (kilograms)		Height by Income Tercile (centimeters)	
		Participants	Nonparticipants	Participants	Nonparticipants
The Gambia	1	52.7	52.3	156.8	158.9
	2	53.0	52.0	158.6	160.0
	3	52.0	53.2	159.4	160.4
Kenya	1	57.2	56.4	161.1	160.1
	2	56.6	57.0	161.2	160.1
	3	58.2	55.8	161.8	159.2
Malawi	1	48.9	50.6	155.8	157.0
	2	50.4	51.6	154.7	155.0
	3	54.9	51.0	157.5	156.7
Philippines	1	47.5	46.9	150.9	150.8
	2	46.7	46.4	148.0	148.4
	3	49.4	47.5	147.8	149.0
Rwanda	1	57.2	57.1	156.0	157.0
	2	59.1	56.6	159.0	157.0
	3	59.0	54.6	160.0	156.0

[a] The Guatemala case study did not have anthropometric data on adult women.

The Body Mass Index stratified by income terciles is shown in Table 43. Here again, there are no differences in BMI with increasing income. In addition, there are no differences between participant and nonparticipant households.

DETERMINANTS OF NUTRITIONAL STATUS IN PRESCHOOLERS

The type of descriptive analysis presented in the previous section does not control for demographic and other factors and does not allow a determination of the effect of commercialization on nutritional status. This section examines the determinants of preschoolers' nutritional status for the six case studies. In this context, the income/nutritional status relationship is taken up again.

Tables 44 to 46 present results of the growth models for the various country case studies and Table 47 summarizes these in qualitative terms. Given that household incomes had increased in all of the case studies partially as a result of the specific commercial agriculture schemes, one interest was to trace through some of the effects of this increased household income on child nutrition.

In three of the four case studies for which caloric intake data are available, household and/or child energy consumption is a major determinant of linear of growth. Similarly for gains in weight-for-age, energy consumption at the household level is a significant determinant in Rwanda and The Gambia and child calories are significant in Kenya, Malawi, and the Philippines. Household calories are less significant in improving short-term growth, i.e., weight/height.

Table 43--Women's body mass index (BMI) (weight/height^2), by income and expenditure per capita tercile for participants and nonparticipants

Country	Income Tercile	BMI by Income Tercile		BMI by Expenditure Tercile	
		Participants	Nonparticipants	Participants	Nonparticipants
The Gambia	1	21.5	20.8	21.4	21.1
	2	21.1	20.3	20.8	20.3
	3	20.4	20.6	20.7	20.0
Kenya	1	22.4	22.1	22.5	22.2
	2	21.5	22.1	22.0	22.2
	3	22.3	22.0	21.9	22.0
Malawi	1	20.2	20.6	20.2	20.6
	2	21.0	21.4	21.3	20.8
	3	21.8	21.0	21.6	21.4
Philippines	1	21.0	21.0	20.0	21.0
	2	21.0	21.0	21.0	21.0
	3	22.0	21.0	22.0	22.0
Rwanda	1	23.4	23.1	24.4	23.1
	2	23.4	22.8	23.3	22.2
	3	23.1	22.4	22.9	22.9

Table 44--Selected coefficients for preschooler growth models for height

Independent Variables	Z-Score for Height/Age					
	The Gambia	Guatemala	Kenya	Malawi	Rwanda	Philippines
Sex (1=boy)	-0.29 (-2.661)	-0.056 (-0.52)	0.090 (1.09)	0.072 (0.95)	0.326 (3.30)	-0.03 (-0.34)
Age (in months)	0.009 (3.26)	0.025 (4.67)	0.025 (8.10)	2.08-03 (0.88)	1.62-03 (0.589)	...
Calories[a]	0.069-03[b] (1.02)	...	2.42-04 (1.96)	1.30-04 (1.32)	1.35-04 (2.79)	2.1-04 (3.35)
Mother's height	0.019 (2.41)	...	0.026 (3.69)	0.022 (2.97)	0.02 (2.39)	0.038 (5.53)
Total time ill (percent)	-0.796 (-2.63)	...	-0.02 (-3.36)	9.28-03 (-3.06)	-1.26-04 (-0.059)	0.32 (1.24)
Prior Z-score of preschooler		0.58 (11.48)	0.605 (20.67)	0.862 (25.72)		

[a] Household calories used for The Gambia and Rwanda; child calories used for Kenya and the Philippines.

[b] A strong positive calorie-nutritional status relationship was identified for preschoolers weight-for-age and in analysis for populations, including children up to age 10 also for height.

Table 45--Selected coefficients for preschooler growth model for weight/age

Independent Variables	Z-Score for Weight/Age					
	The Gambia	Guatemala	Kenya	Malawi	Rwanda	Philippines
Sex (1=boy)	6.019 (0.53)	0.084 (0.41)	0.03 (0.40)	0.146 (1.87)	0.269 (3.56)	-0.40 (-7.07)
Age (in months)	1.799 (0.78)	0.29 (5.71)	0.01 (6.21)	-9.62-04 (-0.39)	5.31-03 (2.53)	...
Calories[a]	0.0161 (2.22)	-9.0-07 (-0.23)	2.02-04 (2.13)	3.16-04 (3.08)	9.49-05 (2.57)	2.27-04 (5.93)
Mother's height			7.80-03 (1.46)	0.018 (2.46)	0.013 (2.04)	0.022 (5.93)
Total time ill	-3.16 (-1.79)		-0.014 (-3.03)	-9.98-03 (-3.29)	-5.90-03 (-3.59)	-0.425 (-2.66)
Prior Z-score of preschooler	0.172 (4.19)	0.388 (8.05)	0.55 (20.09)	0.813 (19.21)		

[a] Household calories used for The Gambia, Guatemala, and Rwanda; child calories used for Kenya, the Philippines, and Malawi.

[b] In this model, the Z-score values are multiplied by 100, thus the scale of parameters other than the prior Z-score is to be adjusted to compare with the other parameters in the table. Time ill reflects diarrhea only in The Gambia model.

Table 46--Selected coefficients for preschooler growth model for weight/height

Independent Variables	Z-Score for Weight/Height					
	The Gambia	Guatemala	Kenya	Malawi	Rwanda	Philippines
Sex	0.058 (0.75)	0.178 (1.80)	-0.03 (0.47)	0.087 (0.98)	0.086 (1.34)	-0.067 (-1.22)
Age (in months)	0.004 (2.15)	0.021 (4.46)	1.27-03 (0.51)	5.73-04 (0.20)	6.54-03 (3.68)	...
Calories[a]	-0.011-03 (-0.23)	-4.0-05 (0.99)	1.10-04 (1.07)	3.37-04 (2.91)	4.46-05 (1.43)	1.52-04 (4.03)
Mother's height	0.0072 (1.29)		6.3-03 (1.09)	4.67-03 (0.58)	7.69-03 (1.41)	9.44-03 (2.28)
Total time ill	-0.32 (-1.48)		-7.09-03 (-1.46)	-7.56-03 (-2.12)	-6.69-03 (-4.82)	-0.74 (-4.68)
Prior Z-score of preschooler		0.169 (3.48)	0.39 (10.64)	0.717 (13.43)		

[a] Household calories used for The Gambia, Guatemala, and Rwanda; child calories used for Kenya, the Philippines, and Malawi.

Table 47--Summary of key determinants of preschooler nutritional status

Independent Variables	The Gambia Z-Scores			Guatemala Z-Scores			Kenya Z-Scores		
	Height/ Age	Weight/ Age	Weight/ Height	Height/ Age	Weight/ Age	Weight/ Height	Length/ Age	Weight/ Age	Weight/ Length
Household calories	NS	+	NS		NS	NS			
Child calories							+	+	NS
Total illness	-	-	NS				-	-	NS
Child gender	Girls better	NS better	NS	NS	NS	NS	Girls[a]	Girls[a] better	Girls[a] better
Mother's height	+	+	NS				+	NS	NS
Child age	+		+	+	+	+	+	+	NS

	Philippines Z-Scores			Malawi Z-Scores			Rwanda Z-Scores		
	Height/ Age	Weight/ Age	Weight/ Length	Height/ Age	Weight/ Age	Weight/ Height	Height/ Age	Weight/ Age	Weight/ Height
Household calories							+	+	NS
Child calories	+	+	+	NS	+	+			
Total illness	NS	-	-	-	-	-	NS	-	-
Child gender	NS	Girls better	NS	NS	NS	NS	Girls better	Girls better	NS
Mother's height	+	+	+	+	+	NS	+	+	NS
Child age				NS	NS	NS	NS	+	+

[a] Girls significantly better on all three indicators if prior nutritional status is not included as a variable in the equation.

+ = positive, significant association
- = negative, significant association
NS = not significant

Three of the cases--Guatemala, Kenya, and Malawi--were longitudinal studies and also in The Gambia, prior weight information of preschoolers was available. For each of these growth models, as expected, the prior nutritional status of preschoolers is a major predictor of child growth in the later period. Preschoolers who were not doing well nutritionally in the earlier period continue to exhibit patterns of inadequate growth. The data from these three country studies give credence to those who advocate growth faltering as one criterion for identifying "at-risk" children.

Increments in household income result in improvements in preschooler nutritional status (as measured by growth) via the income/household calorie/child calorie route. However, even where these linkages are significant, the magnitude of the effect is often small.

Data in Table 48 for the Philippines and Kenya examine these income/calorie/child growth linkages in another way. For these two cases, the data indicate with a doubling of income what effect would ultimately be expected on a preschooler's short-term growth. For the Philippines a doubling of household income would increase a preschooler's caloric intake by 9 percent and would in turn improve the average weight/length Z-score by 3.6 percent. This child calorie/growth effect would change the weight/length Z-score, on average, from -0.63 to -0.61. Even with a very substantial increase in income in the short run, in this case a doubling of income, the ultimate physiological effect on growth via the income/household calorie/child calorie route alone is weak.

Table 48--Effect of doubling income on selected indicators from the Philippines and Kenya

	Philippines		Kenya	
	Elasticity	Cumulative Effect of Doubling Income	Elasticity	Cumulative Effect of Doubling Income
		(percent)		
Income per capita/week ——> Food expenditures per capita/week	0.35	...		
Income ——> Household calories			0.12	
Food expenditures/capita/week ——> Household calories/ adult equivalent/day	0.23	0.08		
Household calories/adult equivalent/day ——> Preschooler calories/day	1.16	0.09	0.33	0.0396
Preschooler calories/day ——> Z-score Weight/length	0.39	0.036	1.76	0.069

The data from Kenya (Table 48) suggest similar income/child calorie/growth linkages. In the Kenya case study, a doubling of household income results in an approximately 4 percent increase in preschooler caloric intake. This increase in the child's energy intake results in an approximately 7 percent improvement in the weight/length Z-score. Similar to the Philippine data, the household income/household calorie/child calorie/ child growth linkages, although statistically significant at each point, result in very small changes in growth. In the Philippine case, however, it turns out that the aggregate income-nutrition relationships derived from reduced-form estimates are much stronger than the sum of the income-calorie-nutrition relationships (see next section). This suggests that effects of income other than through calories impinged favorably on preschooler nutritional status.

As was shown from the regression results in Tables 44 to 46, a major determinant of nutritional status in each of the case studies is the morbidity patterns of the child. The lack of a significant income/morbidity pattern relationship has already been discussed in Chapter 8. Therefore, these data suggest that in order to enhance the income/child growth effect, at least in the short term, the health infrastructure and sanitary environment must be taken into consideration when planning agricultural policies and programs.

AGGREGATE INCOME EFFECTS FOR NUTRITION

The relationships between income and nutritional improvement are certainly complex. Thus far, the analyses have addressed the health-consumption-nutrition effects of income as stimulated through the commercialization process separately. As pointed out in the conceptual framework (Chapter 2), the consumption-health-nutrition linkages do interact and need to be viewed in a dynamic fashion. For many young children, the major environmental stress is infectious diseases. Illness may not only induce some physiological adjustments such as food withholding but may actually cause undernutrition by a generalized anorexia. As Payne (1987, 37) suggests, combining the outcome of food deprivation and disease, as if these causes were interchangeable and indistinguishable, will not help in deciding, for example, whether women's labor time is better deployed in earning cash, growing food, or controlling the disease transmission environment in the home, or spending time administering oral rehydration therapy.

At this stage, the health-nutrition interactions, including related resource allocation issues, can only be partially understood using the existing data sets. Ideally, one would prefer to have long-term panel data sets in which consumption and morbidity records of individual household members and their access to resources and their productivity could be traced over time. An alternative to a detailed partial analysis of the critical linkages can be seen in aggregate approaches assessing the income-nutrition relationships. Such an aggregate approach is followed in this section and is complementary to

the earlier detailed analysis on income-health and consumption-nutrition linkages.

The basic rationale for this aggregate assessment of the income effects on nutritional improvement is that increased household income hypothetically permits households to respond in a number of ways which may be favorable for nutritional improvement: more food may be acquired, workload may be reduced and thereby child care improved, household sanitation and housing environments may be enhanced and thereby reduce exposure to infectious diseases, quality and quantity of water availability may be improved, and the household's effective demand for health care, both preventive and curative, may be strengthened through higher income levels. Finally, the household's ability to respond to existing or new knowledge for nutritional improvement is increased when household resources are less constrained; information may then be put into practice and this may involve increased spending on certain items by the household.

For the 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, etc., are excluded since we hypothesized that these determinants may also be at least partially driven by household income. The model, therefore, includes only the income and income composition-related variables (share of cash crop income/total income) and child demographic variables, such as age, sex, birth order, and, where applicable, duration of breastfeeding of the child. The model is thus:

Nutritional status of child = f(per capita income, per capita income square, cash crop income/ total income, child demographics)

The results of this analysis for the six studv environments, taking weight-for-age as dependent variable, are presented in Table 49. In all but one of the study areas (Kenya), a significant effect of increased income for nutritional improvement is identified. The income effect on nutritional improvement is decreasing at the margin and this decreasing effect is captured by the negative but significant parameters for the income squared variable in the model, which is also significant in all cases but Kenya.

In none of the study areas is there a negative effect of an increased share of cash crop income on the nutrition of children. In three of the study cases (The Gambia, the Philippines, and Rwanda), the effect is positive but statistically not significant. In Guatemala and even more so in Kenya, a positive significant effect of increased shares in cash crops for weight-for-age results from this analysis. In the case of the Guatemala study setting, the cash crop income share variable may capture some of the social programs associated with the commercialization in the export vegetable cooperative described in Chapter 8. The positive effect in Kenya remains somewhat puzzling. It may be that households with more entrepreneurial attitude who use household resources more efficiently for household welfare, including child welfare, have joined the outgrowers' scheme and therefore this variable captures some of such relationships in this case. Anyway, the important point to make on the basis of this

Table 49--Effects of income on nutrition of children: regression analysis for six study areas in the commercialization process

Dependent variable: weight-for-age Z-score values of children[a]

Explanatory Variables	Guatemala		The Gambia[b]		Philippines[c]	
Income[d]	8.231E-04	(3.20)	0.0749	(2.91)	5.853E-03	(5.76)
Income squared[d]	-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)[c]	7.083E-03	(0.12)	8.8169	(1.57)	-0.3938[c]	(-11.55)
Birth order	1.706E-04	(0.01)	...	...	3.241E-03	(0.40)
Breastfeeding (months)	9.663E-05	(2.03)	...	...	5.421E-03	(2.45)
Constant	-2.1165		-282.409		-1.8614	
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 Variables	Kenya		Malawi		Rwanda	
Income[d]	8.224E-05	(0.67)	9.03-03	(3.85)	4.9602E-05	(2.13)
Income squared[d]	-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)[c]	0.08643	(1.22)	2.98	(2.92)	0.2464	(3.43)
Birth order	7.6203E-03	(0.53)	...	...	-0.0452	(-2.16)
Breastfeeding (months)	...	...	...	...	0.0165	(3.68)
Constant	-1.6025		-2.27		-1.1940	
R^2	0.009		0.089		0.054	
F-value	2.15		4.47		5.249	
Degrees of freedom	941		374		662	

[a] 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.

[b] Dependent variable in The Gambia = Z-score value multiplied by 100.

[c] In case of the Philippines and Kenya, male=1, female=0.

[d] Total expenditure per capita is used as income proxy (annual, in national currencies).

analysis is that no evidence is found for an adverse effect on child nutrition from increased commercialization, even when income is held constant.

The same models as presented in Table 49 were estimated for the more long-term nutritional status indicator, height-for-age, and the short-term indicator, weight-for-height. In the height-for-age models, in all but the Kenyan case, significant income effects for nutritional status were identified and the magnitude of these effects appeared even stronger than for the weight-for-age indicator, which points to the more long-term effects of income on nutrition. This was not found for the short-term indicator of weight-for-height, which is probably much determined by short-term events of morbidity.

The analysis of the aggregate income/nutrition effects of commercialization reinforces the more detailed analyses presented earlier. The positive effects of increased household income on the child's nutritional status is apparent only for the longer-term indicators--height/age, weight/age. The lack of a robust effect of income on short-term nutritional status is of concern because deficits in weight/height--particularly in children under three years of age--are highly correlated with mortality. For the moderately and severely malnourished preschooler, income-generating schemes must be combined with other health-augmenting interventions in order to enhance the probabilities of survival for the most nutritionally at risk children.

In Table 50, the parameter estimates are used to evaluate the effect of a 10-percent income change for child nutrition in terms of weight-for-age at a uniform household level income of U.S. $100 per

Table 50--Effect of a 10 percent increase in income of the poor (at U.S. $100 per capita) for children's nutritional status (weight-for-age), and effect of a 10 percent increase in the share of cash crop income over and above income effect

Country	Effect of a +10 Percent Income Change for:		Effect of a +10 Percent Income Share from Cash Crops for:	
	Level of Z-Score	Percentage Change of Z-Score	Level of Z-Score	Percentage Change of Z-Score
Guatemala	+0.019	+1.06	+0.0039	+0.21
The Gambia	+0.023	+1.92	n.s.	n.s.
Philippines	+0.017	+1.13	n.s.	n.s.
Kenya	n.s.	n.s.	+0.0027	+0.26
Malawi	+0.068	+4.90	n.s.	n.s.
Rwanda	+0.015	+2.46	n.s.	n.s.

Source: Derived from Table 49.

capita in each of the study settings (thus moving households from $100 to $110). A respective elasticity of nutritional improvement with respect to income ranges between 0.1 and 0.49 or between 1.0 and 4.9 for a 10-percent income change and is highest in Malawi and Rwanda, followed by The Gambia, and substantially lower in Guatemala and the Philippines. The level of these elasticities suggests that major income increases are required at the level of rural poor households' income to actually have a major nutritional improvement effect. In absolute terms, the nutritional effects of incremental income are highest in Malawi, Rwanda, and The Gambia, followed by Guatemala and the Philippines. With the exception of Malawi, the differences between the five study settings where significant income effects for nutritional improvement were identified, are not very large. They all range between 0.015 and 0.023 Z-scores (weight-for-age) per an incremental U.S. $10 of per capita income increase--that means moving from U.S. $100 to $110 per capita income per annum in these households (Table 50). These reduced-form elasticities reflecting the total income effect (including the nutritional status of the mother during pregnancy and lactation and possibly more general income effects for sanitation and household welfare) are substantially larger than the nutritional status elasticities derived from the income-calorie intake links for Kenya and the Philippines above.

Given the earlier insights from the health-related analysis and the weak relationships found between income and morbidity in the study settings, it should not come as a surprise that the income effects of nutritional improvement decrease rapidly at the margin. This probably

reflects the rapidly increased food consumption effects due to income, but when household food availability constraints are relieved, the more health-related constraints for nutritional improvement become binding; therefore the effect of increased income for nutritional improvement is limited where social and rural health services are not simultaneously expanding to meet the health needs of the population. The results thus further underline the earlier conclusions that income growth fostered through agricultural development is an important factor for alleviation of poverty and hunger, but rural health and sanitation have to move jointly with it in order to strengthen the benefits of income growth for child welfare in the commercialization process of agriculture.

CONCLUSIONS ON NUTRITION EFFECTS

Commercial agriculture schemes are one form of income-generating activity aimed at improving the overall welfare of participating households. Most policymakers assume that as the incomes of cash cropping households increase, the health and nutritional status of family members will also improve.

In the current set of six studies, the impact of increased household income on preschooler growth operates mainly through the income/calorie/preschooler growth linkages. It is noteworthy that nutritional improvement effects of incremental income were found highest in the poorest households in the two poorest study settings--Malawi and Rwanda. The analysis indicates that increases in income

result in improved caloric intake within the household and that a portion of this benefit is passed on to the child. Still, even in households where food availability is greater than energy requirements, preschoolers often fall well below their apparent energy requirement.

The reasons for inadequate preschooler energy consumption in situations where income and household food supplies seem not to be constrained are not addressed directly by the case studies. However, one explanation is plausible. The communities in which the commercial agriculture schemes have been implemented are ones where malnutrition is endemic. There may not be an awareness on the part of households that malnutrition is in fact a problem since their children look like most other children in the community. If primary caretakers do not perceive a nutritional need, then there would be no reason to assume that the children need more food.

A second explanation is also possible. Most of the studies concentrated on evaluating the nutritional status of children up to age 6. However, the Guatemala and The Gambian studies also included a cohort of children up to age 10. The data from Table 47 had indicated that in Guatemala, there was no significant association between household energy intake and child growth. Interestingly, if we analyze growth data for children between the ages of 6 and 10, we find the opposite is true. In this group of older children, increases in household caloric intake result in positive impacts of child growth.

Why the difference? It may be that there is no effective demand on the part of young children, particularly those under age 3, for

additional food. This would be especially true in young children who because of repeated bouts of illness had developed a chronic anorexia. The data from Chapter 8 had shown a high incidence and prevalence of illness. It is very likely that the chronically sick preschooler feels satiated before their "true" caloric needs have been met. It is also not surprising that a parent would not assume that a child needs more food if the child has indicated that they have had enough food.

Two things happen to older children. First of all, they are less likely to be sick. This was shown from both the descriptive data and multivariate analyses from Chapter 8. Therefore, the adverse effect of illness on appetite is less pronounced in the older children. Secondly, older children are probably more likely than the younger child to ensure that they receive adequate food. For one thing, they are able to help themselves and, unlike the very young child, do not depend totally on a caretaker.[19]

The morbidity pattern of the preschooler is a major determinant of growth. As already discussed, the increases in income as a result of the schemes have had limited effect on decreasing illness in the short term and thus there is also little effect on increasing child growth via the morbidity/preschooler growth linkages.

The schemes as they have been implemented have not been associated with increased preschool malnutrition. Therefore, accusations that introduction of cash cropping schemes is usually associated with

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[19] By the end of the rainy season in The Gambia, for instance, children as young as six years old "collect" fresh maize cobs from fields and roast them on fire.

a deterioration in nutritional status are not borne out by data from the six country studies included in this report.

Increased household income in rural areas based on agricultural growth, which also includes the smallest farmers and landless, can make a major contribution to the solution of the hunger problem, but it does not in itself provide a complete solution to the problem of preschooler malnutrition.

10. SUMMARY AND POLICY CONCLUSIONS

This research is based on unique set of studies that link the changes resulting from commercialization of agriculture at the household level to production, income, consumption, and nutrition. The research first addresses the empirical question: Does agricultural specialization and commercialization, in particular if it involves nonfood cash crops, damage or enhance household-level food security and nutrition, and if so, through what mechanisms? Secondly, can agricultural development be designed in such a way that poor households' food security as well as nutritional benefits increase, especially for vulnerable groups within the households? The following summarized conclusions draw on the above comparative analysis *and* the individual detailed case studies that were not reiterated in above comparisons.

1) The effects of commercialization for improved household food security are greatest when *incremental income and employment* from commercialization are most concentrated among the malnourished poor. Moreover, the income effects should be stable and sustainable, not just nominal but real, and should not be reduced by a created food price inflation when local food availability is reduced due to a reduction of local food production in an environment with large marketing margins.

2) We generally find in the six study settings that the *smallest farm households participate less* than proportionally in the respective schemes, but when they participate they tend to be the more radical adapters of the new cash crops and technological change, respectively. The effort to integrate the smallest farms into the schemes can be enhanced as shown in The Gambia where it had favorable effects on food security at the household level.

3) In all of the study settings, smallholder producers make a conscious effort to *maintain subsistence food production* along with the new cash crops. They do this despite the 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 of farm households in view of a risky income environment. Theoretically, this strategy of farm households may be viewed as a second-best option as compared to full market integration as related benefits of specialization are foregone. However, in view of risky economic environments, maintenance of own food supplies is certainly a sensible strategy. Agricultural policy can effectively support it by the *promotion of technological change in staple (subsistence) foods. This also provides further room for specialization at farm levels, and thereby permits capturing further gains from commercialization and market integration of smallholders.*

4) Research and extension policies as well as input supplies (seed, fertilizer) for the subsistence crops are critical for a viable commercialization strategy that meets smallholders' demands in envi-

ronments such as those in the six study areas in Kenya, Malawi, Rwanda, The Gambia, the Philippines, and Guatemala. Extension services in schemes with new crops have to assist farmers in avoiding farm management mistakes. Crop management failures in the more input-intensive cash crops may pose a risk of much increased losses due to potentially higher losses. The export vegetable production in Guatemala that requires 4 times higher input cost than traditional vegetables and 12 times the input cost of maize per hectare, is a case in point.

5) The employment effects for the poor resulting from commercialization are very crop-specific and are a function of the local labor market and technologies introduced. *Choice of crop and technology*, therefore, has a major implication for the actual outcome of the employment effects. Program and policy design in this field can go a long way toward maximizing the income benefits for the poor through agricultural development. This does not only apply to the on-field employment created, as exemplified by the substantial employment increases in vegetable production in the case of Guatemala and potato production in the case of Rwanda. It also applies to processing and trading employment resulting from commercialization. However, it was found that capital-intensive processing of crops, such as sugarcane, may actually provide little incremental employment and with reduced field labor demand may have even an adverse employment effect for smallholder households.

6) In virtually all of the case study environments, the commercialization of agriculture entailed a substantial *expansion of the*

demand for hired labor. To the extent hired labor households rank among the malnourished poor, this employment effect is expected to be of particular benefit.

7) In the case of the Philippines, the rapid expansion of sugarcane production contributed to the *creation of a landless class* of households that used to be tenants growing maize on rented land before. An important contributing factor to the consolidation of landholdings was a long-run decline in maize productivity, which discouraged smallholders, tenants, and landowners from continuing to produce maize, and which resulted in declining incomes of the poor before the introduction of sugarcane. More appropriate policy responses, in terms of helping the poor, would have been (a) to have done more to encourage smallholder sugar production (for example, awarded tenants sugar contracts with the mill), and (b) to have taken steps to raise smallholder maize productivity through extension and credit programs. In the Philippine context, smallholders were less able to respond quickly to new technologies and income-earning opportunities due to (for them) high capital costs, low education, and limited access to appropriate institutions that could potentially assist in the transition.

8) In all of the study settings, *positive income effects* of commercialization programs and projects studied were observed in general, but not necessarily for all households and for all components of the commercialization process. From a small farmer's perspective, the smallholder tea production in Rwanda, for instance, did not contribute to real income increases but rather to a loss to smallholders so far.

Although substantial, the *net income gains* in general were much less than the *gross income* from the new cash crops because of substantial *substitution effects* within agricultural production and between agriculture and the off-farm employment. The latter was particularly the case in Guatemala. Off-farm income earning was reduced when the labor-intensive export vegetable production drew family labor and hired labor back into agriculture. In The Gambia, double-cropped irrigated rice production gained to a large extent at the cost of upland crops (groundnuts, millets).

At least in the short run, some types of households lost income due to the schemes. This group is rather small and heterogeneous across the study settings. 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. While this probably was the case with relocated farmers in Rwanda, it was not so in Kenya where farm households who lost their land to the factory due to the sugar scheme were found worse-off in terms of food consumption (but not in terms of nutritional status). In The Gambia, food aid was used to compensate for the temporarily lost access to swamp fields when the irrigation infrastructure was put in place.

9) In all of the study settings, *off-farm nonagricultural employment and income* already play a significant role and ranges between 20 to 60 percent of total household income. Much of this employment is in local goods and services supply, which, in case of the Central American, the Philippine, and three African (Kenya, Malawi, and Rwanda) study settings, all of which are characterized

with densely populated environments, may suggest favorable indirect multiplier effects for income and employment resulting from agricultural commercialization. The Gambia setting--less densely populated--depicts a case with much less off-farm income in this comparison.

10) Income and employment benefits of commercialization are not equally spread between communities and households, participating and nonparticipating in the respective programs and schemes, but also not equally spread within the households. It is generally found that *women's work in agriculture* is reduced not only relatively but absolutely with rising income, which correlates with increased farm size in most of the study locations.

Sociocultural situations in the study locations determine quite different effects of commercialization on women's work in agriculture: in Guatemala, for instance, the export vegetable production and its dramatic increase in labor demand led to an absolute increase of labor input by both men and women, but with rising farm size, women's labor is relatively reduced while hired labor and child labor shares increase; this was not, however, the case for men's family labor. In The Gambia, on the other hand, it was found that the increased labor demand from double-cropped irrigated rice was to a large extent fulfilled by a shift of male labor from upland crops into rice, but in the final assessment, it turns out that overall workload of men remained more or less constant, while women's labor input, especially into communal agriculture, increased somewhat.

11) It turns out as a common feature in all the six study settings that women's work in cash crops and *women's direct control over*

income from the new cash crops is much less than men's, and frequently even disproportional to the labor input into the very crops. In none of the six schemes studied did women play a significant role as decisionmakers and operators of the more commercialized crop production line. These findings, however, must not be interpreted as if women did not indirectly benefit from the income and employment gains provided through commercialization and technological change in agriculture. Judging benefits distribution only from the production and labor side may be misleading. This becomes clear when spending patterns of income in the study settings are reviewed.

12) The critical issue relating commercialization of agriculture and household-level food security and nutrition is not only whether incremental income is earned by the poor and if such incremental income is sustainable, but also how the incremental income is spent by the poor. Much debated in this context is the suspicion that incremental cash income controlled by male heads of households in developing countries is disproportionately spent on nonfoods and on items that do not improve the welfare of the households in general, and of women and children in particular. We observed, however, that in all of the study settings with rising income, the relative proportion of income spent on food decreases, while the absolute *spending for food consumption increases.* When commercialization led to increased per capita income, we therefore should expect increased food consumption at the household level, unless there is deviation of the use of resources for food consumption because of changes in income control and

different propensities to consume by the different income controllers within the households.

13) In two of the study settings, we find *adverse effects* of increased commercialization for household spending on food *at the margin*. It should be stressed that these effects at the margin are not the net effects of increased commercialization. In Rwanda, increased shares of cash income (male-controlled) lead to a less than expected increase in food expenditures and household calorie availability; in other words, holding income constant, increased cash income as compared to subsistence food income leads to lesser increase in calorie consumption in that setting. Also, in the Guatemalan setting, the income elasticity of calorie consumption among the export vegetable producers is less than that of the other farm households in the same income range. In both settings, however, the overall income increase due to commercialization is much larger than the deviation effects of commercialization for spending on food at the margin. Thus the income effects more than compensated for the marginal deviation effects. In The Gambian case, where new production technology and its related commercialization in rice lead to particular drastic change in crop control and thereby income control within the households, changing a traditional women's crop to a communal crop under the control of the male-headed household, no adverse effects for spending on food and total calorie availability in the households are observed. One should thus refrain from generalizing that increased commercialization of agriculture leads to deviation of food and welfare-oriented spending of households.

14) It should be pointed out that not only food expenditures increased especially with rising income, but much more so do some *non-food expenditures with a high welfare content*, such as health, housing, and clothing expenditures which show very high income elasticities in the study settings. Also, the analysis suggests that poor households build up their asset base out of incremental income. An expanded asset base makes households less vulnerable to short-term fluctuations in income streams, as part of the asset base may be liquidated in such circumstances and therefore increases household-level food security.

15) In order to maximize the development potentials of increased income, policies and programs parallel to commercialization of agriculture have to accommodate the increased ability of households to save and build up productive asset bases in order to avoid investment and savings in the form of nonproductive assets. A rapid *development of rural financial markets* in the commercialization process is therefore of utmost importance. This is particularly called for in environments where commercialization of agriculture leads to large lumpy payments of cash money a few times a year. Establishment of rural banking facilities at the grassroots level is critical and larger development schemes for commercialization can provide the critical mass required for efficient rural banking with low overhead costs. Such banking facilities are to be expressly open to individuals and not just to (male) heads of households that are enrolled into the schemes at the location, say the sugarcane scheme or the export vegetable outgrowers' scheme. This way, through the access to rural

financial institutions, the benefits of commercialization can be spread much more widely across the community and would be less limited to the actual direct participants in schemes.

16) The effects of commercialization on children's welfare are mediated in part through the income-consumption link, which is found to have favorable effects on *child nutritional status*. Potential linkages between income-child education and the demand for child labor that may result from new labor-intensive cash crops may also be relevant. In the Guatemala study, it was found, for instance, that the labor-intensive vegetable production increased child labor in the field. The effects on schooling and child welfare can be adverse.

17) In general, the detailed analysis found no strong relationships between income and *child health*. The adverse household and community health and sanitation environments in the study settings overshadow potential positive effects of income for health improvement.

18) *Community health services* have to move in tandem with the agricultural development process and increased income and wealth of communities may provide the resources required at community level to sustain local health services. Certainly, the effect of demand for health care, both curative and preventive, can increase when increased income is combined with increased knowledge on how to eradicate the sources of disease. Increased water quantity and improved water quality at community and household level is one such factor and it was identified in the setting of The Gambia that it can contribute substantially to child nutritional improvement. We are not suggesting

that agricultural development programs, such as those studied here, should have their own health and sanitation component. This would lead to a noncohesive rural health services system. Agricultural growth, however, facilitates the ability of households in rural areas to effectively respond to health services supplies as the ability to pay for services increases. Also, local initiatives for community development can be effectively stimulated when the resource base of communities expands, as was the case in the Guatemalan setting with the strengthening of local health services.

19) It was found that consistent with the earlier assessment on income-food consumption linkages, the *nutritional improvement associated with increased income* was significant and the increased commercialization and its related potential effects on income control and spending preferences were not identified as having an important adverse effect on nutritional improvement. The observed deviations in expenditures at the margin from food to nonfood in some of the study areas did not translate into measurable adverse effects on nutrition.

20) However, it was also found that the nutritional improvement effects of incremental income are not large and are decreasing at the margin with rising income when *health and sanitation constraints overshadow food-deficit constraints* determining child malnutrition. This strengthens the earlier point that health and sanitation in rural areas have to be promoted in parallel and in tandem with agricultural development. Increased income and increased food availability provide solutions to the *hunger problem* but not to the *problem of malnutri-*

tion, which is a complex result of interaction of lack of food and morbidity.

To sum up, the following policy and program design issues are important in order to maximize potential benefits from agricultural commercialization and minimize damage:

- Promotion of technological change in food crops along with cash crop production for household food security.
- Efforts for sustainability of programs in order to generate sustainable income streams especially for the poor.
- Effective integration of the smallest farm households in schemes for commercialization and technological change.
- Attention to land tenure and resulting land allocation problems when net returns to land increase substantially and landless households operating as tenants lose their access to land. This will be particularly important when there are positive returns to scale.
- Improvement of market infrastructure for food, nonfood goods and services, especially in remote areas where the change in production may lead to a switch to a net food import situation and thereby drastic price changes.
- Setting up effective rural financial institutions to generate savings and make credit available not only for scheme participants but for the community as a whole.
- Provision of extension services for cash management at household level in environments where availability of lumpy cash returns from cash crops is an innovation.

- Careful consideration of specific situations of potential short- and long-term losers due to the commercialization process, and appropriate consideration of short-term compensation and long-term direct or indirect integration of absolute losers into schemes before setting up schemes.
- Development and promotion of community health and sanitation services in order to maximize the health and nutrition returns of increased income. Particular emphasis is to be placed on avoiding water-borne disease problems around irrigation schemes.

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