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INCOME SOURCES OF MALNOURISHED PEOPLE IN RURAL AREAS: MICROLEVEL INFORMATION AND POLICY IMPLICATIONS

EDITED BY JOACHIM VON BRAUN
AND RAJUL PANDYA-LORCH

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Joachim von Braun
and
Rajul Pandya-Lorch

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ACKNOWLEDGMENTS AND FOREWORD

This study is based on surveys to each of which many respondents in households, enumerators, and researchers contributed. It required a large number of committed researchers—in addition to the paper contributors—and considerable effort by many to arrive at such new factual information on this "simple" issue: what are the income and employment sources of malnourished people in rural areas? To individually acknowledge all of the researchers, who at some point helped to generate this information, in addition to the paper contributors, would make an excessive list here. We, instead, refer to the respective case study materials.

This study has been supported by the U.S. Agency for International Development (USAID). Joan Atherton in particular provided careful guidance and advice throughout the project. The study builds on 13 earlier studies carried out by IFPRI with its collaborators for specific and different policy questions. USAID, the Federal Republic of Germany, and the International Fund for Agricultural Development supported these earlier projects including the primary data collections. This research thus capitalizes on previous research investments.

We consider this study to be a step toward comparative analysis at the microlevel from which further research into household behavior and micro-macro linkages should emerge. The specific case study chapters, however, also stand on their own. Making the extensive household information available in this volume serves numerous purposes. Farming systems analysis, for instance, needs to be placed in a comprehensive household income—farm and nonfarm—strategy perspective in order not to miss out on why households actually do what they do, before planning for farm income enhancement programs. The micro case studies can provide valuable guidance to program designers and planners who too frequently rely on too rapid appraisals of rural income and employment conditions of the poor.

Joachim von Braun

SUMMARY

THE RESEARCH QUESTIONS

This research is stimulated by the preliminary insight that rural households, even if they are poor and/or located in so-called subsistence-oriented regions, are dependent on a variety of farm, nonfarm, and nonagricultural income sources. The scale and nature of these income sources and their relationship to the major economic sectors (agriculture, rural manufacturing, and services), through backward and forward linkages, need to be better understood for priority setting in development policy. The objectives of this study are threefold:

1) to identify employment and income sources of rural households of different socioeconomic characteristics in regions and countries at different stages of agricultural transformation and development;

2) to trace income and employment strategies (as revealed by these) of rural households, and, thus, to broaden the information base for policy priorities for integration of the poor into a sustainable growth and development process.

3) to look into distributions below and above the poverty line in order to identify relevant differences in demographic, income, and employment characteristics of poor and nonpoor rural households and, thereby, assess the scope for "targeting" income sources of the poor as a poverty alleviation strategy.

Poverty is essentially, but not always, a matter of low incomes, where the cost of acquiring a certain commodity bundle determines the income- or expenditure-based poverty line. An income-based indicator is an indirect means of measuring poverty. In this study, poverty is measured directly through consumption, given certain commodity characteristics and behaviors, rather than indirectly through incomes. A central and fundamental characteristic of absolute poverty is insufficient food consumption for an active and healthy life. The poverty line (cutoff point) is defined here by calorie consumption being 80 percent of the recommended consumption for an active and healthy life.

DRIVING FORCES OF INCOME DIVERSIFICATION

New household economics theory goes a long way toward explaining household income strategies. Derived from a (farm) household model, we find income diversification driven by the farm resource base, household work force (time), the off-farm wage rate and productivity in commercial and subsistence production, and consumption preferences/needs. Other driving forces toward household income diversification include differentials in opportunity costs of labor within households; and objective risks and (subjective) attitudes toward risks.

Income source diversification is thus driven by the need to select a portfolio with elements of low covariate risks. With increased gains from specialization in risky (commercial) farming, the demand for nonagricultural employment to reduce income variance also increases when insurance mechanisms are imperfect. Thus, farm specialization and off-farm labor supply by farm households may be partly in a reinforcing rather than in a substituting relationship when risk of market failure prevails.

Static household models leave out the dynamic processes of policy/market interactions and their implications for sectoral diversification in the rural economy. Sectoral diversification in the development process is linked via market interlinkages and is impacted upon by policies. Key policies, such as infrastructure improvements, technology, human capital formation, and credit market development result in reduced transactions costs and lower food market risks; in expansion of insurance, financial and labor markets and reduced risk of failure in these; shrinkage of the home goods sector; and expansion of commercial agriculture, rural services, and manufacturing.

SECTORAL AND CROSS-COUNTRY COMPARISONS

There is a tendency for agricultural income shares of the rural population to decline in the context of economic growth, but this relationship is much less clear-cut than the well-known relationship between agricultural income share and national income level. According to plausible estimates, agriculture contributes 41 to 55 percent of rural income in all major developing country regions, with the exception of Central America (34 percent). Africa is no exception (53 percent). Agricultural income forms the major share of total rural income in many low income countries, particularly in those with GNP per capita up to U.S. $500. However, considerable diversity exists: the agricultural income share in rural income ranges from about 30 to 90 percent among this group of low income countries.

The general relationship between absolute poverty (here measured in terms of prevalence of malnutrition) and level of average rural per capita income is strong, particularly in countries with per capita GNP

per annum range of $200 to $800: the prevalence of rural malnutrition is reduced by 14 percentage points, if income increases from $300 to $600, which means an approximate 40 percent reduction in the prevalence rates. The sector structure—holding incomes constant—did not influence prevalence rates of malnutrition over and above the income level effect.

MALNOURISHED RURAL POOR (MRP)

Income Composition and Strategy: Micro-Information for Policy

The 13 household-level surveys used in this comparative study represent a fair amount of differences in regional, ecological, and socioeconomic characteristics. The survey sites are located in Latin America (Brazil, Guatemala); Africa (The Gambia, Burkina Faso, Kenya, Rwanda, Zambia); and Asia (Sri Lanka, Pakistan, Bangladesh, India, the Philippines). None of the surveys claims to be representative for the entire country in which it is located.[1] However, they do represent points of information on a range of different low-income rural settings.

All surveys were conducted in the 1980s and thus represent recent situations. They capture a fair amount of different economic environments and development policy contexts. Areas of more traditional subsistence orientation are represented, as are areas with improved infrastructure, with rapid technological change in agriculture, and with expanded nonfarm employment. It is in terms of these categories, rather than in terms of "country cases," that the microlevel information should be perceived in this study.

Annual per capita household incomes (in 1985 U.S. dollars) of severely malnourished households ranged from about $40 in North Arcot (India) during the drought year to about $716 in the Zona da Mata, Brazil. The diversity in income levels of the severely malnourished suggests against the adoption of a general or common income poverty line applicable across countries or even across regions in one country.

Rural households do not depend directly for income only or mostly on agriculture; in half of the survey locations, the nonagricultural income share of households is about or exceeds 50 percent. The share of nonagricultural income in total income ranges from 13 percent to 67 percent among the 13 surveys.

There is considerable diversity in income sources <u>among</u> the surveys, <u>within</u> the same survey, <u>over</u> time, and <u>between MRP and non-MRP households among the surveys</u>, although interestingly, in this last case,

[1] The Pakistan and Bangladesh surveys are exceptions, with their rather broad coverage.

not so much within the same survey. Thus, there is little basis for making generalizations about income sources of the poor and nonpoor households and for deriving blanket conclusions pertaining to income source targeting. For instance, among the surveys, income from livestock is notable only in Brazil, Pakistan, Bangladesh, and the Sahelian and Guinean zones of Burkina Faso, but inconsequential elsewhere. Crop production is quite important everywhere, except in Guatemala, the Sahelian zone (Burkina Faso), Sri Lanka, Pakistan, and one of the Philippines surveys. Wage employment is an important income source in the Guatemala, Sri Lanka, Pakistan, Bangladesh, North Arcot (India), and the two Philippines surveys, which can be attributed to the agricultural structure and high population densities and consequent landlessness.

Within the same country, too, income sources and their contribution to total income differ substantially by location. For instance, agro-ecological differences, combined with different government policies, contribute to such differences in Burkina Faso. Income from crop production is quite unimportant in the Sahelian zone (agro-climatically a very poor zone, with extreme variations in cropping outcomes) compared to the other two zones as distinguished in the Burkina Faso survey, which are somewhat better off. Instead, transfers and remittances are somewhat more important in the Sahelian zone, where they contribute almost one-third of income, particularly from nonlocal nonfarm, that is, migration income.

Neither are income source patterns steady over time, but rather they are dynamic, as they adjust to varying economic circumstances. During the drought year in North Arcot (India), agricultural wage income was a smaller share of total income, as employment opportunities on large paddy farms dried up. As the agricultural and overall economy improved following the drought, the share of income from agricultural wage employment increased considerably, as did income from services and trading. In The Gambia survey area, the opposite pattern was observed of off-farm income shares being inversely related to crop-production performance; that is, the better the crop production, the lower the off-farm income share. This is related to the low share of agricultural wages in off-farm income. In this context, high off-farm income shares are indicative of either an income diversification strategy or of poor agricultural performance.

There is almost no difference in terms of the share of income coming from aggregated agricultural and nonagricultural sources for MRP and non-MRP households in each survey location. Only in North Arcot, India, during the non-drought year, did a substantial differential arise, when non-MRP households received 81 percent of total income from agriculture as opposed to the 63 percent share of MRP households. However, differences do exist between MRP and non-MRP households in the shares of different income sources within the agricultural or nonagricultural sectors in some cases, especially where wage income

appears to be a distinguishing feature of the income of the MRP, such as in survey sites in Guatemala, Rwanda, or North Arcot (in the non-drought period). In Guatemala, wages from agriculture and nonagriculture were 67 percent of income for non-MRP households, compared to 51 percent for MRP households.

Access to Land

While ownership of land appears to be an important factor for diet adequacy, the physical size of the farm itself (in hectares) does not seem to affect the prevalence of malnutrition as much. Either the farm sizes do not differ much by prevalence of calorie deficiency, such as in the survey sites of Guatemala, Kenya, India, and the Philippines, or there is a u-shaped relationship between farm size and hunger, as in the Zona da Mata survey site or even a positive relationship, as observed in the Zambia survey location. Farm size alone is not indicative of the quality of the land or, for that matter, of the ability to exploit production potentials, or its use as collateral in times of stress.

Ownership of land or access to even small pieces of land for farming made a substantial difference to the poverty outcome. Generally, there tends to be a higher prevalence of poverty among the landless or quasi-landless households than in the sample as a whole. The landless were much more dependent on other (riskier) sources of income than farm incomes and on the diversification of the rural economy. For instance, 70 percent of the income of the landless in one Philippine survey location came from agricultural wages. A much greater proportion of MRP households that were landless could be observed in the Asian survey sites (25 percent in Pakistan to 66 percent in Kandy District and North Arcot (1983/84)) than elsewhere. The comparable proportions were only 6 and 12 percent in Western Kenya and Northwest Rwanda, respectively.

Women's Income

Female-headed households are generally poorer than male-headed households, yet they were sometimes better fed and absolute poverty was less prevalent among them than in the sample as a whole. The control of income (and its resulting expenditure) is a determining factor. Some of the household-level surveys found that women are more likely to spend more of their income on food and nutrition than men, who are more likely to spend their income on personal tastes.

Female-headed households are <u>not</u> more apt to be MRP households (in comparison to the whole sample), except in the Southwestern Kenyan survey area and the Eastern Province of Zambia survey area. Otherwise, the gender of the household head was unimportant for distinguishing between MRP and non-MRP households. At the same time, again with the

exception of Eastern Province, Zambia, female-headedness is not a marker for a significant problem in the food-poverty picture—only 2 to 7 percent of MRP households were female-headed. Hence, the scope for targeting for poverty alleviation on the basis of female gender of head of household appears to be limited in these survey sites. However, there is considerable scope for extra efforts to raise women's incomes—or more generally, women's value of time—especially in the African context, given the evidence that women tend to allocate more of their resources for the family's welfare.

Policy Conclusions

1) Agricultural growth alone is a necessary but not sufficient long-term strategy for poverty alleviation. The poor are closely linked to rural manufacturing and services with their direct income sources and expenditure patterns. Explicit promotion of manufactured goods' and services' availability, in light of the incentive role they play for rural and agricultural growth, and in fostering the complex synergistic feedback effects between agricultural and nonagricultural growth through credit and infrastructure, promise poverty alleviation effects beyond favorable agricultural growth effects.

2) The diverse pattern of the poor's income sources, even in the same macro and micro regions covered by in-depth surveys, does not suggest a general blueprint for targeting the poor's specific income streams. The issue is more one of alleviating the poor's problem of risky income streams and risk of market failure. Only when market development progresses (in food and factor markets) can the poor be efficient.

3) There are two distinct motives underlying income diversification, depending on the nature of the rural economy: one, diversification in stagnating rural economies as a reflection of the poor's coping with income source-specific risks (diversification for "bad" reasons); and two, diversification in growing rural economies as a reflection of dynamism and of capturing of gains from specialization at the household level (diversification for "good" reasons). To move swiftly from the former to the latter is a central task of rural growth strategy. Thus, targeting basic market failure and production instability problems, which have a major impact on the poor, may be more effective for poverty alleviation than direct targeting of the poor—be it on the consumption side or on the income earning side.

4) While hunger is addressed effectively with household income growth (and, possibly, income transfers), malnutrition requires community-level health and sanitation action, which is also facilitated and made sustainable by rural growth. Thus,

households need to be viewed in the community-level context, and the community has to attract much of the policy focus in many areas of development, such as infrastructure, health, and sanitation.

5) The analysis suggests a focus on (a) prevention of policy-induced market failures, that is, in food and labor markets, which otherwise foster income diversification for "bad" reasons; (b) improved market integration through infrastructure, facilitating diversification of income sources for "good" reasons; (c) social security, including community health and sanitation improvement with and before growth, in order to permit specialization by the poor in risky food- and labor-market environments; and, (d) rural growth promotion with technological change in agriculture and rural manufacturing and services to raise productivity and increase availability of goods and services at low prices.

1. INCOME SOURCES OF MALNOURISHED PEOPLE IN RURAL AREAS: A SYNTHESIS OF CASE STUDIES AND IMPLICATIONS FOR POLICY

Joachim von Braun
Rajul Pandya-Lorch

INTRODUCTION

Study Objectives

A central element of successful economic development is the rapid expansion of rural employment and incomes, which, in order to be growth- and equity-oriented, must reach the poorest population groups. The rural economies of developing countries are undergoing rapid transformation. Employment and income sources are becoming much more diverse as labor and product markets increasingly integrate. Furthermore, inherent (production) risks faced by subsistence producers are increasingly being overshadowed by market risks, that is, in food, labor, and capital markets, thereby shifting the weights among the causes of household food insecurity.

Setting long-term priorities for development policy requires an in-depth knowledge of the patterns and tendencies of employment and income sources of the population. This paper, which largely builds on the detailed case studies in this volume, aims at contributing to the improvement of such knowledge for rural areas. The paper's objectives are threefold:

1) to identify socioeconomic characteristics, employment, and income sources of rural households in regions and countries at different stages of agricultural transformation and development;

2) to look into distributions below and above the poverty line as well as disaggregations, for instance, by socioeconomic categories, to identify relevant differences in demographic, income, and employment characteristics of poor and nonpoor rural households and, thereby, assess the scope for "targeting" income sources of the poor as a poverty alleviation strategy;

3) to trace income and employment sources and strategies (as revealed by these) of rural households, so as to broaden the information base for policy priorities for integration of the poor into a sustainable growth and development process.

Before proceeding further, it seems necessary to clarify the poverty concept utilized in this study.

Poverty Concept Underlying this Study

It is desirable, for setting and monitoring policy priorities, to have comparability across countries and regions in the measurement of the prevalence of absolute poverty and its changes in the short and long runs. Poverty's complexity requires a similar complexity in measurement and analysis. Measuring poverty entails two distinct problems: 1) defining the poverty line (defining who the poor are); and 2) constructing an index for intensity of poverty suffered by those below the line (Sen 1982). Mortality information (for example, infant mortality rate), health and nutrition status (various anthropometric indicators), and food consumption (food energy deficiency, lack of dietary quality) all have their justifications for being measures of poverty symptoms, given certain policy and program objectives for poverty alleviation. Thus, the policy focus influences the measurement's focus.

Poverty is essentially, but not always, a matter of low incomes, where the cost of acquiring a certain commodity bundle determines the income or expenditure-based poverty line. While poverty is found to be more common in low average income areas, the link is not always strong (World Bank 1990), and this is corroborated by poverty data from some of the case studies in this volume. An income-based indicator is an <u>indirect</u> means of measuring poverty. In this study, we try to measure poverty <u>directly</u> through consumption, given certain commodity characteristics and behaviors, rather than indirectly through incomes. A central and fundamental characteristic of absolute poverty is insufficient food consumption for a healthy life.[1]

- The poor are defined here as having their food consumption falling below the level at which a healthy life is assured.

Commodities besides food are also required for an active and healthy life. The appropriate expenditure share and composition of nonfoods vary greatly by location, household employment condition, and other factors. Direct surveying of food consumption quantities rather than expenditure values of foods and nonfoods permits us to avoid making assumptions about the quality of commodities (food and nonfood) and household spending behavior. Since all the surveys used here contain information on consumed food quantities, this is permitted.

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[1] This is preferably assessed at the individual level to account for intrahousehold inequalities. However, this is hardly feasible in household systems where eating from the common pot is the rule, such as in many African settings. This argues in turn for supplementing household-level consumption-based poverty information with individual-level anthropometric (nutritional status) information.

- The focus on food consumption does not entail a specific assumption regarding nonfoods in the commodity bundle of the poor.

We acknowledge the complexities of micronutrient and protein deficiencies which require attention especially in certain environments. However, frequently, calorie deficiencies and other food deficiencies are highly correlated.

- Food calories derived from actually consumed quantities of food items is the key aggregate "food" item used here for poverty analysis. This is, preferably, supplemented by diet quality information.

A 10 percent coefficient of variation around the recommended allowances for a "healthy and active" life (derived from FAO, WHO, and country-specific information) is widely accepted. Thus the recommended allowance ± 20 percent covers the majority of variation within the population. Eighty percent of the recommended caloric allowance also approximates 1.5 Basal Metabolic Rate (BMR), which is widely assumed to be the maintenance requirement for an average individual.[2]

- The poverty line (cutoff point) is defined here by calorie consumption being 80 percent of the recommended consumption for an active and healthy life.[3]

The standard techniques for measuring the prevalence of poverty (head count, poverty gap, Sen index) can be applied to a calorie variable as much as to an income variable. The pros and cons regarding each of the techniques still apply. The nonlinearity of the "severity of poverty," by increasing distance below the line, is taken into account by looking at households that fall below 60 percent of requirements.

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[2] Future research into requirement standards and actual measurements may refine this.

[3] Thus the household-specific poverty line is 80 percent of the denominator in the following equation:

$$HHPOV_i = \Sigma_j (FCON_{ji} * CV_j) / \Sigma_n (H^{(K)}_{i,n} * RQ^{(k)}),$$

$HHPOV_i$ = ratio of actual over required calorie consumption of household i,

$FCON_{ji}$ = food consumption of all items (j) in household i,

CV_j = conversion factor for items j,

$H^{(k)}_{i,n}$ = individual household members in household i (by age and sex (k); household size = n) + activity levels and body size when available, and

$RQ^{(k)}$ = age- and sex-specific requirement levels in the survey area.

Note: appropriate time of coverage matters but is site specific (seasonality, fluctuations, etc.), therefore no general rule for time index is introduced here.

It is increasingly being understood that food intake and anthropometric status (nutrition index) are significantly and strongly correlated only at very low levels of (food) poverty. Nutrient elasticities with respect to expenditures or incomes can be fairly low, despite high food income elasticities, although food expenditures may increase in line with income. This can be the case when households place high weights on attributes, such as taste, when making marginal food demand decisions (Bouis and Haddad 1990b; Behrman and Deolalikar 1987). Also, improving nutrition requires improvements in health and sanitation. Progress in health and sanitation increases the benefits of increased food consumption for poor households, whereas reduction in these further aggravates the dysfunctional consequences of calorie deficiencies.

Anthropometric information captures the effects of food intake (or the lack of it) and bad health. Therefore, when survey data permit, we supplement our calorie-consumption poverty measure by anthropometric information. The cutoff points used are commonly <-2 Z-scores standard deviation of appropriate reference population and/or below 80 percent of weight-for-age standard and 90 percent of weight-for-height and height-for-age standards. Supplementing the food-based poverty definition for the household by anthropometric information is advantageous for insights gained on nonuniform intrahousehold distribution.

Overview

This research is stimulated by the preliminary insight that rural households, even if they are poor and/or located in so-called subsistence-oriented regions, do not always have farming as their primary occupation and, even when they do, are much dependent on a variety of nonfarm and nonagricultural income sources (Kilby and Liedholm 1986, and citations therein). The scale and nature of these income sources and their relationship to the major economic sectors (agriculture, rural manufacturing, and services), through backward and forward linkages, need to be better understood for priority setting.

This paper begins with a country-level assessment of relationships between income level, sectoral change in developing countries' rural areas, and nutrition indicators. This is followed by a theoretical section on household strategies and income diversification. Thereafter, the micro data-based synthesis is geared toward fact finding, comparative data presentation, and integrative evaluation of the income and employment patterns, especially income composition and diversification, of malnourished rural poor (MRP) households in developing countries. The relationship between household income and malnutrition is observed. Relevant socio-demographic characteristics are drawn out in the necessary disaggregations. Finally, policy conclusions are drawn from both country (macro) and microlevel insights.

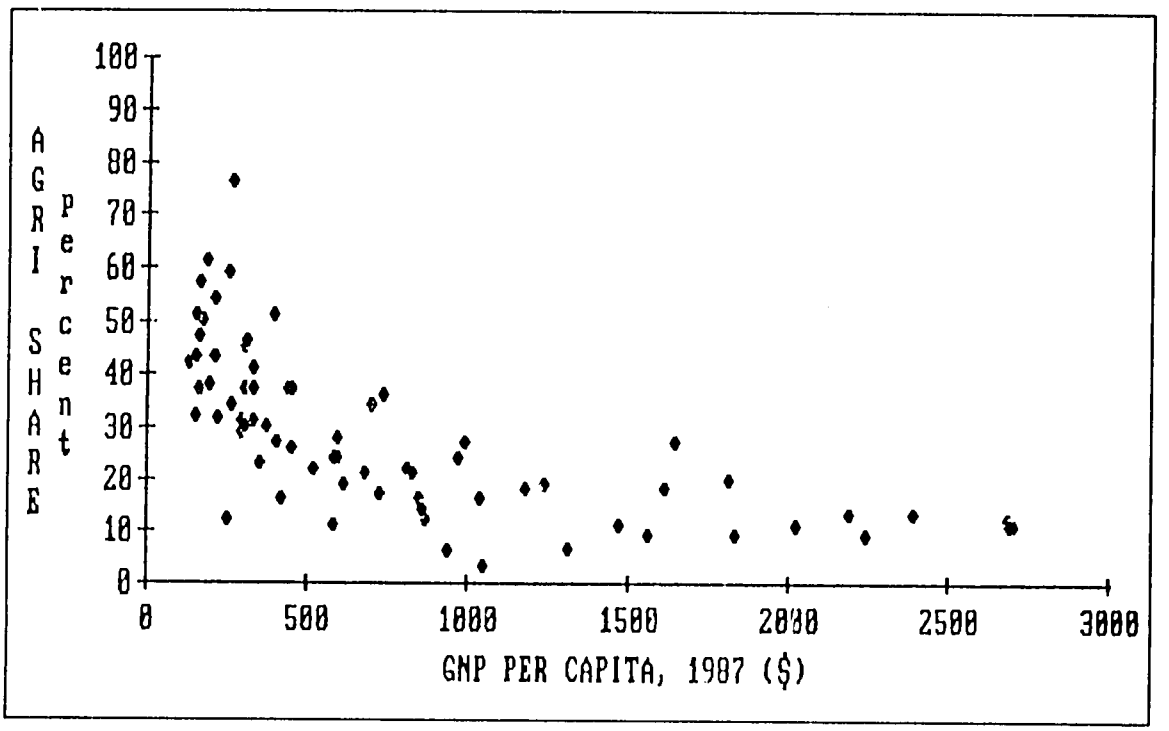
SECTORAL DEVELOPMENT CHANGES IN DEVELOPING COUNTRIES

A broad overview of income structure changes—derived from sectoral information at the country level—is provided in this section, prior to the synthesis of micro- or household-level information. It shows the long-term tendencies for and relationships between economic development and agriculture, and, hence, agriculture's position in the economy. The specific focus is on agriculture's position in the rural economy as well as on nutritional improvement—thus, poverty alleviation—with economic development. This section also provides a context for placing the household-level information from the surveys.

Agriculture's Position in National and Rural Income

The decline of the agricultural sector's share in the gross domestic product (GDP) is an indicator of a successful growth and development process. This relationship between growth (indicated by the level of national income) and agricultural sector share is strong, although there is considerable variance across countries (Figure 1). Underlying this downward-sloping relationship is, of course, agriculture's tendency to lag behind growth in industry and services. Nevertheless, regardless of how fast the agricultural sector can grow, the income inelasticity of agricultural sector products, combined with a long-run decline in the

Figure 1--National per capita income and share of agriculture in GDP, developing countries, 1987



Source: World Bank, World Development Report (Washington, D.C.: World Bank, 1989).

terms of trade for farm products induced by rapid growth in agricultural productivity, will result in the movement of resources out of the agricultural sector (Timmer 1989). A frequently drawn, although misleading, conclusion from these two tendencies is that it would be better to focus on the nonagricultural sectors in the first place. Such a conclusion, however, neglects the role of agriculture as an engine of growth with its forward and backward linkages to industry and services, both directly and indirectly through production, consumption, and expenditure linkages of the farm population (Mellor 1986; Hazell and Röell 1983). There is substantial empirical evidence (Rangarajan 1982; Bell, Hazell, and Slade 1982; Mellor and Mudahar 1974; Haggbladde, Hazell, and Brown 1987) that agricultural growth can generate sizable income and employment multipliers in the rural nonfarm economy.

While the relationship between the level of economic development and the agriculture sector's share of the national economy appears, in general, to be quite clear-cut, there are a number of exceptional or "perverse" cases. In Table 1, all developing countries utilized for this analysis are grouped into four categories on the basis of whether they achieved general economic growth or not during 1965-87, and, furthermore, whether they showed an increase or decrease in agriculture sector share during that same period. A sizable number of countries fall in the category of general economic decline <u>with decreased</u> agriculture sector share. Obviously, in these countries, the agricultural growth rate was even lower than the general economic growth rate and thus contributed to the overall decline of the economy. Notorious cases in this group include Zambia, Senegal, Sudan, and Ethiopia in Africa, and Argentina and Peru in Latin America. No Asian country, however, is found in this group. On the other hand, there were several countries that experienced declining per capita income accompanied by an <u>increased</u> agriculture sector share, which means that their agricultural growth was higher than general growth and, thereby, stabilized the economy. This group of countries is listed in the upper right-hand corner of Table 1.

Since poverty in developing countries remains concentrated in rural areas, sectoral priorities are particularly relevant for rural growth and its poverty alleviation effects. The sectoral information presented thus far tells us little directly about the role of agriculture in <u>rural</u> income. For obvious reasons, the agricultural economy is not synonymous with the rural economy (Johnston and Kilby 1975; Mellor 1976). To assess agriculture's role in the rural economy, we, therefore, estimate the agricultural income shares in developing countries' rural areas. By making some assumptions, we arrive at such country-level estimates from three different angles, and, in the process, delineate lower and upper bounds of a plausible range, as country-level statistics do not allow a direct assessment. Sector-specific labor force information is insufficient because the typical multiple allocation of time by farm households to different sectors is not properly accounted for, which, as shown by Schmitt (1989), may result in misleading conclusions regarding productivity differentials and sectoral priorities.

Table 1--Economic growth and change in agriculture sector share of GDP in developing countries, 1965-87

	GNP Per Capita Growth Rate (+)		GNP Per Capita Growth Rate (-) or stagnation
AGCHANGE (+)			Sierra Leone Uganda Madagascar Zaire Liberia Ghana Mauritania Bolivia Chad Tanzania
AGCHANGE (-)	Sri Lanka Uruguay Syria Algeria Morocco Tunisia Kenya Mexico Costa Rica Bangladesh Pakistan Zimbabwe Congo Nepal Egypt China Brazil Panama Rwanda	Cameroon Paraguay Ecuador Cote d'Ivoire Colombia Malawi Gabon Burkina Faso Thailand India Dominican Republic Honduras Nigeria Korea Republic Indonesia Botswana Philippines Papua New Guinea	Zambia Senegal Jamaica Nicaragua El Salvador Sudan Niger Argentina Peru Benin Ethiopia Togo Central African Republic

Source: World Bank, World Development Report (Washington, D.C.: World Bank, 1989).

Note: AGCHANGE = Agriculture sector share in GDP in 1987 minus Agriculture sector share in GDP in 1965.

In all three estimates, we assume that all agriculture sector income is accrued by the rural population only (which entails some overestimation, since some agricultural income is accrued by the urban population). In the first estimate, we assumed that rural per capita income equals average national per capita income. This assumption also entails an overestimation since, in general, rural income is less than average national per capita income in developing countries. These two overestimations, to a certain extent, cancel each other out when the agriculture income share of the rural population is computed (Column 4, Table 2). In the second estimate, we assumed that rural households do not earn any income from industry,[4] which leads, in general, to somewhat higher agriculture income shares of the rural population than obtained in the first estimate (Column 5, Table 2). It is interesting to note that, according to this quite plausible estimate, agriculture contributes 41-55 percent of rural income in all major developing country regions, with the exception of Central America (34 percent).

Table 2--Agriculture's position in the total and rural economy, developing country regions, 1987

Region[a]	Rural Population Share of Total Population	Agriculture Share in GDP	Change in Agriculture Sector Share[b] (1965-87)	Agricultural Income in Rural Income Range of Estimates		
				INCSH1[c]	INCSH2[d]	INCSH3[e]
			(percent)			
Sub-Saharan Africa	72	32	-9	45	53	63
North Africa/ Middle East	52	18	-6	34	41	50
Asia 1	74	30	-16	41	50	57
South Asia	74	30	-16	41	50	57
East Asia	63	24	-14	39	55	69
Central America/ Caribbean	34	10	-6	29	34	44
South America	27	12	-8	46	48	73

Source: See Table 105 in Appendix 1.

[a] For a list of countries that form the population share-weighted regions, see Table 105 in Appendix 1.

[b] Agriculture sector share in 1987 minus (-) agriculture sector share in 1965.

[c] (Agriculture GDP/Rural Population)/GDP per capita.

[d] (Agriculture GDP/Rural Population) / [(Agriculture GDP/Rural Population) + (Services GDP/Population)].

[e] (Agriculture GDP/Rural Population) / ((Agriculture GDP + Services GDP)/Total Population).

[4] Income from remittances is not specifically considered in these computations.

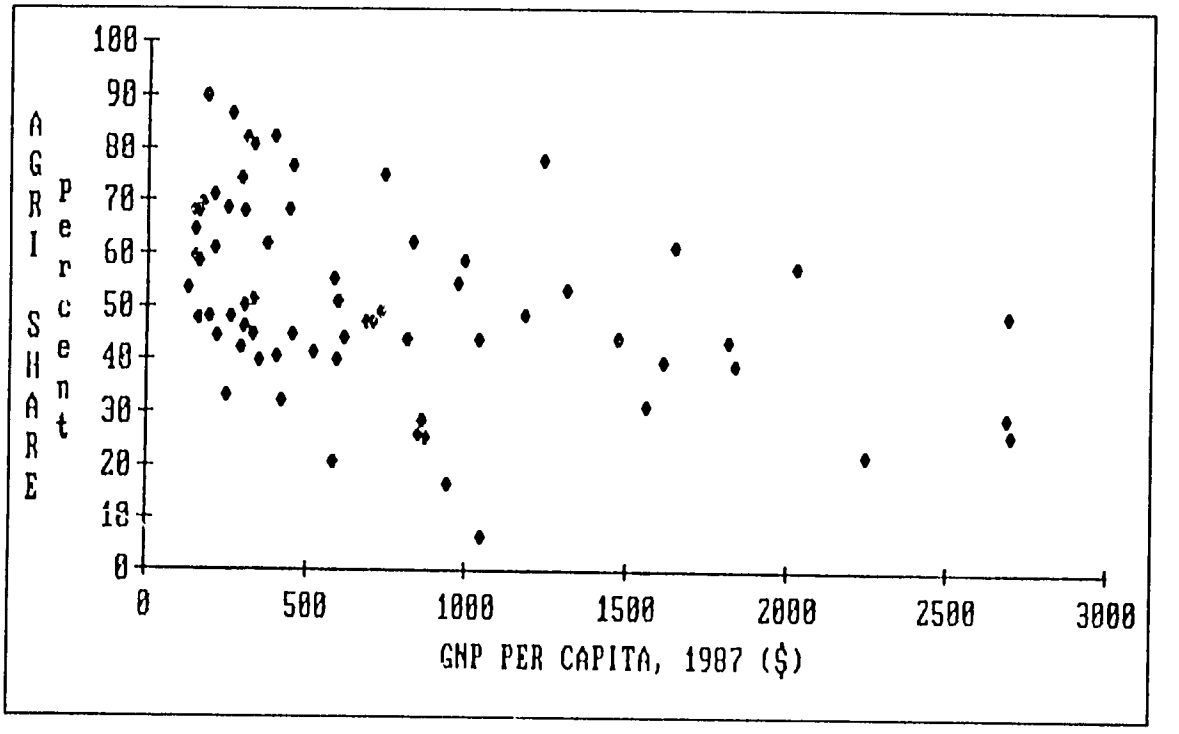
Africa is no exception (53 percent). In the third estimate, we assume that rural income is equivalent to national average agriculture and services income only (Column 6, Table 2).

There appears to be a tendency for the agricultural income shares of the rural population to decline in the context of economic growth, measured by the level of GNP per capita, but this relationship is much less clear-cut than the relationship between the agriculture sector share and national income level as shown in Figure 1 above. Figure 2 shows the simple average of the two most extreme assumptions (estimates 1 and 3 above) plotted against GNP per capita. Agricultural income forms the major share of total rural income in many low income countries, particularly in those with GNP per capita less than U.S. $500. Note, however, that considerable diversity exists in the agricultural income's share in rural income, ranging from about 30 to 90 percent, among this group of low income countries.

Aggregate Income-Poverty (Nutrition) Relationships in Rural Areas

We would like to assess the relationship of aggregate income level and of income composition to absolute poverty in low income countries,

Figure 2--National per capita income and agriculture's share in rural income, developing countries, 1987



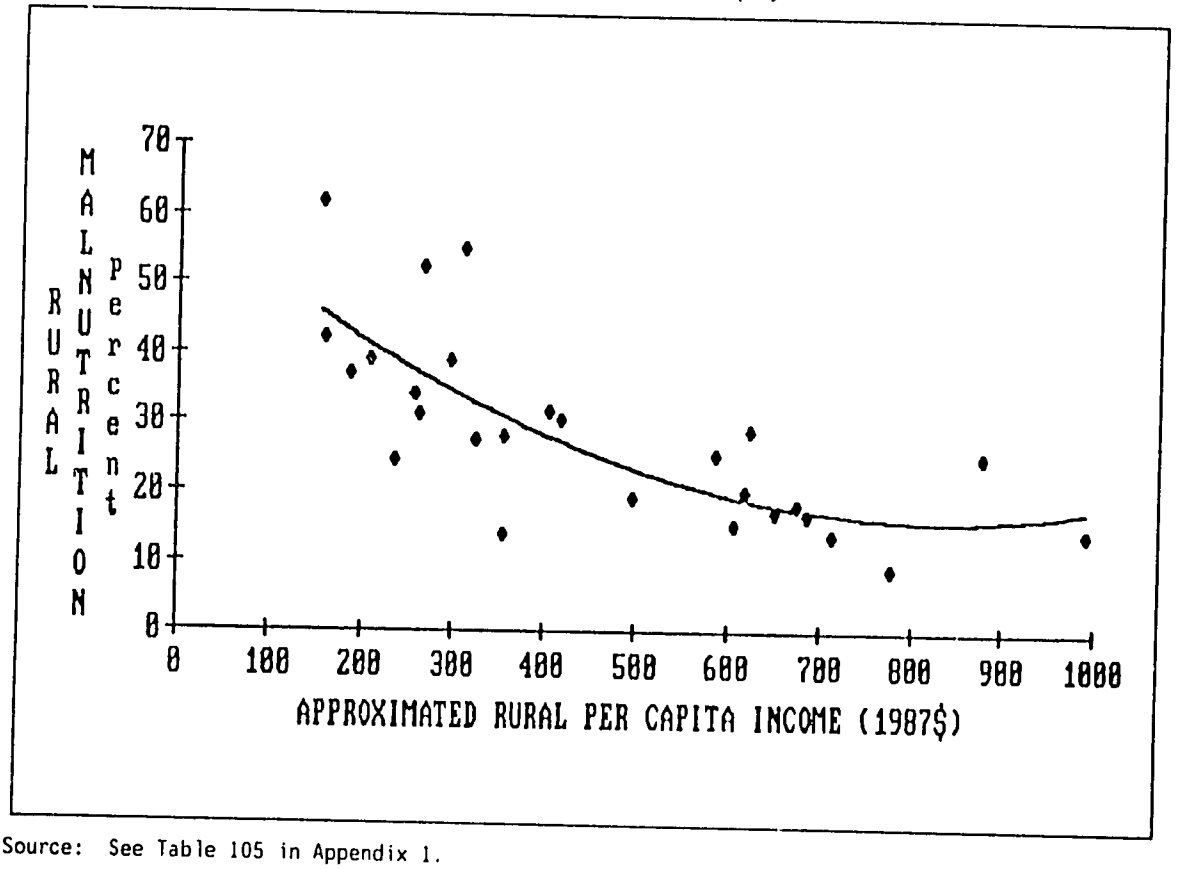
Source: GNP per capita: World Bank, World Development Report (Washington, D.C.: World Bank, 1989).

Note: For derivation of agriculture's share in rural income, see text.

and, given our poverty concept, the prevalence of poverty as defined by food energy deficiency would be the desirable indicator. Such comparable information across countries is, however, sketchy and, for many countries, not available. Therefore, this aspect of the analysis will be limited to the comparative studies with the household survey information further below, which are the focus of this study anyway. For the aggregate analysis of income-poverty relationships, we, instead, choose the nutrition/health status information provided by anthropometric indicators, which refer to the prevalence of underweightedness of preschool children. We employ two measures of underweightedness—less than -2 Z-score of weight-for-age standard and less than 80 percent of the reference median weight-for-age standard. As our focus is on rural populations, we limit the analysis to just this population's nutrition problem.

The general relationship between the prevalence of malnutrition and rural per capita income is strong, particularly in the range of $200-$800 per capita (Figure 3). Regression analysis shows that, while increasing income reduces the prevalence of malnutrition overall, this

Figure 3--Rural income and rural malnutrition in developing countries with GNP per capita of less than $1,000



Source: See Table 105 in Appendix 1.

Note: The regression line results from Model 2 in Table 3.

effect is decreasing at the margin (Table 3). The explanatory power of Regression Model 2 is slightly weaker than that of Model 1, which does not attempt to approximate rural income levels but simply relates national per capita income to rural malnutrition. According to the models, the prevalence of rural malnutrition is reduced by 14 percentage points in both models, if income increases from $300 to $600, which means a 39 or 42 percent reduction in the prevalence rates or an income elasticity of nutritional improvement of °.39 or °.42 in this income range (Table 4). The dummy variable was insignificant in both models. We also performed regression analysis using Z-score measures of underweightedness only (that is, using 21 observations only), which resulted in rather similar estimates—the income elasticity of nutritional improvement ranged from .33 to .35. There may be a tendency

Table 3--Regression analyses—rural malnutrition and income in developing countries

Model	Dependent Variable: Prevalence of Malnutrition (Percent of Underweight Preschoolers)				
Model 1	-0.0787 GNP (-2.784)	0.0000369 GNP^2 (0.958)	3.548 DUMMY (0.91)	R^2 : 0.52	N: 29
Model 2	-0.0943 RGNP (-2.684)	0.0000537 $RGNP^2$ (1.603)	3.817 DUMMY (0.97)	R^2 . 0.51	N: 29

Notes:

t-values in parentheses.

GNP: GNP per capita (1987 U.S. $).

RGNP: Rural GNP per capita (assuming that rural sector has no industry income) (1987 U.S. $).

DUMMY: Dummy = 1 for those countries where prevalence of malnutrition was measured as percent of preschoolers below 80 percent of reference median weight-for-age standard; = 0 when it was measured as -2 Z-scores below weight-for-age standard.

Table 4--(Rural) income and nutritional improvement

	Increase in Rural Per Capita Income from $300 to $600	
	Model 1	Model 2
Reduction in prevalence of malnutrition		
Percentage Points	14	14
Percent	39	42

Source: See Models 1 and 2 in Table 3.

of higher underestimation of GNP in countries with particularly low GNP-levels because of the neglect of home-goods production. To the extent that this is the case, the "true" GNP-elasticity of nutritional improvement is even higher in this group of countries.

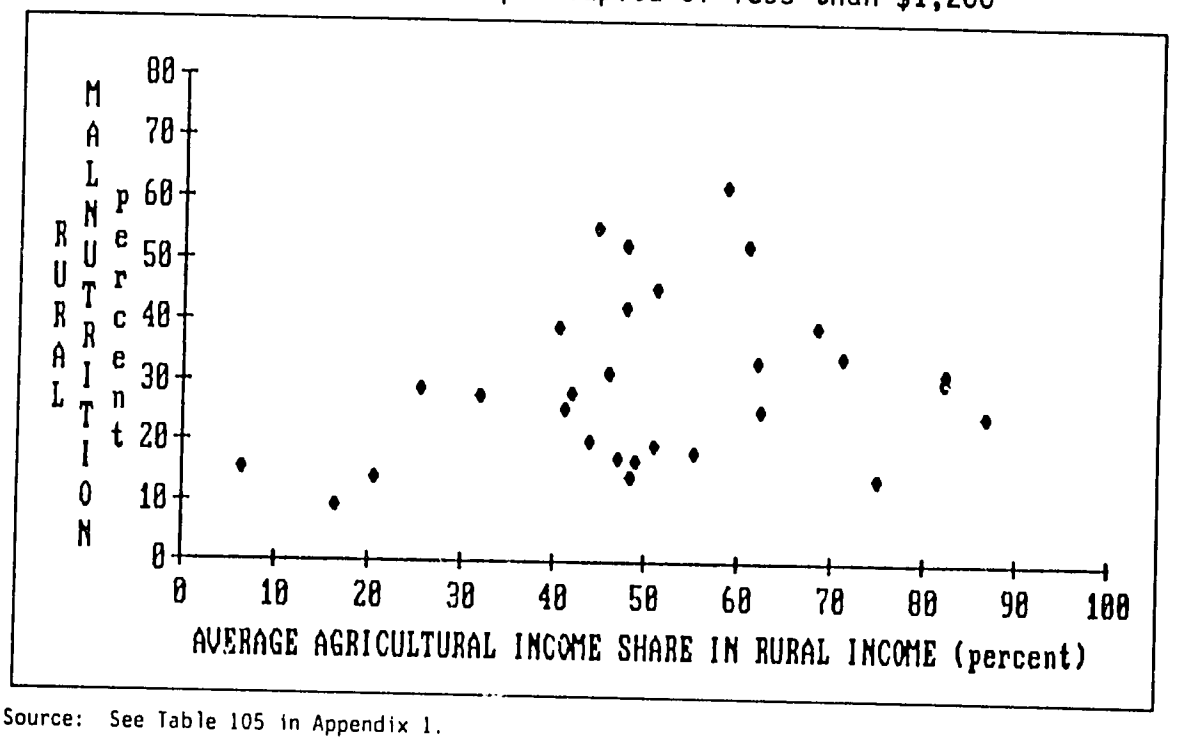
Alternative regression exercises, which took account of the average agricultural income share in rural income in those countries included in the above analysis, did not show a significant parameter for this variable. Thus, the sector structure—holding incomes constant—did not influence prevalence rates of malnutrition over and above the effect on the income level. Accordingly, Figure 4 shows a widely scattered distribution of the prevalence of rural malnutrition by agricultural income share in these economies.

We conclude from this aggregate analysis that

- increased levels of average (rural) income relate strongly to reduced prevalence of malnutrition in rural areas, an indicator for absolute poverty; but,
- the sectoral composition of income in the rural economy, that is, the position of agriculture, does not significantly relate to nutritional performance.

These findings from the aggregate analysis will be further explored in a much more disaggregated way in the household-level analysis.

Figure 4--Agricultural income share and rural malnutrition in countries with GNP per capita of less than $1,200



Source: See Table 105 in Appendix 1.

THEORETICAL UNDERPINNINGS OF POOR HOUSEHOLDS' STRATEGIES FOR INCOME DIVERSIFICATION

The empirical studies in this volume highlight the large extent to which rural households diversify their income sources, both within agriculture (subsistence and market production) and outside agriculture (manufacturing, services, remittances from migrant members of households). Table 5 lists the major rural income sources. In this section, we briefly outline the driving forces behind such household strategies of income diversification.

Household Theory's Explanation of Income Diversification

According to Tschajanow (1923), a peasant family does not try to maximize a monetary profit but a subjective utility. Maximum utility is reached when the marginal drudgery of family labor in various activities is equated with the marginal goods and services gained from the labor input. Stimulated by Tschajanow, Nakajima (1970, 1986) developed a set of more sophisticated subjective equilibrium models, which basically postulate the same behavioral rules, with and without exchange with the external labor market. Nakajima not only specified a more formal mathematical structure, which allows the consequences of external changes, such as variations in wages, prices, and productivities, on the household's labor allocation to be traced, but also specified certain properties of a family's indifference curves, with a lower limit of income ("minimum subsistence"), below which leisure has zero marginal utility, and an upper bound ("achievement standard of living"), above which income generated from further work has a marginal utility of zero. Nakajima's models describe the decision of household members to be engaged in wage employment or to employ hired labor in the farm household, but they do not explicitly describe the factors that influence a household's decision concerning the allocation of resources between subsistence and market production. In order to model this aspect of diversification, it would be necessary to introduce the

Table 5--A listing of major income categories/subsectors in rural areas of low income countries

1. Home goods, food
2. Home goods, nonfood
3. Commercial agriculture (self-employment and wages)
4. Manufacturing (local; self-employment and wages)
5. Services (local; self-employment and wages)
6. Remittances of family (from urban or abroad)
7. Transfers (public and community)

distinction between subsistence and market production at the level of resource use, including labor, and to specify the underlying causal determinants, such as risk aversion, tastes, and habits which may motivate a household to maintain a certain degree of self-sufficiency, even at the cost of market income foregone. Moreover, nonmarketable household goods and services, as well as market goods, would have to have a common nonmonetary utility index.

The specification of a household's utility function in nonmonetary terms is one of the strengths of modern household economics theory (Becker 1965; Lancaster 1966). Models based on this theory postulate that a household's utility function is directly specified by a set of household-produced goods, Z-goods, which are produced by the use of market-purchased or home-produced physical input commodities in combination with the time input of household members. Time, allocated by household members either to income-earning activities or to non-income activities, is an integral component of the model formulation and analysis. Maximization of a household's utility, subject to a full-income constraint, is then equivalent to minimizing the costs of producing a set of Z-goods, including leisure.

Figure 5 portrays the basic structure of the model.[5] The composite Z-good is measured along the vertical axis, whereas the horizontal axis measures the working time with the remainder of the full-time capacity being leisure. Curve s traces the production function for home goods and curve m describes the combined production function of the household, where agricultural production is added on to the home production function. The basic assumption is that the composite Z-good can be either produced at home or purchased in the market. Purchased goods may not be identical but they may be close substitutes to home produced Z-goods. Thus the line d measures the opportunities in terms of Z-goods offered by participation in the labor market. Its slope is defined as the wage rate divided by the goods price, thus indicating the purchasing power of the off-farm wage in terms of Z-goods. Finally, curve u shows the indifference curve in terms of Z-goods and leisure.

At equilibrium, the household would have LH leisure time and LG Z-goods for consumption. It would spend OF units of time (and corresponding household resources) for home goods production, FM units of time for farming for sale, and ML units of time for off-farm earning. Thus, the model postulates principally the same equilibrium conditions as the Nakajima-type model: the marginal productivities of time in various activities inside and outside the household are equated to the off-farm wage rate. But in addition, the physical specification of the utility curve enables inclusion of home production as an extra domain of time allocation.

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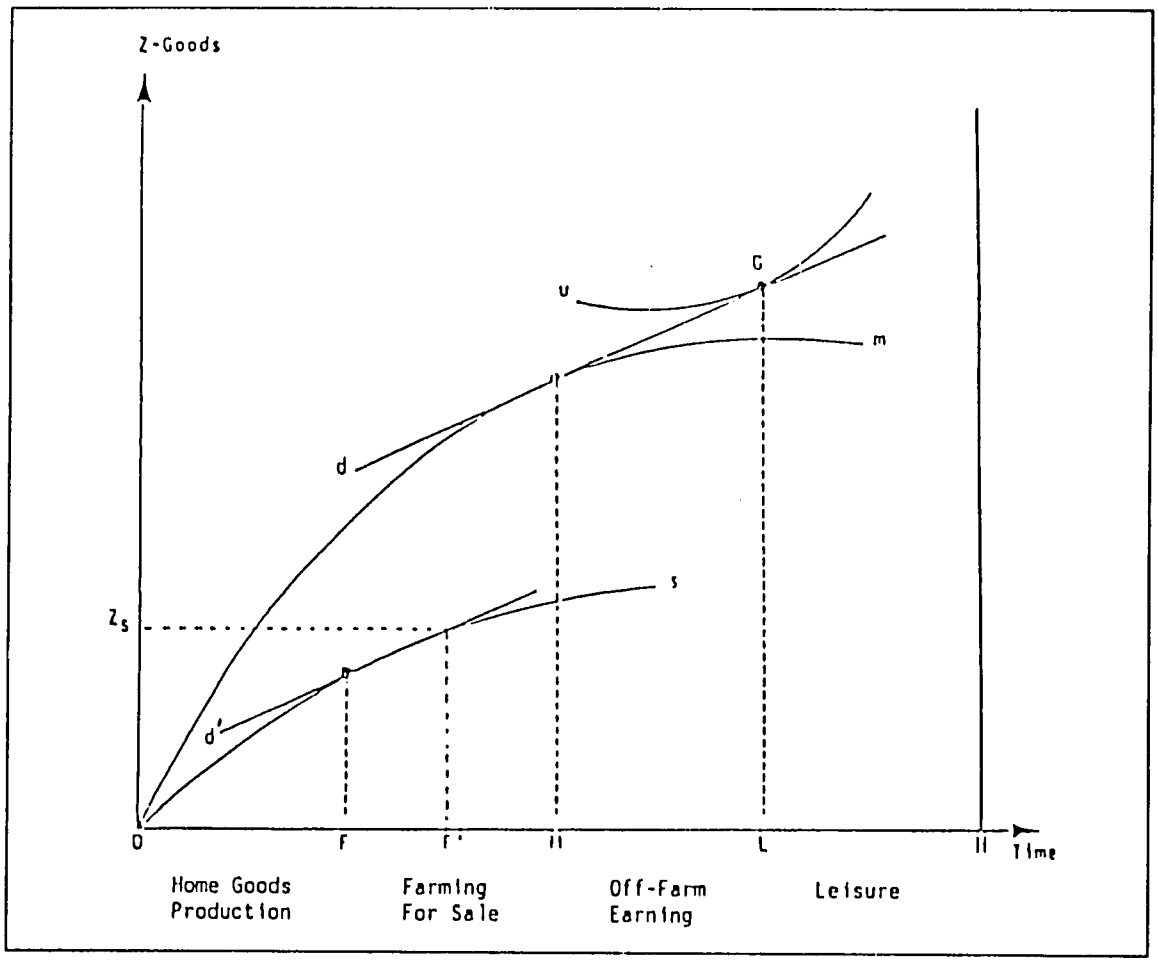
[5] The following discussion draws on von Braun, de Haen, and Blanken (1991).

Various findings can be derived from this simple model:

1) Increasing the wage rate raises the opportunity costs and, hence, motivates a reduction in the volume of home as well as farm production. It increases the incentive to seek wage employment and, depending on the position of the indifference curve, may also affect the overall time allocation between work and leisure.

2) Increasing the value of the Z-good reduces the purchasing power of the wage and, therefore, motivates an increase of the time spent in home production—an implication of the lack of consumer goods in rural areas. Whether or not it also increases the time spent in farm production depends on the size of three separate effects: reduced opportunity costs of labor; increased price for the subsistence component of farm production; and reduced real price—that is, price expressed in Z-goods—for the market component of farm production. Thus, the latter two may imply a shift of the farm production function.

Figure 5--Allocation of household time between home goods production, farming for the market, off-farm earning, and leisure



3) Increasing the productivity of farm work causes an upward shift of the overall production function. It motivates extended on-farm work and reduced off-farm work. Time allocated to home production is not affected unless the improved technology can also be applied in home goods production.

4) Increasing the productivity of home goods production will also shift the combined production curve upwards, but mainly increase the time spent in the household and, depending on the shape of the home production curve, reduce either farm or off-farm work, and possibly increase leisure. As Low (1986, p. 7) points out for Southern Africa, "production-increasing crop technology has been adopted to save time in own production of farm-household consumption requirements, rather than to increase farm production and produce surplus for the market."

In this farm-household model, we find income diversification driven by

- the farm resource base;
- household work force (time);
- the off-farm wage rate and productivity in commercial and subsistence production (slope of curves d, m, s); and
- consumption preferences/needs (curve u).

There are other driving forces toward household income diversification which are not captured by the above simple model. These are:

- differentials in opportunity costs of labor within households; and
- objective risks and (subjective) attitudes toward risk, related to each subset of income generation. These involve risks in
  - home goods yields, production, and price;
  - cash crop yields, production, and prices; and,
  - off-farm employment and wage rates in the context of absent or imperfect insurance markets and their rudimentary substitutes in low income countries' rural areas.

These issues are taken up in the following subsections.

Intrahousehold Differences in Opportunity Costs and Income Diversification

It is widely known—and the case studies will highlight this in greater specificity—that intrahousehold division of labor is not uniform. Female workloads tend to be higher in many settings (Leslie

and Paolisso 1989). The above simple time allocation model disregards different opportunity costs of household members. It assumes one prevailing wage rate at which time could be sold, which may be a realistic assumption only for a one-person-household (which, in any case, hardly exists). It also disregards differential specialization skills of household members in off-farm activities as well as in the two farming enterprises—subsistence crops and commercial farming—which influence productivity in these. The wage rate line (expressed in Z-goods purchasing power) in Figure 6 would, for instance, be a kinked line for a two-person/group household. The first group of household members could obtain high off-farm wages (da in Figure 6c); they would work little or not at all on the farm. The second group would have little (or no) opportunity for obtaining off-farm earnings, thus a lesser slope of the wage-rate line—d_b—after the kink or the d_b-segment may not exist at all (for instance, when off-farm labor supply is customarily restricted for a household subgroup).

This second group—women, in many instances—would allocate much more time to farming, whereas the first group ("men") would, at best, be tempted to allocate M_a time to commercial and F_a to subsistence agriculture (see Figure 6a, b). Variability in on-farm labor needs at the margin would mostly impact on the second group with the (long-term) lower opportunity cost of labor. As Low (1986) points out in great detail for the case of southern Africa, agriculture, and the food crop sector in particular, is left with labor of low opportunity cost, as the time of members with the lowest off-farm wage earning potential will be allocated to subsistence production. Thus, labor with high opportunity cost, working off-farm, is not supplying labor to the farm at the margin. In fact, as analysis of labor-force participation of women shows, men, whose wage rates normally exceed those of women's tend to specialize in market activities, while women specialize in home goods production (Low 1986).

These relationships thus shed light on the division of labor between household members and on the diversification of household income sources. They drive specialization <u>within</u> households rather than between rural enterprises. While taking account of differential opportunity costs of labor suggests differentiation of time allocation to different income earning activities and "intrahousehold dualism," it does not fundamentally change the earlier insight that household-level income source diversification is much determined by opportunity costs of labor in the various alternative work options. However, intrahousehold differentiation goes some way toward explaining sluggish supply response in agriculture in settings with high wage rate differentials by gender.[6]

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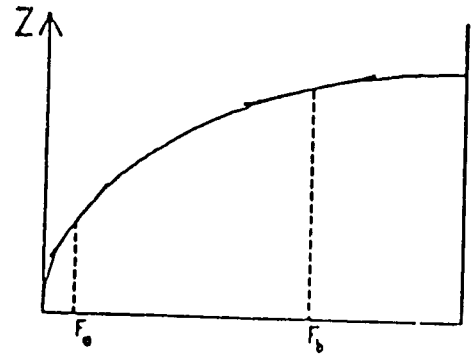
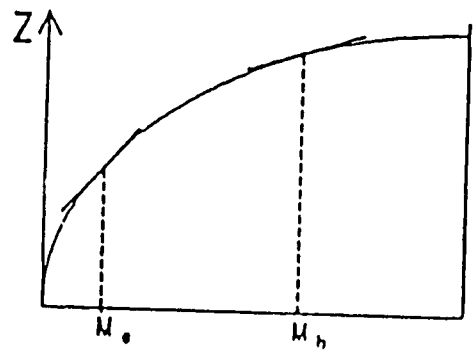
[6] For more on this and other related insights, see Low (1986) and Becker (1990).

Figure 6--Allocation of household income when wage employment opportunities differ for household members

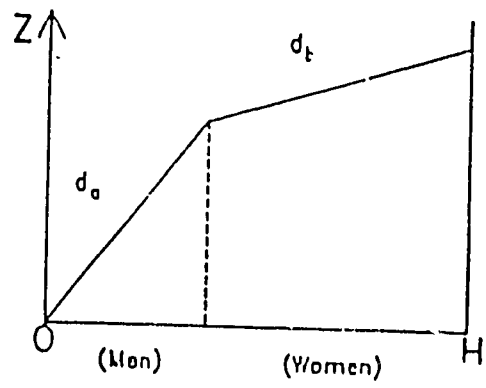
6a: Subsistence



6b: Commercial Agriculture



6c: Wage Employment



Risks and Income Source Diversification

The initial simple household economics model (Figure 5) does not consider risks explicitly. One could argue, however, that risk is implicitly factored in by discounting both off-farm earnings and agricultural income with risk probabilities. The structural outcome of the model would depict all this.

A simple modification would be to postulate a household "food first" strategy in environments with risky markets (food, labor) and absent insurance markets. A certain level of home goods would need to be supplied first, which would deterministically alter the resource allocation between subsistence and commercial agriculture and off-farm employment (see Z_s in Figure 5). Less time would be available for commercial farming and off-farm employment because of an "inefficiently" large time allocation to subsistence production and, hence, a lower level of consumption would be achieved (these implications are not drawn in Figure 5). The net-income foregone can be interpreted as internalized insurance premium incurred by the household.[7] Households close to the poverty income level, where fluctuations in income may mean risking the livelihood of the family, can be expected to be willing to pay a high price for risk-reduction (insurance). Failure in insurance markets or their absence would hit hardest on the poor because internalizing the insurance costs at low levels of income may entail high resource costs.

The degree of subsistence orientation is not just a function of risks in the food market, but of risks in all other markets too. High perceptions of risks of modern agricultural technologies combined with different opportunity costs of time of family members, among other factors, has been shown to underlie weak adoption of yield increasing technologies (Becker 1990). Risk-averse families may tend to keep subsistence production beyond the maximum income point (say at F′ instead of F in Figure 5) in order to keep the risk of market integration low,[8] or, as a recent review on small-farmer perspectives observed,

> most farm households engage in activities in all four of the economic sectors [household production for home consumption, cash crop farming for market sales, self-employed nonagricultural business activities, and off-farm labor], either as a response to limited opportunities in any one sector or as a deliberate strategy of diversification and risk minimization (Kusterer 1989, p. 1).

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[7] See von Braun, Hotchkiss, and Immink (1989) for a quantification of the effect in case of Guatemala survey area.

[8] See von Braun, de Haen, and Blanken (1991) for an explicit theoretical analysis of this relationship.

Stark and Levhari (1982, pp. 192-193) point out, if insurance markets either do not prevail or do not form, or they exist but require prohibitive premiums, the increased-risk risk-avoidance conflict must be resolved internally—that is, through reorganized utilization of the family's own resources. This includes the strategy for diminishing risks by spreading risks not just across various agricultural production activities, but also across local (rural) nonfarm income earning activities and distant (urban) employment by family members.

Income source diversification may thus be driven by the need to select a portfolio with elements of low covariant risks. The costs of risk reduction for the combination of the different income earning activities may differ according to the uncertainties of activity-specific income variance in them. With increased gains from specialization in risky (commercial) farming, the demand for nonagricultural employment to reduce income variance also increases when insurance mechanisms are imperfect. On-farm specialization thus increases the incentive for off-farm work as a form of income source diversification. This can especially be expected at low income levels. Thus, farm specialization and off-farm labor supply by farm households may be partly in a reinforcing rather than a substituting relationship. A policy conclusion which Stark and Levhari (1982) hint is that, to the extent that rural-urban migration is partly a risk reduction strategy, strengthening rural insurance markets might be a more appropriate action than just focusing on narrowing rural-urban wage differentials. It should be pointed out, however, that rural insurance markets are not "absent," but that they do prevail in the form of complex community and family-based institutions. A better understanding of these is a key area of promising research to provide guidance for a policy of "social security with growth."[9]

Process of Diversification and Policy Relationships

The static household model leaves out the dynamic processes of policy/market interactions and their implications for sectoral diversification in the rural economy. Sectoral diversification in the development process is linked via market interlinkages and is impacted upon by policies (Figure 7). Key policies such as infrastructure improvement, technology provision, human capital formation, and credit market development result in reduced transactions costs and lower food market risks, in expansion of insurance, financial and labor markets, shrinkage of the home goods sector, and expansion of commercial agriculture, rural services, and manufacturing.

Agricultural growth and the supply of manufactured goods in rural areas are in a complementary relationship (Berthelemy and Morrison 1989). Growth constraints in the rural services and manufacturing

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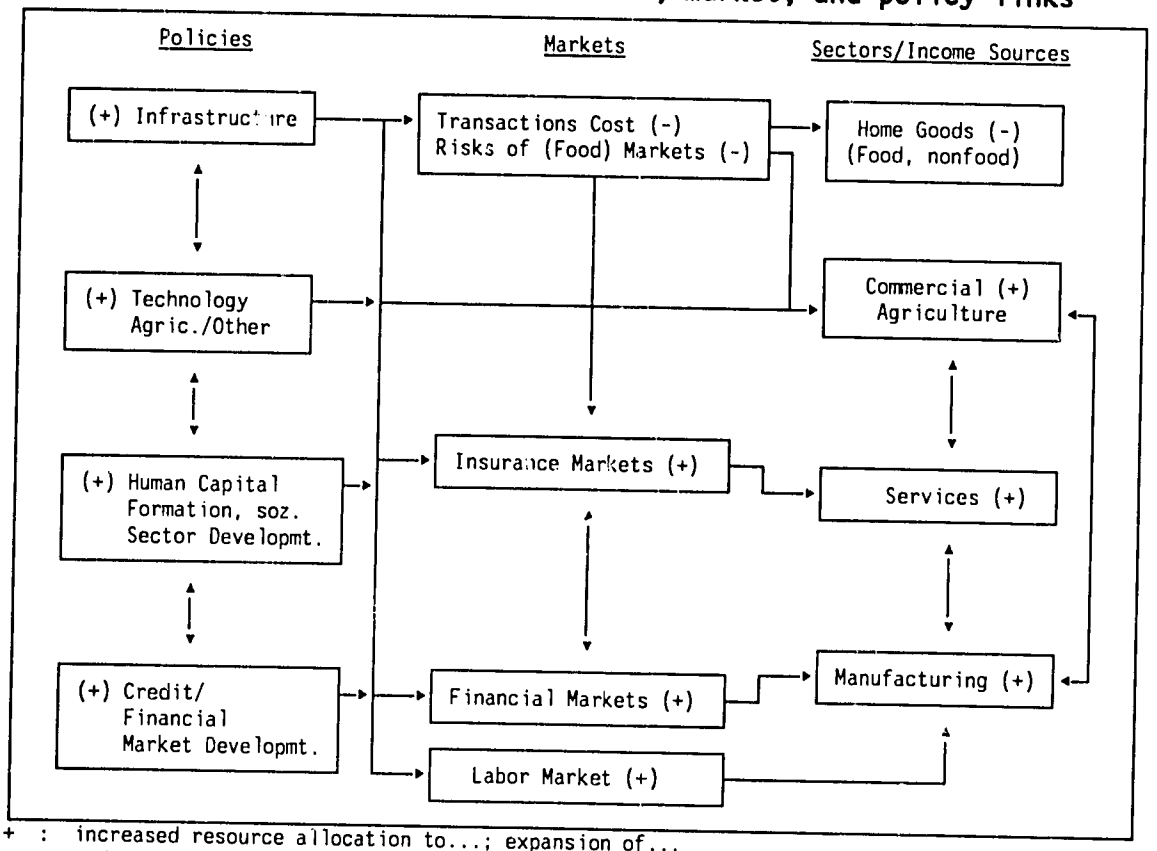
[9] On this issue for Sub-Saharan Africa, see von Braun (1990).

Figure 7--Income source diversification, market, and policy links



\+ : increased resource allocation to...; expansion of...
\- : reduction of...

sectors can result in constraints to agricultural expansion, both because of hampered forward and backward agricultural linkages and because of disincentive effects. The latter may result from high priced (taxed) or nonexistent (import banned) manufactured goods, including consumer items, an effect which is equivalent to unfavorable terms of trade for the farm sector and to an incentive for maintaining home goods production at inefficiently high levels as discussed in the context of the household model above. Thus, the

> elasticity of peasant household response depends crucially on the availability of a reward in their use of cash income. Thus, an elastic and low-priced supply of manufactured consumption goods, such as textiles and shoeware, processed foods and beverages, building materials, and means of transportation are the reward for peasant production of cash crops (de Janvry, Fafchamps, and Sadoulet 1990).

Improved infrastructure and rural financial market development are key instruments for overcoming related constraints but it is policy failure, rather than market failure, which is more frequently at the core of an impaired favorable interaction of agriculture with the rest of the rural economy (Binswanger and von Braun 1990).

OVERVIEW OF HOUSEHOLD SURVEYS

Information on household income composition is essential for understanding household income strategies and underlying comparative advantages. The sectoral level aggregate analysis carried out earlier does not provide insights into these issues and household-level survey information is, therefore, critical for shedding light on the study questions posed at the outset of this paper and discussed on theoretical grounds in the previous section.

The Survey Settings

The 13 household-level surveys used in this comparative study represent considerable differences in regional, ecological, and socioeconomic characteristics. The survey sites are located in Latin America (Brazil, Guatemala); Africa (The Gambia, Burkina Faso, Kenya, Rwanda, Zambia); and Asia (Sri Lanka, Pakistan, Bangladesh, India, the Philippines) (Figure 8). None of the surveys claims to be representative for the entire country in which it is located.[10] However, they capture a range of different economic and development policy environments. Areas of more traditional subsistence orientation are represented, as are areas with improved infrastructure, rapid technological change in agriculture, and expanded nonfarm employment. It is in terms of these categories, rather than in terms of "country cases," that the microlevel information should be perceived in this study. All surveys were conducted in the 1980s and thus represent recent situations.

Practically all surveys were undertaken by IFPRI in collaboration with partner institutions in the respective study countries (Table 6). Several surveys had rather small sample sizes and, if they had been originally designed for a specific purpose, the especially atypical households included in the surveys for the original study purposes were cut back or eliminated for the purpose of this report.

Table 7 shows some basic demographic, farm, and poverty characteristics of the respective sample populations. Average total per capita income ranged widely, between $44 (1985 dollars) in the North Arcot (India) survey site during the 1982-83 drought situation to $829 (1985 dollars) in the Brazil survey area. In general, per capita incomes ranged between U.S. $100-300.

Table 7 provides a broad overview of the demographic, farm, and poverty characteristics of the study sites' sample populations. As can be seen, all survey sites (some more than others) had sizable proportions of their households falling below the (food) poverty line, as well as a sizable prevalence of malnutrition among preschoolers, but

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[10] The Pakistan and Bangladesh surveys are exceptions, with their rather broad coverage.

Figure 8--Location of Household Surveys

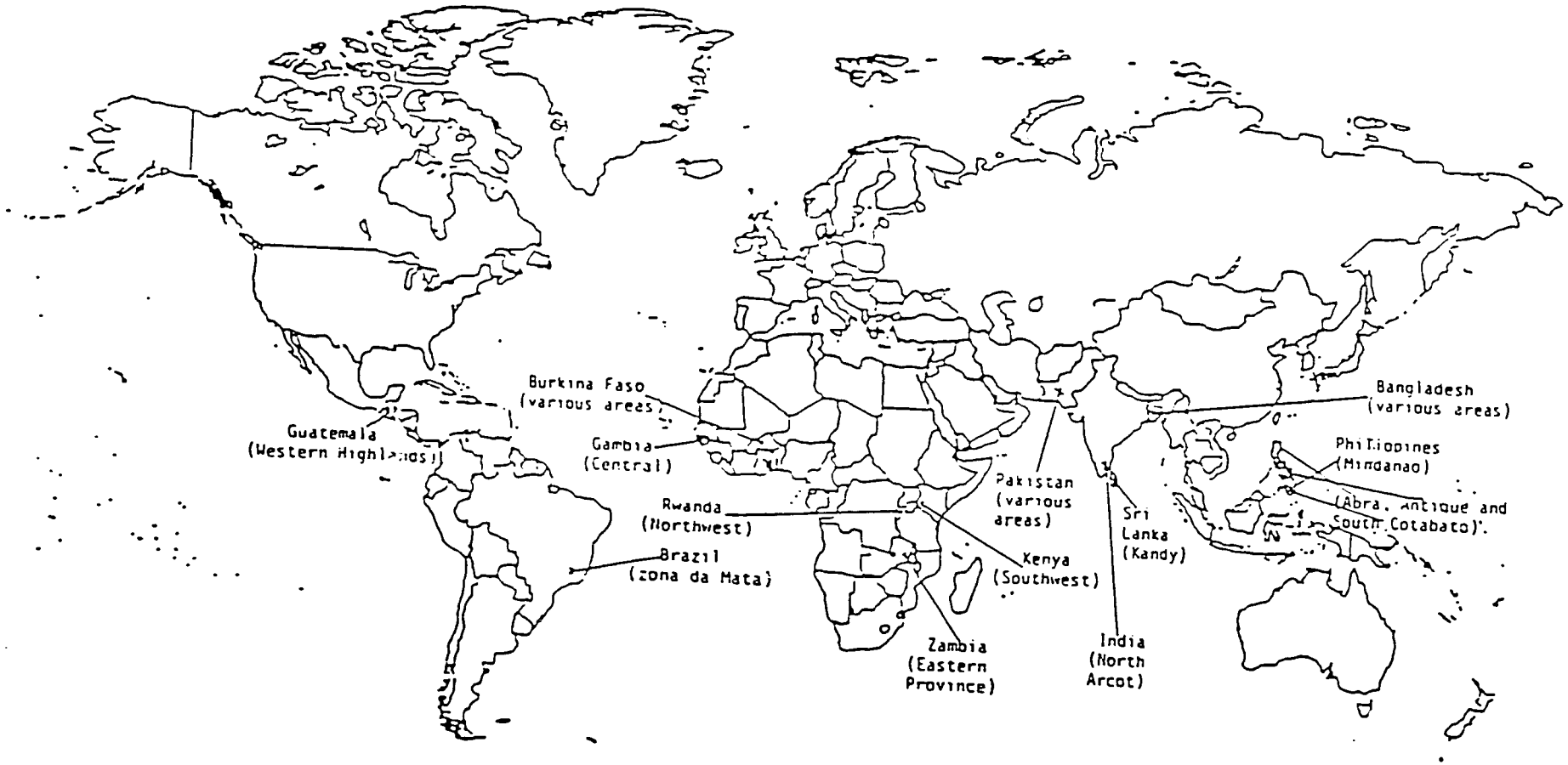

Table 6--Basic survey design features

Survey Location	Year	Sample Size[a] (Households)	Duration of Survey	Collaborating Institutions
Zona da Mata - Integrated Rural Development Project (PRODEMATA), Minas Gerais, Brazil	1984	384	5 years	University of Viçosa (Minas Gerais)
Western Highlands of Guatemala	Nov 1985-Jan 1986	180	3 months	Institute for Nutrition in Central America and Panama (INCAP); Cooperative "Cuatro Pinos," Guatemala
Central Gambia, 300 kms east of Banjul	1985/86 1987/88	212 270	10 months 6 months	Programming, Planning, and Monitoring Unit for the Agricultural Sector (PPMU) (Now Department of Planning (DOP)
Six villages in Sudanian, Sahelian, and Guinean Zones, Burkina Faso	Sept 1984-Aug 1985	150	1 year	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
South Nyanza Province, Kenya	June 1984-March 1985 Dec 1985-March 1987	504 462	9 months 15 months	Government of Kenya
Prefecture Gisenyi, Community Giciye, Northwest Rwanda	1985/86	189	11 months	Ministry of Agriculture, Rwanda; German Agency for Technical Cooperation (GTZ) project in Giciye
Eastern Province, Zambia	1986	722	1 year	Zambian National Food and Nutrition Commission; University of Zambia
Kandy District, Sri Lanka	June/July 1984	480	1 month	Food and Nutrition Policy Planning Division of the Ministry of Plan Implementation
Faisalabad and Attock Districts (Punjab Province), Badin (Sind Province), Dir (NWFP), and Mastung/Kalat (Baluchistan Province), Pakistan	1986/87	1,082	1 year	Applied Economic Research Centre (Karachi); Punjab Economic Research Institute (Lahore); University of Baluchistan (Quetta); and Applied Economic Research Centre (Peshawar)
Sixteen villages in major agro-ecological zones, Bangladesh	1982	563	1 year	Bangladesh Institute of Development Studies
North Arcot District, Tamil Nadu, India	1982/83 and 1983/84	126 70	14 months 12 months	Tamil Nadu Agriculture University
Mindanao, Bukidnon Province, Southern Philippines	1984/85	448	4 surveys, 16 months	Research Institute for Mindanao Culture
Abra, Antique, and South Cotabato Provinces, Philippines	May 1983-	792	4 surveys, 16 months	National Nutrition Council of the Philippines

Source: Case studies in this volume.

[a] In some case studies in this volume, these sample sizes are subsamples from the total samples.

Table 7--Socio-demographic characteristics of average households in the surveys

Survey Location	Household Size	Farm Size	Prevalence of Malnutrition[a] <80 Percent Calorie RDA	<80 Percent Weight-for-Age	Households Headed by Women	Landless or Quasi-Landless Households	Income Per Capita[b]
		(hectares)	(percent of households)		(percent)	(percent)	(1985 US$)
Brazil (Zona da Mata)	5.5	34.70	14.3	(39.3)[c]	8.9	12.2	829
Guatemala (Western Highlands)	6.4	0.67	24.6	77.4	2.0	24.4	377[d]
The Gambia (central region)	11.2[e]	4.16	18.4[e] 13.4[f]	61.0[e] 40.6[f]	0.0	0.0	283[d,e]
Burkina Faso (various areas)	11.0	0.72[g]	32.7	n.a.	n.a.	n.a.	104
Kenya (southwestern area)	9.5		29.6	21.8[h]	11.0	7.6	132 190
Rwanda (northwest)	5.5	0.74	40.7	43.8	11.1	14.8	71
Zambia (Eastern Province)	6.7	2.43[i]	38.8	29.8	25.7		
Sri Lanka (Kandy District)	6.0	0.49	48.0	49.0	15.1	56.7	122
Pakistan (various areas)	11.0		(56.5)[j]	49.3	0.0	25.8	217
Bangladesh (various areas)	6.6	0.94	17.6	79.9	1.8	21.5	153
India (North Arcot District) 1982/83 1983/84	5.7 5.2	1.58 1.40	65.9 21.4	n.a. n.a.	0.0 0.0	43.7 47.1	44 90
Philippines (Mindanao)	6.8	2.6[k]	(64.6)[l]	(26.5)[h]	0.0	33.0	117
Philippines (Abra, Antique, and South Cotabato Provinces)	6.9	1.54	81.8	34.6	n.a.	42.2	187

Source: Case studies in this volume.

Notes: Noncomparable figures are in parentheses.

n.a. = not available

[a] There is one weight-for-age standard among the surveys, but the calorie RDA levels (and corresponding cutoff points) are survey-specific. Also note that households with information on prevalence of malnutrition among preschoolers were usually a subsample of the households with calorie consumption information and, hence, the Z-score indicators were not directly comparable, since they referred to two separate but related samples.

[b] Per capita incomes from the Brazil, Pakistan, India, and Philippines survey sites were converted to constant 1985 U.S. dollars by inflating incomes (in local currency units) to the 1985 level, using Consumer Price Index and, then, applying the 1985 average period exchange rate. The other survey sites already had incomes in 1985 levels. The exchange rates utilized were as follows: (1) Brazil--Cruzados 6.20/$; (2) Guatemala--quetzal 1/$; (3) The Gambia--dalasi 5.06/$; (4) Burkina Faso--francs 479.6/$; (5) Kenya--Kenyan shillings 15.78/$; (6) Rwanda--francs 101.26/$; (7) Zambia--kwacha 2.71/$; (8) Pakistan--rupees 15.928/$; (9) Bangladesh--taka 27.99/$; (10) India--rupees 12.369/$; (11) Philippines--pesos 18.61/$. Source: International Monetary Fund, International Financial Statistics Yearbook (Washington, DC: IMF, 1989) and case studies.

[c] ≤-1 Z-scores.

[d] Expenditure per capita.

[e] Wet season 1985/86.

[f] Dry season 1985/86.

[g] Land per adult equivalent.

[h] Percent of preschoolers.

[i] Total area cultivated.

[j] <2400 calories.

[k] Average area cultivated per round.

[l] Individual calorie intake of preschoolers.

it is certainly not the case that general hunger and malnutrition (of preschoolers) were equally prevalent in most survey sites. Keeping data limitations and seasonality possibilities in mind, it was observed, in the Guatemalan survey site for instance, that the prevalence of malnutrition, probably related to health and sanitation, was much higher than that of calorie deficiency. The opposite pattern was also observed, for instance, in the three Filipino provinces. The table also highlights the wide range in per capita incomes and farm sizes that prevailed among the survey sites. However, it masks the diversity and distributions of characteristics within each of the settings, especially between the malnourished and non-malnourished rural households. These are addressed in more detail in the following analyses and, much more so, of course, in the detailed case-specific chapters below.

Socio-Demographic Characteristics of Malnourished Rural Poor (MRP) Households

This study looks into income and employment sources of households below and above the poverty line, where poverty is defined following the poverty concept elaborated earlier, in terms of food energy consumption (calories) falling below 80 percent of the recommended level for an active and healthy life. A category of severely malnourished households was also identified in terms of a cutoff point of 60 percent of recommended calorie consumption. While some surveys have supplemented the calorie information with anthropometric information of the kind also indicated earlier, for ease of comparability, we will primarily use the food energy consumption poverty definition.

MRP households tended to be larger than non-MRP households, although it was observed in several instances, such as in The Gambia and Pakistan survey sites, that severely MRP households were somewhat smaller than moderately MRP households. This could be indicative of either a coping strategy of paring down household size by sending out members to fend for themselves, or of limited labor resources to generate sufficient incomes and food. Furthermore, some MRP households, for instance, in the Philippines survey areas, were characterized by a younger age composition and a higher number of dependents, that is, children below 10 years of age, with limited income earning potential and a greater need for child care time.

Ownership of land or access to even small pieces of land for farming, such as in the South Nyanza survey, where the landless had access to public land owned by the local council, made a substantial difference to the poverty outcome. However, the physical size of the farm itself (in hectares) did not seem to affect the prevalence of malnutrition as much. Either the farm sizes did not differ much by prevalence of calorie deficiency, such as in the survey sites of Guatemala, Kenya, India, and the Philippines, or there is a u-shaped relationship between farm size and hunger, as in the Zona da Mata survey site or even a positive relationship, as observed in the Eastern

Province, Zambia, survey location. Farm size alone is not indicative of land quality or, for that matter, of the ability to exploit production potentials, or its use as collateral in times of stress. Still, in general, the distribution of all the MRP households among the three farm sizes indicated that MRP households tended to be small or medium in farm size (the distinction between sizes was strictly survey-specific), and only a minority of them (12-33 percent), except in Eastern Province, Zambia, were large in size.

Generally, there tended to be a higher prevalence of poverty among the landless or quasi-landless households than in the sample as a whole, except in unique contexts, such as the Kenya survey mentioned above. The landless were much more dependent on other (riskier) sources of income than farm incomes and on the diversification of the rural economy. For instance, 70 percent of the income of the landless in one Philippine survey location came from agricultural wages. Landlessness was more prevalent in the Asian survey locations, and, not surprisingly, a much greater proportion of MRP households which were landless were observed in the Asian survey sites (25 percent in Pakistan to 66 percent in Kandy District and North Arcot (1983/84)) than elsewhere. The comparable proportions were only 6 and 12 percent in Western Kenya and Northwest Rwanda, respectively. Similarly, a higher proportion of landless households was MRP in the Asian surveys (30 to 87 percent) than elsewhere, with the exception of the Rwanda site, one of the most densely-populated countries in Africa. Clearly, poverty among landless households is a greater problem in the Asian context than in the African or Latin American.

Female-headed households were poorer than male-headed households, yet, they were sometimes better fed and poverty was less prevalent among them than in the sample as a whole.[11] The control of income (and its resulting expenditure) is a determining factor (see Box 1). Female-headed households are <u>not</u> more apt to be MRP households (in comparison to the whole sample), except in the Southwestern Kenyan survey area and the Eastern Province of Zambia survey area. Otherwise, the gender of the household head was unimportant for distinguishing between MRP and non-MRP households. At the same time, again with the exception of

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[11] The percentage of female-headed households which were malnourished compared to the whole sample were: (1) in the Zona da Mata, Brazil, 11.8 percent versus 14.3 percent; (2) in Southwestern Kenya, 34.8 percent of legal female-headed households and 42.4 percent of de facto female households versus 29.6 percent; (3) in Northwest Rwanda, 14.3 percent versus 40.7 percent; (4) in Eastern Province, Zambia, 47.9 percent versus 38.8 percent; (5) in Kandy District, Sri Lanka, 50 percent versus 48 percent; and (6) in various areas of Bangladesh, 20 percent versus 17.6 percent (but note that sample size of total female-headed households is very small, only 10). Per capita incomes of female versus male-headed households were (1) in the Zona da Mata, Brazil, $Cr000 1106 versus $Cr000 1640; (2) in Northwest Rwanda, FRW 590 versus FRW 412 for farm income, FRW 348 versus FRW 3847 for off-farm income, giving a total income of FRW 938 versus FRW 4259; and (3) in Southwestern Kenya, KShs 3052 for legal female-headed households and KShs 2950 for de facto female-headed households versus KShs 3092 for male-headed households. In The Gambia, female income comprised 24 percent and 19 percent of total annual income per adult equivalent in all villages in 1985/86 and 1987/88, respectively.

Box 1--Women's Income and Rural Poverty

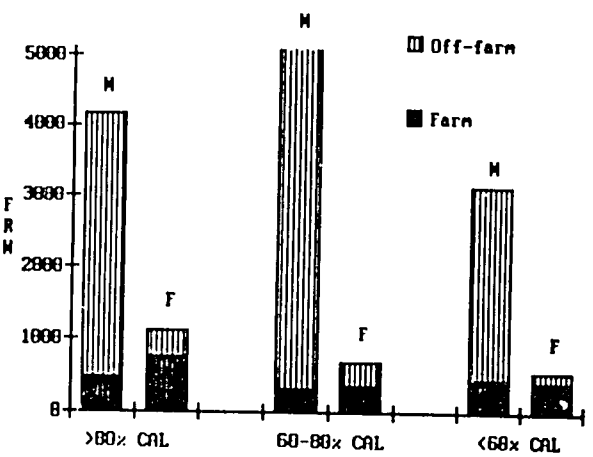
It is frequently suspected that women are more likely to spend more of their income on food and nutrition than men, who are more likely to spend their income on personal tastes. These findings are confirmed by some of the household-level surveys.

In Southwestern Kenya (Chapter 6), while incomes of female-headed households do not differ significantly from those of male-headed households, household consumption analysis indicated that women-controlled income had a positive and significant effect on household food energy consumption. However, improved calorie intake did not always get translated into improved children's nutritional status because of health and sanitation constraints, among other factors. This same consumption function also showed that the amount of nonfarm income had a significant but negative effect on household caloric intake. One explanation offered relates again to the control of income: men, whose expenditure responsibilities differ from those of women, tend to control much of the nonfarm income, whereas by and large, women tend to be largely responsible for food in the household.

This division of spending by gender was also observed in Northwestern Rwanda (Chapter 7): female expenditure was highly correlated with female and subsistence income, while nonfood expenditure was highly correlated with male off-farm income. A division of labor for income earning by gender was also observed: male and female income earning activities acted relatively independently of each other. For instance, in farming activities, women derived income mainly from food crop and beer sales, while men marketed cash crops.

Total female incomes were absolutely lower than total male incomes, but female farm incomes tended to exceed male farm incomes.

Rwanda: Male (M) and Female (F) Incomes



Men earned over ten times as much off-farm income as did women. Yet, there were no female-headed households with severely malnourished children and a less than proportional number were found to be calorie-deficient.

Time spent on generating income is an important determinant of household nutritional status. Water-fetching and wood-collecting are almost always performed by women and children in Northwestern Rwanda, and a shortage of women's time leads to crosscutting effects in their various functions and a greater burden being passed on to children. Timesaving technological changes in agricultural and home-goods production and improved market infrastructure are key to favorable household welfare.

Eastern Province, Zambia, female-headedness is not a marker for a significant problem in the food-poverty picture—only 2 to 7 percent of MRP households were female-headed. Hence, the scope for targeting for poverty alleviation on the basis of female gender of head of household appears to be limited in these survey sites, other than in Zambia. However, there is considerable scope for, and gains to be realized from efforts to raise women's incomes, especially in the African context, given evidence from the case studies that show that women tend to allocate their incomes for the family's welfare.

In summary, although there is considerable diversity among the survey locations, a number of common characteristics of MRP households emerge:

- their larger household size;
- their smaller farm size;
- the importance of ownership of, or access to, land, especially in the densely populated Asian survey locations, to escape poverty; and
- the significance of the gender of the household head and of women's income in influencing the poverty status of the household.

INCOME COMPOSITION AND STRATEGY OF MALNOURISHED RURAL POOR HOUSEHOLDS

The objective of this section is to draw out generalizable findings on income sources and, hence, on strategies of the MRP households, from the empirical household surveys contained in this volume. It cannot be stressed enough that, of course, there are site-, context-, and temporal-specific income strategies and relations. Nevertheless, a number of common patterns can be discerned and light shed on fundamental income-diversification-poverty relations.

Household Income Levels and Malnutrition

MRP households tend to have much lower incomes than non-MRP households, when poverty is measured in terms of food energy consumption. However, the general inverse relationship between the prevalence of malnutrition, measured by anthropometric indicators, and rural per capita incomes, which is evident at the aggregate level (Figure 5), is not as strong at the microlevel (Table 8). This should not come as a surprise: effective reduction of malnutrition requires public action for health and sanitation. Such action is to some extent by economic growth—not withstanding notable exceptions. Local household surveys at a certain point in time do not sufficiently pick up such public (including community) action, and thus understate the indirect nutritional improvement effects of income growth in poor areas.

Table 8--Income levels of the malnourished rural poor (MRP) households relative to incomes of non-MRP households

Survey Location	Income Per Capita as Share of Income of >80 Percent Category			
	Calorie Consumption		Weight-for-Age	
	60-80 Percent	<60 Percent	60-80 Percent	<60 Percent
	(percent)			
Brazil (Zona da Mata)	66.6	82.8	66.3[a]	40.2[b]
Guatemala[c] (Western Highlands)	60.4[d]	54.8	91.5[d]	81.5
The Gambia[c] (central region)	66.1	61.6	89.5	(s.s)
Burkina Faso				
Sahelian Zone	62.2[e]	n.a.	n.a.	n.a.
Sudanian Zone	40.0[e]	n.a.	n.a.	n.a.
Guinean Zone	65.5[e]	n.a.	n.a.	n.a.
Kenya (southwestern area)	76.8	48.7	n.a.	117.9
Rwanda (northwest)	104.0	69.4	80.1	85.8
Zambia (Eastern Province)	53.2	34.2	109.3	59.2
Sri Lanka (Kandy District)	61.3	43.2	46.9	n.a.
Pakistan (various areas)	97.7[f]	72.3[g]	85.9	76.8
Bangladesh (various areas)	64.5	65.4	81.9	66.5
India (North Arcot District)				
1982/83	77.5	62.6	n.a.	n.a.
1983/84	120.7	(s.s)	n.a.	n.a.
Philippines (Abra, Antique and South Cotabato Provinces)	72.3	59.9	84.5	72.3

Source: Case studies in this volume.

s.s = Sample size of less than 10 households.

n.a. = Not available.

[a] -1 to 0 w/a Z-score.

[b] ≤-1 w/a Z-score.

[c] Expenditures per capita.

[d] <80% of standard.

[e] Households within 2 deciles below minimum adequacy.

[f] 1600-2400 calories per person per day.

[g] <1600 calories per person per day.

Incomes of severely MRP households (those consuming less than 60 percent of RDA) relative to incomes of non-MRP households in each survey location ranged from 34 percent in Eastern Province, Zambia, to 83 percent in Zona da Mata. The modal range was about 50-70 percent. Similarly defined proportions for the anthropometric indicator were considerably higher.

Not all survey households fitted this negative income-malnutrition relationship sketched out above. For instance, moderately MRP households in the Zona da Mata (Brazil) and the Guinean Zone (Burkina Faso) surveys had substantially lower incomes than their severely MRP households, while, on the other hand, incomes of moderately MRP

households in the North Arcot (1983/84) and Rwanda sites exceeded those of non-MRP households. In case of the Kenya and Zambia survey sites, the incomes of the MRP (by anthropometric indicator) exceeded the level found among the non-MRP. These exceptions to the general pattern underline that there are factors besides household income levels which hamper the translation of income into nutritional status of children, as measured by anthropometric indicators. Such factors could include the sources of income and the various risk factors attached to them, health and sanitation environments, household size, education of household head, etc. In the Zona da Mata survey, for instance, it was noted that households earning higher proportions of total income from off-farm sources were more likely to be malnourished than the whole sample and, furthermore, worse nutrition was correlated with greater dependence on off-farm agricultural sources of income, as opposed to nonagriculture. Furthermore, all severely MRP farm households in that survey area were farms that had changed their major output mix at least once during the five-year sample period (see Box 2). On the other hand, in the Southwestern Kenya survey, no significant difference in household incomes per capita was found between households with malnourished children versus those with non-malnourished children, but it was found that children who were malnourished over a multiyear period tended to be more frequently sick and tended to come from families with a higher proportion of nonfarm income.

Considerable variance exists in household incomes of the severely MRP across the surveys, as well as within survey areas. Annual per capita household incomes (in 1985 U.S. dollars) of severely MRP households varied from about U.S. $40 in North Arcot, India (during the drought year), to about U.S. $716 in Zona da Mata, Brazil (Table 9). Even within the same geographical region, income levels appeared to differ substantially. For instance, household incomes in the Pakistan survey area tended to be up to four times higher than those of North Arcot, India, survey households. Furthermore, considerable differences also exist in income levels of MRP households in different areas within the same country—it is certainly not the case that all MRP, even in a small country, have similarly low incomes. In the Burkina Faso survey, consisting of small samples from each of the country's three agro-ecological zones, the average total income of severely MRP households in the Sudanian zone, relative to those in the Guinean zone, was only 40 percent. Moreover, the total income of severely MRP households in the Guinean zone was as high as the income of non-MRP households in the Sudanian zone!

These differences in income levels of MRP households between countries and within the same country illustrate the limitations of using a general income-poverty line, for instance, as practiced in the latest World Bank World Development Report (1990), to determine the extent of poverty globally and even nationally. Generalized poverty criteria cannot be established in isolation but must consider country-specific and, where possible, within country (intra-country) specificities, including real prices of food and other commodities with a high share in the poor's consumption bundle.

Box 2--Agriculture Output Mix and Rural Malnutrition: A Case in Brazil

Farm-level output mix and production stability over time can influence household caloric intake and nutritional status, as the case study from the Zona da Mata, Brazil (see Chapter 2) shows.

Distinct differences existed across the five farm clusters distinguished in the survey area with respect to the prevalence of calorie deficiency, malnutrition, and household incomes (see table). The off-farm labor cluster, with the lowest income level, was the poorest-fed and had the highest share of underweight children. Surprisingly, coffee farmers, with the second-highest income, had a comparatively high prevalence of calorie deficiency and underweight children, whereas corn farmers were somewhat better off than income levels would have suggested. Higher incomes do not appear to be necessarily correlated with better nutritional status. Only dairy farms tended to have well-nourished children, which could be due to the availability of a source of high quality protein and calorie in dairy products.

Hence, it is not only the source of income, in terms of agriculture versus nonagriculture, that influences the household's nutritional status/poverty, but it is also the further disaggregation of income source within the farm sector, by farm type, that also influences the household's status.

Families with inter-temporally erratic production patterns were the worst-fed. Not only was the prevalence of calorie deficiency higher among "jumpers" (farms that changed cluster assignments at least once during the sample period 1979-84) than "stayers" (farms that remained in the same cluster assignment), but all farms which met less than 60 percent of calorie requirements were "jumpers." It is quite likely that most of the "jumpers" jumped for reasons of desperation and not from a secure base. The linkage between production stability and children's nutrition suggests to Vosti and Witcover that "'permanent income' plays a critical role in raising rural families above the poverty line."

Table 1 Prevalence of calorie deficiency and malnutrition by production clusters

	Percent of Households in Each Cluster or Category						
	Coffee	Corn	Dairy	Off-farm	Rice	Jumper	Stayer
Prevalence of calorie deficiency							
≥80 percent calories	82	88	92	76	91	83	91
60-80 percent calories	11	9	5	22	9	12	9
<60 percent calories	6	3	3	2	0	5	0
Prevalence of underweight children							
>0 W/A Z-score	32	30	64	8	67	33	34
-1 to 0 W/A Z-score	29	26	18	38	0	27	28
≤-1 W/A Z-score	38	43	18	54	33	40	38
Average total household income per capita ($Cr 000)	2,239	849	2,366	718	1,230	1,194	2,320

Note: Derived from Table 2.8 of Vosti and Witcover. See that table for additional notes.

Table 9--Household income per capita by category of malnutrition, 1985

Survey Location	Calorie Consumption (Percent)			Weight-for-Age (Percent)		
	>80	60-80	<60	>80	60-80	<60
	(U.S. dollars)					
Brazil (Zona da Mata)	865	576	716	858	568	345
Guatemala (Western Highlands)	419	253	230	388	355	316
The Gambia (central region)	302	199	186	279	250	(s.s)
Burkina Faso						
Sahelian zone	115	79	72	n.a.	n.a.	n.a.
Sudanian zone	111	72	44	n.a.	n.a.	n.a.
Guinean zone	167	81	110	n.a.	n.a.	n.a.
Kenya (southwestern area)	213	163	104	193	n.a.	228
Rwanda (northwest)	74	77	52	70	56	60
Pakistan (various areas)	225	220	163	234	201	180
Bangladesh (various areas)	163	105	107	173	142	115
India (North Arcot District)						
1982/83	65	44	41	n.a.	n.a.	n.a.
1983/84	96	90	(s.s)	n.a.	n.a.	n.a.
Philippines (Abra. Antique, and South Cotabato Provinces)	257	186	154	187	158	135

Notes: See footnote b in Table 7 and footnotes to Table 8.

s.s = sample size of less than 10 households.

n.a. = not applicable.

Income Diversification and Malnutrition

In the next section, we will study in more detail household income composition, but before that, we ask whether household income diversification, as driven by the forces derived in the earlier theoretical discussion, is a widely adopted household strategy. We will approach this question in two ways: first, by examining the distribution of households in each survey site by the share of off-farm income in total income; and, second, by conducting a cross-tabulation of frequencies of income sources for three survey areas—Guatemala, The Gambia, and Rwanda.

Household income diversification out of farm and into off-farm, usually nonagricultural, income sources is a widely adopted strategy in most survey sites. In six of the nine survey locations for which comparable data is available (see Table 10), more than half of the survey households had an off-farm income share (out of total income) of

30 percent or more, which, given the rural location of these surveys, is quite indicative of widespread adoption of an income diversification strategy out of agricultural sources. This is roughly in the range which we found in the sector level aggregate analysis earlier (Table 2). Furthermore, almost 20 percent or more of the households in seven survey locations had off-farm income shares greater than 60 percent. This diversification strategy appears to be most widely adopted in the Kandy District survey area of Sri Lanka, where more than 90 percent of the households surveyed had off-farm income shares greater than 60 percent. This area is quite densely populated and more than half of the households were landless. Wage income is a dominant source of income, constituting almost half of average total income. (For a discussion of off-farm employment and rural poverty in the south Asian survey settings, see Box 3.) At the other end of the diversification spectrum are the Zona da Mata (Brazil) and The Gambia surveys, where, it is pointed out, average farm sizes are much larger than for other survey areas, population density is low and the landless form only a small component of the population (Table 7).

We observe that it appears generally to be the case that survey sites with lower incomes on average have a greater degree of income diversification, if simply agriculture versus nonagriculture income is considered as an indicator, as, for instance, in the North Arcot (India), Bangladesh, and Northwest Rwanda surveys. The Brazil survey site, with the highest per capita income level among the surveys, has the lowest degree of income diversification out of the farm, together

Table 10--Distribution of households in each survey region by off-farm income shares (percent)

Survey Location	Off-Farm Income Shares (Percent)			
	<10	10-30	30-60	>60
	(percent of households)			
Brazil (Zona da Mata)	53.1	23.7	14.6	8.6
Guatemala (Western Highlands)	38.3	10.0	7.2	44.4
The Gambia (central region)	38.2	38.2	18.9	4.7
Kenya (southwestern region)	11.3	30.4	36.7	21.6
Rwanda (northwest)	17.5	20.1	29.1	33.3
Sri Lanka (Kandy District)	(s.s)	(s.s)	5.6	91.4
Bangladesh (various areas)	2.7	35.2	43.7	18.5
India (North Arcot District)				
(1982/83)	26.2	(s.s)	7.9	58.7
(1983/84)	21.4	(s.s)	(s.s)	65.7
Philippines (Abra, Antique, and South Cotabato Provinces)	50.0	13.2	11.3	25.5

s.s = sample size of less than 10 households.

Box 3--Off-Farm Employment and Rural Poverty in South Asian Survey Settings

The malnourished rural poor of the four South Asian survey settings in Bangladesh, India, Pakistan, and Sri Lanka (Chapters 9-12) have in common the characteristic that they are more wage-dependent and, in general, more dependent on off-farm income sources than are non-malnourished households.

- In the Bangladesh survey, wages formed about one-third of the income of those consuming less than 60 percent of recommended calories, but only about 8 percent for those consuming more than 120 percent.

- In Kandy, Sri Lanka, the share of wage income in total income is 58 percent among the severely malnourished, 51 percent among the moderately malnourished, and 40 percent among the non-malnourished.

- About 56 percent of the average income of calorie-deficit households in the five districts under study in Pakistan came from nonfarm sources compared to 37 percent for calorie-adequate households.

One explanation for the greater off-farm income dependency of the malnourished is related to their access to land for farming activities and, to a lesser extent, to the size of the farm. In the Sri Lanka survey area, holdings were so small that even "large" farm households depended heavily on wage income. The landless and small farm operators, naturally, in order to supplement their incomes, tended to work more for wages.

Interestingly, the source of the wage income, that is, whether agricultural activities or nonagricultural activities, differs considerably from location to location.

- Agricultural wage labor was quite unimportant in the Pakistan survey area, contributing to about 5 percent of average income. Nonagricultural labor was, instead, much more important: in nearly all sample districts, nonfarm earnings plus transfers exceeded farm earnings.

- Agricultural wage income was double that of nonagricultural wage income in households in the Bangladesh survey area, which consumed less than 60 percent of recommended calories; but the pattern was reversed, and nonagricultural wages were relatively more important than agricultural wages in households which consumed more than 80 percent of their calories.

- Agricultural wages were a very important source of income for malnourished households in North Arcot, India, much more so during a "normal" year, 1983/84, than a drought year, 1982/83, when employment opportunities diminished on large paddy farms, and other sources of income, such as road and factory work, were tapped.

Finally, in all four survey sites, it was clearly observed that as the share of off-farm income in total income increased, the likelihood of being malnourished also increased. It must be kept in mind, though, that it tends to be the landless and the small farm operators who are most in need of supplementing their farm income and in maintaining their food security via off-farm income.

with The Gambia survey. Guatemala is an exception—perhaps the explanation lies in the strongly dual agricultural sector (a modern, export-oriented, large-scale farm sector has long been co-existing with a traditional, subsistence-oriented, small-scale sector) where households in the small farm sector, in most cases, cannot support themselves by relying only on subsistence production and, therefore, seek employment in the large-scale export crop sector (see Box 4).

Rural households diversify to a number of income sources within agriculture and nonagriculture to receive income from a variety of sources, as shown by detailed analysis from the Rwanda, The Gambia, and Guatemala surveys (Table 11). The modal number of income sources was five in the Rwanda and The Gambia surveys, but just three in the Guatemala survey.[12] More than 80 percent of The Gambia survey households had five or more clearly distinguishable sources of income, which, at first glance, seems not reconcilable with the earlier finding that over 75 percent of these households had an off-farm income share of less than 30 percent. The large number of income sources is related to the family size and to intrahousehold specialization. Rural households diversify their income sources, for even small amounts, to supplement their total incomes.

A mixed pattern is observed between malnutrition and number of income sources: in The Gambia survey, all severely MRP households had five or more income sources, whereas there were a number of non-MRP households with fewer sources of income. In the Guatemala survey, there was little difference in the pattern of the number of income sources between MRP and non-MRP households. In the Rwanda survey, a higher proportion of severely MRP households had three or less sources of income, compared to non-MRP households, having more sources. Thus, these three surveys illustrate the difficulty of generalizing conclusions on income source diversification and malnutrition—this relationship is very context- and location-specific. Reasons behind income diversification may differ and income diversification in one context may have a different impact on nutrition than in another context.

Is there a relationship between income diversification and calorie deficiency? Are the calorie deficient more or less diversified in terms of income sources and off-farm incomes? Taking into consideration small sample sizes, there appears to be a positive relationship between off-farm income share and malnutrition (that is, higher off-farm income shares are accompanied by higher prevalence of malnutrition-poverty), most clearly observed in the Kenyan and Indian surveys, but also in Guatemala, a negative relationship in The Gambia survey, and a U-shaped relationship in other survey sites (most clearly in Rwanda) (Table 12).

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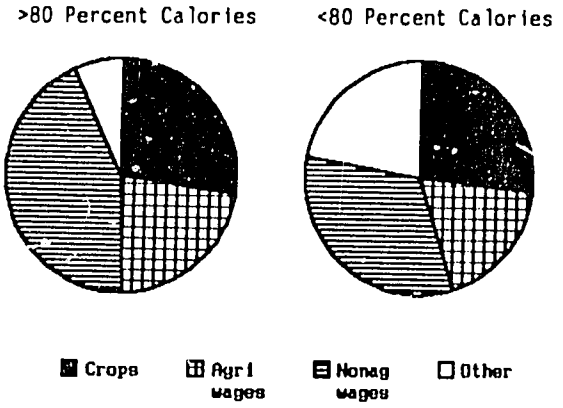
[12] Income sources are defined on an activity basis and include income from marketed and nonmarketed crop production, livestock sales, wages from agriculture and nonagriculture, transfers, and other off-farm income sources.

Box 4--Off-Farm Income and Maintenance of Staple Food Security at the Household Level—A Case in Guatemala

Subsistence farm households in Guatemala (Chapter 3) rely heavily on off-farm income sources for attainment and maintenance of household-level food security. On average, subsistence farms are too small to fully support the household from own crop production and it is common to find some household members being sent off to obtain wage employment in the large-scale export crop sector or nonagricultural employment in the urban areas. Forty-four percent of sample households earned more than 60 percent of their income from off-farm sources.

While both malnourished and non-malnourished households (defined in terms of household caloric intake) relied heavily on off-farm income, on average, the share of wage income in total income was substantially higher for the non-malnourished households (66 percent) than for malnourished households (51 percent). At the same time, it was observed that those households which relied to a lesser extent on off-farm income sources were less likely to be malnourished than other households. This can be explained by the fact that the first-mentioned households tended to be more productive. Crop income was much less important for both groups.

Figure 1 Income composition of households by calorie adequacy indicator



The income composition-poverty relationship was reversed when poverty was measured in terms of underweightedness of children. Households with no underweight children depended on wage income for 55 percent of their total income compared to 67 percent for the malnourished households and a staggering 79 percent for severely malnourished households. Furthermore, households which relied to a lesser extent on off-farm sources of income were more likely to have a malnourished child than other households. One explanation for such an outcome would be farm size: households with malnourished children had much smaller average farm sizes (0.57 hectares) compared to other households (0.80 hectares). In similarity with the previous poverty indication, crop income was less important.

Figure 2 Income composition of households by anthropometric status indicator

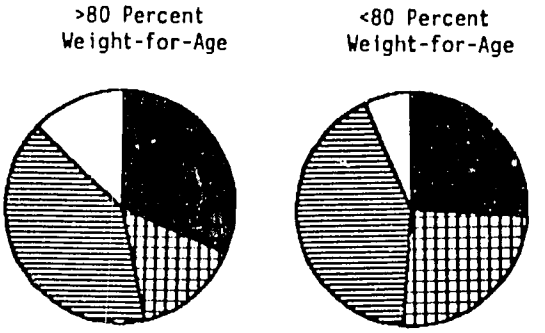


Table 11--Frequencies of income sources for three survey areas: Guatemala, The Gambia, and Rwanda

Country/Degree of Malnourishment	Number of Income Sources					
	1	2	3	4	5	6 or More
	(percent of households)					
Guatemala						
Total sample	11.3	26.0	29.4	22.0	10.2	1.1
Non-malnourished	10.6	29.5	28.8	20.5	9.8	0.8
Moderately malnourished	8.7	13.0	34.8	26.1	17.4	0.0
Severely malnourished	18.2	18.2	27.3	27.3	4.5	4.5
The Gambia						
Total sample	0.0	0.5	2.4	14.2	41.5	41.5
Non-malnourished	0.0	0.6	2.9	13.9	38.2	44.5
Moderately malnourished	0.0	0.0	0.0	20.0	53.3	26.7
Severely malnourished	0.0	0.0	0.0	0.0	66.7	33.3
Rwanda						
Total sample	1.6	4.2	7.4	31.2	38.6	16.9
Non-malnourished	2.7	4.5	5.4	31.3	37.5	18.8
Moderately malnourished	0.0	2.3	6.8	36.4	40.9	13.6
Severely malnourished	0.0	6.1	15.2	24.2	39.4	15.2

Table 12--Off-farm income shares and calorie deficiency

Survey Location	Percentage of Households in Each Off-Farm Income Category with <80 Percent Calories			
	<10 Percent	10-30 Percent	30-60 Percent	>60 Percent
Brazil (Zona da Mata)	12.7	12.1	19.7	(s.s)
Guatemala (Western Highlands)	18.8	(s.s)	(s.s)	28.8
The Gambia (central region)[a]	24.6	17.3	(s.s)	(s.s)
Kenya (southwestern region)	18.5	29.1	31.8	32.3
Rwanda (Giciye community)	36.0	29.1	38.0	52.0
Sri Lanka (Kandy District)	(s.s)	0.0	(s.s)	49.4
Bangladesh (various areas)	(s.s)	16.2	15.0	23.1
India (North Arcot District)				
(1982/83)	48.5	(s.s)	(s.s)	74.3
(1983/84)	0.0	0.0	0.0	32.6
Philippines (Abra, Antique, and South Cotabato Provinces)	80.1	86.9	76.5	84.9

s.s = Sample size of less than 10 households.

[a] Wet season.

One possible explanation for the positive relationship between off-farm income and malnutrition-poverty relates to the gender control of income in the household. Expenditure responsibilities tend to differ between men and women and women tend to be responsible for the families' food consumption in several of these survey areas.

A U-shaped relationship is observed in several surveys: the proportion of MRP households is higher at either end of the income diversification scale. Without being specific, the trough appears to be around the 30 percent off-farm income share, except in the Abra, Antique, and South Cotabato Filipino provinces, where it appears to be around the 60 percent mark. This implies that in these survey locations, when incomes are hardly diversified or when they are substantially diversified out of agriculture, a greater proportion of households is malnourished poor than when a certain degree of income diversification is reached.

The perception that rural households depend for income only or mostly on agriculture does not hold as we have already seen from the distribution of households in each survey by off-farm income shares. This is further confirmed by disaggregated income composition information: the share of nonagricultural income in total income ranges from 13 percent to 67 percent among the 13 surveys (Table 13).

Nine different clusters of farm and nonfarm income sources are distinguished. Agricultural income is disaggregated into four sources: marketed crop production; nonmarketed crop production; livestock; and agricultural wages. Nonagricultural income sources include: wage work, craft work, services and trading, transfers and remittances, and other income.

There is considerable diversity in income sources <u>among</u> the surveys, <u>within</u> the same survey, <u>over</u> time, and <u>between MRP and non-MRP households among the surveys</u>, although interestingly, in this last case, not so much within the same survey. Thus, there is little basis for making generalizations about income sources of the poor and nonpoor households and for deriving blanket conclusions pertaining to <u>income targeting</u>. For instance, among the surveys, income from livestock is notable only in Brazil, Pakistan, Bangladesh, and the Sahelian and Guinean zones of Burkina Faso, but inconsequential elsewhere. Crop production is quite important everywhere, except in Guatemala, the Sahelian zone (Burkina Faso), Sri Lanka, Pakistan, and one of the Philippines surveys. Wage employment is an important income source in the Guatemala, Sri Lanka, Pakistan, Bangladesh, North Arcot (India), and the two Philippines surveys, which can be attributed to the agricultural structure and high population densities and consequent landlessness. Transfers and remittances are notable in the surveys of Rwanda, Sri Lanka, Bangladesh, and the Sahelian zone of Burkina Faso.

Table 13--Income sources of malnourished and non-malnourished households, by survey location

Survey Location		Percent of Household Income From										
		Non-Marketed Crops	Marketed Crops	Live-stock	Agri-culture Wages	Total Agri-culture	Non-Agri-culture Wages	Crafts Work	Ser-vices Trading	Trans-fers/ Remit-tances	Other Income	Total Non-Agri-culture
Latin America												
Brazil	MRP	50.0[a]	...	32.3	3.9	86.2	4.7[b]	...[b]	...[b]	9.0	...	13.7
	Non-MRP	49.8[a]	...	26.7	10.4	86.9	3.7[b]	...[b]	...[b]	9.3	...	13.0
Guatemala	MRP	20.1	7.2	-6.7[c]	22.3	42.9	43.7	...	3.9	9.5	...	57.1
	Non-MRP	13.4	13.3	-2.1[c]	18.2	42.8	33.1	...	14.6	9.6	...	57.3
Africa												
The Gambia	MRP	53.4	23.5	1.3[d]	1.2	79.4	2.8	3.3	9.4	6.0	...	21.5
	Non-MRP	58.4	26.8	0.7	0.7	86.6	1.8	1.6	7.9	3.2	...	14.5
Burkina Faso[n]												
Sahelian Zone	MRP	29.5[a]	...[a]	19.0	3.7	52.2	...	13.3[j]	2.7[k]	30.5[l]	0.3[m]	46.8
	Non-MRP	11.0[a]	...[a]	14.0	3.0	28.0	...	24.0[j]	8.0[k]	28.0[l]	12.0[m]	72.0
Sudanian Zone	MRP	52.0[a]	...[a]	6.7	17.3	76.0	...	3.7[j]	4.3[k]	16.0[l]	2.0[m]	26.0
	Non-MRP	63.0[a]	...[a]	10.0	0.0	73.0	...	7.0[j]	9.0[k]	6.0[l]	3.0[m]	25.0
Guinean Zone	MRP	43.3[a]	...[a]	13.1	1.7	58.1	...	8.9[j]	17.9[k]	5.7[l]	7.5[m]	40.0
	Non-MRP	32.0[a]	...[a]	20.0	2.0	54.0	...	13.0[j]	21.0[k]	2.0[l]	8.0[m]	44.0
Kenya	MRP	40.2	14.4	...	1.6	56.2	14.0	...	21.3	3.6	4.9	43.8
	Non-MRP	38.1	11.7	...	2.2	52.0	13.8	...	2[illegible].2	4.2	3.8	48.0
Rwanda	MRP	33.4	11.6	...	...[e]	45.0	16.4[e]	...[e]	...[f]	17.3	21.3[f]	55.0
	Non-MRP	28.7	11.5	...	...[e]	40.2	29.2[e]	...[e]	...[f]	10.9	22.8[f]	62.9
Zambia	MRP	73.4	18.3	1.5[g]	0.9[h]	...[h]	...[h,i]	...[i]	...[i]	...[i]	5.9[i]	...
	Non-MRP	82.8	9.8	1.8[g]	1.5[h]	...[h]	...[h,i]	...[i]	...[i]	...[i]	3.6[i]	...
Asia												
Sri Lanka	MRP	13.2[a]	...[a]	4.4	40.4[h]	...[h]	...[h]	...	...	18.32	23.7[o]	...[h]
	Non-MRP	7.4[a]	...[a]	1.2	50.9[h]	...[h]	...[h]	...	...	22.5	18.7[o]	...[h]
Pakistan	p	20.5[a]	...[a]	15.5	7.3	43.3	37.5[r]	...[r]	...[r]	14.0	6.2[s]	57.7
	q	23.7[a]	...[a]	14.0	5.7	43.4	35.6[r]	...[r]	...[r]	14.6	6.4[s]	56.6
Bangladesh	MRP	36.2[a]	...[a]	23.4[d]	3.5	63.1	8.9	9.2[t]	...[t]	18.6	...	36.7
	Non-MRP	27.9[a]	...[a]	17.1[d]	16.3	61.3	12.7	9.6[t]	...[t]	16.3	...	38.6
India												
1982/83	MRP	50.7[a]	...[a]	...	23.0	73.7	16.4[u]	5.0[v]	4.7[w]	6.4	-6.2	26.3
	Non-MRP	30.4[a]	...[a]	...	35.2	65.6	18.8[u]	5.0[v]	2.7[w]	7.8	0.1	33.5
1983/84	MRP	40.6[a]	...[a]	...	40.5	81.1	4.1[u]	0.0[v]	6.9[w]	5.7	2.2	18.9
	Non-MRP[x]	-1.0[a]	...[a]	...	64.4	63.4	8.0[u]	0.0[v]	13.6[w]	12.4	2.7	36.7
Philippines I[bb]	MRP	44.0	12.0	...	23.5	79.5	20.5	...	...	...	...	20.5
	Non-MRP	46.0	7.0	...	34.0	87.0	13.0	...	...	...	...	13.0
Philippines II[cc]	MRP	20.0[y]	6.2[z]	10.1	3.2	39.5	10.5	22.5	7.8	6.2	13.5[aa]	60.5
	Non-MRP	16.8[y]	6.1[z]	9.0	7.5	39.4	15.2	21.1	6.6	6.3	11.2[aa]	60.4

(continued)

Table 13--Income sources of malnourished and non-malnourished households (continued)

[a] Aggregate of marketed and nonmarketed crops.

[b] Aggregate of all off-farm nonagricultural income.

[c] Other agricultural income.

[d] Other agricultural income, including livestock.

[e] Wage earnings and self-employment in labor, crafts work, and other income-generating activities.

[f] Included in off-farm income from other income-generating activities.

[g] Animal sales.

[h] Nonagricultural wages included in agricultural wages.

[i] All nonfarm income aggregated under other income.

[j] Aggregate of cottage and gather manufacturing.

[k] Aggregate of services and food preparation.

[l] Aggregate of nonlocal nonfarm income, food aid, intravillage gifts, gifts/aid imports, and income from abroad.

[m] Aggregate of income from transportation; cons and comm.

[n] >80% category is the sum of the medium and adequate consumption categories; <80% category is the low consumption category.

[o] Nonmonetary and miscellaneous income.

[p] Households with >2400 calories per day.

[q] Households with <2400 calories per day.

[r] Nonfarm income.

[s] Rents and returns to capital.

[t] Industry, trade, and crafts.

[u] Factory work wages plus road work wages plus white collar wages.

[v] Trade and craft wages.

[w] Nonfarm business income.

[x] Households >100 percent calories.

[y] Rice crops + maize crops farming.

[z] Cash crop farming.

[aa] Fishing + rentals.

[bb] Mindanao, Bukidnon Province.

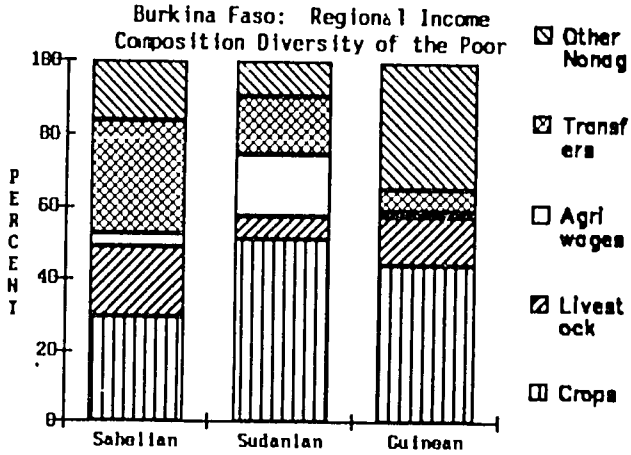
[cc] Abra, Antique, and South Cotabato Provinces.

Within the same country, too, income sources and their contribution to total income differ substantially by location (see Box 5). Neither are income source patterns steady over time, but rather they are dynamic, as they adjust to varying economic circumstances (see Box 6). Surprisingly, there is almost no difference in terms of the share of income coming from aggregated agricultural and nonagricultural sources for MRP and non-MRP households in each survey location, with the exception of North Arcot, India, during the drought in 1982/83. However, differences do exist between MRP and non-MRP households in the shares of different income sources within the agricultural or nonagricultural sectors in some cases, especially where wage income appears to be a distinguishing feature of the income of the MRP, such as in survey sites in Guatemala, Rwanda, or North Arcot (in the non-drought period). In Guatemala, wages from agriculture and nonagriculture were

Box 5--Intra-Country Differences in Income Sources of the Poor

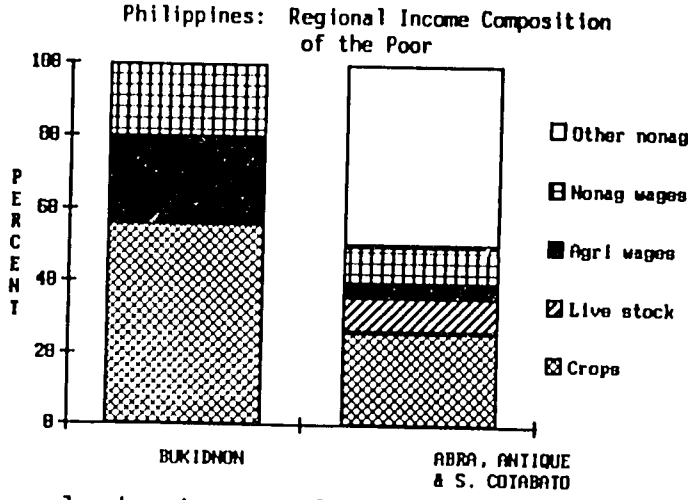
The causes and characteristics of poverty, manifested, for instance, in the composition of the income of the poor, differ not only from country to country but also from region to region within the same country, rendering it difficult to generalize targeted poverty alleviation measures on a national scale. Income composition diversity arises from differences in agro-ecological conditions, economic and infra-structural linkages, the degree of integration into the market economy, the nature of the "social security" system, and individual abilities to bear risks.

In Burkina Faso (Chapter 5), agro-ecological differences combined with different government policies, contributed to such regional income composition differences among the poor (see figure).



Incomes of the poor were much more diversified and less dependent on agriculture in the Sahelian (agro-climatically a very poor zone) and Guinean Zones (moderately favored) than in the Sudanian Zone (poor to intermediate). Transfers and remittances are much more important to the Sahelian Zone poor than to the Guinean Zone poor. Agricultural wages were important only in the Sudanian Zone; the Sahelian agricultural labor market, for instance, is not well-developed. These differences in income characteristics of the poor suggest a need to consider further indicators before employing standard measures for targeting to avoid situations such as in 1984, when food aid was targeted on the basis of production outcome to the Sahelian Zone without considering that the degree of purchasing power from diversified income sources was higher there than in the Sudanian Zone, which because of its less diversified incomes was more vulnerable to cropping outcomes.

Surveys from the Philippines (Chapters 13 and 14) further highlight intra-country differences in income sources of the poor. Poor corn- and sugar-producing households in Bukidnon Province were very dependent on crop production and agricultural wages (see figure). However, for those with access to



land, income from nonagricultural sources was quite important. The poor in a sample from three other provinces—Abra, Antique, and South Cotabato—were less dependent on agricultural activities for income and even among those farmers who owned land, nearly one-third of income was derived from off-farm sources, mainly wage work. Proximity to towns and cities influenced households to send family members to work in cities, or in the case of Antique, to join merchant ships.

Box 6--Inter-Temporal Differences in Income Sources of Malnourished Rural People

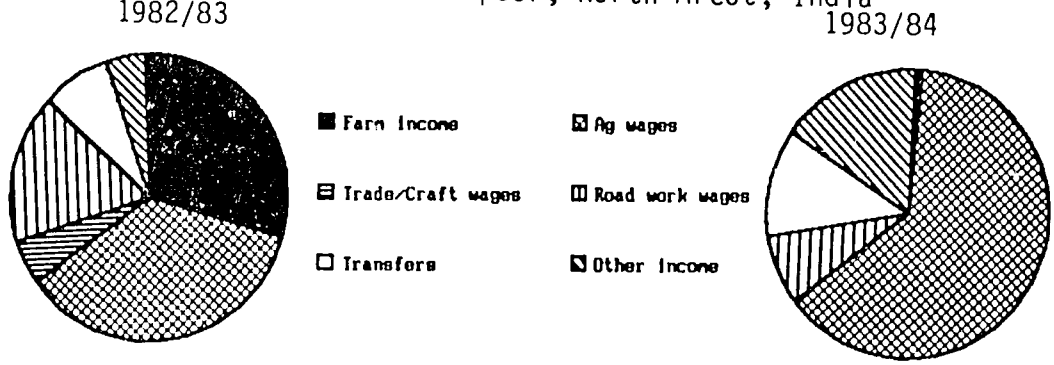
The poor are neither immune nor unresponsive to changes in economic circumstances. They are quick to adjust their income strategies to take advantage of favorable outcomes or to cope with adversities.

In North Arcot District, the 1982/83 drought seriously affected the poor, especially the landless households who were virtually dependent on agricultural wages, when employment opportunities on large paddy farms dried up (Chapter 12). As the figure shows, the poor considerably diversified their incomes in the drought year towards factory work, road work, trade and crafts, to compensate for agricultural wage income shortfalls. They also relied on farm income. As the agricultural and overall economy improved, following the resumption of rains, income levels doubled and the share of income from agricultural wages rose from 35 percent to 65 percent. The compensatory income sources adopted in the drought year were abandoned. Farm income was, in fact, negative. Only 21 percent of households were malnourished compared to 66 percent the year before. Hence, as crop performance worsened, both poor and nonpoor households were more dependent on on-farm income for sustenance, although their off-farm incomes were more diversified.

In The Gambia survey area (Chapter 4), the opposite pattern was observed: off-farm income shares were inversely related to crop production performance, i.e., the better the crop production, the lower the share of off-farm income. This is related to the low share of agricultural wages in off-farm income. Between 1985/86 and 1987/88, cereal production declined and, in combination with decreased crop prices, led to dramatic decreases in incomes. People turned to off-farm sources of income and off-farm income increased both absolutely and relatively to total income. There were locational differences: local growth linkages led to a doubling of off-farm income in upland villages, but they appeared nonexistent in the lowland villages. The survey area was also influenced by the structural adjustment program initiated in 1986 which hit hard at the urban areas and resulted in a decline in transfers and remittances between 1985/86 and 1987/88.

In sum, considerable flexibility is observed in the income strategies of the poor from season to season and over time.

Income sources of poor, North Arcot, India



67 percent of income for non-MRP households, compared to 51 percent for MRP households. On the other hand, the pattern is reversed in Sri Lanka: half of the income of MRP households is from wages as opposed to 40 percent for the non-MRP households.

In summary, the key findings on income, its composition, and diversification strategies of malnourished households in rural areas are:

- The level of household income has a greater influence on the prevalence of calorie deficiency than it does on the nutritional status and health of children.
- A mixed pattern is observed between the degree of income diversification into off-farm income and extent of calorie deficiency.
- The diversity in income levels of the severely malnourished suggests against the adoption of a general or common income poverty line applicable across all countries or even across one country.
- Rural households do not depend only or mostly on agriculture directly for income. Household income diversification from agricultural to nonagricultural sources is a widely adopted strategy.
- The substantial diversities observed in income sources among locations, within locations, over time, and between MRP and non-MRP households disallows generalizations to be made on income sources of the poor and on the application of generalized income source targeting.
- The gender control of income in the household, besides the level of that income, can influence diet adequacy and nutritional status of the household.

POLICY CONCLUSIONS: TOWARD INCOME DIVERSIFICATION FOR "GOOD" REASONS

Economies tend to diversify their sectoral patterns in the process of development. Anticipation of these tendencies and the poor's position in them is important information for development policy.

Agricultural income as a proportion of total income in rural areas of developing countries remains relatively high over a wide range of national income levels—about 40 to 50 percent in most developing countries—while the share of agriculture in national income declines typically with rising income. At the same time, agricultural income is far from dominating the income of malnourished rural people in many settings. Nonagricultural income sources are quite important for them.

It is now widely accepted that the benefits of technological change in agriculture for the poor are quite significant through the indirect effects of income and employment linkages and favorable price depressing effects for poor consumers. However, agricultural growth alone is not a sufficient long-term strategy for the alleviation of poverty. The poor are much linked to rural manufacturing with their direct income sources and expenditure patterns. Explicit promotion of manufactured goods availability in light of the incentive role they play for rural and agricultural growth as well as fostering the complex synergistic feedback effects between agricultural and manufacturing growth through credit and infrastructure promise effects for poverty alleviation beyond those obtainable from favorable agricultural growth.

As comparative micro studies have shown, the diverse pattern of the malnourished poor's income sources, even in the same macro and micro regions covered by in-depth surveys, does not suggest a general blueprint of targeting the poor's specific income streams. The issue is more with alleviating the poor's problem of risky income streams. Market failure risks are part of these risks.

Theoretical analysis suggests that the malnourished rural poor are diversifying their income because of: (1) differences in productivity (comparative advantage) within and among poor households; (2) risks in food, labor, and insurance markets; (3) land and labor constraints.

Broadly speaking, there are two distinct motives and features observed underlying income diversification, depending on the nature of the rural economy: one, diversification in stagnating rural economies as a reflection of the poor's coping with income source specific risks (diversification for "bad" reasons); and two, diversification in growing rural economies as a reflection of dynamism and of capturing of gains from specialization at the household level (diversification for "good" reasons). To move swiftly from the former to the latter is a central task of rural growth strategy. Thus, targeting basic market failure and production instability problems, which have a major impact on the poor, may be more effective for poverty alleviation than direct targeting of the poor—be it on the consumption side or on the income earning side.

It should be noted that income differences do make large differences for the prevalence of hunger (food energy deficiency) and, at the aggregate country level, growth-nutritional improvement relationships are strong, especially in countries at the lowest income levels. However, in many remote rural areas, household income differences are not making much difference for the levels of malnutrition of children in the short run. Thus, while hunger is addressed effectively with household income growth (and, possibly, income transfers), malnutrition requires community-level health and sanitation action, which is also facilitated and made sustainable by rural growth.

In summary, the comparative analysis suggests a focus on:

- Prevention of policy-induced market failures, that is, in food and labor, which foster income diversification for "bad" reasons;

- Improved market integration through infrastructure, facilitating diversification of income for "good" reasons;

- Social security with and before growth, in order to permit specialization by the poor in risky food and labor market environments. This includes community health and sanitation improvement; and,

- Rural growth promotion with technological change in agriculture and rural manufacturing and services to raise productivity and increase goods' and services' availability at low prices. Provision of public goods plays an important role. Research-based agricultural innovations, rural education, and expansion of rural financial systems delivering venture capital to the poor, are all essential components of the policy package for rural growth.

2. INCOME SOURCES OF THE RURAL POOR: THE CASE OF THE ZONA DA MATA, MINAS GERAIS, BRAZIL

Stephen A. Vosti
Julie Witcover

INTRODUCTION

As a result of recent studies documenting the low responsiveness of rural diets to short-term changes in incomes, increased household income is no longer considered either necessary or sufficient for augmenting food consumption among the rural poor. These results suggest that there is substantial variation in nutritional status among households with similar incomes, or, conversely, that malnourished households don't always appear among households with the lowest income levels. If this is true, and if we believe that no one would choose to be malnourished, then other factors, including perhaps income-related factors (aside from total income), must independently or jointly constrain families from achieving adequate food intake.

Sources of income could be one such factor, influencing the diets (and nutritional status) of rural inhabitants in three ways. First, the degree to which households depend on various income categories (that is, crops, livestock, off-farm labor, and unearned income) can affect the extent of household market interaction, access to capital markets, and dependence on farm-produced goods (especially family labor), all of which can affect, in turn, food availability.

Secondly, the composition of income within income source categories (for example, annual versus perennial crops, perishables versus products with long storage lives, etc.) can affect cash flow needed to maintain adequate diets.

Finally, instability in relative dependence on various income sources over time can influence food security in rural households. Such instability could reflect profit maximization behavior by farmers already doing well, and thereby represent a cushion to both income and consumption. On the other hand, such instability might reflect last resort reactions to pending crises by farmers struggling for subsistence, and therefore signal the onset of food-first survival strategies.

The purpose of this paper is to assess the influence of the amount and composition of total household income available to agricultural

households on their food consumption and short- to long-term nutritional status.

DATA SOURCES AND SAMPLE OVERVIEW

Data for this study were drawn from the final year of panel data covering 1979-84 from surveys conducted to monitor the progress of the Integrated Rural Development Project (PRODEMATA) in the impoverished Zona da Mata of Minas Gerais, Brazil. Detailed agricultural production, socioeconomic, and food consumption data were collected at the household level using an annual retrospective survey questionnaire. Information was solicited on inputs and outputs, market linkages, and the "transfer of knowledge" (via contact with agricultural extension agents, farmers' organizations, and the like) for a large set of agricultural products (by crop), and livestock (by type). Income from these and other on- and off-farm sources were noted.

Food intake was measured through 24-hour recall, and food consumption was converted into household-level caloric intake using the 1977 food composition table generated for the 1973/74 ENDEF National Nutrition Survey. Caloric requirements were based on the approximate age and gender composition of individuals present at meals during which the 24-hour recall data were collected.[13]

Unfortunately, households reported only aggregate, not individual, food consumption, precluding any intrahousehold analysis of caloric intake. Study of individual nutritional status was limited to anthropometric analysis of children aged 0-6 years present in the household at the time of interview: their weights, heights, and ages were recorded, then compared to international standards for children in similar age groups.[14]

The sample was skewed towards the smaller, poorer farms targeted by the PRODEMATA project, and included a representative number of

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[13] Using standard set forth in Energy and Protein Requirements, Technical Report Series #724, published in 1985 by the World Health Organization (WHO). For ages 10-18, estimated caloric requirements were scaled back from WHO estimates made in 1971. In addition, since individuals present during 24-hour recall meals were identified by age group, rather than specific age, average ages within each age group for males and females (calculated from specific ages given as part of household information) were used to determine energy requirements for anyone falling into that age (and gender) group, assuming a moderate work level. This calculation resulted in an adult equivalence of 2804 calories/day.

[14] Standards taken from NCHS Growth Curves for children, Birth-18 Years, United States, Series 11-No.165, DHEW Publication No. 78-1650. (Using software developed by Michael Jordan and Norman Staehling of the Centers for Disease Control (CDC), version 3.0/1986.)

sharecroppers. Of the 384 rural households appearing continuously over the 1979-84 sample period,[15] 84 contained children aged 0-6.

The descriptive statistics presented in Table 14 provide an overview of the entire sample, and measure a variety of indicators across subsamples of interest: households with children under 6 years of age are compared to households without children under 6, and female-headed households are compared to male-headed households. The subsamples do overlap: of the 34 female-headed households, six had children aged 0-6. Yet, as Table 14 shows, the subsamples were, in fact, quite different.

Average household incomes per capita varied substantially, depending on household composition. Households without small children earned significantly more per capita (on average) than did those with young children to support. Likewise, male-headed households netted significantly more per capita than did their female-headed counterparts. Note that, at an average per capita income of $Cr1,106,000, female-headed households fared no worse than households with young children.

Over 50 percent of the households with small children appeared in the lowest per capita income tercile based on the entire sample (a highly disproportionate representation), and only 23.5 percent of the female-headed households came from the top tercile category.

The sample's farm size averaged approximately 35 hectares, and did not vary significantly between households with and without young children. Female-headed households, however, had significantly smaller farms (only 21.1 has.) than the rest of the sample.

On average, households in the sample ate enough during the 24-hour recall period to more than meet their daily caloric needs. In fact, none of our subsamples averaged less than 100 percent of its requirements. They did show, however, significant variations in caloric intake. Households without children under age 6 consumed a significantly higher percentage of daily requirements on average than did households with young children, mirroring differences in their per capita incomes. Interestingly, the best fed of our subsamples in terms of caloric intake was (on average) households headed by females, despite their relatively low average income per capita (on a par with the income of the worst-fed subsample!).

Our sole infrastructure variable, distance to the nearest large market town (the municipio seat), also varied across subsamples. Households without small children tended to live significantly closer to municipio seats than did households with them. Female-headed households tended to be closest of all.

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[15] The sample was restricted to these households because several variables used in the analysis take farm performance over the entire panel period into account.

Table 14--Descriptive statistics for total sample, households with children, and female-headed households, Zona da Mata, Brazil

Means (Standard Deviations)	Total Sample	Households With Children < 6 Years	t-Value[a]	Households Without Children < 6 Years	Female-Headed Households	t-Value[b]	Male-Headed Households
N	384	84		300	34		350
Total income ($Cr000)	7,469.8 (9,011.6)	7,954.6 (10,461.8)	0.50	7,334.1 (8,563.1)	3,611.9 (3,430.8)	5.5***	7,844.6 (9,285.4)
Income per capita ($Cr000)	1,592.4 (2,117.9)	1,108.8 (1,259.8)	-3.3+++	1,727.8 (2,285.0)	1,106.0 (978.2)	2.61**	1,639.7 (2,192.4)
Farm size (hectares)	34.7 (40.1)	31.0 (38.5)	-0.98	35.8 (40.6)	21.1 (26.5)	2.97***	36.1 (41.0)
Household size (persons)	5.5 (2.7)	7.6 (2.5)	8.8+++	4.9 (2.4)	3.8 (2.1)	4.56***	5.64 (41.0)
Adult equivalent[c]	5.2 (2.5)	6.2 (2.6)	4.3+++	4.9 (2.4)	4.0 (2.2)	2.98***	5.32 (2.53)
Percent of daily caloric requirement[c]	120.0 (40.5)	111.4 (32.7)	-2.6++	122.4 (42.4)	136.5 (53.9)	-1.92*	118.4 (38.7)
Distance to municipio (kilometers)	22.5 (13.6)	25.4 (15.1)	2.08++	21.6 (13.1)	18.6 (12.3)	1.73*	22.8 (13.7)
Illiterate household head (percent)	52.9	53.6		52.7	100.0		48.3
Landless (percent)	12.2	22.6		9.3	2.9		13.1
Households without unearned income (percent)	54.4	58.3		53.3	38.2		56.0
Terciles of income per capita:							
Bottom (percent)	33.3	52.4		28.0	38.2		31.1
Middle (percent)	33.3	21.4		36.7	38.2		34.0
Top (percent)	33.3	26.2		35.3	23.5		34.9

Source: Universidade Federal de Viçosa, Programa de desenvolvimento rural integrado da Zona da Mata-MG-"PRODEMATA" survey.

[a] Results of t-test between households with children <6 years, and households without children <6 years, with +, ++, +++ denoting significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

[b] Results of t-test between female-headed households and male-headed households with *, **, *** denoting significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

[c] Adult equivalent based on energy requirements for adult male of mean age (44 years), height of 1.65 meters (2,804 calories/day).

Heads of households with and without small children had similar literacy rates (where 'literacy' required having all household heads literate), but 100 percent of females who headed households were illiterate.

Of the 84 families with small children, 22.6 percent were landless, compared with only 9.3 percent of the remaining households. Slightly less than 3 percent of female-headed households were landless, and a smaller percentage of them went without unearned income (that is, rent, interest, etc.) than did the sample as a whole (38.2 percent, compared with 54.4 percent).

In sum, the sample contains identifiable subsamples that differ, often dramatically, across several socioeconomic indicators. Where similarities exist, such as in income per capita of households with children under 6 and female-headed households, differences elsewhere belie them—in this case, income distribution, farm size, landlessness, illiteracy, distance to market, access to unearned income, and, importantly for this study, caloric intake.

CALORIC INTAKE OF SAMPLE HOUSEHOLDS

Farm households are classified into three categories, according to the percentage of household caloric requirements met: 1) those which met 80 percent or more of their daily caloric requirement, the 'healthiest' households; 2) those which met between 60-80 percent of their caloric needs; and 3) those that failed to reach even 60 percent of their caloric needs.

The Zona da Mata sample was fairly well fed in terms of caloric intake. Of the 384 households contained in the sample, 329 (85.7 percent) consumed 80 percent or more of their caloric requirements, 42 households (10.9 percent) fell into the 60-80 percent bracket, and only 13 households (3.4 percent) failed to meet at least 60 percent of their caloric needs (Table 15).

Small farms (0-10 hectares) were relatively underrepresented among the best fed households, with only 79 percent falling into that category. Only a small percentage of households in each farm size category consumed under 60 percent of their daily caloric requirements during the 24-hour recall period, and the proportional incidence of this sign of possible severe malnourishment was not significantly different among the farm-size groups and landless sharecroppers.

An interesting relationship surfaced between caloric intake and the percentage of income derived from off-farm sources. While a majority of households earned less than 10 percent of their income from off-farm sources (with the numbers of households steadily decreasing in categories with higher percentages of off-farm income), households earning higher percentages of income off farm fell more frequently into

Table 15--Prevalence of calorie deficiency in different groups, Zona da Mata, Brazil, 1984

Group	Total Sample	Calorie Consumption		
		≥ 80 Percent	60-80 Percent	< 60 Percent
	(N)	(percent of households[a])		
Farm households by farm size				
Small (0-10 ha)	123	78.9	17.1	4.1
Medium (11-50 ha)	171	89.5	8.2	2.3
Large (51+ ha)	90	87.8	7.8	4.4
Landless sharecroppers	47	76.6	19.1	4.3
Female-headed households	34	88.2	8.8	2.9
Households by share of off-farm income in total income				
< 10 percent	204	87.3	9.8	2.9
10-30 percent	91	87.9	8.8	3.3
30-60 percent	56	80.4	16.1	3.6
>60 percent off-farm	33	78.8	15.2	6.1
N	384	329	42	13
Percent		(85.7)	(10.9)	(3.4)

Source: Universidade Federal de Viçosa, Programa de desenvolvimento rural integrado da Zona da Mata-MG-"PRODEMATA" survey.

[a] Percent of households consuming given percentage of household energy requirement, based on an adult equivalency of 2,804 calories/day.

lower caloric categories than did the entire sample. Over 87 percent of households reporting less than 10 percent of total income from off-farm sources belonged to the best fed group, and only 3 percent of this income group fell below the 60 percent caloric intake cutoff. Households depending more on off-farm income fared worse nutritionally: of the 56 farms earning 30-60 percent of their income off-farm, over 16 percent fell into the 60-80 percent calorie column (nearly double the 8.8 percent of farms in the same nutritional category earning 10-30 percent of their income off-farm).

Table 16 contains a more detailed stratification of household characteristics across the three caloric intake groups, revealing substantial differences among them. While farms in all three caloric intake categories derived roughly half their income from crops (on average), the other half came from sources that varied with nutritional status. Worse nutrition was correlated with greater dependence on off-farm agricultural, as opposed to nonagricultural, income. Only the best-fed group derived a higher share of its income from off-farm nonagricultural activities, than from off-farm agricultural, activities (4.7 percent versus 3.9 percent). Farm households getting 60-80 percent

Table 16--Income and employment sources of the poor, by calorie consumption indicators, Zona da Mata, Brazil, 1984

Indicator	Calorie Consumption			Total
	≥ 80 Percent[a]	60-80 Percent[a]	<60 Percent[a]	
N	329	42	13	384
Average percent of household total income from				
Crops	50.0	49.6	50.6	50.0
Livestock	32.3	26.3	27.8	31.5
Off-farm agricultural employment	3.9	10.7	9.6	4.8
Off-farm nonagricultural employment	4.7	4.7	0.6	4.5
Unearned income	9.0	8.7	11.4	9.1
Average household income per capita ($Cr000)	1,662.8	1,107.8	1,376.9	1,592.4
Average farm size (hectares)	35.3	26.9	44.7	34.7
Terciles based on total sample of 384:				
Percent in bottom income per capita tercile	31.3	47.6	38.5	33.3
Percent in middle income per capita tercile	33.7	28.6	38.5	33.3
Percent in top income per capita tercile	35.0	23.8	23.1	33.3
Average distance to municipio (kilometers)	22.0	24.8	26.7	22.5
Dependency ratio[b]	0.61	0.74	0.66	0.63
Percent of household head illiterate	52.6	47.6	76.9	52.9

Source: Universidade Federal de Viçosa, Programa de desenvolvimento rural integrado da Zona da Mata-MG-"PRODEMATA" survey.

[a] Adult equivalent based on energy requirements for adult male of mean age (44 years), height of 1.65 meters (2,804 calories/day).

[b] These ratios are based on 364 cases, the 20 missing households (all falling in the ≥80% calorie category) consisted of all seniors, and, in one case, seniors and children under the age of 15.

of their caloric needs, by contrast, depended on off-farm agricultural employment for nearly 11 percent of their income, and, like the best-fed group, got almost 5 percent of income from off-farm nonagricultural activities. Income from off-farm nonagricultural employment dropped to almost nothing for the poorest fed group, while off-farm agriculture continued to weigh in at nearly 10 percent of total income.

NUTRITIONAL STATUS OF CHILDREN AGED 0-6

In this section, the results of a descriptive analysis of the anthropometric data collected in 84 households containing children between the ages of 0 and 6 years are presented. Long-term nutritional status was measured by height-for-age, medium-term by weight-for-age, and short-term by weight-for-height. To eliminate potential double and triple counting of households having more than one child between the ages of 0 and 6, only the worst-off child in each household in terms of

each of the three anthropometric measures was studied in this section.[16] Therefore, the same child from each household need not (but generally does) appear in the samples analyzed for long-, medium-, and short-term nutrition.

Anthropometric Indicators of Nutritional Status

Nutritional status was measured in standard Z-scores from the mean values for a standard population of children aged 0-6 (adjusted for age and gender—see footnote 14), and appears in three sets of columns per anthropometric measure in Table 17. The first set of columns represents the households whose worst-off child was above average in terms of the particular nutrition measure. The second set of columns includes children who were below average but fell within one standard deviation below the standard population mean, and the third contains children more than one standard deviation below the standard mean.

Table 17--Prevalence of malnutrition by anthropometric status of children in different groups, Zona da Mata, Brazil, 1984

Group	Percentage of Households with Z-Scores[a] of Height-for-Age			Weight-for-Age			Weight-for-Height			N
	>0	-1 to 0	≤-1	>0	-1 to 0	≤-1	>0	-1 to 0	≤-1	
N	15	24	45	28	23	33	42	28	14	84
Percent	(17.9)	(28.6)	(53.6)	(33.3)	(27.4)	(39.3)	(50.0)	(33.3)	(16.7)	
Farm size										
Small (0-10 ha)	9.7	19.4	71.0	16.1	32.3	51.6	41.9	38.7	19.4	31
Medium (11-50 ha)	23.5	32.4	44.1	41.2	23.5	35.3	55.9	32.4	11.8	34
Large (51+ ha)	21.1	36.8	42.1	47.4	26.3	26.3	52.6	26.3	21.1	19
Landlessness	10.5	21.1	68.4	15.8	26.3	57.9	31.6	52.6	15.8	19
Share of off-farm income in total income										
< 10 percent	20.0	28.9	51.1	37.8	26.7	35.6	53.3	31.1	15.6	45
10-30 percent	15.0	25.0	60.0	25.0	20.0	55.0	45.0	20.0	35.0	20
30-60 percent	12.5	37.5	50.0	37.5	1.3	31.3	50.0	58.3	0.0	16
> 60 percent	33.3	0.0	66.7	0.0	66.7	33.3	33.3	66.7	0.0	3

Source: Universidade Federal de Viçosa, Programa de desenvolvimento rural integrado da Zona da Mata-MG-"PRODEMATA" survey.

[a] Height-for-age, weight-for-age, and weight-for-height samples are of households with children <6 years old. Within each anthropometric measure, each household is identified by the lowest Z-score among its children.

[16] Forty-seven of the households had only one child under age 6, 23 had two children under age 6, 10 had three, and 4 had four, for a total of 84 households with 139 children under age 6.

Unlike the fairly positive short-term picture described in the previous section regarding caloric intake by rural households, data analyzed in this section suggest that the growth of this sample's children aged 0-6 was stunted, but that nutrition improved over time. Over half of the 84 children fell below one standard deviation from the standard population mean in height-for-age, the long-term measure of nutritional status (Table 17). Although the children scored higher in terms of the medium-term measure, still, almost 40 percent of the children's weight-for-age fell more than one standard deviation below the standard population mean.

The second row in Table 17 provides the baseline percentages for all the Z-score categories against which other characteristics are compared. Note that, with this smaller sample, the number of cases in stratified categories at times dropped too low for meaningful statistical interpretation.

Farm Household Characteristics and Nutritional Status

A clear link surfaced between farm size and both height-for-age and weight-for-age. Children from relatively large farms (11-50 and 50+ hectares) had a much better chance of achieving above average height than those from small farms (0-10 hectares), of whom fully 71 percent were below one standard deviation from the standard healthy population mean height-for-age (Table 17). Children brought up on relatively large farms also appeared more frequently in the above average weight-for-age category. Coming from a larger farm did not translate, however, into improved weight-for-height. Small farms (0-10 hectares) still had proportionately the least children of any farm size group in the above average nutritional category.

Landlessness showed a stronger tie to low nutritional status of young children the more long term the nutrition proxy. Nearly 70 percent of the (19) children of landless sharecroppers sampled for long-term nutrition were in the lowest height-for-age category—a highly disproportionate presence.[17] In the medium term, the pattern of poor nutrition in landless households held up, though the situation improved slightly, with children of landless sharecroppers comprising 58 of the lowest weight-for-age category. The weight-for-height distribution for landless sharecroppers more closely followed the u-shaped trend of their caloric intake distribution (Table 15).

Percentage of income earned from off-farm sources did not display the clear relationship with nutritional status of young children as it did with household caloric intake in the larger sample, and the decreased sample size hampered efforts to make useful comparisons across off-farm

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[17] Since only 19 of the 84 households containing children were landless, cell frequencies for anthropometric categories should be interpreted with care.

income categories. No dramatic patterns emerged between the percentage contribution of different types of income, on the one hand, and height-for-age, on the other (Table 18).

With weight-for-age, by contrast, an analysis of the types of income did yield interesting patterns. Households deriving an above average share of income from livestock were much more likely to have children in the highest weight-for-age Z-score category. Farms depending more heavily than average on off-farm labor (agricultural and nonagricultural) as an income source, on the other hand, tended to raise children with below average weight-for-age Z-scores, and, like households in the lower caloric intake categories, derived more of their income from agricultural than nonagricultural off-farm employment.

A more confused picture emerged in the relation between off-farm income and weight-for-height, though analysis of the components of household income did strengthen the impression from the weight-for-age data that reliance on livestock made a difference for child nutrition. Increased concentration in livestock went hand in hand with improved weight-for-height for the household's worst-off child. Markedly above average concentration on crops, on the other hand, characterized farms in the lowest weight-for-height category.

There was a positive correlation of absolute income per capita with both height-for-age and weight-for-age. Children with the best long- and medium-term nutrition came from families earning nearly twice as much per capita as the households with children making up the lowest height-for-age, and weight-for-age Z-score categories, respectively. Income distribution figures within Z-score categories reflect this inequity.

The dependency ratios suggest how burdened the productive household members in each of these samples were in caring for old and young. Across the three anthropometric measures, the dependency ratio for the lowest nutritional category was always substantially above the 84-household mean of 1.39.

PRODUCT-LEVEL OUTPUT MIX AND RURAL POVERTY

In this section, the importance of farm-level output mix to caloric intake and household nutritional status (measured by caloric intake for the whole sample, and by anthropometrics for the households with young children) is examined.

Five farm types were determined on the basis of relative product-specific concentration of the value of total farm output using cluster

Table 18--Income and employment sources of the poor, by anthropometric status indicators, Zona da Mata, Brazil, 1984

	Percentage of Households with Z-Scores[a] of									
	Height-for-Age			Weight-for-Age			Weight-for-Height			Total Average
	>0	-1 to 0	≤1	>0	-1 to 0	≤1	>0	-1 to 0	≤1	
N	15	24	45	28	23	33	42	28	14	84
Average percent of household total income from										
Crops	52.3	53.4	57.8	48.0	59.7	59.1	55.3	49.9	67.8	55.6
Livestock	30.2	33.1	24.8	38.0	21.6	24.4	30.3	27.8	22.4	28.2
Off-farm agricultural employment	5.2	4.7	6.6	3.9	7.3	6.5	3.8	10.4	2.9	5.8
Off-farm nonagricultural employment	4.4	3.7	4.3	2.9	4.0	5.4	3.8	6.1	1.4	4.2
Unearned income	7.7	5.1	6.4	7.3	7.4	4.7	6.8	5.8	5.7	6.3
Average household income per capita ($Cr000)	1,552.4	1,379.4	816.7	1,648.6	1,092.2	662.5	1,228.1	751.4	1,466.1	1,108.8
Average farm size (hectares)	31.4	48.7	21.5	37.8	38.6	20.0	32.7	28.9	30.4	31.0
Income per capita tercile[b]:										
Percent in bottom	40.0	41.7	62.2	35.7	56.5	63.6	50.0	60.7	42.9	52.4
Percent in middle	20.0	25.0	20.0	21.4	17.4	24.2	16.7	25.0	28.6	21.4
Percent in top	40.0	33.3	17.8	42.9	26.1	12.1	33.3	14.3	28.6	26.2
Average distance to market (kilometers)	15.4	28.1	27.3	19.6	28.5	28.2	24.4	26.3	26.8	25.4
Average dependency ratio	1.20	1.08	1.62	1.09	1.19	1.79	1.12	1.68	1.60	1.39
Average percent of household illiteracy	46.7	50.0	57.8	42.9	65.2	54.5	52.4	71.4	21.4	53.7

Source: Universidade Federal de Viçosa, Programa de desenvolvimento rural integrado da Zona da Mata-MG-"PRODEMATA" survey.

[a] Height-for-age, weight-for-age, and weight-for-height samples are of households with children <6 years old. Within each anthropometric measure, each household is identified by the lowest Z-score among its children.

[b] Based on total sample of 384 households.

analysis.[18] Farms focusing productive activities in coffee, corn, dairy products, rice, and off-farm labor formed distinct clusters. This cluster analysis was performed for the sample of 384 farms every year of the panel survey (1979-1984), creating the basis for an indicator of production stability over time: a dichotomous variable labeled "jumper" for farms that changed cluster assignments at least once during the sample period, and "stayer" for farms that remained in the same farm type cluster over the entire sample period.

The sample consisted primarily of producers concentrating on coffee or corn, with close to a third of the sample in each of these clusters (Table 19). Concentration in rice production was the most rare production activity (6 percent of farms). Nearly 65 percent of the sample "jumped" production clusters over the five-year period monitored. Their collective (low socioeconomic) profile hints that most jumped out of desperation, rather than from a secure base (or that the jump itself eroded that secure base).

Farm size varied dramatically across clusters, with dairy farms being the largest, and off-farm labor farms, the smallest (Table 19 and

Table 19--Prevalence of calorie deficiency in production clusters, Zona da Mata, Brazil, 1984

Group		Clusters 1 Coffee	2 Corn	3 Dairy	4 Off-Farm	5 Rice	Jumper	Stayer
	(N)	(percent of households)						
Farm households by farm size								
Small (0-10 hectares)	123	27.6	36.6	2.4	25.2	8.1	76.4	23.6
Medium (11-50 hectares)	171	33.9	32.2	20.5	7.6	5.8	63.7	36.3
Large (51+ hectares)	90	35.6	16.7	38.9	5.6	3.3	50.0	50.0
Landless sharecroppers	47	31.9	27.7	0.0	29.8	10.6	85.1	14.9
Female-headed households	34	17.6	29.4	20.6	23.5	8.8	73.5	26.5
Households by share of off-farm income in total income								
< 10 percent	204	46.1	26.5	21.1	1.0	5.4	57.8	42.2
10-30 percent	91	24.2	41.8	26.4	5.5	2.2	62.6	37.4
30-60 percent	56	10.7	32.1	8.9	33.9	14.3	78.6	21.4
> 60 percent	33	6.1	15.2	3.0	68.7	6.1	87.9	12.1
N	384	124	115	73	49	23	248	136
(Percent)		(32.3)	(29.9)	(19.0)	(12.8)	(6.0)	(64.6)	(35.4)

Source: Universidade Federal de Viçosa, Programa de desenvolvimento rural integrado da Zona da Mata-MG-"PRODEMATA" survey.

[18] See Nerlove, Vosti, and Basel (1989) for a detailed description of methodologies adopted and cluster results.

Table 20). Corn farms tended to cover less than 50 hectares. Coffee farms were fairly uniformly distributed across farm size categories. Farms that "jumped" production clusters over time tended to be much smaller than "stayers."

Landless sharecroppers also tended to be unevenly distributed across clusters, as one would expect. The dairy cluster contained no landless sharecroppers. Landlessness was, however, over twice as prevalent in the off-farm labor cluster than in the sample as a whole. In addition, the landless switched production clusters much more often than did the sample at large (85.1 percent, compared with 64.6 percent).

Table 20--Income and employment sources of production clusters, Zona da Mata, Brazil, 1984

Indicator	Clusters 1 Coffee	2 Corn	3 Dairy	4 Off-Farm Labor	5 Rice	Jumper	Stayer	Total Average
N	124	115	73	49	23	248	136	384
Average percent of household total income from								
Crops	77.5	50.3	20.4	26.1	45.5	50.0	50.0	50.0
Livestock	14.9	32.1	68.8	17.5	29.1	27.9	38.0	31.5
Off-farm agricultural employment	1.4	3.4	1.0	21.4	7.5	6.6	1.7	4.8
Off-farm nonagricultural employment	1.4	1.5	3.0	23.5	1.3	5.6	2.6	4.5
Unearned income	4.7	12.8	6.8	11.5	16.5	10.0	7.6	9.1
Average farm size (hectares)	35.8	25.4	62.7	16.4	26.1	29.1	45.0	34.7
Average household income per capita ($Cr000)	2,239.4	849.0	2,366.1	717.7	1,229.5	1,193.6	2,319.8	1,592.4
Income per capita tercile[a]								
Percent in bottom	20.2	47.0	11.0	59.2	52.2	41.9	17.6	33.3
Percent in middle	31.3	41.7	30.1	30.6	17.4	32.7	34.6	33.3
Percent in top	48.4	11.3	58.9	10.2	30.4	25.4	47.8	33.8
Average distance to municipio (kilometers)	26.7	19.3	21.7	22.1	18.1	22.1	23.1	22.5
Dependency ratio[b]	0.63	0.72	0.49	0.62	0.65	0.66	0.57	0.63
Percent of household head illiterate	46.8	63.5	38.4	59.2	65.2	60.1	39.7	52.9

Source: Universidade Federal de Viçosa, Programa de desenvolvimento rural integrado da Zona da Mata-MG-"PRODEMATA" survey.

[a] Based on total sample of 384 households.

[b] Based on 364 cases; the 20 missing households consisted of all seniors, and, in one case, seniors and children under the age of 15.

The 34 households headed by females were also disproportionately represented in the off-farm labor and "jumper" categories, and highly underrepresented in the coffee category.

The percentage of total income derived from off-farm sources gives some idea of which clusters' farms supplemented their income through off-farm employment. In clusters other than off-farm labor (which by definition depended heavily on off-farm employment), some trends emerged out of somewhat erratic patterns: farms earning more than 30 percent of their income off farm were far less likely to concentrate on coffee or dairy production than was the sample at large. The trend pertaining to production stability over time, by contrast, stood out clearly: farms more dependent on off-farm income belonged disproportionately to the "jumper" category.

The composition of total income by source (Table 20) confirms the appropriateness of cluster assignments, and highlights some differences across clusters. The coffee and dairy clusters led in highest concentrations of income source: the coffee cluster farms derived an average of 77.5 percent of their income from crop production; the dairy cluster, 68.8 percent of income from livestock. On average, the off-farm labor cluster split its primary income source almost evenly between our two types of off-farm employment: agricultural and nonagricultural. Finally, the "stayer" group was substantially more dedicated to livestock production and less dependent on off-farm income than were "jumpers."

Average household income per capita varied dramatically across cluster types and across "jumper/stayer" categories. Dairy and coffee farms registered the highest average per capita incomes. Farms in the corn, rice, and off-farm labor clusters came predominantly from the lowest income tercile, the latter reporting the lowest average per capita income. Moreover, the "stayers" earned nearly twice the income per capita of the "jumpers." Sixty percent of the "jumpers" had illiterate household heads, compared to only 40 percent of the "stayers."

Coffee households exhibited a steady representation (and, therefore, one close to the sample norm) in all Z-score categories for both height-for-age and weight-for-age, despite their high average household income per capita (Table 21). In weight-for-height, however, the children from coffee farms fell disproportionately into the lowest category. Corn-producing and off-farm labor households (both poorer on average than coffee farms) tended to be below average in every anthropometric measure. Only on dairy farms did high income accompany healthier children, according to all three anthropometric measures of nutritional status. Finally, and surprisingly given the low income profile of the average "jumper," "jumper" households' children appeared with nearly equal incidence across Z-score measures.

Table 21--Prevalence of malnutrition in production clusters by anthropometric status of children, Zona da Mata, Brazil, 1984

Group			Clusters 1 Coffee	2 Corn	3 Dairy	4 Off-Farm Labor	5 Rice	Jumper	Stayer
		(N)	(percent of households)						
Height-for-Age Z-score[a]									
>0		15	40.0	20.0	26.7	13.3	0.0	66.7	33.3
-1 to 0		24	41.7	33.3	12.5	8.3	4.2	58.3	41.7
≤-1		45	40.0	26.7	8.9	20.0	4.4	62.2	37.8
Weight-for-Age Z-score[a]									
>0		28	39.3	25.0	25.0	3.6	7.1	60.7	39.3
-1 to 0		23	43.5	26.1	8.7	21.7	0.0	60.9	39.1
≤-1		33	39.4	30.3	6.1	21.2	3.0	63.6	36.4
Weight-for-Height Z-score[a]									
>0		42	40.5	23.8	19.0	11.9	4.8	59.5	40.5
-1 to 0		28	32.1	32.1	7.1	25.0	3.6	64.3	35.7
≤-1		14	57.1	28.6	7.1	7.1	0.0	64.3	35.5
N		84	34	23	11	13	3	52	32
(Percent)			(40.5)	(27.4)	(13.1)	(15.5)	(3.6)	(61.9)	(38.1)
Calorie consumption[b]									
≥80%	329	31.1	30.7	20.4	11.2	6.4	62.3	37.7	
60-80%	42	33.3	26.2	9.5	26.2	4.8	71.4	28.6	
<60%	13	53.8	23.1	15.4	7.7	0.0	100.0	0.0	
N		384	124	115	73	49	23	248	136
(Percent)			(32.3)	(29.9)	(19.0)	(12.8)	(6.0)	(64.6)	(35.4)

Source: Universidade Federal de Viçosa, Programa de desenvolvimento rural integrado da Zona da Mata-MG-"PRODEMATA" survey.

[a] Sample is of households with children <6 years old. Each household is identified by the Z-score of its worst-off child.

[b] Adult equivalent based on energy requirements for adult male of mean age (44 years), height of 1.65 meters (2,804 calories/day).

The lower portion of Table 21 reports caloric intake information by cluster. Off-farm labor households, the poorest economically, were highly overrepresented in the 60-80 percent calorie group, but underrepresented in the <60 percent caloric group. The picture of the households belonging to the "jumper" category looks a lot grimmer when looking at the whole sample than when restricting the sample to households with young children: Although they were only slightly underrepresented in the best-fed caloric intake category, they were considerably overrepresented in the moderately underfed (60-80 percent calorie requirement) category, and made up <u>100 percent</u> of all farms falling below 60 percent of caloric intake needs!

MULTIVARIATE ANALYSES OF DETERMINANTS OF CALORIC INTAKE AND NUTRITIONAL STATUS

Up to now, the descriptive statistics presented have illuminated some of the bivariate relationships that exist among a series of farm-level characteristics, on the one hand, and household caloric intake and child nutritional status, on the other. In this section, regression analysis is used to test simultaneously a series of hypotheses aimed at identifying factors that (other things remaining constant) influence the caloric intake of rural households and the nutritional status of children aged 0-6 years.

Caloric Intake Equation

Table 22 presents Ordinary Least Squares regression results, where the dependent variable is the percentage of household daily caloric requirement consumed over the 24-hour recall period. Explanatory variables (suggested by the descriptive tables) include such household characteristics as: distance to municipio, a household head illiteracy

Table 22--Determinants of household caloric intake

O.L.S. Regression Estimates—Dependent Variable = PREQ
(Percentage of household daily caloric requirement consumed over 24-hour recall period[a])

Variable		Coefficient	t-ratio[b]
DIST	Distance (km) to nearest municipio seat (major market town)	0.15	0.97
ILLIT	Illiterate household head; male or female (1=yes, 0=no)	-1.46	0.31
FHHH	Female-headed household (1=yes, 0=no)	22.86	2.85**
DEPRTIO	Household dependency ratio	-6.36	2.22*
JUMP	Household production cluster movement from 1979-84 (1=jump, 0=stay)	-11.85	2.55*
CROPVLS	Ratio of crop income to livestock income	0.15	0.66
PINCOFA	Percentage of total income from off-farm agricultural labor	-0.63	3.68**
PINCOFNA	Percentage of total income from off-farm nonagricultural labor	0.06	0.34
PUNEARN	Percentage of total income from unearned income (rents, interest, etc.)	0.03	0.20
TOTINC	Total income ($Cr)	-3.67×10^{-7}	1.44
Constant		132.09	20.13**

$\bar{R}^2$ = 0.07

N = 352

[a] Household daily requirements based on individuals present at 24-hour recall.

[b] Absolute value of t-ratios; *, ** indicate significance levels of 5 percent and 1 percent, respectively.

dummy variable, a female-headed household dummy variable, and a dependency ratio. Also included were income and income source measures: the percentage of income derived from off-farm agricultural activities, the percentage of income derived from off-farm nonagricultural activities, the percentage of income derived from unearned sources, and total household income, as well as a measure for stability of income sources (a "jumper" dummy variable), and, with the view that ready access to livestock products (showing up in substantial livestock income) boosts caloric intake, the ratio of crop to livestock income, and a constant term. The equation was estimated using 352 observations.

Results suggest that female-headed households, all other things remaining constant, were significantly better nourished than male-headed households. Increases in dependency ratios (either due to the presence of young children or the presence of older unproductive adults) led to a significant decrease in caloric intake relative to caloric needs. Farm households that substantially altered their production activities over time (that is, "jumpers") tended to consume significantly fewer of their needed calories. Finally, increases in the percent of income derived from off-farm agricultural activities tended to decrease slightly the percentage of household daily caloric requirements consumed. It is interesting to note that total income did not significantly influence caloric intake when controlling for the above factors.

Nutritional Status Equations

Regression analysis is used to identify the household- and individual-specific characteristics that influence the nutritional status of not just each household's worst-off child, but all children aged 0-6. A bootstrapping technique was employed to avoid the pitfalls associated with simultaneously including children from identical households as independent observations. This technique makes use of repeated random samples (in our case, 10) from multi-child households (only one child was drawn from each of the 84 households at a time) to estimate (and re-estimate) all coefficients for each of the samples drawn. Estimated coefficients and confidence intervals were then averaged and significance tests performed on these averages. Table 23 presents the results of the height-for-age Z-scores equation, with estimated coefficients and standard errors for each of the right-hand side variables appearing in the first two columns. In trying to explain long-term nutritional status, earlier years of the panel data were used to generate a long-term income value: in place of total 1984 income, the average value of total output in inflation-free corn units across all years of the panel period was used.[19] Long-term income measured in this way was highly significant in determining height-for-age (once again, measured in terms of Z-scores). As expected, the ratio of crop

[19] See Nerlove, Vosti, and Basel (1989) for details.

Table 23--Determinants of height-for-age for all young children

Variable	Avg. β	Avg. SE	t-ratio[a]	Range β Low	Range β High	Range SE Low	Range SE High
Income							
VTOAV	0.0004	0.0001	2.70+++	0.0003	0.0004	0.0001	0.0001
Income Sources							
CROPVLS	-0.03	0.01	2.12++	-0.03	-0.02	0.01	0.01
PINCOFA	0.004	0.01	0.31	-0.003	0.01	0.01	0.01
PINCOFNA	0.005	0.01	0.46	-0.001	0.01	0.01	0.01
PUNEARN	-0.01	0.01	0.84	-0.01	-0.005	0.01	0.01
Household Characteristics							
DEPRTIO	-0.28	0.16	1.73+	-0.35	-0.18	0.14	0.17
DIST	-0.001	0.008	0.12	-0.005	0.003	0.008	0.009
FHHH	-0.04	0.53	0.08	-0.21	0.18	0.48	0.57
HHSIZE	-0.07	0.05	1.27	-0.10	-0.01	0.05	0.06
ILLIT	0.29	0.30	0.95	0.02	0.56	0.28	0.32
JUMP	-0.10	0.26	0.40	-0.29	0.07	0.24	0.29
PREQ	0.01	0.004	2.43++	0.009	0.01	0.004	0.004
Individual Characteristics							
AGECH	-0.02	0.03	0.81	-0.06	0.002	0.02	0.03
AGECH2	0.0002	0.0003	0.73	-0.00001	0.0006	0.0003	0.0004
SEXCH	0.07	0.25	0.29	-0.14	0.21	0.23	0.27
WHZSCORE	0.19	0.15	1.25	0.12	0.26	0.13	0.17
Constant	-0.95	0.90	1.05	-1.42	-0.51	0.80	1.02
$\bar{R}^2$ Average	0.16	Range: (Low)	0.08	(High)	0.29		
N	84[b]						

[a] Absolute value of ratio of avg. estimated β to avg. SE calculated from 10 randomly-drawn samples (in each sample, each household containing children <6 years old was represented by a randomly selected child), with +, ++, +++ denoting significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

[b] Composition of sample varied each round.

Notes:

AGECH	Age of child (months)
AGECH2	AGECH x AGECH
CROPVLS	Ratio of 1984 crop income to livestock income
DEPRTIO	Household dependency ratio
DIST	Distance (km) to nearest municipio
FHHH	Female-headed household (1=yes, 0=no)
HAZSCORE	Child's height-for-age Z-score (standard deviations away from a standard population's mean)
HHSIZE	Household size
ILLIT	Illiterate household head; male or female (1=yes, 0=no)
JUMP	Household production cluster movement from 1979-84 (1=jump, 0=stay)
PINCOFA	Percentage of 1984 total income from off-farm agricultural labor
PINCOFNA	Percentage of 1984 total income from off-farm nonagricultural labor
PREQ	Percentage of household daily caloric requirement consumed over 24-hour recall period (based on individuals present at 24-hour recall).
PUNEARN	Percentage of 1984 total income from unearned income (rents, interest, etc.)
SEXCH	Gender of child (1=male, 0=female)
TOTINC	Total 1984 income ($Cr)
VTOAV	Average annual value of total real agriculture output (1979-84)
WAZSCORE	Child's weight-for-age Z-score (standard deviations away from a standard population's mean)
WHZSCORE	Child's weight-for-height A-score (standard deviations away from a standard population's mean)

to livestock income was correlated with children's growth, with decreases in that ratio (that is, increases in the relative importance of livestock income) significantly associated with improved height-for-age. More dependents relative to productive household members showed up significantly related to decreases in children's height-for-age. Finally, the percentage of caloric requirement consumed by the household as a whole was positively and significantly linked to height-for-age for young children.

Table 24 presents regression results for the weight-for-age Z-scores equation. Here, average value of total output was dropped in favor of total 1984 income due to the shorter-term nature of the nutritional measure being explained. Only one included variable registered a significant influence. Predictably, height-for-age was strongly (and positively) correlated with weight-for-age (that is, long-

Table 24--Determinants of weight-for-age for all young children

Variable	Avg. β	Avg. SE	t-ratio[a]	Range β		Range SE	
				Low	High	Low	High
Income							
TOTINC	8×10^{-9}	9.1×10^{-9}	0.88	-6.0×10^{-10}	1.5×10^{-8}	8.3×10^{-9}	1.0×10^{-8}
Income Sources							
CROPVLS	0.004	0.007	0.60	-0.006	0.01	0.007	0.008
PINCOFA	-0.007	0.008	0.86	0.01	-0.002	0.007	0.009
PINCOFNA	-0.004	0.007	0.67	-0.01	-0.001	0.007	0.008
PUNEARN	0.005	0.007	0.69	0.002	0.009	0.007	0.008
Household Characteristics							
DEPRTIO	-0.02	0.10	0.18	-0.08	-0.04	0.09	0.11
DIST	-0.007	0.005	1.27	-0.01	-0.003	0.005	0.006
FHHH	-0.09	0.33	0.26	-0.19	0.07	0.31	0.37
HHSIZE	-0.01	0.03	0.42	-0.05	0.009	0.03	0.04
ILLIT	0.20	0.19	1.06	0.12	0.29	0.17	0.21
JUMP	0.06	0.17	0.35	-0.06	0.17	0.16	0.19
PREQ	-0.004	0.002	1.55	-0.006	-0.002	0.003	0.003
Individual Characteristics							
AGECH	-0.007	0.02	0.42	-0.02	0.003	0.02	0.02
AGECH2	0.0003	0.0002	0.15	-0.00008	0.0002	0.0002	0.0002
SEXCH	-0.12	0.16	0.74	-0.23	0.07	0.15	0.18
WHZSCORE	0.69	0.07	9.45+++	0.63	0.75	0.06	0.08
Constant	1.04	0.54	1.92+	0.54	1.46	0.50	0.61
$\bar{R}^2$ Average	0.58		Range: (Low)	0.49	(High)	0.67	
N	84[b]						

[a] Absolute value of ratio of avg. estimated β to avg. SE calculated from 10 randomly-drawn samples (in each sample, each household containing children <6 years old was represented by a randomly selected child), with +, ++, +++ denoting significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

[b] Composition of sample varied each round.

Note: For variable description, see Table 23.

term nutrition strongly affects nutrition in the medium term—its inclusion in the equation boosted average R-square to 0.58).

Table 25 presents the results for the short-term measure of nutritional status, weight-for-height. This was the weakest of all regression equations, with an average R-square of only 0.02, with only the constant registering as significant. Interestingly, long-term nutrition (height-for-age Z-score) did not display any significant link to nutrition in the shortest run (weight-for-height).

CONCLUSIONS

The sample population drawn from the Zona da Mata of Minas Gerais, Brazil, for this analysis was not poorly nourished in terms of meeting

Table 25--Determinants of weight-for-height for all young children

Variable	Avg. β	Avg. SE	t-ratio[a]	Range β Low	Range β High	Range SE Low	Range SE High
Income							
TOTINC	1.0×10^{-8}	1.2×10^{-8}	0.86	1.5×10^{-9}	1.9×10^{-8}	1.1×10^{-8}	1.3×10^{-8}
Income Sources							
CROPVLS	0.008	0.01	0.80	-0.008	0.02	0.009	0.01
PINCOFA	-0.01	0.01	1.02	-0.02	-0.005	0.009	0.01
PINCOFNA	-0.005	0.003	0.55	-0.01	-0.0005	0.009	0.01
PUNEARN	0.009	0.01	0.88	0.003	0.01	0.009	0.01
Household Characteristics							
DEPRTIO	-0.05	0.13	0.35	-0.13	0.03	0.12	0.14
DIST	-0.009	0.007	1.24	-0.01	-0.004	0.006	0.007
FHHH	0.005	0.43	0.01	-0.13	0.18	0.40	0.47
HHSIZE	-0.02	0.05	0.39	-0.06	0.02	0.04	0.05
ILLIT	0.27	0.25	1.10	0.15	0.40	0.23	0.27
JUMP	0.09	0.22	0.39	-0.09	0.28	0.21	0.23
PREQ	-0.005	0.003	1.54	-0.007	-0.003	0.003	0.004
Individual Characteristics							
AGECH	-0.003	0.02	0.13	-0.02	0.01	0.02	0.03
AGECH2	0.00004	0.0003	0.15	-0.0002	0.0002	0.0003	0.0003
SEXCH	-0.11	0.21	0.54	-0.29	0.15	0.19	0.23
WHZSCORE	0.12	0.10	0.19	0.06	0.16	0.08	0.11
Constant	1.29	0.71	1.80+	0.68	1.89	0.66	0.78
$\bar{R}^2$ Average	0 02		Range:	(Low) -0.06	(High) 0.12		
N	84[a]						

[a] Absolute value of ratio of avg. estimated β to avg. SE calculated from 10 randomly-drawn samples (in each sample, each household containing children <6 years old was represented by a randomly selected child), with +, ++, +++ denoting significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

[b] Composition of sample varied each round.

Note: For variable description, see Table 23.

caloric requirements based on household adult equivalents, nor were the children present in 84 of the 384 households particularly malnourished with regard to international standards for children aged 0-6. Our analysis focused on total household caloric intake and the nutritional status of the worst-off child in every household (better-off children were excluded from the analysis in the 36 households having multiple children until the multiple regression stage). To the extent that our focus on aggregate caloric intake and worst-off children biased potentially nonlinear interrelationships examined in this paper, the results should be interpreted with some caution.

Nevertheless, several important interrelationships between food consumption, nutritional status, and a series of household and individual characteristics were revealed by the analysis.

Several strong interrelationships surfaced between farm characteristics and nutrition in the descriptive analysis. Farm size was positively correlated with the long-term and medium-term measures of children's nutritional status, while a U-shaped relationship existed between farm size and the short-term measure of nutritional status (weight-for-height). A strong and consistently negative relationship was detected between distance to nearest major market and both caloric intake and nutritional status of young children. Landlessness was found to be directly linked to poor nutrition of children in rural households but was not conclusively linked to caloric intake. Female-headed households were consistently better fed.

Several important links were established between the income sources and their nutritional status and caloric intake. Degree of reliance on income sources did make a difference: households deriving above average percentage of total income from livestock tended to be both better fed and had better-nourished children, and families that depended more heavily on off-farm employment as a source of income tended to fare worse, both in terms of caloric intake and nutritional status. Composition of income within income source categories also made a difference for the one category we examined, off-farm labor: evidence suggests that off-farm agricultural employment was more directly linked with poor caloric intake than was off-farm nonagricultural employment.

Finally, agricultural output mix, and its changes over time, made a difference for caloric intake and children's nutrition, and highlighted the lack of a direct correlation between higher incomes and better nutritional status. Dairy farms, possibly due to the available source of high quality protein and calorie in dairy products, tended to have the most well-nourished children. Coffee farmers, which, on average, had the second highest income levels, failed to lever this income into either improved caloric intake or improved nutritional status of young children. The off-farm labor cluster (with the absolute lowest income level) did not fare nearly as badly as one would expect in either the caloric intake or the nutritional status measures. Finally, farms with inconsistent production activities over time (that is, those who jumped

from one production cluster to another at least once during the sample period) tended to have less well-nourished children, and made up 100 percent of the poorest fed households in the sample.

Several policy implications and implications for further research can be derived from the results. First, since income sources were seen to influence caloric intake and nutritional status, they could serve as valuable targeting instruments. While some measures of income sources may not be quickly ascertainable, others (for example, households' dependencies on off-farm agricultural income) can aid in the detection of poverty-prone households in this setting. Farm types (defined in terms of output mix) were also shown to affect household caloric intake and measures of nutritional status in children. Since these farm types are readily recognizable by agricultural extension agents and others, their identification could serve as an ideal instrument for rapid field-level poverty assessment.

Secondly, female-headed households were better nourished despite significantly lower purchasing power and access to land, but their children were not above average in terms of our nutritional measures. Clearly there is room for further research to understand how female-headed households generate above average caloric intake from below average entitlements, and why their children don't show any improvement in growth, despite their apparent access to more calories.

Thirdly, the important link between production stability and the performance of children in the height-for-age and weight-for-age nutrition measures suggests that "permanent income" plays a critical role in raising rural families above the poverty line. Families with inter-temporally erratic production patterns were the worst fed, indicating a strong correlation between being at the margin in terms of agricultural production and being at the margin in terms of nutritional status. Policies aimed at stabilizing production patterns might be called for.

3. INCOME SOURCES OF THE MALNOURISHED RURAL POOR IN THE WESTERN HIGHLANDS OF GUATEMALA

Joachim von Braun
David Hotchkiss

This is a study of the sources of both income and employment among rural poor households in the Western Highlands of Guatemala. To provide the context of this research, the role of the subsistence agricultural sector within the traditional dualistic pattern of Guatemalan agriculture should be kept in perspective when assessing the sources of income for small farmers.

A modern export-oriented, large-scale farm sector and a traditional subsistence-oriented, small-scale sector have been in existence for decades. These two sectors are closely linked through the rural labor market. In most cases, the households in the small scale farm sector cannot support themselves by relying only on the production of subsistence crops. The households in this sector farm on average 0.66 hectares, 78 percent of which is allocated to subsistence crops, mostly maize and beans. Employment is sought by household members by moving to the areas of the large-scale export crop sector, located mainly in the lower altitude regions. In recent decades, off-farm work in the urban services sector has increasingly become a source of income for the subsistence farm sector.

This study first looks at the prevalence of malnutrition among the small farmers. The malnourished poor are defined either by the adequacy of their available food supply or by the prevalence of malnutrition among their children. Emphasis is placed on the association between the prevalence of malnutrition and both farm size and the share of income that comes from off-farm sources.

The next section concerns income and employment characteristics of the sample population. The amount of available farm land, the sources of income, and the level of both income and expenditures of the malnourished poor will be compared to those of other households. Are the malnourished poor more likely to have smaller farms? Do the malnourished poor rely more on off-farm sources of income? To what extent do households with malnourished children earn and spend less than other low income rural households? How (un)stable is the distribution of income among the low income households?

SOURCE OF DATA

The household level data used in this research are based on a survey of six Guatemala villages in 1985. The survey was conducted as part of a project that assessed the effects of increased commercialization of smallholder agriculture on production, employment, income, food consumption, and nutritional status of children. This increased commercialization was the result of the organization of small farmers into a cooperative promoting labor intensive vegetable production for exports.

The sample for 1985 was drawn at random from a 1983 Institute for Nutrition in Central America and Panama (INCAP) census of the villages where the cooperative Cuatro Pinos was active, and is divided between members of the cooperative and nonmembers. Comparisons between 1983 and 1985 permit some longitudinal assessment of changes. An earlier study of these data concluded that the increased commercialization significantly increased income and changed the sources of income of the cooperative farmers (von Braun, Hotchkiss, and Immink 1989). Because the sources of income of these households should not be considered representative, only households which are not members in cooperatives—thus the control group of the above mentioned survey—representing 75 percent of the 6 villages' households are included in this analysis. While the exclusion of the cooperative members may exclude the direct effects of the cooperative-related income effects, there are indirect effects to be expected among the noncooperative members. As the expanded production of labor intensive vegetables increased employment in agriculture both for family labor of the actual growers and for locally hired labor, the employment and income from agriculture in these villages may be higher than in other typical communities in the Western highlands.

INDICATORS OF MALNOURISHMENT

Two indicators are used to identify the malnourished poor. The first is the household's estimated calorie consumption in percent of recommended dietary allowance (RDA) in terms of calorie requirements. In this study, data on food purchases and food used from own farm production were used to estimate the household availability of calories. The World Health Organization suggested calorie requirements were used. Two cutoff points identify the calorie-deficient malnourished poor:

- households below 80 percent of RDA are considered malnourished, and
- households below 60 percent of RDA are considered severely malnourished.

The other indicator of nutritional well-being is the anthropometric measure of weight-for-age of children, a medium-term indicator. Because the survey only weighed and measured persons 10 years of age or younger,

this part of the analysis only includes households with children. Again, two cutoff points are used to identify the malnourished:

- households with at least one child under 80 percent of weight-for-age standards are considered malnourished, and,
- households with at least one child under 70 percent of weight-for-age standards are considered severely malnourished.

The weight standards come from the National Center for Health Statistics (NCHS).

PREVALENCE OF INADEQUATE CALORIE AVAILABILITY

Almost one-fourth of the households were malnourished in terms of caloric deficiency in 1985 and about 11 percent were severely malnourished (Table 26).

The farm size does not appear to have a large effect on the prevalence of calorie deficiency. In fact, the prevalence for the top tercile of farm households was slightly greater than that of the other two terciles—almost 30 percent of the larger farm households were malnourished compared to 24 percent of households in the bottom tercile (Table 26). However, households in the landless group (or with very small farms) had the highest prevalence of being below 60 percent of recommended calorie levels.

Table 26--Prevalence of calorie deficiency in different groups, Guatemala, 1985

Group	Total Sample	Calorie Consumption >80 Percent	<80 Percent	<60 Percent
	(N)	(percent of households)		
Farm households by farm size	167	75.4	24.6	10.8
Small (below 0.47 hectares)	80	76.3	23.8	12.5
Medium (0.47 - 0.79 hectares)	53	77.4	22.6	7.5
Large (above 0.79 hectares)	34	70.6	29.4	11.8
(Quasi) landless[a]	44	70.5	29.5	15.9
Households by share of off-farm income in total income	180	75.0	25.0	12.2
< 10 percent	69	81.2	18.8	10.1
10 - 30 percent	18	72.2	27.8	11.1
30 - 60 percent	13	69.2	30.8	15.4
> 60 percent	80	71.3	28.8	13.8

Source: Institute of Nutrition of Central America and Panama/International Food Policy Research Institute Survey, 1985.

[a] The landless and quasi-landless are also partly in the bottom tercile of farm size. They include households with less than 0.25 hectare.

Forty-four percent of the households earn more than 60 percent of their income from off-farm sources. There appears to be an association between the prevalence of inadequate calorie intake and reliance on off-farm income sources. Households that relied on off-farm sources for less than 10 percent of their income were less likely to be malnourished than other households. These households are also the somewhat bigger and more productive farms among the small farms. The prevalence rate of malnourishment was 19 percent for households with the lowest reliance on off-farm sources, compared to 29 percent for households with an over 60 percent reliance on off-farm sources (Table 26). Fewer differences show up in prevalence rates between households earning 10-30 percent and those with higher income shares (Table 26).

PREVALENCE OF CHILD MALNUTRITION AMONG HOUSEHOLDS

Over one-third of the households with children had at least one child below 70 percent of weight-for-age standards. Moreover, three out of every four households had at least one child below 80 percent of weight-for-age standards (Table 27).

While increasing farm size did not have much effect on the prevalence of caloric inadequacy, it significantly increased the chance of having well-nourished children. Table 27 shows that over 41 percent of households in the bottom farm size tercile had at least one child below

Table 27--Prevalence of malnutrition by anthropometric status of children, in different groups, Guatemala, 1985

Group	Total Sample	Weight-for-Age		
		>80 Percent	<80 Percent	<70 Percent
	(N)	(percent of households)		
Farm households by farm size	146	22.6	77.4	34.9
Small	75	17.3	82.7	41.3
Medium	45	28.9	71.1	31.1
Large	26	.9	73.1	23.1
(Quasi) landless[a]	43	16.3	83.7	48.8
Households by share of off-farm income in total income	159	22.6	77.4	34.0
< 10 percent	60	16.7	83.3	40.0
10 - 30 percent	18	27.8	72.2	38.9
30 - 60 percent	11	36.4	63.6	18.2
> 60 percent	70	24.3	75.7	30.0

Source: Institute of Nutrition of Central America and Panama/International Food Policy Research Institute Survey, 1985.

[a] The landless and quasi-landless are also partly in the bottom tercile of farm size. They include households with less than 0.25 hectare.

70 percent of weight-for-age standards, compared to 23 percent for households in the top tercile.

For those households either landless or with very small farms, the prevalence of having a severely malnourished child was 49 percent, which is higher than observed in any tercile of farm households.

The prevalence of having a child below 80 percent of weight-for-age standards and farm size has a weaker relationship. Almost 83 percent of households in the bottom farm size tercile had a child whose weight-for-age measurement fell below 80 percent of the standard, compared to 71 percent for households in the middle tercile and 73 percent for households in the top tercile.

Households with a low reliance on off-farm sources of income were more likely to have a malnourished child than other households. This is contradictory to the household calorie availability analysis. Forty percent of households that relied on off-farm sources for less than 10 percent of their income had at least one child less than 70 percent of the weight-for-age standard, compared to 30 percent for households with an off-farm income share of over 60 percent (Table 27). Households with a more diversified income had the lowest prevalence of having a severely malnourished child.

In sum, while increasing farm size reduces the prevalence of hunger (calorie deficiency) to some extent and significantly reduces the prevalence of child malnutrition, an increased share of off-farm income is associated with a higher level of calorie deficiency as soon as off-farm income share exceeds 10 percent. This association, however, is not translated into a similar pattern for child malnutrition which is highest among households with undiversified income. However, the relationship and interactions between income level, income diversification, food consumption and child malnutrition are certainly not straightforward and linear.

CHARACTERISTICS OF THE MALNOURISHED POOR

In this section, we further assess the income and employment characteristics of the malnourished poor.

Income Level

Total expenditure including value of food from own production is used as an income proxy here.[20] Total expenditures per capita of households consuming below 80 percent of caloric requirements were almost 40

[20] 1983 income statistics were incomplete and total expenditure figures may give more robust comparisons between the two surveys.

percent lower than of non-malnourished households (Table 28). The difference in income (expenditures) between the two groups is considerably smaller if the prevalence of malnourished children is used as the indicator. Table 29 shows that the expenditure per capita of households with at least one child below 80 percent of weight-for-age standards was 355 quetzales, which is only 9 percent lower than the well-nourished households' total expenditures of 388 quetzales. Households with severely malnourished children were, however, on average 20 percent poorer than the households without malnourished children.

Source of Income

Income sources for the malnourished and the non-malnourished households are similar when calorie inadequacy is used as an indicator of malnourishment. Both groups rely on crop production for just over one fourth of their income (Table 28). Transfers and remittances account for about 10 percent of income of both groups. Moreover, if off-farm income is defined as nonagricultural wages plus income from services, both groups have a similar reliance on this source: The malnourished receive 47.7 percent of their income from off-farm income, compared to 47.6 percent for other households.

However, if the prevalence of having an underweight child is used as an indicator, differences exist in the sources of income between malnourished and non-malnourished households (Table 29). For instance, malnourished households received 26 percent of their income from crop production, thus, less than the 32 percent share for non-malnourished households. Moreover, the share of income from other agricultural sources for malnourished households is a negative 12 percent—out-payments of rent and losses in crop operations are mostly responsible

Table 28--Income and employment sources of the poor, by calorie consumption indicators, Guatemala, 1985

Income Source	Calorie Consumption		
	>80 Percent	<80 Percent	<60 Percent
Average percent of household total income from			
Crops (total)	27.3	26.7	29.4
Marketed crops	7.2	13.3	18.7
Other agricultural income	-6.7	-2.1	-4.3
Agricultural wages	22.3	18.2	24.7
Nonagricultural wages	43.7	33.1	33.5
Services	3.9	14.6	11.2
Transfers, remittances	9.5	9.6	5.8
Average total expenditures per capita (quetzales)	418.9	253.1	229.6

Source: Institute of Nutrition of Central America and Panama/International Food Policy Research Institute Survey, 1985.

Table 29--Income and employment sources of the poor, by anthropometric status indicators, Guatemala, 1985

Income Source	Weight-for-Age >80 Percent	<80 Percent	<70 Percent
Average percent of household total income from			
Crops (total)	31.5	26.3	26.7
Marketed crops	11.1	10.2	11.6
Other agricultural income	0.1	-11.6	-28.0
Agricultural wages	14.5	25.3	27.8
Nonagricultural wages	40.3	41.7	50.9
Services	7.8	7.0	7.4
Transfers, remittances	5.3	11.2	15.2
Average total expenditures per capita (quetzales)	388.2	355.3	316.3

Source: Institute of Nutrition of Central America and Panama/International Food Policy Research Institute Survey, 1985.

for this negative statistic. Severely malnourished households have an even larger negative income from other agricultural activities. Both groups rely similarly on nonagricultural wage and service income. Households with severely malnourished children (<70 percent W/A), however, are much more dependent on income from transfers and remittances (15 percent versus 5 percent) and their income share from nonagricultural wages is much higher (50 percent versus 40 percent).

Farm Size

Farm size does not differ in calorie deficiency groups. Households with less than 60 percent of recommended calorie availability have a somewhat smaller average farm size, 0.57 hectares than the 0.67 hectares of better-off households (Table 30).

There are greater differences in farm size if households with malnourished children are compared to those with only healthy children. Table 31 shows that the average farm size of households with malnourished children is 0.57 hectares, compared to 0.80 hectares for other households.

Malnourished households are more likely to have smaller farms than better-off households, whichever indicator is used. Table 30 shows that 62 percent of malnourished households are in the bottom farm size tercile, compared to 49 percent of non-malnourished households. Table 31 shows that 55 percent of households with at least one child with a low weight-for-age measure are in the bottom farm size tercile, compared to 39 percent for other households with children.

Table 30--Distribution of households by farm size and nutritional status, Guatemala, 1985

Indicator	Calorie Consumption		
	>80 Percent	<80 Percent	<60 Percent
Farm size (hectares)	0.67	0.65	0.57
Percent distribution (total)	100.0	100.0	100.0
Small	48.4	61.6	55.6
Medium	32.5	29.3	22.2
Large	19.0	24.0	22.2
(Quasi)landless	24.6	31.7	38.9
Household size	6.6	7.3	7.1
Percent of household <10	41.5	48.2	47.4
Schooling of household head	2.9	2.9	2.9

Source: Institute of Nutrition of Central America and Panama/International Food Policy Research Institute Survey, 1985.

Table 31--Distribution of households by farm size and anthropometric status, Guatemala, 1985

Indicator	Weight-for-Age		
	>80 Percent	<80 Percent	<70 Percent
Farm size (hectares)	0.80	0.57	0.52
Percent distribution (total)	100.0	100.0	100.0
Small	39.4	54.9	60.8
Medium	39.4	28.3	27.5
Large	21.2	16.8	11.8
(Quasi)landless	21.2	31.9	41.2
Household size	6.7	7.2	7.4
Percent of household <10	40.9	50.8	50.5
Schooling of household head	3.8	2.6	2.5

Source: Institute of Nutrition of Central America and Panama/International Food Policy Research Institute Survey, 1985.

Demographic Indicators

Malnourished households are larger and have a greater proportion of children than non-malnourished households. These findings hold regardless of which of the two indicators of poverty is used. The average household size is 7.3 for those under 80 percent of recommended calorie levels and 6.6 for other households (Table 30). Table 31 shows similar findings if the sample is classified by anthropometry of children.

The age composition of malnourished poor (calorie deficient) households is younger than that of better off households. Table 30 shows that the average percent of household members under 10 years of age was 48.2 percent for malnourished households, compared to 41.5 percent for non-malnourished households. Again, if the sample is classified by the prevalence of malnourished children, a similar pattern emerges (Table 31).

For differences between the two groups' educational attainment level of the household head, the type of indicator of the malnourished poor does make a difference. For example, the average number of school years completed is not different by degree of caloric adequacy: The number of completed years of education of the household head of both malnourished and non-malnourished households was 2.9 (Table 30). However, if the caloric indicator of well being is replaced with the childrens' anthropometric variable, educational attainment does differ: The number of school years completed by the household head was 3.8 years for those households with all children with adequate weight-for-height measurements, compared to 2.6 years for those with a malnourished child (Table 31). This is an indication that education plays a role in the nutritional status of children in the region, through its impact on either labor productivity and income and/or productivity in home goods production, which translates into child welfare.

CONCLUSIONS

Our bottom-line findings are that:

- Households without severely malnourished children (below 60 percent weight-for-age) have an income which is 23 percent higher than that of households with severely malnourished children;
- Households with serious calorie deficiencies have an income lower by 45 percent than non-deficient households;
- Crop income is only about 27 percent of total income, while nonagricultural income from wages, services, and transfers is 58 percent among the malnourished rural poor;
- The share of (quasi) landless among the malnourished is about twice that among the non-malnourished (41 percent versus 21 percent).

Both groups, malnourished and non-malnourished households, rely heavily on off-farm income sources of nonagricultural wage employment and services. However, among households with severely malnourished children, nonagricultural wages appear to play an even greater role, as it supplies these households with over 50 percent of their income. Moreover, income from transfers and remittances was greater for households with malnourished children.

Households with the least reliance on nonagricultural wages had the lowest prevalence of inadequate food supplies but the highest prevalence of having an underweight child. It should be remembered, however, that weight-for-age is a medium term indicator of nutritional status much influenced by health and sanitation. As a result, current food availability does not affect the anthropometric measure. Nutrition-improving development in this economically diversified setting cannot rely solely on agricultural income growth but agricultural growth remains central to nutritional improvement. In households with severely malnourished children, all agricultural income (own and wages) was 26.5 percent of total income, whereas in households above the 80 percent cutoff point, this was 46.1 percent.

Further analyses on this data set have shown that the health and sanitation environment are critical determinants of nutritional improvement in this setting (von Braun, Hotchkiss, and Immink 1989). Also identified were large fluctuations in income positions among the poor. Only 40 percent of households in the bottom tercile in 1983 were identified in the bottom tercile of total expenditure in 1985. Some had moved up, others had dropped down. It should, therefore, not come as a surprise that a medium-term anthropometric measure (weight-for-age) is not highly income "responsive" in a cross-sectional analysis. Nevertheless, a significant income-nutrition link and a significant calorie consumption-nutrition link was found in multivariate analyses for cohorts of children (von Braun, Hotchkiss, and Immink 1989).

4. SOURCES AND INSTABILITY OF INCOME OF THE MALNOURISHED RURAL POOR IN THE GAMBIA

Detlev Puetz
Joachim von Braun

INTRODUCTION

The study area is located in a semi-arid setting in central Gambia, 300 kilometers east of the country's capital, Banjul. Agriculture is characterized by a land-surplus situation. Crop production is concentrated in the single rainy season with some irrigated rice and vegetables grown during the dry season. Seasonality of income, food availability and health environment is an important problem. Income-earning and consumption activities are institutionalized through complex production and consumption subunits in the extended family households of 17 persons on average. These households are commonly referred to as "compounds." Farming is organized in two distinct ways: there is a communal farm under the control of the compound head; and, there is a set of private farms comprising of fields allocated to individuals for growing cash crops, mainly groundnuts, cotton, and rice, under their personal control.

Communal crops, mostly millet, sorghum, maize and rice, are produced by the combined labor of all compound members—all men and women have a customary obligation to provide labor to the communal fields (von Braun and Webb 1989). Craft work, trading, and remittances are the most prominent sources of nonagricultural income. While individuals within the compound economy tend to specialize in some off-farm activity, they also remain involved in crop production. Thus specialization in this setting takes place, to a large extent, in an intrahousehold form, rather than by whole household units.

The Data

The data are based on detailed household surveys undertaken in 1985/86 and 1987/88 by IFPRI in collaboration with the Programming, Planning and Monitoring Unit for the Agricultural Sector (PPMU). The original sample was around a rice development project. The first survey consisted of a wet season ('hungry season') and a postharvest dry season round. The second survey was confined to the dry season for anthropometric and consumption data, but contained long-term recalls of agriculture and off-farm income.

Income is assessed at the field level from crop production (plot by plot), and by individual adult from livestock and off-farm sources. Consumption information is aggregated to food energy (calories) on the basis of seven-day recalls of consumption in the cooking unit and individual snack food surveys. Anthropometric surveys for all children under 10 years were part of the surveys, but, to facilitate comparison with other surveys in this volume, only the results for children aged 7-60 months are presented here.

PREVALENCE OF HUNGER AND MALNUTRITION

Hunger and malnutrition in this setting are both chronic and transitory in nature. The chronic hunger relates to the very low incomes in this area. On top of this, transitory hunger and malnutrition are amplified by intra-year, seasonal fluctuations between the wet and dry seasons and by large year-to-year fluctuations resulting from droughts and other crop failures. Table 32 highlights the scale and seasonal pattern of malnutrition and hunger of the richest 25 percent households versus the poorest 25 percent households in the sample. On average, the richest quartile has neither in the wet season nor in the dry season a significant shortfall in food energy consumption, whereas the bottom quartile, on the other hand, consumes on average 35 percent less calories than the top quartile in the wet season. The consumption shortfall in the poorest households is reflected in the children's growth performance: these children are much more frequently stunted as indicated by height-for-age and weight-for-

Table 32--Income, hunger, and malnutrition in different seasons, The Gambia, 1985/86

Indicator	Age of Children	Season	Income Groups[a] Bottom Quartile	Income Groups[a] Top Quartile
	(months)			
Calories consumed		wet	1,893	2,917
		dry	2,176	2,972
Height-for-age <90 percent[b]	6 - 59	wet	30.1	14.3
	60 - 120	wet	11.0	3.0
Weight-for-age <80 percent[b]	6 - 59	wet	40.5	39.3
		dry	28.5	20.8
	60 - 120	wet	32.8	15.2
		dry	16.7	10.5

Source: 1985/86 survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

[a] Total expenditure used as income proxy.

[b] WHO/NCHS standard.

age indicators. While seasonal fluctuations in children's weights are also found among the top quartile households, children from the poorest quartile remain much more frequently below the critical cutoff points of weight-for-age in both seasons. This may then result in the high levels of stunting observed in the long run.

Farm Production, Hunger, and Malnutrition

The relationship between farm size, hunger, and malnutrition in this setting cannot be usefully explored by simply relating the acreage of cultivated land to consumption and nutrition indicators. Yields in this area range from 10 tons per hectare per annum of paddy from irrigated rice using modern technology, on one hand, to about 300 kilograms of sorghum in rainfed upland fields, on the other hand. We, therefore, express farm size in terms of production value per adult equivalent and form farm "size" classes on the basis of this volume-related indicator.

Less than 10 percent of the large farmers' group (top tercile) falls below the cutoff point of 80 percent of calorie requirements per adult equivalent person in either season (Table 33), whereas 21-23 percent of the small farmers' group (bottom tercile) are below that cutoff point in both seasons. An interesting point to note is that the medium tercile shows the largest impact of seasonality: it is as calorie-deficient as the bottom tercile in the wet season (hungry season), but recovers up to the level of the top tercile in the dry season. This is not the case with the smallest farms. The highest prevalence of malnutrition among

Table 33--Farm size and prevalence of malnutrition by calorie consumption indicator, The Gambia, 1985/86

Households by Farm Production Size[a]	Sample		Calorie Consumption					
			>80 Percent		<80-60 Percent		<60 Percent	
	WS[b]	DS[b]	WS	DS	WS	DS	WS	DS
	(N)	(N)	(percent of households[c])					
Small	70	70	77.1	78.6	18.6	15.7	4.3	5.7
Medium	71	69	77.5	88.4	18.3	8.7	4.2	2.9
Large	71	70	90.1	92.9	5.6	7.1	4.2	...

Source: 1985/86 survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

[a] "Farm size" is measured in production value per adult equivalent person; small, medium, large refers to bottom, middle, top tercile.

[b] WS: wet season.
DS: dry season.

[c] "Household" refers to compounds or respective subunits where compounds are subdivided into distinct work and food economies.

children in both seasons is found in the group of small farms (Table 34), where, it is reminded, size is defined in terms of production value per adult equivalent, not by land area. Clearly, agricultural performance matters for hunger and malnutrition in this setting, where agriculture plays a critical role for income earning and for household food availability (von Braun 1988).

ANNUAL AND SEASONAL INCOME FLUCTUATIONS

Total income, as well as income from different sources, fluctuates strongly from year to year (Table 35). Variability of agricultural production and changes in absolute and relative crop prices produce large fluctuations in agricultural income. The degree to which rural households are affected depends on their pattern of income diversification and their ability to adjust their income portfolio to changing production and price environments.

Between 1985/86 and 1987/88, the average annual income of survey households declined by 26 percent, from 778 dalasi per adult equivalent to 576 dalasi (Table 35). Declines in cereal production, combined with falling prices for rice and coarse grains, led to a dramatic decrease of cereal income in 1987: income from dry season rice decreased 56.7 percent and from wet season cereals, 70.6 percent. The decline in food crop production was only partly offset by increased income from groundnuts—through both higher production and crop prices—and income from off-farm sources.

Table 34--Farm size and prevalence of malnutrition by anthropometric status indicator, The Gambia, 1985/86

Households by Farm Production Size[a]	Sample[b]		Weight-for-Age					
			>80 Percent		<80-60 Percent		<60 Percent	
	WS[c]	DS[c]	WS	DS	WS	DS	WS	DS
	(N)	(N)	(percent of households[d])					
Small	58	50	31.0	54.0	60.3	42.0	8.6	4.0
Medium	56	48	44.6	66.7	58.4	33.3	...	...
Large	50	45	42.0	57.8	54.0	40.0	4.0	2.2

Source: 1985/86 survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

[a] "Farm size" is measured in production value per adult equivalent person; small, medium, large refers to bottom, middle, top tercile.

[b] This sample excludes those households without children aged 7-60 months.

[c] WS: wet season.
DS: dry season.

[d] "Household" refers to compounds or respective subunits where compounds are subdivided into distinct work and food economies.

Table 35--Income per adult-equivalent, The Gambia, 1985/86 and 1987/88 (in constant February 1986 dalasi)

Income Source	All Villages		Lowland		Upland	
	1985/86	1987/88	1985/86	1987/88	1985/86	1987/88
	(dalasi/adult equivalents and percent shares of total)					
Annual income	778	576	728	405	845	803
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
Annual crop	613	399	528	217	725	640
	(78.8)	(69.0)	(72.5)	(52.7)	(85.8)	(79.7)
Annual off-farm	162	179	210	195	98	159
	(20.8)	(31.0)	(28.8)	(47.3)	(11.6)	(19.8)
Dry season rice	104	45	148	68	45	14
	(14.3)	(7.8)	(22.5)	(16.8)	(5.5)	(1.7)
Wet season crops						
Cereals	326	96	303	57	356	147
	(44.9)	(16.7)	(46.0)	(14.1)	(43.6)	(18.3)
Groundnuts	171	256	71	91	305	476
	(23.6)	(44.4)	(10.8)	(22.5)	(37.4)	(59.3)
Off-farm work	119	148	159	160	67	133
	(15.3)	(25.7)	(21.8)	(39.5)	(7.9)	(16.6)
Transfers, remittances	43	32	51	36	32	26
	(5.5)	(5.6)	(7.0)	(8.9)	(3.8)	(3.2)
Female income	183	111	220	77	134	157
	(24.0)	(19.3)	(31.5)	(19.0)	(16.4)	(19.6)
Cash income	276	363	211	243	375	546
	(38.0)	(63.0)	(32.1)	(60.0)	(46.0)	(68.0)

Source: 1985/86 survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia; and 1987/88 follow-up survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

Note: Differences in sums due to rounding of values.

There is a striking difference in the development of income between villages by their location: households in lowland villages—which traditionally place great emphasis on swamp and irrigated rice production—lost 44.4 percent of their 1985/86 income in 1987/88. Upland villages on the other side—that cultivate mostly rainfed groundnuts and coarse grains—retained nearly the same income level as before (a mere 5 percent decrease). Households in upland villages largely managed to divert resources from cereal production to more profitable groundnuts and, thereby, maintained their income levels. Their counterparts in lowland villages, however, were hit hard by a combination of declining rice prices and operational problems in the irrigated rice project which led to significantly reduced yields (von Braun, Johm, Kinteh, and Puetz 1990). It appears that a strong focus on rice—which in 1985/86 provided more than 60 percent of their income—reduced these households' ability to cushion the impact of sudden disruptions in production and price changes. They failed to

digress into alternative crops and employment opportunities. Upland villagers in 1987/88 were fortunate, although a high dependence on income from groundnuts (nearly 60 percent) could have hurt them in a similar way if either yields or crop prices had dropped.

When incomes decline, savings and disinvestments, such as selling of animals, can provide additional means for stabilizing expenditure levels and consumption. Animal ownership in lowland villages dropped by 34 percent between 1986 and 1988, while in the same period farmers in upland villages increased their animal stocks by about 8 percent. In 1987/88, expenditure in lowland villages was 10.7 percent below that in 1985/86, which is a far smaller decline than the above noted decline in income (44.4 percent) during the same period. Thus, fluctuations in incomes did not directly translate into similar fluctuations in expenditures.

Income Sources

While total annual income decreased between 1985/86 and 1987/88, off-farm income—from work and remittances—went up by about 10.5 percent, and its share of total income rose as high as 47.3 percent in lowland villages (Table 34). Transfers and remittances declined, not surprisingly, given the harsh economic conditions in urban areas resulting from a structural adjustment program, which was initiated in 1986. On the other hand, local off-farm work income increased. However, improved opportunities in this sector were confined to those villages with favorable income development in the primary income sector, agriculture. Local growth linkages doubled off-farm work income in upland villages, but they appear to be missing in the less fortunate lowland villages. Shifts in the composition of off-farm work income also reflect this trend (Table 36). Income from services and crafts more than doubled in upland villages, most likely as a response to increased demand, while it decreased in lowland villages. Households in lowland villages in 1987/88 depend more on work as hired farm or other wage laborers. On the other hand the decline of wage labor in upland villages reflects the increased opportunity costs of agriculture, particularly groundnut production, in these villages.

Stability of Income Groups

Incomes in lowland and upland villages went into different directions, yet a remarkably large share of households that were in the poorer income groups (lower half) in 1985/86 found themselves in the same groups in 1987/88. For the total sample, 61.7 percent of households stayed in the bottom half of the income groups. In upland villages, even 65.9 percent stayed in the relatively poor groups while in lowland villages, where total income fluctuated more strongly, this figure is somewhat lower, 57.4 percent. The numbers for the upper income groups are 60.8 percent, 58.2 percent, and 65.9 percent, respectively.

Table 36--Off-farm work income sources, The Gambia, 1985/86 and 1987/88

Off-Farm Income Source	All Villages 1985/86	All Villages 1987/88	Lowland 1985/86	Lowland 1987/88	Upland 1985/86	Upland 1987/88
	(dalasi/adult equivalent and percent shares of total)					
Total annual off-farm work[a]	119 (100.0)	148 (100.0)	159 (100.0)	160 (100.0)	67 (100.0)	133 (100.0)
Farm Labor	7 (6.1)	13 (9.1)	4 (2.5)	13 (7.9)	11 (16.4)	15 (11.0)
Nonfarm wage labor	22 (18.0)	19 (12.8)	29 (18.2)	32 (20.2)	12 (17.9)	1 (1.0)
Crafts work	28 (23.8)	35 (23.6)	42 (26.4)	32 (20.2)	10 (14.9)	39 (29.0)
Services	62 (52.1)	81 (54.5)	83 (52.2)	83 (51.7)	34 (50.7)	78 (58.9)

Source: 1985/86 survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia; and 1987/88 follow-up survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

[a] Excluding transfers and remittances (see Table 34 for these).

Thus for a majority of households relative poverty and wealth are not transitory but appear to have structural reasons.

Income Sources and Income Differentiation

To what extent is permanent poverty or wealth related to the main income sources of these households? We address this question by looking at the income accounts of those households that fall into the poorest and richest income quartile in both years of the survey (income halves respectively in the breakdown by location). In 1985/86 the annual income of the upper income group was about three times as high as that of the lower income group (Table 37). This income disparity increases in 1987/88 to a factor of about 5.4, largely because of erosion of income at the low end of the distribution. In general, richer households appear to be better able to maintain their income level than the poorer ones. This is particularly true for upland villages where richer households managed better at switching into the more profitable groundnut production. On the other hand, the richer households in lowland villages who put most of their eggs into the rice basket lost as many of them as the poorer ones when rice yields and prices tumbled.

Permanently poorer groups—especially when contrasting the extreme quartiles—show a higher share of off-farm income in total income. Yet off-farm income plays also an important role in the income strategy of

Table 37--Income structure of households in the same income groups, The Gambia, 1985/86 and 1987/88

Income Source		All Villages Lowest Quartile	All Villages Highest Quartile	Lowland Lower Half	Lowland Upper Half	Upland Lower Half	Upland Upper Half
Annual income (dalasi)	1985/86	444	1,333	520	1,081	483	1,096
	1987/88	208	1,125	258	606	274	1,005
Shares of annual income (percent)							
Off-farm	1985/86	28.6	13.2	25.4	32.0	15.9	11.4
	1987/88	31.8	22.3	39.9	51.2	33.3	18.6
Groundnuts	1985/86	15.4	38.7	10.6	7.2	28.8	46.7
	1987/88	35.9	54.8	23.7	14.5	47.8	60.0
Cash income	1985/86	32.0	48.0	28.0	35.0	42.0	47.0
	1987/88	55.0	75.0	57.0	62.0	65.0	69.0
Female	1985/86	32.7	16.6	39.2	32.0	19.4	14.3
	1987/88	26.7	18.1	21.4	21.2	32.9	18.1
Shares of off-farm work income (percent)							
Farm labor	1985/86	5.4	5.4	2.9	0.7	13.0	19.6
	1987/88	7.0	7.7	22.0	4.0	18.3	9.7
Wage labor	1985/86	5.5	25.5	5.1	15.5	19.8	15.6
	1987/88	10.6	1.5	18.1	21.8	1.2	1.0
Crafts	1985/86	0.4	42.4	13.7	35.6	5.6	15.4
	1987/88	15.6	26.5	30.6	32.7	28.0	23.8
Services	1985/86	89.0	26.7	78.3	48.2	61.6	49.5
	1987/88	66.8	64.3	29.3	41.5	52.5	65.5
Household size (adult equivalents)	1985/86	9.55	8.02	10.18	9.33	7.82	9.25
	1987/88	9.52	10.50	10.54	11.85	8.45	11.18

Source: 1985/86 survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia; and 1987/88 follow-up survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

richer households in lowland villages where it contributes between 32.0 and 51.2 percent of total income (in 1985/86 and 1987/88 respectively). Lowland villages, located near the main highway, contain the commercial centers of the area. In these villages off-farm income sources contribute strongly to income differentiation and relative wealth, particularly in years of poor agricultural performance.

Further disaggregation of the off-farm work sources shows that households of the highest income quartile receive absolutely—and also relatively in most cases—more income from craft work (tailors, black- and goldsmiths, bakers etc.) than the poorer group. Wage labor loses some importance for the richer group in 1987/88 after retrenchments and

pay cuts in the government sector made it more difficult and less attractive to look for official jobs. In both years income from hired farm labor plays only a small role for the lowest and highest income quartiles. However, including other income groups in the analysis (as in the comparison of lower and upper income halves by location), shows that work on other people's farms is increasingly important for lower income households when their own harvests are relatively poor, as was the case in 1987/88.

Most important for income differentiation, poorer and richer households differ in the absolute amount and share of income received from groundnut production. Groundnut income is significantly larger in upper income households. Thus a household's potential—labor and capital resources (technology)—to produce groundnuts, largely determines its income level.

Lower income households show higher income shares for women. This partly reflects the fact that women traditionally are more involved in rice than in groundnut production. It also appears that with increased income levels, women's participation in the work force decreases, and given the high labor demand from household chores women work less in income earning activities.

Table 37 also reveals an interesting phenomenon about household growth and personal mobility at this African location. While the number of household members in the most wealthy quartile increased by nearly one third, from 8.02 to 10.5 members in the two years between the surveys, the size of permanently poor households in the lowest income quartile stagnated, with 9.55 and 9.52 members in the respective years. In this environment with extended family systems beyond the compound boundaries, interhousehold migration is common to offset regional or individual households' income fluctuations. This includes settlement of nonfamily labor in those households that look most promising in their income perspectives.

INCOME SOURCES OF FOOD INSECURE AND MALNOURISHED HOUSEHOLDS

How do different income levels and sources of income relate to food insecurity and malnutrition in the context of The Gambia survey? Households with a reasonably sufficient calorie consumption level in the critical wet season (above 80 percent of requirements) tend to have more diversified income sources than the more deficient households (Table 38). The income share from crops is 76.9 percent for households with more than 80 percent of requirements versus 85.2 percent for the group with below 80 percent of requirements (weighted average of the 60-80 percent group and the below 60 percent group). The better-off group has relatively higher income shares from nonagricultural wages and income from craft work, services and remittances. Their total expenditure is more than 50 percent higher than that of the group which consumes less than 80 percent of required calories per adult equivalent.

Table 38--Income sources of households by calorie consumption level, The Gambia, wet season, 1985

Indicator	Calorie Consumption >80 Percent	<80-60 Percent	<60 Percent	Total Averages
N	173	30	9	212
Average percent of household total income from				
Crops (total)	76.9	88.1	75.6	77.9
Marketed crops	23.5	25.3	31.8	24.0
Other agricultural (incl. livestock)	1.3	...	3.0	1.3
Agricultural wages	1.2	0.9	0.1	1.1
Nonagricultural wages	2.8	1.8	1.6	2.6
Crafts work	3.3	0.7	4.7	3.1
Services and others (incl. trading)	9.4	7.8	8.2	9.2
Transfers, remittances	6.0	3.2	3.4	5.7
Annual expenditures per capita (dalasi)	1,532	1,013	943	1,434
Household size (persons)	10.67	13.97	12.67	11.22
Percent of children less than 10 years of age	17	22	18	18

Source: 1985/86 survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

Similar trends emerge for dry season consumption. Comparing households struck by continuously low calorie consumption in both 1986 and 1988 with those in the top calorie intake group, we find significantly higher income and expenditure levels for households that are permanently well-fed (Table 39). The most significant difference in the income structure of these two groups is the income share from the main cash crop, groundnuts. For instance, in 1987, groundnuts contributed 58.8 percent of income in households with high consumption, compared to only 41.6 percent in the low calorie households. This underlines the importance of agricultural income, but not necessarily food production, for food security. Also, corresponding to the wet season, mean off-farm income and its share in total income is higher for the best nourished households in the dry season, although the difference of shares is not very large (an average share of 24.0 percent versus 21.8 percent for the two years). But, surprisingly, households with higher shares of off-farm income are also often found in lower calorie intake categories (Table 40). In both dry seasons, around 40 percent of households with an off-farm income share between 10 and 60 percent belong to the lowest tercile of calorie consumption, compared to less than 30 percent for those with less than 10 percent off-farm income. There are two reasons for this. First, these households are better able to smooth out consumption over the year and thus are less in need to increase consumption in the dry season in order to compensate for weight losses suffered during the wet season ("hungry" season). Such weight losses are often the combined result of low caloric intake and high

Table 39--Income sources of households by calorie consumption level, The Gambia, dry seasons, 1986 and 1988

Indicator	Calorie Consumption Terciles			
	Lowest		Highest	
	1986	1988	1986	1988
N	25[a]		26[a]	
Annual income (dalasi)	731	488	836	716
Average percent of household total income from				
Crop income	79.3	71.3	77.6	73.6
Off-farm income	18.7	24.8	19.9	28.2
Groundnut income	20.2	41.6	27.5	58.8
Cash income share	38.0	63.0	43.0	71.0
Female income share	20.0	20.1	22.1	16.3
Dry season expenditure (dalasi)	690	573	1,087	907
Household size (adult equivalents)	10.42	11.66	6.95	8.06

Source: 1987/88 follow-up survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

[a] The observations relate to households which in both surveys fall in the respective groups.

energy expenditures during that season. Households which specialize in agriculture are more prone to such fluctuations and reveal the highest level of calorie deficiency in the wet season (Table 40). But as documented earlier (Table 33), this affects households with large per capita agricultural production less than small and medium farms. Second, when higher shares of off-farm income are largely a consequence of low agricultural production and low overall income levels—thus a symptom of poverty—their relationship to food consumption tends to be negative, since it mainly reflects the adverse impact of the low income level on food security.

Household food insecurity over time shows a stability similar to that observed in low income groups. In the two comparable consumption surveys—of February 1986 and 1988—41 percent of all households with lowest caloric intake (the bottom tercile) in the first survey were found in the same group in the second one. This figure is 43 percent for the lowland villages where fewer households managed to improve consumption than in upland villages where the figure stands at 37 percent.

Income and Children's Malnutrition

How far are different income levels and sources related with children's malnutrition? Comparing different categories of households which are grouped by the criteria of having malnourished children,

Table 40--Off-farm income and calorie consumption level, The Gambia, wet season, 1985, and dry seasons, 1986 and 1988

Share of Off-Farm Income in Total Income	N	Total Annual Income[a] 1985/86	Calorie Consumption (Wet Season 1985)			Caloric Intake Terciles Dry Season 1986			N	Total Annual Income[a] 1987/88	Caloric Intake Terciles Dry Season 1988		
			>80 Percent	60-80 Percent	<60 Percent	Lowest	Medium	Highest			Lowest	Medium	Highest
		(dalasi)	(percent of households)							(dalasi)	(percent of households)		
< 10 percent	71	691	76.4	15.3	8.3	29.6	35.2	35.2	40	606	27.5	40.0	32.5
10-30 percent	69	699	79.7	18.9	1.4	39.1	27.5	33.3	56	517	42.9	26.8	30.4
30-60 percent	34	678	91.4	5.7	2.9	38.2	38.2	23.5	55	447	38.2	29.1	32.7
> 60 percent	8	894	87.5	-	12.5		50.0	50.0	33	440	18.2	39.4	42.4

Source: 1985/86 survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia; and 1987/88 follow-up survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

[a] Median.

defined in terms of weight-for-age, suggests that those with reasonably well-nourished children in the critical wet season (above 80 percent of weight-for-age standard) tend to have slightly higher incomes (with expenditure used as an income proxy), a higher income share from marketed crops, and lower shares from wage incomes (Table 41). Yet, again, income shares from particular sources, on their own, are not indicative for malnutrition. Comparing the incidence of malnutrition by off-farm income categories shows that, in a year where overall income levels do not differ that much across these groups (1985/86), a higher share of off-farm income parallels less malnutrition (Table 42). The reverse is the case for 1988. A clear demographic difference, however, emerges in this grouping which shows a smaller household size in the group of households without malnourished children (Table 41).

Altogether, malnutrition in the survey households between 1986 and 1988 follows the earlier discussed income development: with lower income in lowland villages, the prevalence of malnutrition increases, but there are no significant changes in the uplands (von Braun, Johm, Kinteh, and Puetz 1990). Altogether, out of 106 households with children aged 7-60 months, 56 households maintained their nutritional status, 35 changed for the worse, and only 15 improved. In lowland villages, the nutritional status worsened for 41 percent of surveyed households compared with 22 percent in upland villages.

Table 41--Income sources of households by anthropometric status indicator, The Gambia, wet season, 1985

Indicator	Weight-for-Age (Children 7-60 Months)		
	>80 Percent	60-80 Percent	<60 Percent[a]
N	64	93	7
Average percent of household total income from			
Crops (total)	77.6	76.7	60.9
Marketed crops	25.3	20.6	17.3
Other agricultural (including livestock)	1.6	.5	4.0
Agricultural wages	.8	1.4	2.6
Nonagricultural wages	2.0	3.0	3.4
Crafts work	4.7	1.8	12.0
Services and others (including trading)	10.3	10.3	7.9
Transfers, remittances	5.0	6.2	7.5
Total expenditures per capita (dalasi)	1,418	1,269	(1,568)
Household size (persons)	9.18	11.21	16.53
Percent of children less than 10 years of age	16	21	18

Source: 1985/86 survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

[a] Only a very small proportion of the sample falls in this group.

Table 42--Off-farm income and prevalence of malnutrition by anthropometric status, The Gambia, 1985, 1986, 1988

Share of Off-Farm Income in Total Income	Wet Season 1985				Weight-for-Age (Dry Season) 1986				1988			
	N	All >80 Percent	At Least 1 Child 60-80 Percent	At Least 1 Child <60 Percent	N	All >80 Percent	At Least 1 Child 60-80 Percent	At Least 1 Child <60 Percent	N	All >80 Percent	At Least 1 Child 60-80 Percent	At Least 1 Child <60 Percent
	(percent of households)				(percent of households)				(percent of households)			
< 10 percent	56	35.7	62.5	1.8	49	49.0	51.0	...	30	60.0	40.0	...
10-30 percent	57	42.1	52.6	5.3	52	57.7	38.5	3.8	45	53.3	44.4	2.2
30-60 percent	30	40.0	53.3	6.7	23	69.6	30.4	...	38	31.6	65.8	2.6
> 60 percent[a]	8	25.0	62.5	12.5	6	66.7	33.3	...	24	29.2	70.8	...

Source: 1985/86 survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia; and 1987/88 follow-up survey by International Food Policy Research Institute/Planning, Programming, and Monitoring Unit, Ministry of Agriculture, The Gambia.

[a] Only a very small proportion of the sample falls into this category in 1985/86.

Cash and Female Income Shares

The share of income earned in cash—by selling agricultural produce or working off-farm for cash payments—as opposed to in-kind income, which includes consumption of home-grown agricultural produce and in-kind payments, does not seem to affect the nutritional status of households in a negative way. On the contrary, the average cash income share of households which had no child falling below 80 percent weight-for-age in both 1986 and 1988 was slightly higher than in those households which counted at least one of their preschool children in that category (54.5 percent versus 53.5 percent). Similarly, multivariate analysis based on the sample of children up to the age of 10 years shows that, after controlling for total income levels, increased income shares from cash crops have a small, but positive, effect on children's nutritional status in weight-for-age Z-scores (Table 43).

At the same time, households with the highest calorie consumption show higher cash income shares in both dry seasons 1986 and 1988 than those with the lowest calorie consumption (43 percent versus 38 percent in 1986 and 71 percent versus 63 percent in 1988) (Table 39). This is consistent with findings reported in von Braun, Puetz, and Webb (1989) that the share of cash income had a significant positive impact on caloric intake in dry season 1986. It was also found that there is no difference in households' marginal propensity to spend on food out of cash versus kind income in this setting.

Table 43--Effects of income, income composition, and income control on nutrition of children: regression analysis

Dependent variable: Explanatory Variables	Weight-for-age Z-score values of children aged 7-120 months[a] Beta	t-value	Mean
Income[b]	0.0749	(2.91)	1295.21
Income squared[b]	-1.487E-05	(-2.00)	$(1295.21)^2$
Income share from cash crops	0.267	(1.62)	.23
Male off-farm income share	-0.4649	(-2.59)	.18
Female income share	-0.5762	(-0.99)	.24
Age (months)	2.3634	(6.16)	56.62
Age (squared)	-0.01151	(-3.57)	$(56.62)^2$
Sex (1=male, 2=female)[c]	8.8169	(1.57)	1.51
Constant	-282.409		
R^2	0.111		
F-value	20.23		
Degrees of freedom	1,227		

[a] Dependent variable = Z-score value multiplied by 100.

[b] Total annual expenditure per capita is used as income proxy.

Female income shares do not appear to differ significantly for households with better or worse status in food security or child malnutrition. Although in 1987/88 they are slightly higher in households that fare worst on both accounts this again is a reflection more of the generally bad situation in lowland villages in that year than of a negative impact of female income shares. This is because traditionally in lowland villages women spend more time in agriculture and thus contribute a higher share of income than in upland villages.

Other Factors Causing Malnutrition

The causes of malnutrition are complex, related last but not least to the health and sanitation environment. As explored in multivariate regression analysis, income and its impact on food consumption is only one important explanatory factor for nutritional outcomes. Sequences of disease attacks, age, sex, and relationship of child to household head play a significant role in determining nutritional income. (These relationships are further explored in von Braun, Puetz, and Webb 1989.)

Further analysis also shows that income-consumption-nutrition relationships are not linear. Incremental income and incremental food consumption show a much more significant effect for nutritional improvement in the groups of households with severely malnourished

children (children below -3 scale Z-scores of weight-for-age) versus children which are less severely malnourished (-2 scale Z-scores of weight-for-age). For children to be malnourished to the extent of falling below -3 scale Z-scores of weight-for-age is three times less likely with incremental calorie consumption at household level than the probability for children falling below -2 scale Z-score weight-for-age responding to incremental calorie consumption of the same magnitude (for details of the model analysis, see von Braun 1988).

CONCLUSION

In this West African Sahelian setting, agriculture plays a key role in income generation and food availability. Low levels of crop production, accompanied by high fluctuations are key determinants of food consumption and nutrition. Households with lower levels of calorie deficiencies and malnutrition tend to have more diversified income sources and less fluctuations in their income streams. However, the differences in income source patterns are not large between the hungry, malnourished poor and the other low income households in this area. Agricultural growth and development remain a key force for nutritional improvement in this setting. But to achieve effective translation of agriculture growth and the resulting income growth into nutritional improvement requires joint promotion of health and sanitation in this setting where child malnutrition is much determined by disease attacks.

5. INCOME SOURCES OF THE MALNOURISHED RURAL POOR IN A DROUGHT YEAR IN BURKINA FASO

Thomas Reardon

INTRODUCTION

This chapter discusses the income sources of the malnourished rural poor during the drought year of 1984/85 in Burkina Faso. First, the household characteristics of the malnourished versus adequately nourished groups are described. Then, the income sources of these groups are compared.

Reardon and Matlon (1989) examined the incidence of hunger in the Sahelian and Sudanian zones of Burkina Faso (using the same data base as is used for this paper) and showed that during 1984/85, following the Sahel drought, hunger was prevalent in the Sudanian zone (the Mossi Plateau), but was much less so in the Sahelian zone. They hypothesized that the difference was due to lower purchasing power in the Sudanian zone despite the latter's higher rainfall, and despite yields per person that are similar to those of the Sahelian zone.

Reardon, Matlon, and Delgado (1988) investigated the hypothesis of the Sudanian zone's having lower purchasing power, and whether it is linked to differences in the share of non-cropping income in total income across zones. They compared income sources between the Sahel and Sudanian samples, again for 1984/85, and found that the Sahel sample households had a much higher degree of income diversification (into non-cropping sources) than did the Sudanian households, as well as incomes about 25 percent higher, on average. When the drought brought a disastrous fall in the cereal harvest, the zone and households most dependent on agriculture were the most vulnerable, and hence the most affected. Less than a third of the Sahel zone's average household income was earned in own-cropping and agricultural labor; in the Sudanian sample households, the figure was near two-thirds. Given the extreme fluctuations in cropping outcomes over years, this meant that the Sudanian households were both hungrier on average, and more vulnerable.[21]

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[21] This had important food aid targeting consequences: the Sahel received much more food aid than the Sudanian zone during the drought because targeting was done on the basis of crop production outcomes. Consumption, however, was being driven by overall income (from all sources). More food aid should have also been targeted to the Sudanian zone; food aid targeting needed to take purchasing power much more explicitly into account. See Reardon and Matlon (1989).

Reardon and Delgado (1989) extended the above analysis to the third ICRISAT study zone, the Guinean zone, a higher agro-climatic potential zone in southwest Burkina Faso, and investigated the composition of income over all four study years (1981-85). It was found that, for the Guinean zone, diversification was as important as in the Sahelian zone, despite relatively good and consistent cropping outcomes.[22] About one-half of total household incomes, on average over both good and poor harvest years during 1981-85, in the Sahelian, Sudanian, and Guinean zones, came from income sources other than cropping and livestock husbandry.

This chapter differentiates itself from prior work using the ICRISAT Burkina baseline data by stratifying the household sample by "degree of consumption adequacy" and then examining the income sources of the strata. The purpose is to see whether the more vulnerable and malnourished have a strikingly different composition of income, and what policy and research implications this might have.

The stratification is as follows: 1) "adequate": households above minimum consumption adequacy (2280 kcals/day average, per adult equivalent—AE); 2) "80 percent adequate": households within two deciles (in terms of consumption per AE) below minimum adequacy; 3) "below 80 percent" adequacy. The latter are the severely malnourished.[23]

DATA AND ZONES

The data are drawn from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) cost-route farm household survey in Burkina Faso.[24] The data used here cover September 1984 through August 1985—that is, a harvest year following a poor harvest—very poor in the case of the northern two of the three zones. Focusing on a drought year allows us to see the poor at their most vulnerable, and the coping mechanisms that they employ.

The survey used a sample of 150 households, in six villages, in three zones: a) the Sahelian zone in the northwest (agro-climatically a very poor zone, with low rainfall, poor soils, and extremely variable cropping outcomes); b) the Sudanian zone in the Mossi Plateau (agro-climatically a poor to intermediate zone, with low-medium rainfall, poor

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[22] The ways in which income composition differed between drought and non-drought years are analyzed in an upcoming IFPRI research report (Reardon, Delgado, and Matlon, "Food Security and Income Strategies in Rural Burkina Faso: The Role of Coarse Grains").

[23] Household size and land size are closely correlated in these regions; that is, households appear to be able to adjust farm size easily as household size grows—the probable implication of this is that land is not a constraint. Hence land size was not used as a stratifier.

[24] For details on the survey, see Matlon (1988).

soils, and moderately variable cropping outcomes); c) the Guinean zone in the southwest (agro-climatically a moderately-favored zone, with medium to high rainfall, good soils, and relatively stable cropping outcomes).

Household income is income from all sectors, from home production, labor market participation, and transfers. The value of in-kind income (for example, from home production) was imputed using market prices. Consumption was measured by disappearance.[25]

Characterizing the Malnourished Households

Table 44 presents household characteristics according to the "consumption adequacy" stratification. Here the strata are referred to as "low" (0-79 percent of adequacy), "medium" (80-99 percent of adequacy), and "adequate" (100 percent or more of adequacy). The same terms are employed in the tables.

In the Sahelian zone, cropping outcomes are positively related to the level of consumption adequacy; the adequate households have about twice the level of yields and production per person. It must be noted, however, that the range is still low, so that even though the adequate households produce more, they are still producing at low levels. They also have more land per person, and about twice the level of livestock holdings.

The average production sufficiency ratio—the portion of the year after harvest during which the household can be fed adequately solely from own production—is less than 100 percent for all the strata, meaning that all resort to purchases and food aid. Purchases are important for almost all households (Reardon, Delgado, and Matlon, 1987).

Technology (here, the presence of animal traction) is not very related to consumption adequacy, given poor cropping outcomes for all. The households of the hungry are relatively larger, with higher dependency ratios.

In the Sudanian zone, where hunger is much more prevalent, the inadequate and adequate households are not very different in terms of size and composition. There are no appreciable technology differences. Cropping outcomes are poorer for the inadequate households relative to the adequate, but the difference is smaller than in the Sahelian zone.

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[25] The disappearance and direct consumption data were not significantly different for the two zones for 1984/85 for which both consumption recall data and consumption-derived-from-disappearance data were available—the Sahelian and Sudanian zones. The consumption recall data are not yet available for the Guinean zone. However, I believe that the closeness of the direct and disappearance estimates for this year for two of the three zones inspires a fair degree of confidence in the use of the disappearance data, and allows comparisons of all three zones.

Table 44--Strata characteristics of Burkina Faso sample, 1984/85

Region Consumption Adequacy	Households	Households Using Animal Fraction	Household Size[a]	Dependency Ratio[b]	Crop Value Per AE[c]	Livestock Value Per AE[d]	Land Per AE[e]	Production Sufficiency Ratio[f]	Yield Hectare[g]
		(percent)						(percent)	
Sahelian									
Low	10	21	11	.51	4518	21150	.84	15	5468
(CV)			.72	.25	.62	1.43	.27	.62	.61
Medium	7	3	7	.57	9280	31972	.77	32	12091
(CV)			.42	.29	.80	1.47	.30	.81	.72
Adequate	14	6	8	.40	18627	53971	1.22	64	16485
(CV)			.51	.45	.32	1.29	.32	.33	.43
Total	30	10	9	.48	11368	37039	.99	39	11349
(CV)			.62	.36	.73	1.45	.37	.74	.70
Sudanian									
Low	13	16	11	.57	13613	11383	.56	40	24376
(CV)			.54	.22	.36	.42	.30	.39	.24
Medium	14	10	9	.53	20638	30084	.74	61	27949
(CV)			.56	.18	.42	1.82	.27	.48	.33
Adequate	6	17	10	.52	23253	25068	.66	71	37570
(CV)			.48	.15	.68	1.42	.23	.73	.66
Total	34	14	10	.54	18282	21496	.65	54	28354
(CV)			.53	.19	.54	1.77	.29	.59	.47
Guinean									
Low	13	17	15	.56	19998	19462	.50	59	44333
(CV)			.64	.28	.61	1.98	.55	.34	.34
Medium	4	16	11	.61	25970	10507	.61	66	44054
(CV)			.63	.18	.21	.86	.34	.25	.20
Adequate	29	21	11	.44	41516	20970	.66	130	63598
(CV)			.67	.39	.60	1.82	.47	.38	.31
Total	46	19	12	.49	32965	19638	.60	101	55502
(CV)			.66	.35	.68	1.86	.50	.52	.36

[a] Average size of household in unweighted persons.

[b] Average percentage (over households) of children (less than 15 years) in total persons.

[c] Harvest of all crops, evaluated at harvest-year average producer prices, per adult equivalent.

[d] Livestock holdings, evaluated at harvest-year average sales prices, per adult equivalent.

[e] Land cultivated in cropping season of calendar year 1984, average over households, per adult equivalent.

[f] Production sufficiency ratio, averaged over households; the ratio is of the amount of calories represented by the grain and pulse harvest of the household to the amount of calories necessary to feed the household at 2,280 kcals per day per AE over the harvest year.

[g] Same as crops per AE, but the deflator is now not AE but HA.

Again, production sufficiency ratios average less than 100 percent over all strata.

Livestock holdings are not appreciably different among the strata (compared to the strong differentiation in the Sahel). Because of overgrazing and disaccumulation of herds due to drought, cattle holdings are smaller in this zone than in the Sahel; cattle holding as an insurance mechanism also plays a smaller role. There was significant disinvestment of cattle in both the Sahelian and Sudanian households during the drought period (Christensen 1989).

In the Guinean zone, land holdings were not appreciably different among the strata, but yields and total harvests per person were. As in the Sudanian zone, livestock does not play a crucial role in differentiating the strata. In both of the "inadequate" strata, households are larger with higher dependency ratios as in the Sahel. Perhaps this implies that they are in an earlier stage in the Chayanovian life cycle. As in the Sahel, the majority of households are in the adequate stratum.

Income Sources of the Malnourished

Table 45 presents a breakdown by income source, and total income (per adult equivalent), using the same stratification.

In terms of the prevalence of inadequately nourished households in the total households in each zone, the Sahelian zone had 58 percent, the Sudanian had 80 percent, and the Guinean only 42 percent.

In the Sahelian zone, following the very poor harvest, those households with inadequate consumption had significantly lower incomes than those with adequate consumption. The share of cropping income in total income was actually higher for the adequate stratum, but the absolute level of non-cropping income was higher for this group.

In terms of the composition of income for the two inadequate strata, only about 11-22 percent came from cropping, and another 14-19 percent from livestock.

The most striking differences in income sources as between those with low levels of adequacy and the other groups were in the gathering and commerce sectors. The malnourished depended relatively more on the commons—gathering condiments/foodstuffs, wood, etc. The increasing degradation of the commons will thus especially hurt the malnourished. This coincides with the results concerning consumption composition reported in Reardon and Matlon (1989) that gathered food constituted about one-tenth of consumption of the poorest in the Sahelian zone during the same drought year—hence the products of the commons were their buffer for survival.

Table 45--Income sources by consumption adequacy stratum, Burkina Faso, 1984/85

Region Consumption Adequacy	No. HHs	Crop Prod	Ag Wages	Lvstck	Trnspt	Cons	Comm	Cottage Manuf.	Gather	Srvice	Food Prep	Nonlcl Nonfrm	Food Aid	Intra Vill	Gf/Ai Inpts	Abroad	Total Income
Sahelian																	
Low	12	3348	1022	4247	24	298	3334	4897	2554	1827	593	5985	1056	940	42	1076	31439
(Percent)		11	3	14	0	1	11	16	8	6	2	19	3	3	0	3	
(CV)		.83	1.08	1.51	1.90	1.66	2.58	1.50	2.65	2.62	1.31	.98	.66	1.03	1.94	2.26	.49
Medium	6	7569	511	6668	390	34	0	4670	627	580	267	10584	2199	396	67	0	34562
(Percent)		22	1	19	1	0	0	14	2	2	1	31	6	1	0	0	
(CV)		1.01	1.90	1.32	2.20	1.59		1.59	3.20	2.35	1.92	1.26	.64	1.70	1.78		.29
Adequate	13	16535	2767	9652	0	95	184	5554	515	0	821	11094	1876	317	41	162	50540
(Percent)		33	5	19	0	0	0	11	1	0	2	22	4	1	0	0	
(CV)		.34	1.92	1.31		1.87	2.99	1.92	2.19		1.90	1.01	.62	2.26	1.58	6.77	.28
Total	31	9708	1668	6981	81	164	1388	5134	1337	824	630	8992	1613	577	47	492	40104
(Percent)		24	4	17	0	0	3	13	3	2	2	22	4	1	0	1	
(CV)		.81	2.16	1.42	4.60	2.09	3.97	1.68	3.28	3.75	1.80	1.10	.70	1.47	1.74	3.48	.41
Sudanian																	
Low	14	12221	76	1944	2	127	294	1256	219	548	1185	477	83	259	27	645	19444
(Percent)		63	0	10	0	1	2	6	1	3	6	2	0	1	0	3	
(CV)		.40	2.24	.95	5.64	1.13	3.39	.69	3.12	3.70	1.13	4.48	1.67	1.28	2.18	1.65	.31
Medium	14	17912	5515	2427	17	136	715	550	251	581	973	862	115	425	11	1104	31758
(Percent)		56	17	8	0	0	2	2	1	2	3	3	0	1	0	3	
(CV)		.52	2.09	1.10	3.46	1.73	2.66	1.23	2.16	2.60	1.24	1.77	1.15	1.58	2.89	1.94	.34
Adequate	7	21202	8627	1968	0	197	801	2341	0	0	1639	10633	112	160	90	873	48643
(Percent)		44	18	4	0	0	2	5	0	0	3	22	0	0	0	2	
(CV)		.75	1.36	1.04		1.45	2.94	1.56			.93	1.28	1.45	1.47	1.42	2.20	.34
Total	35	16230	3901	2141	7	144	560	1184	189	455	1188	2595	102	306	33	872	30008
(Percent)		54	13	7	0	0	2	4	1	2	4	9	0	1	0	3	
(CV)		.61	2.37	1.03	4.96	1.45	2.96	1.50	2.91	3.49	1.10	2.73	1.36	1.58	2.23	1.94	.50

(Continued)

Table 45--Income sources by consumption adequacy stratum, Burkina Faso, 1984/85 (continued)

Region Consumption Adequacy	No. HHs	Crop Prod	Ag Wages	Lvstck	Trnspt	Cons	Comm	Cottage Manuf.	Gather	Srvice	Food Prep	Nonlcl Nonfrm	Food Aid	intra Vill	Gf/Ai Inpts	Abroad	Total Income
Guinean																	
Low	15	15323	746	9586	1575	225	2604	4276	2145	2067	8098	1198	0	195	97	44	48181
(Percent)		32	2	20	3	0	5	9	4	4	17	2	0	0	0	0	
(CV)		.63	.77	1.83	3.04	2.00	1.27	1.80	1.34	1.50	.90	3.03		2.12	1.73	3.73	.71
Medium	4	15925	2259	2627	0	585	570	6648	858	0	3763	0	0	99	924	299	35739
(Percent)		45	6	7	0	2	2	19	2	0	11	0	0	0	3	1	
(CV)		.50	.89	.60		1.32	1.66	1.29	1.44		.29			2.04	1.89	1.64	.48
Adequate	26	31965	918	10457	0	26	5806	4071	912	4490	9655	3528	0	205	315	746	73528
(Percent)		43	1	14	0	0	8	6	1	6	13	5	0	0	0	1	
(CV)		.67	.87	1.62	4.58	3.00	2.23	2.28	1.18	3.80	2.04	2.30		1.75	3.41	2.40	.59
Total	45	25038	964	9548	537	138	4305	4342	1328	3313	8664	2458	0	193	288	472	61933
(Percent)		40	2	15	1	0	7	7	2	5	14	4	0	0	0	1	
(CV)		.76	.96	1.72	5.28	2.62	2.36	1.97	1.46	3.96	1.80	2.69		1.88	3.27	2.97	.66

Notes: Home production activities other than cropping are not evaluated.
The number of households per stratum differs slightly from the earlier table because some households had to be dropped because of missing data.
All levels are FDFA per adult equivalent over the year.

Crop Prod = Value (at average producer prices over harvest year) of the harvest of the household in calendar year 1984.
Ag Wages = Wages earned by household members working for other households, doing cropping work.
Lvstck = Net value of livestock sales and home consumption.
Trnspt = Net income earned in the transport sector.
Cons = Net income earned in construction.
Comm = Net income earned in commerce.
Cottag Manuf. = Net income earned in cottage production (of mats, etc.).
Gather = Net income earned by gathering and selling (for example, leaves or wood).
Srvice = Net income earned in the service sector (for example, braiding hair).
Food Prep = Net income earned making and selling prepared food.
Nonlcl Nonfrm = All migration income (sent back and brought back, in money and in kind).
Food Aid = Imputed value of all food aid received from NGOs, government).
Intra Vill = Intravillage gifts or interhousehold gifts within a village.
Gf/Ai Inpts = Gifts of aid received of inputs.
Abroad = Gifts received from non-household members living abroad.

Agricultural wages were not an important part of the malnourished households' income. In this zone the land holdings per person do not differ greatly, and the agricultural labor market is not well developed.

Interhousehold gifts ("intravillage"), despite conventional visions of a village welfare "net" in the Sahel, were a tiny part of total income; food aid was more important. Together these sources were only 5-7 percent of all groups' income. For the most malnourished, interhousehold gifts composed only 3 percent of income—which was greater than the share in the other strata, only 1 percent, but still very small. This coincided with responses received in my qualitative interviews in the villages in 1985. Respondents said that interhousehold gifts were "ritual", and not meant to redress critical problems of individual households. The latter were redressed by earning off-farm income.

Perhaps the most important policy result implied by the figures in the table is that despite income and consumption-adequacy differences, the share of food aid in total income was actually greater for the less hungry.[26] Food aid was not appropriately targeted at a household level—that is, it was not targeted by household purchasing power or other indicators, but was just targeted to the zone in general because of perceived production outcomes. Below we shall see that it was not targeted according to need at a household level.

Transfers received from abroad (usually from family members living on the coast) were most important for the malnourished—but still only 3 percent of income.

Migration income (nonlocal off-farm income) was important for the inadequate-consumption strata (19-31 percent). Cottage manufacturing and commerce are relatively more important for these groups, and these vary more directly than other sources with cropping outcomes.

In the Sudanian zone, the two inadequate strata relied greatly on agriculture; about 2/3 - 3/4 of their income came from cropping and local agricultural wages. Thus, these households were very vulnerable to vacillating cropping outcomes. An explanation of this reads as follows:

> While cultural differences clearly exist between the two regions [Sahel and Sudanian zones], it is also clear that they alone cannot provide a satisfactory explanation [of the difference in degree of diversification]. Traditions presumably develop in response to specific physical, political and economic conditions....Yet these conditions change and insufficient adjustment time can be a key constraint to the modification of income strategies. Until relatively recently,

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[26] This result is discussed in more detail in Reardon and Matlon, 1989.

> crop farmers on the Mossi Plateau [Sudanian zone] had fared adequately by pursuing a production strategy based on the separation of livestock and crop management functions, whereby they could enjoy the benefits of cattle-based insurance mechanisms with low maintenance costs. Sufficient pasture away from the village and a subordinate pastoral ethnic group made this possible. Relatively rapid sociopolitical, demographic, resource base, and climatic changes have undermined this strategy. On the other hand, migration and the establishment of links with the regional nonagricultural economy also require investment of capital and time, and appear, at least to the present time, to have been largely neglected...Currently, the relative dearth of assets militates against the former and the rapidity of the alteration of the situation against the latter...Farmers in the Sahel, by contrast, have traditionally been exposed to severe production variability. The latter, combined with the cultural presence of pastoralism, led the sedentary agriculturalists to build up their asset or insurance base. At the same time they invested in links to sources of effective demand for their products and labor in the urban areas, abroad, and in other regions whose agricultural situations were not highly covariant with the Sahel. It appears that time, need, and relatively liquid stores of wealth may have combined to make practicable the sectoral and geographical diversification of their income strategy (Reardon, Matlon, and Delgado 1988, p. 1,072).

Moreover, the better nourished households had a much higher share of income from migration—which appears to be an important coping mechanism.

Finally, the share of food aid in total incomes of all strata was minuscule. Hence, despite the greater prevalence of hunger, food aid was not targeted to this zone because the targeting was done on the basis of crop production in that year, and not purchasing power—despite the latter being the important factor in maintaining consumption adequacy in poor years, as the table shows.[27] As in the case of the Sahelian zone, interhousehold gifts were only a tiny part of income.

In the Guinean zone, the incomes of the consumption-inadequate strata were not significantly less diversified than the adequate, but mean incomes were much lower. Reliance on food preparation (local beer, condiments) and migration, as well as livestock husbandry, were important for the inadequate group.

In this zone the proportion of households in the inadequate strata is much lower than in the other zones, as is the degree of income-structural differentiation among the strata.

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[27] This argument is developed in more detail in Reardon and Matlon, 1989.

CONCLUSIONS

First, the incidence of malnourishment in the drought year 1984/85 was the highest in the zone which can be characterized as "intermediate" in agro-climatic terms. The poorest zone in agricultural terms had only an intermediate incidence of hunger—mainly because of the higher degree of diversification of household incomes, to compensate for poor cropping outcomes.

Second, the malnourished had lower overall incomes. Policies which raise overall incomes reduce hunger.

Third, interhousehold transfers/gifts played a very small role in the incomes of the malnourished. Perhaps the very existence of a sizable malnourished group in the Sahelian zone indicated that a "safety net" of shared welfare was not functioning. This is less the case in the Sudanian zone, where hunger was more widespread.

On the other hand, food aid was targeted to the zone (Sahelian) where the degree of purchasing power from diversified sources was higher, hence the incidence of hunger was lower. The Sudanian zone, which had higher per hectare crop output, had similar per person crop output to that of the Sahelian zone, but less diversified incomes. Hence, they were more vulnerable to cropping outcomes.

The upshot is that food aid needs to be targeted according to the variables that determine the existence of hunger—and if hunger is not tied only to cropping outcomes, but rather to other variables such as the asset base and the level of purchasing power, then targeting needs to take into account the latter. Moreover, the interhousehold welfare net did not appear to be significant, at least in this case, and should not assumed by policymakers to be functioning as an alternative to external food aid, or diversified incomes to compensate harvest fluctuations.

The malnourished are dependent on local off-farm work opportunities—the role of the latter is not very different than it is in the case of the well-nourished, although they have not usually been as successful at taking advantage of these opportunities. It appears that the development of these would create the purchasing power necessary to alleviate hunger in drought years.

6. INCOME SOURCES OF THE RURAL POOR IN SOUTHWESTERN KENYA

Eileen Kennedy

INTRODUCTION

The main theme of this paper is to examine the relationship between the income sources of the rural poor and some indicators of overall welfare in the households and individuals. The paper assesses the impact of not only total income but also of the source and regularity of this income on selected indicators of food security, health, and nutrition.

The data for this paper derive from a study in Southwestern Kenya which evaluated the effects of shifting from maize to sugarcane production. The research project included two distinct studies: the baseline study conducted from June 1984 to March 1985 and a follow-up study carried out from December 1985 to March 1987. The present paper focuses heavily on the longitudinal aspects of the data and will stress the sample of households—the cohort sample—who were present in both surveys. This will allow us to examine the implications not only of absolute income but of shifts in income as well.

METHODS

The methods employed in the baseline and follow-up Kenya studies have been described in detail elsewhere (Kennedy and Cogill 1987; Kennedy 1989). The sample of households included in the study was classified into various groups based on the chief economic activity of the household. The new entrant group is those households for whom socioeconomic and health/nutrition information was collected prior to their entry into the smallholder sugarcane scheme. Sugar farmers are those households who had received at least one payment for the sugarcane crop, and non-sugarcane households are the group not in the outgrowers' scheme. These three groups of household make up the agricultural sample. In addition, there was a sample of nonagricultural households: merchants (small businesses), landless, and wage earners (landless households with a regular source of income). Of the 504 households in the baseline survey, 462 or 92 percent remained in the follow-up study.

RESULTS

Table 46 provides a comparison of the income per capita for the cohort sample of households for the baseline and follow-up study. The

Table 46--Per capita income for each cohort group, Southwestern Kenya

Activity Group	Mean Nominal Income 1984/85	Mean Nominal Income 1985/86	Mean Real Income 1985/86
	(KShs per capita[a])		
New entrants	1,956 (42)	3,837 (38)[c]	3,070 (38)[c]
Sugar farmers with income	2,591[b] (139)	3,390 (135)[d]	2,712 (135)[d]
Nonsugar farmers	1,924 (231)	2,708 (205)[c,d]	2,166 (205)[c,d]
Merchants	2,209 (29)	5,265 (15)[e]	4,212 (15)[e]
Wage earners	2,037 (18)	3,222 (14)	2,578 (14)
Landless	1,290 (43)	2,338 (33)	1,870 (33)
Sample mean	2,077 (502)	3,091 (440)	2,473 (440)

Source: International Food Policy Research Institute (IFPRI), "Survey, 1984/85," South Nyanza, Kenya; and IFPRI "Follow-Up" Survey, 1985-87," South Nyanza, Kenya.

[a] 1985/86 incomes adjusted to 1984 levels using GDP deflator. World Bank, World Development Reports, 1986, 1987 (Oxford University Press).

[b] Sugar farmers significantly ($p < 0.05$) higher income than nonsugar and landless groups.

[c] New entrants versus nonsugar farmers $p < 0.05$.

[d] Sugar farmers versus nonsugar farmers $p < 0.05$.

[e] Merchant households significantly ($p < 0.05$) higher income than landless, nonsugar farmers, and sugar farmer groups.

baseline study was conducted in 1984 which was a drought year for Kenya. The comparisons of the baseline versus the follow-up study indicate that the incomes per capita of all types of households have increased both in nominal and real terms. However, the magnitude of this increase varies dramatically. The nonsugar producers can be used as the reference for the difference in income between a "good" and a "bad" production year. Although yields for the major staple maize declined by about 60 percent in the drought year, incomes for the nonsugar farmers increased only 13 percent in real terms in the 1985/1986 period. This is because the higher maize yields in the 1986 seasons were offset in part by the lower amount of total land put into production in the non-drought year by the nonsugar farmers.

With the exception of the merchant group, the biggest jumps in incomes between the two time periods were for the new entrant and the landless groups. The reasons for this vary. Table 47 presents a breakdown of the sources of income for the different categories of households. Part of the difference in the incomes of the new entrant

Table 47--Mean per capita annual income, by source for activity group (cohort group), 1984/85 and 1985/87, Southwestern Kenya

Activity Group		Agricultural Income: Used for Own Consumption, Mean		Agricultural Income: Marketed, Mean		Nonagricultural Income, Mean	
	(N)	(KSh)	(percent)	(KSh)	(percent)	(KSh)	(percent)
Baseline study (1984/85)							
New Entrants	42	728	37	404	21	824	42
Sugar farmers	139	748	29	942[a]	36	901	35
Nonsugar farmers	231	822	43	393	20	709	37
Merchants	29	51	2	17	1	2,141	97
Wage earners	18	171	8	45	2	1,821	90
Landless	43	163	13	48	4	1,079	83
Total sample mean	502	669	32	482	23	926	45
Follow-up study (1985/87)							
New entrants	27	1,761[b,c]	46	791[b]	21	1,285	33
Sugar farmers	146	1,370[c]	40	625[c]	19	1,395[d]	146
Nonsugar farmers	205	1,302[b]	48	365[b,d]	14	1,041[d]	38
Merchants	15	571	11	49	<1	4,646[e]	88
Wage earners	14	972	30	233	7	2,017	63
Landless	33	841	36	162	7	1,336	57
Total sample mean	440	1,292	42	452	15	1,347	43

Source: International Food Policy Research Institute (IFPRI), "Survey, 1984/85," South Nyanza, Kenya; and IFPRI "Follow-Up" Survey, 1985-87," South Nyanza, Kenya.

[a] Sugar farmers have significantly ($p < 0.05$) higher marketed agricultural income per capita than all other groups.

[b] New entrant versus nonsugar farmers ($p < 0.05$).

[c] New entrants versus sugar farmers ($p < 0.05$).

[d] Sugar farmers versus nonsugar farmers ($p < 0.05$).

[e] Merchants significantly higher ($p < 0.05$) than all other groups.

group in the follow-up study period is due to the higher income from marketed agricultural production. The income per capita of KShs 791 from marketed agricultural production for the new entrants is significantly higher than the KShs 365 per capita for the non-sugarcane producers. However, other sources of income also contribute to the difference in incomes between the two types of households; 38 percent of the difference is contributed by an increase in subsistence income.

Interestingly, the landless group of households is the lowest income group in both studies, yet it is the group that has had one of the highest increases in real income between the two time periods. The major portion of the income increase for the landless group is from subsistence income that is production used for own consumption. This may seem counterintuitive since one normally thinks of the term landless as implying that a household has no land. However, in this case, although the landless households do in fact own no land, they have

access to public land controlled by the local council. Not only do we see an increase in absolute income but the relative increase in real income is accounted for primarily by the subsistence income.

The coping strategy used by the agricultural households in the 1984 drought year—put more land into production—was not possible for the landless. Thus, the drought affected them more since they could not put more land into production to compensate for the lower yields of basic staples per hectare. As shown in Table 48, the agricultural households, whether sugar or nonsugar producing, use only 44 percent to 58 percent of their land for production as opposed to the landless who use all land possible to produce food. Despite using 100 percent of the land within their access for food production, the area per capita cultivated by the landless is 0.08 hectare per person compared to 0.14 to 0.17 hectare for the agricultural households.

It is clear from Table 47 how diversified the income sources are for each category of household. Even agricultural households depend on nonagricultural sources for 33 percent to 41 percent of their total household income.

A major objective of this paper is to look at the implications of various sources of income on food security and nutrition. As expected, higher household income is associated with a higher probability of household caloric sufficiency (Table 49). Households consuming less than 80 percent calorie adequacy have significantly lower incomes per capita than households above 80 percent; this income differential is even wider for households with less than 60 percent of caloric adequacy.

The relative sources of income for the caloric-deficient households are not significantly different than for the food-secure households with one exception. Households consuming less than 60 percent of caloric requirements have a higher proportion of income coming from transfers

Table 48--Cropping patterns, 1986 long rains, Southwestern Kenya

Indicator	New Entrants	Sugar	Nonsugar	Landless[a]
Farm size (hectares)	5.0	5.1	3.4	0.53
Mean number of plots	7.0	7.0	5.9	3.2
Mean number of crops	8.4	8.6	7.2	4.5
Percent of farms devoted to all crops	55.6	58.2	44.4	100.0
Percent of farms devoted to food crops	31.4	29.6	40.3	100.0
Mean area (hectares/capita) devoted to food crops	0.17	0.14	0.14	0.08

[a] Includes public-owned Council land that is allocated to, but not owned by, the landless.

Table 49--Income and employment sources of the malnourished rural poor, Southwestern Kenya

Indicator	Calorie Consumption >80 Percent		<80 Percent		<60 Percent		Total Averages	
	(KShs)	(percent)	(KShs)	(percent)	(KShs)	(percent)	(KShs)	(percent)
Household total income from								
Nonmarketed crops	1,354.35	40.2	909.78	38.1	721.01	43.9	1,222.91	39.7
Marketed crops	485.79	14.4	278.35	11.7	159.17	9.7	424.46	13.8
Other agricultural (including livestock)								
Agricultural wages	53.04	1.6	53.16	2.2	32.61	2.0	54.48	1.8
Nonagricultural wages								
Permanent	357.10	10.6	249.45	10.4	163.85	10.0	325.28	10.6
Casual	114.37	3.4	80.79	3.4	111.23	6.8	104.44	3.4
Crafts work								
Services and others (including trading)	719.27	21.3	626.20	26.2	212.72	13.0	691.76	22.5
Transfers, remittances	119.83	3.6	99.66	4.2	168.98	10.3	113.87	3.7
Other income	164.21	4.9	90.71	3.8	72.47	4.4	142.47	4.6
Total income per capita (KShs)	3,369.96		2,388.10		1,642.04		3,079.67	
Total expenditures per capita (KShs)	3,078.00		2,098.31		1,742.01		2,796.72	
Household size (persons)	8.78		11.42		12.19		9.53	
Percent of women-headed households								
Legal female								
As percent of all households	7.2		3.8		0.5		11.0	
As percent of legal female households	65.2		34.8		4.5		100.0	
De facto female								
As percent of all households	3.2		2.3		0.3		5.5	
As percent of de facto female households	57.6		42.4		5.6		100.0	
Schooling or literacy of head of households (years)	5.06		4.89		5.00		5.01	

Source: International Food Policy Research Institute (IFPRI), "Follow-Up Survey, 1985-87," South Nyanza, Kenya.

and remittances and a much lower proportion of income coming from services and other activities (including trading).

Landholdings are not a significant determinant of caloric sufficiency. In each tercile of landholdings, there are no significant differences in the hectares of land owned by food secure versus insecure households. This concept is enforced even more if we look at the data on the landless households. The landless have a higher proportion of households falling in the greater-than-80-percent category than all agricultural households combined.

De facto female-headed households are, on average, poorer and it is therefore not surprising that a smaller proportion meet greater than 80 percent of household energy needs.

The proportion of nonfarm income in the household has an inverse relationship to the household food security. In Table 50, data indicate that as the proportion of nonfarm income increases, there is an increased probability of households falling below 80 percent of caloric adequacy. This finding is reinforced by the consumption function shown in Table 51. The amount of nonfarm income has a significant but negative effect on household caloric intake.

The issue of the impact of different sources of income on consumption is complex and can only partially be addressed by models of this type. One explanation of why nonfarm income, holding total income constant, appears to have a negative effect on consumption may relate to control of income in the household. Men tend to control much of the nonfarm income. Not only do men control different sources of income, but their expenditure responsibilities differ from those of adult women in the household. By and large, the major responsibility for food lies with women in the household. Table 51 data also indicates that the percent of women-controlled income has a positive significant effect on household energy consumption.

The relationship between income and child level nutritional outcomes was also explored (Table 52). Interestingly, the income/ household calorie relationships that we saw for many of the household-level indicators did not show up for preschooler nutritional status. There is no significant difference in household income per capita between those with malnourished versus not malnourished children. In fact, the mean household income is higher (although not significantly) for households

Table 50--Prevalence of malnutrition in different groups (overview), Southwestern Kenya

Group	Total Sample	Calorie Consumption >80 Percent	<80 Percent	<60 Percent
	(N)	(percent of households[a])		
Farm households by farm size[b]	568	70.4	29.6	6.3
Small tercile	177	68.4	31.6	7.3
Medium tercile	199	71.9	28.1	6.0
Large tercile	192	70.8	29.2	5.7
Nonfarm/landless households	47	78.7	21.3	8.2
Households by share of off-farm income in total income				
< 10 percent	65	81.5	18.5	1.5
10-30 percent	175	70.9	29.1	5.7
30-60 percent	211	68.2	31.8	8.5
> 60 percent	124	67.7	32.3	5.6

[a] Same table using the weight/age indicators as in Table 52.

[b] By terciles.

Table 51--Household consumption function[a]

Variable	Beta	t-Statistic	Significance
Percent women's income	15.3	2.4	0.017
Dummy Round 2	-1,183	-2.3	0.02
Round 3	-1,943	-3.7	0.0002
Round 4	-1,720	-3.3	0.0011
HOH school	-104	-2.1	0.035
Adult equivalent	2,243	48.2	0.0000
Income/capita	1.9	6.1	0.0000
Income squared	-1.34-04	-4.3	0.0000
Percent nonfarm income	-24.7	-2.6	0.007
Relocated dummy	306	-0.49	0.62
Sugarcane dummy	-308	-0.75	0.45
Constant	-246	-0.26	0.79
R^2 = 0.62			
Analysis of variance			
Regression 11	F = 225		
Residual 1,527	Sig F = 0.0		

[a] Dependent variable equals total daily household caloric intake.

with malnourished preschoolers and highest for the households with severely malnourished preschoolers.

If household income is not a good discriminator of malnutrition, what are the characteristics of children likely to be malnourished? Table 53 presents a profile of preschoolers who were less than 80 percent weight-for-age in both the 1984/1985 and 1985/1987 studies. This is contrasted with those children who were above 80 percent in both studies. The data here reinforce the fact that there is not a difference in income per capita of households with and without malnourished children. Surprisingly on most variables, the characteristics of children who are malnourished are remarkably similar. However, there are two criteria which differentiate the two groups of children. Children who are malnourished over the multiyear periods tend to be sicker and their families tend to have a higher proportion of nonfarm income. These results are similar even if we look at children of less than 36 months of age in the baseline study. This profile is consistent with data presented in the earlier tables.

The comparisons thus far on income have relied on data for a limited period. It is plausible to assume that income may have to be of sufficient magnitude for a long enough period of time in order to begin to see a health and/or nutrition effect. Table 54 presents data for two classes of households—those who for both studies were in the bottom

Table 52--Income and employment sources of the malnourished rural poor, for nutritional status indicators, Southwestern Kenya

Indicator	Weight-for-Age >80 Percent		<80 Percent		<60 Percent	
	(KShs)	(percent)	(KShs)	(percent)	(KShs)	(percent)
Household total income from						
Nonmarketed crops	1,209.12	39.6	1,167.12	39.9	1,408.65	39.1
Marketed crops	394.27	12.5	336.04	11.5	357.53	9.9
Other agricultural (including livestock)						
Agricultural wages	46.16	1.5	58.67	2.0	15.00	0.4
Nonagricultural wages						
Permanent	327.31	10.7	228.04	7.8	233.74	6.5
Casual	89.73	2.9	84.39	2.9	229.57	6.4
Crafts work						
Services and others (including trading)	733.91	24.0	830.56	28.4	1,221.57	33.9
Transfers, remittances	107.08	3.5	107.91	3.7	42.50	1.2
Other income	146.85	4.8	113.89	3.9	91.32	2.5
Total income per capita (KShs)	3,054.43		2,926.62		3,599.88	
Total expenditures per capita (KShs)	2,692.20		2,604.70		2,679.66	
Household size (persons)	11.32		11.24		11.31	
Percent of women-headed households						
Legal female						
As percent of all kids' households	8.9		2.2		0.1	
As percent of legal female households	80.2		19.8		11.1	
De facto female						
As percent of all kids' households	5.0		1.1		0.1	
As percent of de facto female households	82.0		18.0		11.1	
Schooling or literacy of head of households (years)	5.10		4.93		3.29	

Source: International Food Policy Research Institute (IFPRI), "Follow-Up Survey, 1985-87," South Nyanza, Kenya.

quartile of income, compared to those households who during the same time period were in the top quartile of income. Here again, the findings differ between the household- and the child-level indicators.

Household food security is significantly better in the top quartile households. The effect of a good versus bad agricultural year can be seen when we compared within the top quartile group. In the 1984 drought year, 20.6 percent of the households fell below 80 percent of caloric adequacy while in 1986, a normal agricultural production year, only 7.7 percent fell below the cutoff. This is important to emphasize since the average level of caloric adequacy—approximately 101 percent—did not differ in the two time periods. This reinforces the finding that average level of caloric adequacy can mask very large variations in intake.

Table 53--Characteristics of preschoolers malnourished[a] and not malnourished, both study 1 and study 2, cohort sample (preschoolers less than 36 months in study 1)

Characteristics	All Ages		Children Less Than 36 Months	
	Malnourished Both Studies	Not Malnourished Either Study	Malnourished Both Studies	Not Malnourished Either Study
N	110	490	68	341
Percent of sample	14.7	65.4	13.8	63.4
Mean age - study 1 (in months)	27.8	26.1	18.6	17.3
Birth order	4.2	4.1	...	...
Mean number of hours to fetch water	0.6	0.5	0.6	0.5
Health expenditures per capita (KShs)				
Study 1	49.5	42.2	51.92	39.07
Study 2	123.7	101.1	114.79	104.68
Age of introduction to solids	5.9	5.7	5.5	5.4
Age breast-feeding stopped	18.1	18.4	17.5	16.8
Landholdings per capita (hectares)	0.4	0.4	0.4	0.45
Percent energy adequacy per adult equivalent unit				
Study 1	92.0	91.1	92.25	89.60
Study 2	90.8	94.6	90.37	93.62
Percent time ill				
Study 1	32.1	26.9	31.87	28.47
Study 2	34.7	27.2	37.47	27.72
Mean income/capita (KShs)				
Study 1	1,679	1,983	1,650.38	1,931.92
Study 2	2,887	3,107	3,013.65	3,053.76
Marketed farm income (percent)				
Study 1	17.8	21.5	18.66	21.67
Study 2	11.3	13.4	12.15	12.93
Nonfarm income (percent)				
Study 1	45.6	40.9	43.75	40.86
Study 2	40.8	37.1	42.85	37.14

Source: International Food Policy Research Institute (IFPRI), "Survey, 1984/85," South Nyanza, Kenya; and IFPRI "Follow-Up" Survey, 1985-87," South Nyanza, Kenya.

[a] Based on less than 80 percent weight/age.

For the group of households in the bottom quartile in both studies, average caloric intake actually decreased between the two studies despite an increase in income. This is reinforced by the data on calorically deficient households. The percent of households falling below 80 percent of requirements increased between study one and two.

Table 55 examines the characteristics of children from households in the lowest versus highest income quartile for both studies. Unlike what was shown for many of the household-level variables, there is less of a direct relationship between child level variables and household income. There are no significant differences between the nutritional

Table 54--Selected household variables, by income quartile group in both studies: top quartile both studies versus bottom quartile both studies

Variable	Income Quartile Indicator	
	Bottom Quartile Both Studies	Top Quartile Both Studies
Household caloric adequacy (percent)		
Study 1	86.01	101.73
Study 2	80.83	101.96
Household calories/adult equivalent unit		
Study 1	2,451.16	2,899.34
Study 2	2,303.79	2,905.97
Percent of households less than 80 percent caloric adequacy		
Study 1	46.3	20.6
Study 2	55.0	7.7
Income/capita (KShs)		
Study 1	591.36	4,066.20
Study 2	1,174.55	6,028.66
Farm income/capita (KShs)		
Study 1	87.84	1,003.48
Study 2	98.18	1,368.42
Nonfarm income/capita (KShs)		
Study 1	306.72	2,044.41
Study 2	369.61	3,223.40
Semi-subsistence income/capita (KShs)		
Study 1	296.80	1,018.31
Study 2	706.77	1,436.84
Landholdings per capita (hectares)	0.18	0.64
Household size		
Study 1	11.20	9.69
Study 2	9.93	8.51
N	41	39

Source: International Food Policy Research Institute (IFPRI), "Survey, 1984/85," South Nyanza, Kenya; and IFPRI "Follow-Up" Survey, 1985-87," South Nyanza, Kenya.

status or health indicators for preschoolers from the low- versus high-income group households. However, children from the high-income group do have a greater caloric intake than preschoolers from the low income category. This reflects in part the fact that children from the higher-income category are capturing a portion of the incremental household calories accruing as a result of the higher household income.

SUMMARY AND CONCLUSIONS

The paper examines the amount and sources of income for a rural population group in Southwestern Kenya. Data indicate that for all types of households, sources of income are very diversified. There is

Table 55--Characteristics of preschoolers, by income quartile group in both studies: top quartile both studies versus bottom quartile both studies

Characteristics	Income Quartile Indicator	
	Bottom Quartile Both Studies	Top Quartile Both Studies
Weight-for-Age Z-score		
Study 1	-0.85	-0.96
Study 2	-1.06	-0.86
Height-for-Age Z-score		
Study 1	-1.31	-1.24
Study 2	-1.83	-1.55
Weight-for-Height Z-score		
Study 1	-0.07	-0.21
Study 2	-0.04	-0.02
Percent total time ill		
Study 1	26.63	27.07
Study 2	25.61	29.29
Percent time ill with diarrhea		
Study 1	6.00	3.98
Study 2	3.70	4.55
Child caloric adequacy		
Study 1	47.00	73.00
Study 2	50.30	61.26

Source: International Food Policy Research Institute (IFPRI), "Survey, 1984/85," South Nyanza, Kenya; and IFPRI "Follow-Up" Survey, 1985-87," South Nyanza, Kenya.

no household in this community that is purely subsistence. The analysis of the multiyear period indicates that in a normal agricultural production year, a non-drought year, incomes of all classes of households increased substantially from a drought year. The two classes of households where real incomes increased the most are the new entrants and the landless. The reasons for this rapid increase in relative incomes differ between the two groups.

Increases in incomes of the new entrants to the sugarcane outgrowers' program are due to two main factors. A large part of the increase in marketed agriculture income is due to payment for the sugarcane crop. Thus commercial agriculture income has raised smallholder income. In addition, the increase in yields of the basic staples by about 60 percent has added to the semi-subsistence income.

The landless have also benefitted from the good agricultural production; the major portion of the increase in their income comes from increased production on publicly owned land that they are able to use for cultivation.

Increased income is associated with improved household food security in all households. Households falling below 80 percent or 60 percent of caloric requirements are more likely to have lower incomes.

Farm size is not a significant determinant of household food security. In this community, the more important factor is amount of cultivated land which is a function in part of available household labor.

The amount of nonfarm income has a significant but negative effect on household food security. This is apparent from both the descriptive and multivariate analyses. One explanation for this is that nonfarm income is more likely to be male controlled. Not only do men have different income sources but they also have different expenditure responsibilities. Women are primarily, although not exclusively, responsible for providing food for the household. Women's income is positively and significantly associated with increased household caloric consumption.

Absolute amount and sources of income are clearly two of the key determinants of household food security. However, this relationship between income and nutrition of children is less robust. The data presented in this paper indicate that there are no significant differences in the household incomes of malnourished and not malnourished children. In fact, on many of the variables, there are no obvious differences in children who are above and below 80 percent weight-for-age. The same is true if malnutrition is based on weight-for-length or height-for-age (data are not presented here).

The two variables that seem to differ between the groups of malnourished and not malnourished preschoolers are the total time ill and the amount of nonfarm income.

In order to try to sort out some of the longer-term effects of income on nutrition, analyses were conducted on children who were from households who were consistently from the highest- versus lowest-income quartile households. Results indicate that on each of the anthropometric indicators, there are few significant differences in the average values for the preschoolers from the highest- versus lowest-income category.

However, preschooler caloric adequacy is significantly better in children from the highest-income category. The food security of the child has improved through the income/household caloric/child energy linkages.

These data would indicate that improved income does benefit the child by the income/calorie route. However, without a simultaneous improvement in preschooler morbidity patterns, the net effect on child growth is limited. Improvements in household income should be coupled with complementary improvements in the health/sanitation environment in order to enhance child health and nutritional status.

7. INCOME SOURCES AND INCOME USES OF THE MALNOURISHED POOR IN NORTHWEST RWANDA

Joachim von Braun
Graciela Wiegand-Jahn

SETTING AND QUESTIONS

Most of sub-Saharan Africa is currently experiencing extremely rapid population growth. This demographic change has a very different meaning for regions with an already high population density and no readily available means to increase food production than for regions with low density and possible food production increase given current technology. The case presented here is set in the most densely populated rural area of sub-Saharan Africa—Northern Rwanda—where population growth was 4.2 percent per annum in the mid-1980s. This mountainous zone of the Zaire-Nil-Divide is characterized by favorable climatic conditions and, in parts of the zone, good soils. However, population pressure has reduced farm size to an average of 0.7 hectare and man-land-ratios are around 11 persons per hectare of cultivable land. The need for yield increasing technology is immense but apart from the case of potato cultivation with modern inputs (new varieties, pesticides), no other new techniques are readily available to farmers.

The location has become a net-import area and is dependent upon fragile markets (for example, Uganda, Burundi, Eastern Zaire) with frequently interrupted trade routes. Food insecurity and malnutrition are chronic problems aggravated by occasional, severe shortages in the region and in micro locations. Existing rural household strategies for food security have to be understood in order to design development strategies aimed at improving food security and nutrition. This paper tries to answer the following questions:

- What is the nature and prevalence of the nutrition problem?
- What are the sources of income in the area?
- To what extent are division of labor (where women provide about 70 percent of labor input in food crop production) and household organization a factor for food security and nutrition?
- What role does rapidly increasing land scarcity play for hunger and malnutrition?

DATA SOURCES

During 1985-1986, IFPRI surveyed 189 households in the prefecture of Gisenyi in the high-altitude zone (2,000-2,600 meters). The random sample is scattered over the community of Giciye. In one of the five parts of the community, the sample is slightly biased toward farms growing tea, but since tea plays only a minor role in regional agricultural production, this bias is not to be considered very distorting. The region as a whole, and therefore many farms in the sample, benefits from an opportunity to grow potatoes in a forest area nearby (off the core farm). This may give the sample a somewhat higher level of agricultural employment than in other communities. Potato growing partly occurs in a controlled scheme and partly "wild" in this forest area ("Gishwati Forest").

The sample survey is comprised of a one year data collection effort, capturing three cropping seasons (two long and one short season) and information on off-farm income, time allocation, consumption expenditure recalls, anthropometry, morbidity, and health care (for details, see von Braun, de Haen, and Blanken 1991). All 189 households were interviewed three times.

INCOME SOURCES OF THE HUNGRY AND MALNOURISHED

Off-farm income contributes 58 percent of total income (Table 56). This off-farm income stems from self-employment and wage earnings (75 percent), and transfers and remittances (25 percent). Roughly 70 percent of farm income is earned through subsistence production and the rest is obtained through the marketing of agricultural products. Average household figures demonstrate that household income sources are quite diversified, although individual households may be more specialized.

Two different consumption and nutrition indicators are used to identify the hungry and malnourished:

- calorie consumption levels[28] (per adult equivalent) in terms of recommended daily requirements[29] (RDA) (above 80 percent of RDA, between 60 and 80 percent, and below 60 percent), and

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[28] Calorie consumption was measured in weekly household food consumption recalls.

[29] Calorie recommendations were extracted from World Health Organization, Energy and protein requirements (Geneva: WHO, 1985).

Table 56--Income and employment sources of the malnourished rural poor (calorie consumption level) indicator, Rwanda, 1985-86

Indicator	Calorie Consumption >80 Percent	60-80 Percent	<60 Percent	Total Averages
Total income (FRW)	7,506	7,807	5,212	7,176
Farm income	3,382	2,447	2,325	2,980
Subsistence	2,510**	2,019	1,694**	2,253
Market	1,195	639	832	1,002
Cash crops	343	153	194	273
Food crops	524	272	387	441
Sorghum beer	328	214	251	288
Off-farm income	4,124	5,360	2,887	4,196
Transfers and remittances	1,296	975	455	1,074
Wage earnings/self employment	2,828	4,385	2,432	3,122
Labor and crafts work	1,228**	2,461**	1,362	1,539
Other income-generating activities	1,600	1,924	1,070	1,583
Male farm income	451	301	432	412
Female farm income	744	339	400	590
Male off-farm income	3,724	5,005	2,725	3,847
Female off-farm income	401	356	161	348
Total male income	4,175	5,306	3,157	4,259
Total female income	1,145	695	561	938
Calories/day/adult equivalent from subsistence production	1,865* **	1,401*	1,306**	1,671
Farm size (hectares)	0.77	0.68	0.69	0.74
Households in smallest farm size tercile (percent)	33.0	29.5	36.4	32.8
Households in middle farm size tercile (percent)	33.0	40.9	24.2	33.3
Households in top farm size tercile (percent)	34.0	29.5	39.4	33.9
Quasi-landless (percent)[a]	17.0	6.8	18.2	14.8
Man-land-ratio	10.1**	11.0	14.8**	11.1
Household size (persons)	5.1* **	5.9*	6.5**	5.5
Adult equivalents	3.6* **	4.6**	5.1**	4.1
Persons less than 10 years (percent)	33.2	26.7	31.6	31.4
Women-headed households (percent)	16.1**	0.0**	9.1	11.1
N	112	44	33	189

Source: IFPRI Survey, 1985/86.

[a] Percent households with land below 0.25 hectares.

* Denotes pairs of groups significantly different at 10 percent level.

** Denotes pairs of groups significantly different at 5 percent level.

- nutritional status of preschool children in terms of weight-for-age using WHO/NCHS standards (above 80 percent of weight-for-age standard, between 70 and 80 percent, and below 70 percent).[30] Only 153 households had preschool children, and, therefore, the other households were excluded in this table.

Comparison of the two extremes in each indicator—the >80 percent versus <60 percent of RDA, and the >80 percent versus <70 percent weight-for-age standard (Tables 56 and 57)—highlights a few points on income-consumption-nutrition links, most of which seem to make intuitive sense although they have been much debated recently in some circles:

- total income in the seriously calorie-deficient households (<60 percent) is 31 percent below that of the "acceptable group" (>80 percent). The same pattern of similarly lower income can be observed for farm income (-31 percent) and subsistence food income (-33 percent). Thus the pattern of agricultural income sources of the hungry poor is similar to that of the calorie-sufficient (but still low income) households. This is not true in the case of off-farm income: wage earnings/self-employment income differs only by 14 percent while transfers/remittances are almost three times higher for the calorie-sufficient group.

- the man-land-ratio is 47 percent higher in the severely calorie-deficient group because farm size is smaller (by 10 percent) and household size is larger (by 27 percent).

- households with severely malnourished children (<70 percent of weight-for-age standard) have an average total income per capita lower by 14 percent, farm income lower by 27 percent, and subsistence income 25 percent lower than households with well-nourished children. However, the difference in off-farm incomes is only 6 percent.

- households with severely malnourished children consume 19 percent less calories per adult equivalent from subsistence food production.

- households with severely malnourished children show 21 percent higher man-land-ratios more because of smaller farms and less because of larger households.

Thus the tabulations suggest fairly strong income-hunger (calorie deficiency) and income-nutritional status linkages which will be confirmed by multivariate analysis.

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[30] The nutritional status of the most malnourished child in the household is used for classification.

Table 57--Income and employment sources of the malnourished rural poor by nutritional status of children, Rwanda, 1985-86

Indicator	Weight-for-Age >80 Percent	70-80 Percent	<70 Percent	Total Averages
Total income (FRW)	7,062	5,657	6,056	6,495
Farm income	2,744	2,463	2,001	2,567
Subsistence	2,105	1,979	1,583	2,003
Market	921	743	619	829
Cash crops	270	311	167	271
Food crops	293	209	284	265
Sorghum beer	358	223	168	293
Off-farm income	4,318	3,194	4,055	3,928
Transfers and remittances	1,113	566	1,047	930
Wage earnings/self employment	3,205	2,628	3,008	2,998
Labor and crafts work	1,347	1,201	1,464	1,314
Other income-generating activities	1,858	1,427	1,544	1,684
Male farm income	335	442	395	376
Female farm income	586	301	224	453
Male off-farm income	4,160	2,831	4,015	3,717
Female off-farm income	158	363	40	210
Total male income	4,495	3,273	4,410	4,093
Total female income	744	664	264	663
Calories/day/adult equivalent from subsistence production	1,675	1,583	1,355	1,608
Farm size (hectares)	0.80	0.74	0.61	0.76
Households in smallest farm size tercile (percent)	32.6	28.6	33.3	31.4
Households in middle farm size tercile (percent)	32.6	36.7	44.4	35.3
Households in top farm size tercile (percent)	34.8	34.7	22.2	33.3
Quasi-landless (percent)[a]	14.0	12.2	16.7	13.7
Man-land-ratio	11.2	12.5	13.5	11.9
Household size (persons)	5.7	6.3	6.0	5.9
Adult equivalents	4.2	4.4	4.2	4.3
Persons less than 10 years (percent)	37.1	41.3	88.0	38.5
Women-headed households (percent)	10.5	6.1	0.0	7.8
N	86	49	18	153

Source: IFPRI Survey 1985/86.

[a] Percent households with land below 0.25 hectares.

It should be noted that female income is absolutely and relatively (in terms of income share) much lower in households with malnourished children and in households of the hungry poor than in the better-off ones. Surprisingly, the female income source patterns of severely malnourished and non-malnourished are quite similar—about 70 percent of total income derived from the sale of food crops and beer and about 30 percent from transfers and wages—while almost half of the female income of moderately malnourished households originates as wage income and the bulk of the remainder from market farm income.[31] Also interesting is the fact that there are no female-headed households among those with severely malnourished children (Table 57) and a less than proportionate number are found among the calorie deficient households (Table 56).

Table 58 further explores the relationship of farm and off-farm income. The information contained in this table highlights that off-farm income has to be understood more as additional income than as income that substitutes for farm income. Off-farm income shares rise with total income while the farm income shares decline. Note that the range of off-farm income increase (3 percent-338 percent) is much wider than the corresponding decrease in farm income (132 percent-46 percent). Even households with large off-farm income shares at higher income levels maintain a high level of subsistence food production. Once the share of off-farm income exceeds 30 percent, the proportion of well-nourished households in each category begins to decline for both indicators (see columns 5 and 6 in Table 58).

Table 58--Annual total income per capita, by share of off-farm income, Rwanda

Off-Farm Income as Percent of Total Income	N	Total Income as Percent of Average Total Income	Off-Farm Income as Percent of Average Off-Farm Income	Farm Income as Percent of Average Farm Income	Percent of Households in	
					Best Calorie Group	Best Nutrition Group
< 10 percent	33	56.2	2.7	131.7	64	56
10 - 30 percent	38	63.9	20.4	125.1	71	61
30 - 60 percent	55	88.0	72.4	109.9	62	56
60 - 80 percent	37	111.8	142.2	69.1	49	55
> 80 percent	26	216.9	338.1	46.1	46	50
Total	189	100.0	100.0	100.0		

Source: IFPRI Survey 1985/86.

[31] The breakdown of farm income by gender was done on the basis of who actually did the market transaction, whereas subsistence income (reported in Tables 56 and 57) was determined as jointly earned income.

INTRAHOUSEHOLD INCOME LINKAGES

The somewhat loose connection between farm and off-farm income leads to the question about how strongly incomes from different sources earned by different members of the household are linked to each other.

In this survey, women's farm income is derived mainly from food crop and beer sales (cash crops sales are insignificant), while men market the cash crops. While female farm incomes are somewhat higher than male farm incomes, this is not the case for off-farm income, where men receive over 10 times as much as women.

The pattern of correlations between the incomes from different sources earned by men or women are shown in Table 59. They give an indication of the intrahousehold income linkages. No significant correlations between any male and female income source are found. Subsistence income which is predominantly obtained from female work is correlated only with female farm income. It seems that there are two income-earning parties which act relatively independent from each other within these households: Women who grow food crops for subsistence and market excess food crop production as well as sorghum beer; and men who engage mainly in cash cropping and off-farm income activities.

Table 59--Correlations between different income sources by gender

Income Source	Male Income			Female Income			Subsistence Income	Total Income
	Farm	Off-Farm	Total	Farm	Off-Farm	Total		
Male income								
Farm	X	0.29**	0.39**	...	...	...	...	0.35**
Off-farm		X	0.99**	...	...	...	...	0.92**
Total			X	...	...	...	...	0.92**
Female income								
Farm	...	...	...	X	0.43**	0.91**	0.32**	0.31**
Off-farm	...	...	...		X	0.76**	...	...
Total	...	...	...			X	0.28**	0.30**
Subsistence income	...	...	...	0.32**	...	0.28**	X	0.27**
Total income	0.35**	0.92**	0.92**	0.31**	...	0.30**	0.27**	X

** 1-tailed significance = 0.001 (t-test).

... No significant correlation

LINKS BETWEEN INCOME AND EXPENDITURE

Total annual expenditure, which was computed from several weekly food and three-month nonfood expenditure recalls, shows the expected pattern: the better the calorie consumption or nutritional status is, the higher is total expenditure per capita (von Braun, de Haen, and Blanken 1991). This means that expenditure may also be interpreted as a more permanent income proxy.

Households with serious calorie deficiency (<60 percent RDA) have total expenditure lower by an average 36 percent than households with (barely) sufficient calories (<80 percent RDA). The latter group had a total expenditure of 13,103 FRW ($119) while the hungry poor spent on average 8,342 FRW ($76) per annum per capita. Households with severely malnourished children had total expenditure lower by 19 percent than of those with well-nourished children. The variable "travel expenses" expresses a reverse trend: The worst nutritional group spends significantly more money on travelling than the other groups, which is probably because travelling is an income-searching activity in this setting and the poorest have to do more of it. An increased absence of adults (caretakers) may have an additionally adversely affect on the nutritional status of small children. Energy and health expenditure seem quite constant across groups. For the calorie consumption indicator, the best group has a significantly higher food expenditure and food expenditure from own production than the other groups. The food budget of the hungry poor is 78 percent of total expenditure and that of the calorie sufficient is 79 percent (Table 60). The propensity to spend on food was found to be high and nearly constant in the (low)

Table 60--Correlations between annual income by source and selected expenditures

	Food Expenditure	Nonfood Expenditure	Total Expenditure
Male farm income	...	...	...
Male off-farm income	...	0.30**	0.22**
Total male income	...	0.31**	0.22[a]
Female farm income	0.60**	0.19*	0.55**
Female off-farm income	0.27**	...	0.24**
Total female income	0.55**	...	0.50**
Subsistence income	0.30**	...	0.29**
Total income	0.35**	0.36**	0.40**

* 1-tailed significance = 0.01 (t-test).

** 1-tailed significance = 0.001 (t-test).

... No significance correlation.

income range of this sample. Nevertheless, diversity in diet increases rapidly when income increases (von Braun, de Haen, and Blanken 1991). The food budget of the households with severely malnourished children is 82 percent of total expenditure and that of households with adequately nourished children is 79 percent (Table 61).

Given the distinct pattern of income sources by gender noted above, it may be hypothesized that incomes from different sources may be spent differently because of distinct spheres of decision-making and preferences inside the household. Table 60 shows correlations between income by sources and expenditures by type. Food expenditure is highly correlated with female and subsistence income while nonfood expenditure is mainly correlated with male off-farm income. More detailed correlation matrices show very strong links between certain expenditure items within the food and nonfood groups and male or female income. There is not only a division of labor for income earning but also a "division of spending" by gender in the families surveyed in Rwanda.

CALORIE CONSUMPTION AND INCOME: A MULTIVARIATE ANALYSIS

The above chapters have examined income from various angles. Ir this section, we employ a multivariate analysis in which we seek to explain calorie consumption at the household level. Income (in a logarithmic form in order to capture decreasing impact of income on calorie consumption at the margin), prices, degree of subsistence in calorie consumption, and demographic household characteristics are the independent variables included in these models. The dependent variable is calories consumed per day per adult equivalent as observed during the three survey rounds.[32] The results for the whole sample (model 1), the poorest 25 percent (model 2), and the richest 25 percent (model 3) of households are shown in Table 61. The income elasticity for calories at the mean is strong (0.48), and it is even stronger for the poorest households (0.56), and weaker for the richest (0.41). The relation of sweet potato prices with potato prices (the first being a cheap calorie source for the poor) and the degree of subsistence are significant variables for model 2 (the poor) but not model 3 (the rich). This means that subsistence food production and cheap calories available on the market are important determinants for calorie consumption of poor households but not for better-off ones.

LINKS BETWEEN INCOME AND NUTRITIONAL STATUS OF CHILDREN

Since detailed information about income sources is available, the attempt was made to link this information to anthropometric data. The data used to calculate the figures in Table 62 was collected from 235 children aged six months to seven years. These children were measured

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[32] For a comprehensive discussion of the model, see von Braun, de Haen, and Blanken (1991).

Table 61--Calorie consumption, income level, source, and control: estimation results for different income groups (Dependent variable: calories per day per adult equivalent person - CALADEQ)

Explanatory Variables	MODEL 1 Total Sample Parameters	t-Values	Mean of Variable	Standard Deviation	Elasticity at Mean	MODEL 2 Bottom Quartile (Poorest) Parameters	t-Values	Mean of Variable	Standard Deviation	Elasticity at Mean	MODEL 3 Top Quartile (Richest) Parameters	t-Values	Mean of Variable	Standard Deviation	Elasticity at Mean
TOEXCA	1243.084	20.91	6.70	0.55	0.476	1334.465	10.99	6.51	0.54	0.561	1102.420	8.99	6.88	0.58	0.406
POTPRICE	-24.518	-2.44	8.55	3.55	-0.080	-24.464	-1.02	8.57	2.98	...	-15.959	-0.70	8.64	3.41	...
POTSWEET	-135.269	-1.32	0.84	0.37	...	-527.582	-2.24	0.83	0.34	-0.184	89.532	0.41	0.83	0.37	...
SUBCAL	5.221	3.71	75.91	21.68	0.152	8.376	3.02	76.24	21.55	0.268	3.497	1.13	74.68	22.04	...
CAPITA	-84.951	-6.12	5.51	2.24	-0.179	-40.528	-1.22	5.94	1.92	...	-75.474	-3.04	5.51	2.74	-0.153
CHSHARE	1323.005	8.66	0.29	0.20	0.147	1480.867	4.24	0.33	0.18	0.205	1410.199	4.26	0.22	0.21	0.114
FEMSHARE	5.122	3.60	15.37	20.96	0.030	1.461	0.60	21.08	24.00	...	10.515	3.66	13.16	23.36	0.051
ROUND 1	496.410	6.29	0.33	0.47	0.063	276.425	1.75	0.33	0.47	...	592.291	3.54	0.34	0.47	0.072
ROUND 2	437.296	5.40	0.33	0.47	0.055	559.805	3.31	0.33	0.47	0.078	441.648	2.64	0.33	0.47	0.054
Constant	-6093.713	-13.42	...	...	...	-6854.623	-7.58	...	...	...	...	...	...	...	...
(CALADEQ)	...	...	2609.40	1103.34	...	...	...	2379.80	1054.66	...	...	...	2715.36	1100.66	...
R^2			0.598					0.591					0.526		
F-value			93.1					23.5					18.1		
Degrees of freedom			549					131					130		

Variables:

TOEXCA = income proxy; logarithm of total expenditure per capita per month in respective survey round (in FRw).
POTPRICE = price of potatoes in FRW per kilogram.
POTSWEET = price ratio of potato over sweet potato rice.
SUBCAL = consumed own-produced calories in percent of total calories.
CAPITA = household size (number of persons).
CHSHARE = percent of children under 5 per capita in households.
FEMSHARE = female income share over total income.
ROUND 1, ROUND 2 = dummy variable for survey rounds 1 and 2.

Table 62--Correlations between income from different sources and nutritional status of children

Indicator	Income/Capita from: Cash Crop Sales	Food Crop Sales	Beer Sales	Sub-sistence	Wage Earnings/ Self-Employment	Transfers/ Remittances	Total Income
Height-for-age							
Z-Score	0.15**	...	...	...	...	0.14**	0.12**
Median	0.15**	...	...	...	...	0.13**	0.11**
Percent children >90 percent of median	...	...	...	...	...	...	...
Weight-for-age							
Z-Score	0.09*	...	...	...	...	...	...
Median	0.11*	...	...	...	...	...	...
Percent children >80 percent of median	...	...	...	...	...	...	...
Weight-for-height							
Z-Score	...	-0.12**	...	...	0.09*	...	...
Median	...	-0.12**	...	...	0.13**	...	...
Percent children >90 percent of median	...	...	...	...	...	...	...

* 1-tailed significance = 0.01.

** 1-tailed significance = 0.001.

... No significant correlation.

three times between March and october 1986 and all three measurements are included here.

The major source for food—subsistence—shows, at this correlation matrix, no link to any nutrition variable. This changes, however, in multivariate analysis controlling for demographics and health (von Braun, de Haen, and Blanken 1991). Income through cash crop sales and transfers are positively linked to the long-term nutritional indicator, height-for-age in multivariate analysis. The table suggests that the income source, "food crop sales," is negatively connected with the short-term variable, weight-for-height, while wage earnings/self-employment demonstrate reverse correlations. Correlations listed under weight-for-height invite speculation on whether short-term cash needs lead to food crop sales which then decrease food availability for children. Wage earnings/self-employment seem to have a positive short-term effect on children's nutritional status.

This sample statistical testing for correlations is, of course, not sufficient to explain the complex intrahousehold transformations that exist between income and nutrition. We, therefore, tried to explain the nutritional status of preschoolers (weight-for-age Z-score) in a multivariate analysis. Since detailed health-nutrition interactions,

including related resource allocations, were not recorded in the survey, an alternative aggregate approach of analysis is chosen. We hypothesize that increased household income permits families to take a number of actions which may be favorable for nutritional improvement. We exclude all potentially income-related determinants of nutritional status such as consumption or morbidity. Included are only income, income composition, and child demographic variables. The results of this regression are shown in Table 63. A significant income effect for nutritional improvement (elasticity at the mean = 0.79) was observed.[33] A negative and significant parameter of the income square variable indicated that the income effect on nutrition is decreasing at the margin. Very interesting is the negative, slightly significant parameter of female income share. This result suggests that increased engagement of women in cash earning has a negative effect on nutritional status of children. However, it should be kept in mind that this aggregated model is not suitable to explain how this effect functions.

Table 63--Effects of income on nutrition of children: regression analysis

Dependent variable: Weight-for-age Z-score values of preschoolers					
Explanatory Variables	Parameter	t-Values	Mean	Standard Deviation	Elasticity at Mean
Income[a]	4.926E-05	2.118	10310.01	4848.63	0.794
Income squares[a]	-1.534E-09	-2.153	129770490.00	155501167.00	-0.311
Income share from cash crops	0.503	1.562	0.05	0.12	...
Female income share	-3.497E-03	-1.772	14.26	18.87	-0.078
Age (months)	-0.011	-1.169	45.10	22.10	...
Age squared	1.070E-04	1.149	2521.92	2133.10	...
Sex (1=male, 2=female)	0.249	3.465	1.53	0.50	0.595
Birth order (1=oldest)	-0.045	-2.151	3.27	1.79	-0.230
Breast-feeding (months)[b]	0.016	3.663	16.55	11.67	0.407
Dependent weight-for-age Z-score			-0.64	0.94	
Constant	-1.190				
R^2	0.054				
F-value	5.291				
Degrees of freedom	662				

[a] Total annual expenditure is used as income proxy.

[b] Months of breast-feeding = 0 for children younger than 24 months.

[33] For a comprehensive discussion of this model, see von Braun, Kennedy, and Bouis (1988).

SPECIFIC HOME GOODS PRODUCTION: WATER AND WOOD

The above picture of income-expenditure-nutrition links would remain incomplete without looking into specific home goods production, especially water and fuel wood acquisition. Water and wood fetching are time-consuming activities. The amount as well as the quality of water and wood gathered can influence sanitation, food preparation, and heating. Water and wood fetching compete with other activities for time.

Water fetching takes about half an hour a day and is almost only performed by women and children. Time for collecting wood adds up to about nine hours per week and household. In two-thirds of all households, only women and children collect wood. Time allocation variables for fetching water and wood are highly correlated with each other.

Table 64 shows the discussed variables broken down by the three cutoff points of calorie consumption. The group with the highest calorie deficiency spends significantly more time on water and wood fetching than the other groups. The share of households that have to

Table 64--Water and wood acquisition by calorie consumption

Activity	Calorie Consumption			Total Averages
	>80 Percent	60-80 Percent	<60 Percent	
Water acquisition				
Minutes/day fetching water	34*	34	48*	36
Percent who fetch water				
Only woman	46**	34	16**	38
Only child(ren)	27**	36*	53* **	33
Woman and child(ren)	23	27	30	25
Family including husband/others	4	3	1	4
Wood acquisition				
Hours/week wood fetching	9	7**	11**	9
Percent who fetch wood				
Only woman	40**	27	22**	34
Only child(ren)	11	14	21	13
Woman and child(ren)	22	19	22	21
Family including husband/others	27	40	35	32
Households that purchase wood (percent)	8	4	16	8
households with own wood fields (percent)	32**	56**	44	39

Source: IFPRI Survey 1985/86.

* Denotes pairs of groups significantly different at 10 percent level.

** Denotes pairs of groups significantly different at 5 percent level.

buy wood doubles from 8 percent in the best-off group to 16 percent in the worst-off group. These calorie-deficient households may live in areas which are disadvantageous for water and wood collection and it may hold that the poorest tend to not only be short in money but also short in time. Disadvantageous is also the children's situation in this group: the percentage of households in which only children fetch water or wood increases substantially, while women's involvement in this activity decreases. Women of calorie-deficient households obviously do not have time to get water or wood. They also do not spent much time on marketing agricultural products or working off-farm (Table 56). But we know that farmers in the surveyed area react to a rising man-land-ratio by changing calorie production (towards cheaper calories and a higher output) and by intensifying labor input (von Braun, de Haen, and Blanken 1991).

We therefore conclude that the rapid increase of child work for household services (water, wood) in these calorie-deficient households might point to the fact that the food producers (which means the women) have reached a point where they devote all their efforts to subsistence production without being able to generate enough food.

CONCLUSION

Income-hunger-malnutrition linkages appear to be particularly strong in the highlands of Northern Rwanda, probably because of very low income levels. The role of subsistence food and home goods production is very important for hunger and child welfare in this land-scarce setting.

A common strategy among the households is the diversification of income sources in order to cope with on-farm and off-farm income risks. This income diversification follows along gender lines. For reduction of hunger and malnutrition it matters, therefore, not only how large a farm is and how much income is earned, but also who earns the income. The time spent on generating income is another important determinant. Shortage of women's time leads to crosscutting effects in their various functions as food producer, child caretaker, and housekeeper when they expand their income-earning activities. Time-saving technological change in agriculture and home goods production and improved (market) infrastructure are key to favorable household welfare effects in view of these constraints.

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8. INCOME SOURCES OF THE MALNOURISHED POOR IN RURAL ZAMBIA

Shubh K. Kumar

INTRODUCTION

This paper studies the income sources and characteristics of rural households in a relatively well off agricultural region in Zambia, in order to identify how the malnourished differ from the rest of the households. Both caloric adequacy and child nutritional status are used as discriminating factors to separate household into poorly and well-nourished households. Household demographic characteristics are used to derive the number of adult equivalents in the households.[34]

DATA

This data is derived from a sample of about 300 households drawn from ten study sites distributed in each of the nine districts of the Eastern Province of Zambia. The sampling procedure adopted is thus expected to give a representative sample of households from the whole Province.

The Eastern Province is among the most agriculturally progressive regions in Zambia. However it is different from the other agriculturally better off parts of the country in that it is located away from the 'line of rail' which is the area with the best level of infrastructure and nonagricultural economic activity. Other characteristics of the Eastern province include a very low population density—about 7 persons per square km in rural areas in 1980.

The data collection procedure consisted of monthly visits to each household during which both socioeconomic and dietary information was obtained. Food consumption was derived from a modified food expenditure record in which adjustment was made for foods actually consumed during

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[34] The daily caloric requirement per adult equivalent (adult male with a moderate level of activity) used is 3100. This corresponds to the figure of 2800 used for the Bangladesh case. The difference is due to the larger body size of the Zambian population relative to that of South Asia. Even though agricultural work is usually classified as heavy work, agricultural workers were given a moderate requirement due to the uneven nature of agricultural work. This lower figure is therefore a more conservative estimate, and is likely to be more applicable to the annual average level of requirements. This figure would therefore not be appropriate for assessing seasonal dietary adequacy. In the case of this paper, that is not an objective, and annual average dietary figures are used.

the past week. It is expected that this method would produce a more accurate reflection of intake than the simple expenditure record. Dietary information represents the annual consumption aggregated for 12 months of observations. For these tables, only those individuals measured during the February anthropometric survey and their annual household intakes are included.

Anthropometric measurements were recorded for all household members four times during the year. In this paper, the figures presented are for the measurements taken in the month of February at which time the level of nutrition status was found to be the lowest for the year. As in the other cases, the sample size in the anthropometric tables is different from the dietary results where all households are included. For anthropometric results, only children under five years of age are represented.

EXTENT OF MALNUTRITION BY FARM SIZE AND INCOME

The overall extent of malnutrition in the sample is found to be surprisingly high—about 38 percent of individuals were in households with less than 80 percent of caloric requirements for the year. About 30 percent of preschoolers were malnourished (below 80 percent of reference weight-for-age). From the results, it does appear that there is considerable overlap between these two indicators, in spite of the difference in sample sizes and composition.

It is also interesting that results in the case of both diet inadequacy and child malnutrition show a different pattern of association with farm size and with per capita household income. In the case of farm size (this does not include fallow land), there is an inverse relationship with diet adequacy. The lowest tercile of farm size have about 40 percent with less than 80 percent of caloric adequacy, those in the highest tercile have about 44 percent, while the middle tercile does somewhat better than the other two groups, with about 30 percent below 80 percent adequacy (Table 65).

The results for child malnutrition are similar in some respects. The middle farm size tercile again appears to be doing the best, with about 25 percent below 80 percent of reference weight-for-age (Table 66). The figure for the bottom farm size group is 34 percent and about 30 percent for the top group.

There is a clear and direct linear association between per capita household income and dietary adequacy. Over 70 percent of the bottom income tercile have less than 80 percent diet adequacy. That figure decreases to 31 percent in the second tercile and to 11 percent in the top income tercile. Similarly, severe diet inadequacy (below 60 percent of adequacy) affects 31 percent of the bottom income, 10 percent of the middle, and 0 percent of the top income group, which suggests a strong income caloric intake association.

Table 65--Prevalence of malnutrition in different groups, Zambia, 1986

Group	Sample Size	Dietary Adequacy of Households (Calories) <60 Percent	60-80 Percent	80-120 Percent	>120 Percent
		(household member and percent shares)			
Farm size	715	95 (13.3)	177 (24.8)	265 (37.1)	178 (24.9)
Small (0-1.1 hectares)	227	24 (10.6)	66 (29.1)	72 (31.7)	65 (28.6)
Medium (1.1-2.53 hectares)	242	30 (12.4)	43 (17.8)	109 (45.0)	60 (24.8)
Large (> 2.53 hectares)	246	41 (16.7)	68 (27.6)	84 (34.1)	53 (21.5)
Per capita income tercile	722	103 (14.3)	177 (24.5)	265 (36.7)	177 (24.5)
Low (<366.3)	249	78 (31.3)	100 (40.2)	64 (25.7)	7 (2.8)
Medium (366.3-674.3)	258	25 (9.7)	54 (20.9)	138 (53.5)	41 (15.9)
High (>674.3)	215	0 (0.0)	23 (10.7)	63 (29.3)	129 (60.0)

Source: IFPRI/RDSB/NFNC Survey on Growth and Equity in Eastern Province, 1986.

Table 66--Prevalence of child malnutrition (children aged less than 5 years) in different groups, Zambia, February 1986

Group	Sample Size	Weight-for-Age of Children < 5 Years <60 Percent	60-80 Percent	>80 Percent
		(preschoolers and percent shares)		
Farm size	169	5 (3.0)	45 (26.6)	119 (70.4)
Small (0-1.1 hectares)	56	1 (1.8)	18 (32.1)	37 (66.1)
Medium (1.1-2.53 hectares)	57	1 (1.8)	13 (22.8)	43 (75.4)
Large (>2.53 hectares)	56	3 (5.4)	14 (25.0)	39 (69.6)
Per capita income tercile	171	5 (2.9)	46 (26.9)	120 (70.2)
Low (<366.3)	68	3 (4.4)	18 (26.5)	47 (69.1)
Medium (366.3-674.3)	61	2 (3.3)	15 (24.6)	44 (72.1)
Large (>674.3)	42	0 (0.0)	13 (31.0)	29 (69.0)

Source: IFPRI/RDSB/NFNC Survey on Growth and Equity in Eastern Province, 1986.

Child malnutrition results show a similar pattern, particularly for the severely malnourished category. The prevalence of this group is highest in the lowest income group, 4.4 percent, and decreases to 3.3 percent in the middle group and to 0 percent in the top income group. The differences in the moderately malnourished and well nourished categories are less marked.

The results suggest that

- while diet improvements continue to occur with income increases, income alone appears to be able to eliminate only the most severe forms of child malnutrition; and
- farm size alone is a poor identifier of the malnourished poor.

INCOME SOURCES AND PREVALENCE OF MALNUTRITION

The two groups with inadequate diets also have below average per capita income (Table 67). Per capita income nearly quadruples between the lowest adequacy level and the highest adequacy level. Differences are not so marked in the case of the child malnutrition group. Only those children with severe malnutrition have low income levels on average, while the moderate malnutrition group has an average income level which is higher than the entire sample (Table 68).

All groups have a similarly high share of expenditures on food—about 75 percent of their total expenditure. There is only a very slight and imperceptible decline in this share of food expenditure from 78 to 74 percent, even with a near quadrupling of per capita income between the lowest adequacy level and the highest adequacy level (Tables 67 and 68). A sustained high share of food expenditure with substantial improvement in income and diet adequacy could indicate that there are continued noncaloric improvements in diet quality being made, or that diets are still perceived to be inadequate. The share of food expenditure from own production is similarly high, with only 25 percent of all food coming from purchases. The share of food purchases also does not change perceptibly between the groups.

Agriculture is the most important source of income for the sample households. Retained production alone provides about 77 percent of household incomes, with crop and animal sales providing an additional 17 percent (Table 67). Given the overwhelming importance of agriculture, agricultural income per se does not appear to be a very useful discriminating variable for assessing the malnourished poor—at least in the aggregate. However, those with poorer diets are more likely to retain a larger share of their agricultural production and to sell a smaller share. The share of nonfarm income increases slightly with better dietary adequacy. Income from remittances or gifts have not been included.

Table 67--Income sources of the malnourished rural poor (calorie consumption), Zambia, 1986

Group	Dietary Adequacy of Households (Calorie Consumption) <60 Percent	60-80 Percent	80-120 Percent	>120 Percent	Total Averages
Percentage of household income from					
Agriculture production retained	86.0	81.0	73.0	74.0	77.0
Wages	1.1	1.8	1.2	0.5	1.1
Nonfarm	2.7	4.1	7.1	4.1	5.0
Crop sales	7.8	11.0	17.5	19.4	15.2
Animal sales	2.7	1.2	1.3	1.9	1.6
Per capita total income/year (kwacha)	255.02	396.10	623.70	928.05	589.92
Proportion food expenditure (percent)	77.8	78.8	75.5	73.7	76.2
Proportion own-produced food expenditure (percent)	78.3	76.5	76.7	79.9	77.7
Total male-headed households	70	121	212	134	537
Percentage (percent)	13.04	22.53	39.48	24.95	100.0
Total female-headed households	33	56	53	44	186
Percentage (percent)	17.74	30.11	28.49	23.66	100.0
Non-hybrid maize user	69	157	151	94	471
Percentage (percent)	14.65	33.33	32.06	19.96	100.0
Hybrid maize user	26	20	114	83	243
Percentage (percent)	10.70	8.23	46.91	34.16	100.0
Fertilizer user	39	62	180	161	442
Percentage (percent)	8.82	14.03	40.72	36.43	100.0
Fertilizer nonuser	56	115	85	16	272
Percentage (percent)	20.59	42.28	31.25	5.88	100.0
Total land cultivated (hectares)	2.92	2.21	2.57	2.17	2.43
Per capita farm size (hectares)	0.269	0.283	0.439	0.432	0.376
Household size	10.5	7.9	5.7	4.8	6.7
Number of adult equivalents	6.7	5.3	3.7	3.3	4.4
Education of household head (last grade attended)	3.6	3.5	4.0	3.9	3.8
Education of female (last grade attended)	3.5	2.4	2.7	3.2	2.9

Source: IFPRI/RDSB/NFNC Survey on Growth and Equity in Eastern Province, 1986.

Table 68--Income sources of households with malnourished children (aged less than 5 years), Zambia, 1986

Group	Weight-for-Age of Children < 5 Years			
	<60 Percent	60-80 Percent	>80 Percent	Total Averages
Percentage of household income from				
Agriculture production retained	81.0	75.0	78.0	78.0
Wages	0.0	0.0	0.2	0.2
Nonfarm	1.3	8.0	7.0	7.0
Crop sales	15.0	16.0	13.0	14.0
Animal sales	2.0	0.7	1.8	1.5
Per capita total income/year (kwacha)	329.72	608.43	556.64	563.93
Per capita total expenditure/ month (11) (kwacha)	35.83	53.65	55.76	54.61
Proportion food expenditure (percent)	76.4	75.6	75.4	75.2
Proportion own-produced food expenditure (percent)	82.0	74.0	77.0	76.0
Total male-headed households	3	36	91	130
Percentage (percent)	2.31	27.69	70.00	100.0
Total female-headed households	2	10	29	41
Percentage (percent)	4.88	24.39	70.73	100.0
Non-hybrid maize user	3	29	74	106
Percentage (percent)	2.83	27.36	69.81	100.0
Hybrid maize user	2	16	45	63
Percentage (percent)	3.17	25.40	71.43	100.0
Fertilizer user	4	32	80	116
Percentage (percent)	3.45	27.59	68.97	100.0
Fertilizer nonuser	1	13	39	53
Percentage (percent)	1.89	24.53	73.58	100.0
Total land cultivated (hectares)	3.16	2.1	1.85	2.37
Per capita farm size (hectares)	0.34	0.3	0.38	0.36
Household size	10.3	6.9	6.9	6.98
Number of adult equivalents	6.5	4.3	4.4	4.4
Education of household head (last grade attended)	3	5	4.2	4.4
Education of female (last grade attended)	1.9	3.6	3.2	3.3

Source: IFPRI/RDSB/NFNC Survey on Growth and Equity in Eastern Province, 1986.

Even though the differences between the groups is very small, child malnutrition has some similar characteristics to diet adequacy. Children with severe malnutrition are more likely to be from households who retain a somewhat larger share of agricultural production, and have the lowest share of nonfarm income (Table 68). These findings suggest that the malnourished poor have a less diversified income source than other households in rural Zambia.

OTHER HOUSEHOLD CHARACTERISTICS

Female Head of Household

There is a higher percentage of female-headed households among the malnourished poor than in the population as a whole. Thus while about 38 percent of the total sample population has less than 80 percent caloric adequacy, 48 percent of female-headed households fell in this category. Similarly, 3 percent of children overall are severely malnourished, compared with nearly 5 percent for female-headed households.

Hybrid Maize Production

Households growing hybrid maize are less likely to have inadequate diets. Only 19 percent of hybrid maize producers have below 80 percent dietary inadequacy compared with 48 percent of those who are not hybrid maize-users (Table 67). However, the use of hybrid maize is not a good discriminating factor for identifying households with child malnutrition (Table 68).

Use of Fertilizers

Fertilizer use shows a similar pattern to that seen for hybrid maize production. Households who use fertilizers are less likely to have dietary inadequacies than those who do not. Less than 23 percent of fertilizer users have diets with less than 80 percent adequacy, compared with 63 percent for nonusers (Table 67). This may appear to be a useful indicator, since the majority of households do use fertilizers. However, the results for child malnutrition do not lend support to this criteria. Even though the differences are very small, the results may be indicative of changes that occur with fertilizer use. If labor use in agriculture is increasing with fertilizer use, then the results for diet would be in line with that (independent of the income effect of fertilizer use). For instance, increased labor use results in lower levels of child care, then the results would be a poorer child nutrition despite a higher caloric availability. Further research into this issue is required.

Farm size

Farm size has an unusual relationship with impoverishment as defined here. It appears that households with inadequate diets are likely to have somewhat larger farm sizes than households with a more adequate diet. However, the reverse is the case with per capita farm size—the more appropriate indicator of land endowment—which is lowest for those with inadequate dietary calories (Table 67). In the case of child malnutrition, per capita farm size does not differ between the groups (Table 68).

Household Size

Household size is found to be higher for the malnourished poor (Tables 67 and 68). For both indicators, the most severely affected households have an average household size of more than 10 members. In the case of dietary adequacy, both groups with below 80 percent caloric adequacy have above average household size, and, for those with above 80 percent caloric adequacy, household size decreases to below average. In the case of child malnutrition on the other hand, only the severely malnourished have an above average household size, with the other two groups showing a household size of about seven, the same as the sample average. Results for the number of adult equivalents parallels those for household size.

Education

Differences in education of both the household head and of females are clearer in the case of child malnutrition than in the case of dietary adequacy. Since dietary adequacy was earlier seen to be highly associated with income (which is primarily from agricultural sources), it appears that education, at least at the level at which it exists at present, may not be an important factor in agricultural production and income. That however, cannot be concluded from the present analysis, and it needs to be examined further. The education of both the head of household and of females is lower in the severely malnourished children's households, but in all the other groups is similar to the sample average.

9. INCOME AND EMPLOYMENT SOURCES OF THE MALNOURISHED RURAL POOR IN KANDY DISTRICT, SRI LANKA

Neville Edirisinghe

INTRODUCTION

Sri Lanka has just embarked upon a somewhat unique poverty alleviation program, called the "Janasaviya" ("strengthening people"). Under this program, the government would transfer Rs. 2,500 per month to each family in poverty, where poverty is defined for operational purposes as all those families who are recipients of food stamps. There are over 2 million such families who constitute over 50 percent of the population. This intended monthly transfer has a "consumption component" amounting to Rs. 1,458 (compared with about Rs. 400-500 from the present food stamps) and a savings component of Rs. 1,042. The program would end in two years at which time the savings component could be used as collateral to obtain loans for any investment activity. All government departments are expected to work during this period and beyond to assist these families to obtain productive employment and income earning activities.

If this program achieves the expected levels of success, poverty-related research in Sri Lanka would tend to be more on issues associated with relative poverty rather than with absolute poverty—the implicit subject matter of this paper. But many have cast doubts whether absolute poverty could be eliminated in such a short period as envisaged in this new program. Therefore, notwithstanding the very laudable goals of this program, it still makes sense to obtain a clear understanding of the dynamics of poverty and the role played by income and employment sources of the malnourished poor. In this regard, this paper uses data from a sample survey in the Kandy District to obtain some preliminary insights into income sources-nutrition relationships.

DATA SOURCE

During June/July 1984, a survey of 480 households in the district of Kandy was conducted jointly by the Food and Nutrition Policy Planning Division of the Ministry of Plan Implementation and the International Food Policy Research Institute. The primary purpose of this survey was to gather information on the food stamp scheme as it operated at the household level. The survey was also designed to examine factors related to the nutritional well-being of preschool-aged children. It should be noted that this survey did not include households from the

estate sector (plantations sector) since the primary objective of the survey was related to the food stamp scheme per se and the estate sector had a very low incidence of food stamp recipients. Thus, the discussions below on income and employment sources of the rural malnourished poor do not include the traditional export crops subsector.

Income Sources of the Malnourished

Virtually one-half of the rural households were consuming less than 80 percent of the recommended daily calorie allowance (on a per adult equivalent basis). Thirteen percent of the households were consuming less that 60 percent of the RDA (Table 69). Nutritional welfare, based on calorie consumption levels, is much higher among farm households than among nonfarm/landless households. One-third of farm households are calorie-deficient, whereas among nonfarm/landless households, calorie-deficient households constitute 56 percent. More importantly, 20 percent of the nonfarm/landless households consume less than 60 percent of the RDA.

As farm size increases, the likelihood of being ill-fed diminishes substantially. Forty-seven percent of small farm households consume less than 80 percent of the RDA, compared to just 23 percent of the large farm households. About one-fifth of the farm households in the top tercile still fall within the category of malnourished.

Table 69--Prevalence of malnutrition defined by calorie deficiency in different groups, Kandy District, Sri Lanka, 1984

Group	Total Sample	Calorie Consumption		
		>80 Percent	<80 Percent	<60 Percent
	(N)	(percent of households)		
Farm household by farm size[a]	161	63.0	37.0	9.0
Small	53	53.0	47.0	13.0
Medium	55	58.0	42.0	9.0
Large	53	77.0	23.0	4.0
Nonfarm/landless households	211	44.0	56.0	20.0
All households	372	52.0	48.0	13.0
Households by share of off-farm income in total income				
< 10 percent	8	75.0	25.0	0.0
10-30 percent	3	100.0	0	0.0
30-60 percent	21	61.9	38.1	9.5
> 60 percent	340	50.6	49.4	15.9

Source: Survey conducted by IFPRI/F&NPPD Collaborative Project, 1984.

[a] By terciles.

As dependence on off-farm income increases, the likelihood of being malnourished increases. Half of the nearly 94 percent of the households who receive over 60 percent of their total income from off-farm earnings were consuming less than 80 percent of the RDA, compared to 25 percent of the households with an off-farm income share of less than 10 percent.

With regard to sources of household income, the highest dependence is on wages (45 percent of all income on the average, as seen in Table 70). The malnourished are more wage-dependent. The share of wage incomes in total income among those households consuming more than 80 percent of RDA is substantially higher than such a share among the rest of the households. In the nutritionally better-off households, agricultural income (including income from livestock) constitutes about 18 percent of all income, compared to 9 percent in the malnourished households. In general, the nutritionally better-off households appear to have a reasonably well-diversified portfolio of income sources. Income from nonagricultural activities and other cash income, and income from transfers, remittances and rents, contribute almost equal shares to total income, while wage incomes (including salaries), as mentioned

Table 70--Income and employment sources of the malnourished rural poor, defined by calorie consumption, Kandy District, Sri Lanka, 1984

Indicator	Calorie Consumption >80 Percent	<80 Percent	<60 Percent	Total Averages
Percent of household total income from				
Agricultural income	13.21	7.42	5.69	10.44
Livestock income	4.37	1.19	0.35	2.85
Wage income	40.42	50.91	58.03	45.44
Nonmonetary and miscellaneous income	23.68	18.74	15.68	21.31
Transfers, remittances	18.32	22.47	18.72	19.04
Total income per capita (Rs/Month)	305.97	172.56	132.06	242.15
Average farm size (hectares)	0.64	0.23	0.18	0.49
Percent in bottom tercile	27.7	41.7	50.0	33.0
Percent in middle tercile	31.7	38.3	35.7	34.0
Percent in top tercile	40.6	20.0	14.3	33.0
Landless (percent)	47.94	66.29	75.00	56.72
Total expenditures per capita (Rs/Month)	379.25	199.92	186.93	293.44
Household size (persons)	5.64	6.38	6.67	6.00
Children less than 10 (percent)	17.52	24.31	23.17	20.77
Women-headed households (percent)	14.43	15.73	14.28	15.05

Source: Survey conducted by IFPRI/F&NPPD Collaborative Project, 1984.

earlier, dominate these. The percent landless is much higher (66 percent) among the malnourished households.

Whatever may be the income sources, it is clearly seen that the level of per capita income could be the most important variable affecting nutritional welfare of households. Those households having calorie consumption levels amounting to more than 80 percent of the RDA earned, on the average, almost twice as much per capita income than the other households.

Malnutrition Based on Weight-for-Age (WA) Measurements

The percentage of households that are malnourished, according to this anthropometric indicator, is almost the same as under the calorie consumption definition: Nearly one-half of the households are malnourished according to either indicator. However, there does not appear to be a clear distinction between farm households and nonfarm households in this variable (Table 71). The observed association between the weight-for-age variable and farm size presents a somewhat confusing picture where the largest farm-size category is associated with a lower-level nutritional status for preschool children. However, total per capita income does matter for the nutritional status of preschool children—those households having children with weight-for-age

Table 71--Prevalence of malnutrition, defined by weight-for-age of preschool-aged children, in different groups, Kandy District, Sri Lanka, 1984

Group	Total Sample	Weight-for-Age >80 Percent	Weight-for-Age <80 Percent
	(N)	(percent of households)	
Farm household by farm size[a]	76	48.68	51.32
Small	26	50.0	50.0
Medium	26	53.8	46.2
Large	24	41.7	58.3
Nonfarm/landless households	110	52.56	47.44
All households	186	51.0	49.0
Households by share of off-farm income in total income			
< 10 percent	6	66.67	33.33
10-30 percent	2	0.00	100.00
30-60 percent	12	33.33	66.67
> 60 percent	166	42.17	57.83

Source: Survey conducted by IFPRI/F&NPPD Collaborative Project, 1984.

[a] By terciles.

greater than 80 percent of the expected level, have per capita incomes more than double that of the remaining households (Table 72). The higher income levels of households with well-nourished children is accentuated by a substantially higher share of income coming from livestock-related incomes. As in the case of the calorie indicator, the percentage of landless households and the dependence on wage incomes is much larger among households with malnourished children relative to nutritionally better-off households.

CONCLUSION

Malnourished households in Kandy district are heavily dependent on wage incomes as well as transfers and remittances for their total incomes. Increasing household incomes through farming activities appears to be a bleak prospect, given the smallness of landholdings. Even the large farm households depend heavily on wage labor to supplement their incomes. Agriculture (non-tea) in this district is characterized by relatively small home gardens, growing a multiplicity of crops including high-value crops, such as spices. Labor requirements in these farms are relatively small compared to the major paddy-growing

Table 72--Income and employment sources of the malnourished rural poor, defined by weight-for-age of preschool-aged children, Kandy District, 1984

Indicator	Weight-for-Age	
	>80 Percent	<80 Percent
Percent of household total income from		
Agricultural income	11.84	11.64
Livestock income	9.43	1.78
Wage income	43.87	50.24
Nonmonetary and miscellaneous income	21.83	18.46
Transfers, remittances, rents	12.43	17.18
Total income per capita (Rs/month)	298.70	140.19
Average farm size (hectares)	0.38	0.10
Percent in bottom tercile	35.13	33.33
Percent in middle tercile	37.84	30.77
Percent in top tercile	27.03	35.90
Landless (percent)	52.56	63.89
Total expenditures per capita (Rs/month)	382.69	229.87
Household size (person)	5.87	6.30
Children less than 10 (percent)	35.37	40.54
Women-headed households (percent)	10.25	6.48

Source: Survey conducted by IFPRI/F&NPPD Collaborative Project, 1984.

areas in other parts of the country. Under these circumstances, it is likely that a major part of wage incomes come from nonagricultural activities. Miscellaneous income sources such as crafts work, services, and trading also contribute substantially to total income of both well-nourished and malnourished households. Public action, where necessary, to improve these skills and provide markets for them may be productive in alleviating the problem of malnutrition among the poorer households.

10. INCOME SOURCES OF THE MALNOURISHED RURAL POOR IN PAKISTAN

Marito Garcia
Harold Alderman

INTRODUCTION

Policy formation aimed at alleviating poverty, whether relative or absolute, must begin with an understanding of the characteristics of poor households. The levels and distribution of various welfare indicators help in defining the policy issues that need to be addressed. Similarly, a better knowledge of the sources of income of low income households, their expenditure patterns, asset base, and demographic characteristics assists in conceptualizing approaches to poverty programs.

This paper attempts to characterize the sources of incomes and expenditure patterns and relating these to levels of undernutrition measured by household food consumption and children's nutritional status. Data utilized for this analysis were collected in Pakistan in 1986/87 under the Food Security Management Project, a study undertaken in collaboration with the Pakistani research institutes—Applied Economic Research Centre (Karachi), Punjab Economic Research Institute (Lahore), the University of Baluchistan (Quetta), and Applied Economic Research Centre (Peshawar). The sample comprises of 1,082 households from five districts in the rural areas. The five districts include Faisalabad and Attock (Punjab Province), Badin (Sind Province), Dir (NWFP), and Mastung/Kalat (Baluchistan Province). Samples were not meant to be representative of the national population. These were chosen from among the poorest districts in the country, except for the irrigated areas in Faisalabad which was selected to provide a comparison with the rainfed areas.

SOURCES OF INCOME

The sources of earnings shown in Table 73 depict patterns that differ markedly across the five districts under study, although the variations within the district were moderate. A somewhat surprising result is that households in these areas, except for Mastung district, were not dependent on casual agricultural wages. Only two households out of 260 in Badin received more than half of their annual earnings from agricultural wages, although a third received at least some agricultural wage earnings. The corresponding percentages are 9.4 percent and 11.1 percent for Faisalabad, while less than 5.0 percent of

Table 73--Income sources by expenditure quintile, Pakistan, 1986/87

District	Expenditure Quintile	Total Household Income Including Transfers	Total Household Income from: Crop Profits	Livestock Profits	Rent and Return to Capital	Agricultural Wages	Nonfarm Activities	Transfer
		(Rupees)	(percent)					
Mastung	1	19,634	7.3	4.3	0.8	26.9	44.8	15.9
	2	24,326	7.7	2.8	0.4	30.2	52.2	6.7
	3	24,285	5.1	2.2	1.5	24.8	57.9	8.5
	4	30,526	10.7	5.8	4.3	26.2	57.2	7.4
	5	37,392	17.7	2.7	3.2	10.9	5.5	9.0
Dir	1	31,374	20.0	13.9	1.5	0.2	51.5	12.6
	2	38,610	19.6	14.1	3.3	0.4	44.6	17.9
	3	33,992	16.7	18.7	3.2	0.5	37.3	23.8
	4	45,258	17.7	17.9	5.1	0.1	30.6	28.7
	5	68,092	14.2	16.4	14.2	0.0	28.1	27.0
Faisalabad	1	23,893	7.8	16.3	1.3	7.3	66.5	5.0
	2	26,438	19.1	35.7	2.9	1.8	36.1	4.7
	3	22,124	11.1	36.0	1.7	1.5	49.0	9.7
	4	34,176	6.8	27.6	15.9	3.1	34.3	12.7
	5	58,584	29.5	25.6	19.0	1.1	15.8	10.0
Attock	1	11,429	1.7	32.2	0.0	3.4	49.4	15.8
	2	18,405	11.3	31.4	4.2	1.3	37.4	15.4
	3	21,047	8.2	30.8	5.7	0.8	39.0	17.0
	4	19,336	5.7	37.8	7.8	1.8	31.9	16.3
	5	30,482	12.4	20.2	20.3	0.0	29.7	17.4
Badin	1	18,569	36.7	17.6	3.7	5.5	24.7	11.8
	2	21,333	34.1	15.6	6.8	3.7	25.7	14.2
	3	28,296	38.8	19.8	.9	1.6	26.4	6.5
	4	34,862	40.2	11.9	9.4	1.2	22.7	14.5
	5	25,841	41.9	9.8	10.5	4.4	22.2	10.7

Source: IFPRI Rural Survey of Pakistan, 1986/87.

the sample in Dir or Attock had agricultural wage earnings and no families relied on such earnings for about half of their annual income. Consequently, the proportion of earnings from agricultural wages to the average income in each district is very low, as indicated in Table 73, ranging from less than 1 percent in Dir, 5 percent in Badin, and 4 percent in Attock.

The minor contribution of agricultural wages contrasted with the observations by other researchers in Pakistan (Noamon and Nadvi 1987; Nabi, Hamed, and Zahid 1986). The implication from the present data, nonetheless, points to the fact that, currently, there are not many wage laborers relying principally on their earnings on agriculture in the five rural districts under study.

The importance of nonagricultural labor, on the other hand, is clearly shown in all of the five districts and provides evidence of the

increasing role of nonfarm developments in rural areas. In nearly all sample districts, nonfarm earnings plus transfers exceed farm earnings. These patterns are indeed a reflection of the changing patterns of the rural economy in Pakistan. The large nonfarm contribution was achieved despite the high growth rate, 5.3 percent, in the agricultural sector in the last decade (Economic Survey, Government of Pakistan 1988). This simply indicates the growing opportunities for nonfarm employment and possibly migration as reflected by the high rates of income transfers. This may also be the effect of policies that promote off-farm employment and of educational investments that have received emphasis over the last five years.

Transfers, which include remittances from cities and from abroad, provide a major source of income. Remittances from abroad provide nearly a quarter of all incomes in Dir, while remittances in other districts are commonly domestic remittances from relatives working in the cities. These transfers are usually part of the social support network that is common in Pakistani culture.

The proportion of earnings contributed by crop farming (net farm profit) in Attock and Faisalabad is less than the livestock earnings (profit). The relative shares directly reflect the damage to crops sustained from the bad weather at harvest in 1987. In Badin and Dir, however, crop farm earnings are higher than livestock earnings. It should be stressed, however, that in the present analysis draught animals are treated as inputs into agricultural production, and as earnings from livestock. The substantial share from livestock earnings is generally in accord with national statistics, which indicate that for Pakistan as a whole, the contribution of livestock to total agricultural production is roughly one-third (Government of Pakistan 1988).

Rental earnings is another category that includes estimates of the returns to the ownership of tractors, mills, and other forms of capital assets. The share to total earnings is not significant in absolute terms, except for the highest expenditure quintile where about 10 percent of all incomes come from rental incomes.

MALNUTRITION AND INCOMES

Absolute levels of under-consumption and undernutrition can be approximated by using data on food intake and by anthropometric measurements in relation to the standards. This study utilizes food consumption information from the expenditure surveys (by food recall) aggregated in terms of calories. For the anthropometric measurements, children under the age of 6 years were included in the analysis.

Using expenditures as proxy for incomes, calorie consumption per capita shown in Table 74 clearly shows that the average calorie intake of the lowest income quintile is considerably less than the consumption of the top income quintile, indicating the important role that income

Table 74--Calories per capita, by per capita expenditure quintile, Pakistan, 1986/87

District	Expenditure Quintile				
	1	2	3	4	5
Mastung (Baluchistan)	1,931	2,212	2,458	2,598	3,105
Dir (NWFP)	1,810	1,907	2,004	2,124	2,348
Faisalabad (Punjab)	1,874	2,274	2,445	2,926	3,231
Attock (Punjab)	2,145	2,523	2,645	2,941	2,763
Badin (Sind)	1,973	2,085	2,206	2,339	2,653

Source: IFPRI Rural Survey of Pakistan, 1986/87.

plays in hunger in Pakistan. A multivariate analysis of such relationships, which is modeled using the same data elsewhere (Alderman 1989), has shown that households increase calorie consumption by 1.5 to 4.5 percent for every 10 percent increase in total expenditures with variations by district. The evidence thus points to an elasticity of demand for calories that is modest.

Under-consumption translates into poor nutrition among children in these households, as will be shown in Table 75 where the top income quintile have lower incidence of child wasting (low weight-for-height—below 80 percent of standards) and child stunting (low height-for-age —below 90 percent of standards) than those in the bottom income quintile. In terms of absolute incidence, however, malnutrition even among upper-income groups are still surprisingly high. It is also clear from this table that the absolute and relative levels of under-consumption do not perfectly correlate with the levels of malnutrition, indicating the complexity of the pathways of increasing nutrition into subsequent improvement in nutritional status. Although the present paper does not formally model the relationship of incomes and malnutrition, a number of policy-related information can be obtained by understanding the behavior of nutrition indicators with respect to differences in the sources of incomes of the poor.[35]

RELATIONSHIP OF MALNUTRITION AND ACCESS TO LAND

If access to economic resources is a good proxy for food security and nutrition, then access to land would theoretically have positive effects on the population's nutrition. Ownership of land is the main productive asset in rural Pakistan. The distribution of land in the sample areas is highly skewed, as indicated by the Gini coefficient for

[35] Modeling of nutritional status in Pakistan is pursued in Garcia and Alderman (1989).

Table 75--Prevalence of malnutrition, by expenditure quintile, Pakistan, 1986/87

District	Top Expenditure Quintile	Bottom Expenditure Quintile
	(percent)	
Weight-for-age (<80 percent of standard)		
Mastung (Baluchistan)	1.1	3.7
Dir (NWFP)	3.5	14.0
Faisalabad (Punjab)	4.1	7.0
Attock (Punjab)	3.4	14.2
Badin (Sind)	5.7	7.3
Height-for-age (<90 percent of standard)		
Mastung (Baluchistan)	33.1	71.4
Dir (NWFP)	36.0	47.1
Faisalabad (Punjab)	25.1	33.3
Attock (Punjab)	32.7	42.8
Badin (Sind)	31.6	41.4

Source: IFPRI Rural Survey of Pakistan, 1986/87.

land ownership in Table 76. A coefficient of zero indicates equality of ownership. Ownership is more skewed than operational holding, except in the case of Baluchistan where tenancy is not common. While Sind has the highest proportion of landlessness in the sample, it also has the lowest proportion of households with no operational holding, which implies that a big portion of the labor force relies on off-farm employment for livelihood.

The relationship between farm size and food consumption is explored in Table 77. The main conclusion that can be drawn from this is that size of farm does not affect the incidence of under-consumption. The proportion of households consuming less than 1,600 calories, for example, is not statistically different between small and large farms. However, it is evident that landless households consume less calories than those who own land--about 12 percent of landless households consume less than 1,600 calories per day compared to about 6 percent for those who owned land. Reliance on off-farm sources implies a slight but negative impact on food security in our sample households. This is clearly the case when one looks at relationships between the proportion of off-farm incomes and calorie consumption levels. More than 14 percent of the households who rely on more than 60 percent of their incomes from off-farm sources consume less than 1,600 calories per day compared to 4 percent for those who derive a tenth of their incomes from off-farm sources.

In Table 78, it is clear that the nutritional status of children in households who derive more than half of their incomes from off-farm

Table 76--Land and operational holding, Pakistan, 1986/87

District	Category: 0 Acre		< 5 Acres		> 5 and < 12.5 Acres		> 12.5 Acres		Gini Coefficient of Distribution
	Number of Households	Average	Number of Households	Average	Number of Households	Average	Number of Households	Average	
		(acres)		(acres)		(acres)		(acres)	
Mastung (Baluchistan)									
Land owned	53	0.00	59	2.58	37	7.55	76	52.08	0.746
Land rented in	219	0.00	5 (4)[a]	1.32	1 (0)	5.00	0 (0)	0.00	...
Land rented out	208	0.00	7 (5)	2.14	6 (6)	6.83	4 (3)	47.25	...
Operational holding[b]	118	0.00	38	2.20	28	8.02	41	48.71	0.848
Dir (NWFP)									
Land owned	97	0.00	98	2.00	38	7.66	39	38.29	0.795
Land rented in	192	0.00	46 (7)	1.97	23 (7)	7.41	11 (6)	23.09	...
Land rented out	185	0.00	43 (4)	2.23	23 (1)	7.87	21 (5)	40.17	...
Operational holding[b]	93	0.00	101	2.11	54	7.46	24	28.00	0.722
Attock and Faisalabad (Punjab)									
Land owned	139	0.00	98	2.23	69	7.54	74	44.27	0.801
Land rented in	268	0.00	36 (13)	2.66	55 (15)	7.40	21 (1)	19.20	...
Land rented out	311	0.00	18 (1)	2.48	25 (2)	7.86	26 (4)	63.34	...
Operational holding[b]	122	0.00	87	2.63	114	8.06	57	22.81	0.640
Badin (Sind)									
Land owned	130	0.00	30	3.13	37	7.80	78	37.66	0.733
Land rented in	111	0.00	35 (1)	3.46	94 (4)	7.80	35 (5)	21.40	...
Land rented out	211	0.00	10 (2)	3.30	22 (2)	8.20	24 (5)	32.81	...
Operational holding[b]	39	0.00	38	3.23	125	8.14	73	24.73	0.502

Source: IFPRI Rural Survey of Pakistan, 1986/87.

[a] Numbers in parentheses indicate rental on fixed rent as opposed to share cropping.

[b] Operational holding excludes land classified as uncultivatable.

sources appears to have similar nutritional levels with those who depend on 10 percent of incomes from off-farm sources. The inconsistency of such results compared to the calorie-off-farm income relationships implies that other factors should be considered when trying to elucidate the pathway from food intake to child nutrition.

SOURCES OF INCOME, FOOD SECURITY, AND NUTRITION

To understand the above relationships, we shall examine the breakdown of earnings according to their sources given in Tables 79 and 80 and cross-tabulated by the levels of caloric intakes and by nutritional status of children. On average, households in our sample depend on a fifth of all incomes on crop production, 15 percent on livestock earnings, and only 6 percent on agricultural wages. The largest single source is nonfarm incomes (excluding transfers and remittances), which on average accounts for 36 percent of the total

Table 77--Prevalence of malnutrition, by calorie consumption, in different groups, Pakistan, 1986/87

Group	Samples	Calorie Consumption Per Day		
		> 2,400	1,600-2,400	< 1,600
	(N)	(percent of households)		
Farm household by farm size				
Landless	256	39.3	48.5	12.2
Small	269	50.5	43.6	5.9
Medium	281	36.0	55.3	8.7
Large	276	49.3	46.2	4.5
Households by share of off-farm income in total income				
< 10 percent	360	45.5	50.3	4.2
10-30 percent	183	28.3	65.4	6.3
30-60 percent	250	46.7	44.5	9.9
> 60 percent	289	46.9	49.7	14.8

Source: IFPRI Rural Survey of Pakistan, 1986/87.

Table 78--Prevalence of malnutrition, by weight-for-age, in different groups, Pakistan, 1986/87

Group	Samples	Weight-for-Age		
		>80 Percent	60-80 Percent	<60 Percent
	(N)	(percent of households)		
Farm household by farm size				
Landless	256	49.0	46.1	4.9
Small	269	57.3	40.2	2.5
Medium	281	49.8	46.9	3.3
Large	276	51.9	48.9	4.0
Households by share of off-farm income in total income				
< 10 percent	360	49.0	46.7	4.3
10-30 percent	183	51.0	42.8	6.2
30-60 percent	250	52.8	42.0	5.2
> 60 percent	289	52.1	45.6	2.3

Source: IFPRI Rural Survey of Pakistan, 1986/87.

Table 79--Income and employment sources of the malnourished rural poor, by calorie consumption, Pakistan, 1986/87

Indicator	Calorie Consumption Per Day			
	> 2,400	1,600-2,400	< 1,600	Total Averages
Percent of total household income from				
Crops	20.5	24.8	17.0	21.3
Livestock	15.5	14.2	13.1	14.9
Agricultural wages	7.3	6.1	3.4	6.0
Rents and returns to capital	6.2	7.2	1.5	6.0
Nonfarm	37.5	32.3	56.0	37.9
Transfers				
Total	14.0	15.4	9.5	14.0
Zakat and pension	0.7	0.8	0.8	0.8
Remittances	12.7	15.9	9.0	13.0
Total transfers per capita (Rs)	682.1	854.1	217.1	725.0
Total income per capita (Rs)	3,704.4	3,620.6	2,678.6	3,579.0
Total expenditures per capita (Rs)	3,349.1	2,863.9	2,436.5	3,037.0
Household size (persons)	10.4	11.6	10.6	11.0
Children less than 10 (percent)	43.3	42.1	45.6	43.2
Maximum years of schooling of husbands in household	7.2	6.5	5.5	6.7

Source: IFPRI Rural Survey of Pakistan, 1986/87.

Table 80--Income and employment sources of the malnourished rural poor (for nutritional status indicators), Pakistan, 1986/87

Indicator	Weight-for-Age			
	>80 Percent	60-80 Percent	<60 Percent	Total Averages
Percent of total household income from				
Crops	21.0	22.2	29.7	21.4
Livestock	17.0	13.0	15.2	15.6
Agricultural wages	4.5	9.2	5.4	6.0
Rents and returns to capital	6.1	6.0	5.0	5.8
Nonfarm	37.0	37.2	32.3	36.3
Transfers				
Total	15.0	13.0	13.0	14.1
Zakat and pension	0.7	1.2	1.5	1.2
Remittances	14.0	12.7	14.5	11.0
Total transfers per capita (Rs)	873.5	587.3	387.0	725.0
Total income per capita (Rs)	3,860.0	3,315.0	2,965.0	
Total expenditures per capita (Rs)	3,180.0	2,886.0	2,873.0	3,037.0
Household size (persons)	11.2	10.8	11.1	11.0
Children less than 10 (percent)	43.3	43.6	38.9	43.3
Maximum years of schooling of husbands in household	7.4	5.9	6.0	6.7

Source: IFPRI Rural Survey of Pakistan, 1986/87.

incomes. Remittances account for 13 percent while transfers (mostly *zakat*[36]) account for nearly 1 percent.

A detailed breakdown of the sources of incomes of households consuming adequate calories (above 2,400 per day) appears to be somewhat different from the sources for those with inadequate intakes (below 1,600 calories per day). Households with inadequate diets tend to depend more on nonfarm sources. Around 56 percent of the average income of calorie-deficit households come from nonfarm sources compared to 37 percent for the calorie-inadequate households. Both adequate and inadequate groups, however, tend to have similar sources with respect to incomes derived from crops and livestock. Households with high absolute levels of remittances and transfers were found to consume higher calories. Part of the explanation may be simply that employment outside the villages provides for a security net for those left in the villages. Funds that arrive in regular intervals (such as fixed salary incomes) tend to smooth consumption patterns. Consumption for those who depend on farm earnings may not be as smooth because of the lumpy and seasonal nature of their earnings. As expected, households with sufficient calories depend more on incomes from land and equipment rented out than the calorie-deficit households. It is, however, somewhat surprising to note that both calorie-deficit and calorie-adequate households derive some of their income from *zakat*, since, in principle, *zakat* are transfers that are targeted only to very poor households.

Results for children given in Table 80 indicate more similarities than differences in sources of incomes for those households with malnourished versus those with well-nourished children, which again emphasizes the complexity of looking at anthropometric measurements. The role of other factors that produce better-nourished children needs to be examined much more closely.

CONCLUSION

The levels of child malnutrition in Pakistan are high even when compared to countries with the same levels of income. This is quite perplexing given that the average per capita calorie consumption in the country is relatively high and nearly adequate. In order to get a better picture of the relationships, the present paper examined the problem from the point of view of sources of incomes and assets of the malnourished and well-nourished groups.

Food security in the five sample districts in Pakistan is associated with higher levels of income and higher levels of total expenditures per capita. Households with per capita daily intake of less than 1,600 calories per day earn nearly a third less than those

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[36] Zakat in Islamic tradition is a percentage of assets directed to charity.

consuming above 2,400 per day. The link between income and food consumption is therefore positive but moderate in magnitude.

Ownership of land appears to be a determinant of food security. Landless households are twice as much likely to belong to the calorie-inadequate categories than those households who owned land. However, size of land does not appear to be an important determinant of food security in the rural areas of Pakistan where households with large farms have nearly similar intakes as those with small-sized farms.

The results also indicate that households with higher dependence on off-farm earnings are likely to be worse-off in terms of caloric intake and in the nutritional status among children.

There are more similarities than differences in the sources of income among calorie-deficit versus calorie-adequate groups. The main differences tend to be in the off-farm sources where the deficient groups have larger shares. Clearly, the role of factors other than income is important in understanding the nutrition problem. The difficulty of isolating such factors may be explained by the fact that these factors are also income-mediated. Other studies using the same data set (Garcia and Alderman 1989) found the important role played by community factors, which are not only related to physical environment and sanitation but also to distance to markets, inputs to agriculture and health services.

11. INCOME SOURCES OF THE MALNOURISHED POOR IN RURAL BANGLADESH

Shubh K. Kumar

INTRODUCTION

This paper describes the characteristics and sources of income of rural households in Bangladesh which show inadequate caloric intakes and low levels of child malnutrition. The basis for deriving caloric adequacy was household demographic composition and primary occupation of each member of the household. Some prior assumption had to be made about the level of physical exertion required. Most rural occupations were assumed to require a 'moderate' level of activity. Some activities, such as office work, teaching, and activities associated with retail trade, were classified as 'sedentary' while a few, such as rickshaw pulling and similar level of work were classified as a 'high' level of activity. No allowances could be made beyond that for the actual exertion required and the extent of employment actually obtained.

DATA

The data are derived from a sample of 16 villages from the major agro-ecological zones in Bangladesh, which were selected to represent variations in the degree of adoption of improved agricultural technologies and access to physical infrastructure. The sampling was structured more to obtain the variations that were analytically important, and not necessarily to obtain a representative sample overall for the agro-ecological zones or for Bangladesh. It is likely that since the weighing of 'good' areas was equal to that for the 'poor' areas, the sample as a whole may be biased towards characteristics of the better areas when using the aggregate sample, as is being done for this analysis, and in making national comparisons.

Food consumption information is derived from the expenditure records. It is usually expected that expenditure records overstate food consumption in comparison with actual intake, and this should be noted in connection with the results presented here. However, both this and the previous caveat on possible biases in the data are not likely to influence the present analysis of income sources of the malnourished.

Anthropometric measurements were available only for a subsample of eight villages, and, therefore, the tables reflecting household characteristics of those with malnourished children is for a smaller sample. The observations used are from one of the three rounds of

information collected during the year 1982, and reflect the season during which the nutrition levels are usually the worst, viz. in September.

EXTENT OF MALNUTRITION BY FARM SIZE AND INCOME

For the sample as a whole, nearly 18 percent of households have below 80 percent of dietary adequacy, and, therefore, are most likely to have an insufficient intake (Table 81). Landless households have the highest prevalence, with over 31 percent of them with insufficient diets. The next most vulnerable group is the small farmer category (lowest one-third of farm sizes), with 25 percent of households having inadequate diets. Of the top third of farm size households, less than 5 percent have dietary insufficiency.

Similar results are obtained for the anthropometric results, with, however, a smaller decline in prevalence of child malnutrition from the landless group to the top one-third of farm sizes (Table 82). Moreover, the declines are obvious only for the category of severe child malnutrition—below 60 percent of weight for age. In the moderate category, there is no apparent change in prevalence with an improvement in land status. For the sample as a whole, nearly 10 percent of household with children aged less than five years are in the severely malnourished category. The figure for landless households is nearly 13 percent, and it is 12 percent for the smallest farm size category. The difference between these two groups and the two larger farm size categories is quite substantial, with about a 30 percent decrease in severe malnutrition. Unlike in the case of dietary intakes, prevalence of moderate child malnutrition is virtually the same for all land size groups. It is important to note that only about one-fifth of children overall (including the largest farm size group) are in the above 80 percent weight for age, or normal range.

In the second part of Tables 81 and 82, the importance of off-farm income for the prevalence of malnutrition is shown. Dietary insufficiency is highest for those with the lowest share of off-farm income. Forty percent of households with less than 10 percent share of off-farm income were in the below 80 percent adequacy category compared to about 18 percent in the sample as a whole. There is a U-shaped relationship between off-farm income and dietary inadequacy. Thus the highest inadequacies are found at the lowest and highest shares of off-farm income.

In the case of child malnutrition, it is interesting to note that the pattern of severe malnutrition is similar to the dietary results, but with the differences much less marked, as before. What is also noteworthy with respect to child malnutrition, is that the pattern for the moderate and normal nutrition categories suggests a detrimental effect of off-farm income. Thus the prevalence of moderate child malnutrition is highest in the group with more than 60 percent of income from off-farm sources, and is the lowest in the group with less than 10

Table 81--Prevalence of calorie deficiency in different groups, Bangladesh, 1982/83

Group	Total Sample	Calorie Consumption <60 Percent	60-80 Percent	80-120 Percent	>120 Percent	Mean Adequacy
		(households and percent shares)				
Farm households by farm size	442	16 (3.6)	45 (10.2)	229 (51.8)	152 (34.4)	106.35
Lowest tercile (<=0.41 hectares)	148	11 (7.4)	26 (17.6)	83 (56.1)	28 (18.9)	97.9
Middle tercile (0.41-1.03 hectares)	147	4 (2.7)	13 (8.8)	74 (50.3)	56 (38.1)	110.99
Highest tercile (>1.03 hectares)	147	1 (0.7)	6 (4.1)	72 (49.0)	68 (46.3)	117.16
Nonfarm/landless households (cultivated land=0)	121	8 (6.6)	30 (24.8)	55 (45.5)	28 (23.1)	97.34
Total sample	563	24 (4.3)	75 (13.3)	284 (50.4)	180 (32.0)	106.35
Households by share of off-farm income in total income						
< 10 percent	15	3 (20.0)	3 (20.0)	5 (33.3)	4 (26.7)	94.6
10-30 percent	198	10 (5.1)	22 (11.1)	98 (49.5)	68 (34.3)	107.59
30-60 percent	246	9 (3.7)	28 (11.4)	135 (54.9)	74 (30.1)	106.42
> 60 percent	104	2 (1.9)	22 (21.2)	46 (44.2)	34 (32.7)	105.49
Total sample	563	24 (4.3)	75 (13.3)	284 (50.4)	180 (32.0)	106.35

Source: International Food Policy Research Institute/Bangladesh Institute for Development Studies 1982/83 Survey

percent from off-farm sources. Conversely, in the well-nourished group of children, the lowest prevalence is in the group with the highest share of off-farm income. The two groups who have below 30 percent of off-farm income have the highest prevalence of well nourished children (Table 82).

INCOME SOURCES AND PREVALENCE OF MALNUTRITION

Per capita household income increases about 50 percent between the group with below 60 percent of dietary adequacy to the group with above 80 percent adequacy. Similar increases are seen in the case of child malnutrition—with per capita household income increasing about 50 percent between households with severe malnutrition to households with above 80 percent weight-for-age. On the other hand, consumption

Table 82--Prevalence of malnutrition (anthropometric status) in different groups of households with children aged 5 years and below, Bangladesh, 1982/83

Group	Total Sample	Weight-for-Age <60 Percent	60-80 Percent	>80 Percent
		(household and percent shares)		
Farm households by farm size	283	26 (9.2)	198 (70.0)	59 (20.8)
Lowest tercile (<=0.47 hectares)	92	11 (12.0)	63 (68.5)	18 (19.6)
Middle tercile (0.47-1.2 hectares)	97	8 (8.2)	68 (70.1)	21 (21.6)
Highest tercile (>1.2 hectares)	94	7 (7.4)	67 (71.3)	20 (21.3)
Nonfarm/landless households (Cultivated land=0)	55	7 (12.7)	39 (70.9)	9 (16.4)
Total sample	338	33 (9.8)	237 (70.1)	68 (20.1)
Households by share of off-farm income in total income				
< 10 percent	12	2 (16.7)	7 (58.3)	3 (25.0)
10-30 percent	143	8 (5.6)	98 (68.5)	37 (25.9)
30-60 percent	139	17 (12.2)	99 (71.2)	23 (16.5)
>60 percent	44	6 (13.6)	33 (75.0)	5 (11.4)
Total sample	338	33 (9.8)	237 (70.1)	68 (20.1)

Source: International Food Policy Research Institute/Bangladesh Institute for Development Studies 1982/83 Survey.

expenditure doubles from the below 60 percent to the above 80 percent diet adequacy groups, but increases by only about 50 percent from severe to normal child nutrition categories.

Tables 83 and 84 show the share of household income from different sources. The most distinct characteristic of households with a low level of dietary adequacy (below 80 percent) is that they have the highest share of agricultural wage income and the lowest share of other agricultural income (predominantly livestock income). Thus it may be expected that landless households predominate in this category. In the case of child malnutrition, the indication that the worst off households are likely to be the landless appears to be greater, even though this was only slightly apparent in Table 82. In Table 84, children with severe malnutrition come from households with the lowest share of

Table 83--Income and employment sources of the malnourished rural poor, Bangladesh, 1982/83

Group	Calorie Consumption <60 Percent	60-80 Percent	80-120 Percent	>120 Percent	Total Averages
	(in percent and Taka)				
Household income from (in percent of total income)					
Agriculture production (Taka)	(40.6) 6187.0	(23.9) 3457.93	(34.4) 6783.45	(39.1) 9890.36	(35.5) 7308.34
Other agricultural (including livestock)	(11.6) 1768.4	(18.8) 2727.27	(24.1) 4756.1	(22.4) 5669.51	(22.6) 4650.5
Agricultural wages	(23.6) 3592.9	(14.0) 2033.42	(4.7) 930.58	(1.5) 386.7	(4.9) 1013.46
Nonagriculture wages	(11.1) 1692.5	(13.2) 1913.48	(10.7) 2109.47	(6.2) 1578.58	(9.2) 1894.93
Industry, trade crafts	(2.4) 359.7	(11.9) 1724.6	(7.1) 1408.23	(12.6) 3190.44	(9.6) 1975.48
Transfers, remittances and others	(10.7) 1623.37	(18.1) 2617.79	(18.9) 3716.25	(18.2) 4598.13	(18.3) 3762.65
Total	(100.0) 15223.79	(100.0) 14474.49	(100.0) 19704.08	(100.0) 25313.72	(100.0) 20605.36
Total income per capita (Taka)	2233.31	2202.58	3012.62	4053.85	3204.39
Average cultivated farm size (hectare)	0.41	0.56	0.9	1.14	0.94
Percent in bottom tercile	68.8	57.8	36.2	18.4	33.5
Percent in middle tercile	25.0	28.9	32.3	36.8	33.3
Percent in top tercile	6.3	13.3	31.4	44.7	33.3
Percent landless	33.3	40.0	19.4	15.6	21.5
Consumption expenditure per capita (Taka)	1399.58	1786.41	2495.94	3426.87	2655.86
Total expenditure per capita (Taka)	1442.77	1955.08	2836.73	3862.31	2991.84
Household size	6.33	6.68	6.71	6.26	6.55
Children less than 10 (percent)	22.02	28.94	30.18	32.18	30.31
Women-headed households (percent)	0.0	2.67	1.06	2.78	1.78
Education of household head (years)	1.58	1.05	2.49	3.2	2.49
Education of all adults (years)	0.9	0.9	1.87	2.78	1.99
Education of female adults (years)	0.38	0.35	0.96	1.68	1.08
Education of household head's wife (years)	0.21	0.25	0.88	1.45	0.96

Source: International Food Policy Research Institute/Bangladesh Institute for Development Studies 1982/83 Survey

Table 84--Income and employment sources of the malnourished rural poor, 5 years and below, Bangladesh, 1982/83

Group	Weight-for-Age <60 Percent	60-80 Percent	>80 Percent	Total Average
	(in percent and Taka)			
Household income from (in percent of total income)				
Agriculture production	(32.5) 6422.9	(33.9) 7699.81	(48.4) 14255.00	(37.4) 8893.98
Other agricultural (including livestock)	(26.0) 5136.5	(26.2) 5956.76	(22.1) 6507.63	(25.2) 5987.5
Agriculture wages	(5.5) 1077.9	(3.5) 802.9	(2.7) 803.4	(3.5) 829.46
Nonagriculture wages	(10.7) 2113.3	(9.4) 2140.86	(4.9) 1432.47	(8.4) 1993.21
Industry, trade crafts	(6.8) 1334.76	(8.1) 1838.02	(5.2) 1544.5	(7.3) 1729.83
Transfers, remittances and others	(18.6) 3665.24	(18.9) 4290.96	(16.6) 4893.75	(18.3) 4351.14
Total	(100.0) 19750.62	(100.0) 22729.31	(100.0) 29436.75	(100.0) 23785.12
Total income per capita (Taka)	2405.91	2965.62	3620.3	3042.64
Average cultivated farm size (hectare)	1.07	1.06	1.03	1.05
Percent in bottom tercile	42.3	31.8	30.5	32.5
Percent in middle tercile	30.8	34.3	35.6	34.3
Percent in top tercile	26.9	33.8	33.9	33.2
Percent landless	26.9	16.5	13.2	16.3
Consumption expenditure per capita (Taka)	2190.87	2534.43	2918.61	2580.05
Total expenditure per capita (Taka)	2408.32	2948.61	3645.55	3039.33
Household size	8.00	7.89	8.44	8.01
Children less than 10 (percent)	44.01	38.72	37.10	39.90
Women-headed households (percent)	3.0	0.4	0.00	0.59
Education of household head (years)	2.56	2.42	3.65	2.69
Education of household head's wife (years)	0.33	0.69	1.5	0.82
Education of adults (years)	1.78	1.77	2.58	1.93

Source: International Food Policy Research Institute/Bangladesh Institute for Development Studies 1982/83 Survey

agricultural production income, and a slightly higher share of agricultural and nonagricultural wage income.

OTHER HOUSEHOLD CHARACTERISTICS

Household Size

There is no apparent pattern between household size and level of dietary adequacy or nutritional status. However, households with children of under five years have a larger household size—about 8 on average as compared with about 6.5 for the entire sample population.

Children Under 10 Years of Age

The differences between the groups is not substantial but the pattern differs between them. The better nourished households in the whole sample have a larger proportion of children under 10 years of age, whereas households with the most severely malnourished children have a higher proportion of children less than 10 years old.

Education of Household Members

The education of all household members is higher as the level of dietary adequacy and child nutritional status increases. However, the extent of increase in years of education of the wife of the head of the household is much more striking for both indicators than that of the head of household or all adults. In the case of dietary adequacy, the years of schooling doubles between the lowest and the highest levels of diet for the head of household, while the increase is over sevenfold for the wife of head of household. Similarly, in the case of nutritional status of children, the head of household's education increased only 50 percent between households with children in the severely malnourished and well nourished categories, while the education of the wife of the head of the household increases nearly five times. This points to the possible importance of women's education and/or decision making capacity in the household as a factor in the improvement of diet and nutrition.

Households Headed by Women

As may be expected, female-headed households are an insignificant part of the population in Bangladesh. Despite their minuscule size in the population as a whole—about 0.6 percent of households—it is noteworthy that among the households with under five children, their proportion is substantially higher—nearly 2 percent. It thus appears, that even though female headed households are relatively rare in Bangladesh, they are more likely to consist of young children.

12. PATTERNS AND FLUCTUATIONS OF INCOME OF THE MALNOURISHED RURAL POOR IN NORTH ARCOT DISTRICT, INDIA

Yisehac Yohannes

INTRODUCTION

The purpose of this study is, first, to identify the malnourished rural poor households in the North Arcot District of India, and second, to examine their employment and income sources.

North Arcot District[37] is located in the northwest of Tamil Nadu State in India. This study is confined to a specific region within that district. The study region is an important paddy and groundnut producing region and the rural population derives its income from these two crops and sugarcane farming, as well as from employment in agro-processing industries. The study region is further characterized by the widespread use of irrigation and by high yield varieties of rice adopted in the 1960s. Wells and storage tanks are the principal sources of irrigation with 60 percent of the tanks in North Arcot being located in the study region. The continuous use of water for irrigation from these sources may be interrupted or reduced by decreased levels of rainfall, thus making the farm population vulnerable to drought.

This paper first identifies the malnourished farm households. This is followed by discussions on the landless, on the distribution of malnourished households by off-farm income class, and the employment and income sources of these malnourished households.

DATA SOURCES

The data used in this study is from a monthly income and expenditure survey conducted by the International Food Policy Research Institute and Tamil Nadu Agriculture University in 1982/83 and 1983/84. It was felt that the results from the 1982/83 survey, due to a drought during that period, may not convey a true picture of the welfare of the population, and therefore, in 1983/84, subsamples of villages surveyed in 1982/83 were resurveyed. The 1983/84 subsamples were taken from the villages severely affected by the 1982/83 drought. It must be emphasized that, although the sample villages were the same in both

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[37] The regional description is drawn from Ramasamy, Hazell, and Aiyasamy, forthcoming.

surveys, the sample households in the 1983/84 survey were not necessarily the same as in the 1982/83 survey.

In both surveys, independent samples were taken from three population groups—paddy farms, non-paddy farms, and landless and nonagriculturalist households—under different sampling procedures (for details, see Ramasamy, Hazell and Aiyasamy, forthcoming). The analysis in this paper is based upon a pooled data set obtained by applying proper weights to the three independently drawn samples.[38]

IDENTIFICATION OF THE MALNOURISHED HOUSEHOLDS

Rural households were stratified according to their per capita daily calorie consumption. Two cutoff points were established in accordance with a recommended daily per capita calorie allowance of 2,200 calories. Those households falling below 80 percent and 60 percent of RDA will be respectively referred to as 'malnourished' and 'severely malnourished' in this analysis.

PREVALENCE OF MALNUTRITION AMONG RURAL HOUSEHOLDS IN NORTH ARCOT

In 1982/83, malnutrition was rampant in North Arcot (Table 85). Sixty-six percent of all households had a daily per capita energy intake below 80 percent of the RDA, and 44 percent of the households were severely malnourished. There was a dramatic improvement in the level of energy intake among all households in 1983/84; only 21 percent of all households had a daily per capita energy intake below 80 percent of RDA, and only 6 percent were severely malnourished.

Farm Households

In 1982/83, 61 percent of farm households were malnourished and 32 percent were severely malnourished (Table 85). There was a marked improvement in their nutrition status the next year, as only 13.5 percent of the farm households were malnourished and 2.7 percent

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[38] Sampling ratios and weights:

		Sampling Ratio	Sample Size	Weights
I.	1982/1983			
	Paddy farms	17.8%	64	.447
	Non-paddy farms	5.9%	9	.190
	Nonagriculturalists	19.1%	56	.363
			129	1.000
II.	1983/84			
	Paddy farms	9.3%	33	.438
	Non-paddy farms	6.2%	9	.179
	Nonagriculturalists	10.6%	33	.383
			75	1.000

Table 85--Prevalence of malnutrition among farm households and landless in North Arcot, 1982/83 and 1983/84 (resurveyed villages)

Group	Calorie Consumption							
	1982/83				1983/84			
	Total Sample	> 80 Percent	< 80 Percent	< 60 Percent	Total Sample	> 80 Percent	< 80 Percent	< 60 Percent
	(N)	(percent of households)			(N)	(percent of households)		
Farm households by farm size	71	39.43	60.56	32.39	37	86.50	13.50	2.70
Small	21	19.05	80.95	52.40	13	61.50	38.50	7.70
Medium	28	39.30	60.70	32.10	12	100.00	0.0	0.0
Large	32	59.10	40.90	13.60	12	100.00	0.0	0.0
Landless[a]	55	27.30	72.70	58.20	33	70.00	30.00	9.10
Total sample	126	34.10	65.90	43.70	70	78.60	21.4	5.7

Source: 1982/83 and 1983/84 International Food Policy Research Institute/Tamil Nadv Agriculture University (TNAU) survey, North Arcot, India.

[a] The landless category is composed of agricultural laborers and nonagricultural households that are not agricultural laborers.

severely malnourished. The drought of 1982/83 resulted in a dramatic reduction in paddy production and, hence, in reduced consumption from own production (Pinstrup-Andersen and Jaramillo, forthcoming).

The proportion of households which are malnourished declines with increases in farm size (Table 85). In 1982/83, there were nearly twice as many malnourished small-farm households as there were large-farm households, and there were four times as many severely malnourished small-farm households as there were large-farm households. In 1983/84, however, malnourished households consisted of only small-farm operators.

In 1982/83, only 21 percent of the malnourished farm households were in the top tercile, and the remaining malnourished farm households were equally split between the bottom and middle farm terciles with 39.5 percent each (Table 86). Among the severely malnourished farm households, there were nearly four times as many in the bottom tercile as there were in the top tercile. In 1983/84, all malnourished farm households were in the bottom tercile.

The proportion of malnourished farm households declined in 1983/84 relative to 1982/83, mainly due to increased food production as a result of normal rainfall during this period and, hence, due to increased food consumption from own production. The importance of own production as a major source of food consumption for paddy-farm households in this data set has been pointed out by Pinstrup-Andersen and Jaramillo (forthcoming). They found that, in 1983/84, 70 percent of the total calories consumed by large paddy-farm households was from own

Table 86--Distributional pattern of malnourished farm households by farm size in North Arcot, 1982/83 and 1983/84 (resurveyed villages)

Group	Calorie Consumption							
	1982/83				1983/84			
	> 80 Percent	< 80 Percent	< 60 Percent	Average	> 80 Percent	< 80 Percent	< 60 Percent	Average
Farm size (Hectare)	2.11	1.26	0.97	1.58	1.67	0.32	0.12	1.40
Bottom tercile (percent)	14.29	39.53	47.83	29.60	25.00	100.00	100.00	35.14
Middle tercile (percent)	39.29	39.53	39.18	39.40	37.50	0.00	0.00	32.43
Top tercile (percent)	46.43	20.33	13.04	31.00	37.50	0.00	0.00	32.43

Source: 1982/83 and 1983/84 International Food Policy Research Institute/Tamil Nadv Agriculture University (TNAU) survey, North Arcot, India.

Note: Percentages may not add to 100 because of rounding.

production. Since, in this study, paddy farm households constitute 76 percent of farm households of which 93 percent were well-nourished, increased consumption from own production was undoubtedly a major contributing factor in the proportional reduction of malnourished farm households. The malnourished small-farm operators in 1983/84, however, were unable to produce enough for consumption or their income base had not improved significantly to enable them to acquire enough food commodities for consumption.

Landless Households

The drought of 1982/83 also affected the landless households. In fact, they were most among the malnourished households during that year. Seventy-three percent of them were malnourished and 58 percent were severely malnourished (Table 85). The next year saw a dramatic decrease in the prevalence of malnourishment among them, when only 30 percent of these households were malnourished and only 9 percent severely malnourished. During the drought year, there had been a reduction in employment in the agricultural sector, and since the landless virtually depended on agricultural wages for household income, their nutritional status was affected through reductions in household income. The following year, however, the situation was reversed for the landless as it was for the farm households, largely due to improved employment opportunities and, hence, income (Hazell, Ramasamy, Rajagopalan, Aiyasamy, and Bliven, forthcoming).

SHARE OF OFF-FARM INCOME

Off-farm income[39] was an important source of income for a significant number of households. In 1982/83, 59 percent of the households had an off-farm income share of over 60 percent (Table 87). This increased in 1983/84, when 66 percent of households had an off-farm income share of over 60 percent.

The data of both survey years, especially 1982/83, show that, as the percentage of off-farm income increased, the proportion of malnourished households also increased in each off-farm income class. In 1982/83, the proportion of malnourished households increased from 48.5 percent in the lowest off-farm income class to 74.3 percent in the highest off-farm income class. In 1983/84, however, such distributional patterns did not emerge as all of the malnourished households had an off-farm income share of over 60 percent.

In the case of the well-nourished, those that met at least 80 percent of the recommended calorie consumption, their proportional distribution increases with a decreasing share of off-farm income. In 1982/83, the proportion of well-nourished households with less than 10 percent of off-farm income was twice as high as those households with over 60 percent of off-farm income. The following year, all households whose off-farm income share was less than 60 percent were well-nourished. Even though 1982/83 was a drought year, both years' data provide a clear pattern of increasing nourishment with a decrease in the share of off-farm income in households' total income. However, one has to bear in mind that those who depend more on off-farm income are all of the landless, and are small-farm households who supplement their income as wage earners (Table 88).

Table 87--Prevalence of malnutrition by share of off-farm income in North Arcot, 1982/83 and 1983/84 (resurveyed villages)

Households by Share of Off-Farm Income in Total Income	Calorie Consumption							
	1982/83				1983/84			
	Total Sample	> 80 Percent	< 80 Percent	< 60 Percent	Total Sample	> 80 Percent	< 80 Percent	< 60 Percent
	(N)	(percent of households)			(N)	(percent of households)		
< 10 percent	33	51.50	48.50	15.20	15	100.00	0.00	0.00
10 to 30 percent	9	44.40	55.60	33.30	5	100.00	0.00	0.00
30 to 60 percent	10	30.00	70.00	60.00	4	100.00	0.00	0.00
> 60 percent	74	25.70	74.30	55.40	46	67.40	32.60	8.70

Source: 1982/83 and 1983/84 International Food Policy Research Institute/Tamil Nadu Agriculture University (TNAU) survey, North Arcot, India.

[39] Off-farm income is here defined as total income less farm gross margin.

Table 88--Prevalence of malnutrition by share of off-farm income in North Arcot, 1982/83 (resurveyed villages in 1983/84) and 1983/84, by type of farm household

Household Type (Percent of Off-Farm Income)	Calorie Consumption							
	1982/83 (Resurveyed)				1983/84			
	Total Sample	> 80 Percent	< 80 Percent	< 60 Percent	Total Sample	> 80 Percent	< 80 Percent	< 60 Percent
	(N)	(percent of households)			(N)	(percent of households)		
Small-farm								
< 10	1	100	0	0	1	100	0	0
10 - 30	1	0	100	100	0	0	0	0
30 - 60	3	0	100	67	1	100	0	0
> 60	16	19	81	50	11	55	45	9
Medium-farm								
< 10	13	38	62	23	6	100	0	0
10 - 30	4	75	25	0	2	100	0	0
30 - 60	4	50	50	50	3	100	0	0
> 60	5	20	80	60	1	100	0	0
Large-farm								
< 10	19	58	42	11	9	100	0	0
10 - 30	3	33	67	33	2	100	0	0
30 - 60	2	50	50	50	0	0	0	0
> 60	0	0	0	0	1	100	0	0
Landless and nonagricultural								
< 10	0	0	0	0	0	0	0	0
10 - 30	1	0	100	100	0	0	0	0
30 - 60	1	0	100	100	0	0	0	0
> 60	53	28	72	57	33	70	30	9

Source: 1982/83 and 1983/84 International Food Policy Research Institute/Tamil Nadv Agriculture University (TNAU) survey, North Arcot, India.

EMPLOYMENT AND INCOME SOURCES

There were remarkable increases in income and expenditure levels of all households in 1983/84, following the drought year (Table 89). Average per capita level was nearly twice as high, while per capita expenditure more than doubled. In 1982/83, malnourished households had an annual per capita expenditure of Rs. 514, which was only 44 percent of that of the well-nourished, but in 1983/84, the annual per capita expenditure of the malnourished had risen to Rs. 1,062, which was 58 percent of that of well-nourished households. Thus, while expenditures of the well-nourished improved by 57 percent over the previous year, for the malnourished, it improved by 107 percent. Were these changes in the expenditures of the malnourished translated into changes in their food consumption? Although the answer is difficult to arrive at, it may be conjectured that this may indeed have been the case; that is, the malnourished households in 1983/84 might have been nutritionally better off than they were during the drought year, presumably due to increased food expenditure which resulted from increased income. It might further be argued that, for these households, income did not increase enough to

Table 89--Income and employment sources of the malnourished rural poor in North Arcot, 1982/83 and 1983/84 (resurveyed villages)

Indicator	Calorie Consumption 1982/83 > 80 Percent	1982/83 < 80 Percent	1982/83 < 60 Percent	1982/83 Average	1983/84 > 80 Percent	1983/84 < 80 Percent	1983/84 < 60 Percent	1983/84 Average
Percent of household total income from								
Farm income	50.70	30.43	20.96	37.35	40.59	-1.01	-0.59	31.68
Agricultural wages	22.95	35.24	43.34	31.05	40.49	64.43	48.59	45.62
Trade and crafts wages	5.04	4.96	2.90	4.98	0.04	...	...	0.03
Factory work wages	0.20	0.13	...	0.16	2.49	...	...	1.96
Road work wages	12.26	16.90	19.64	15.31	1.39	7.95	22.79	2.80
White collar wages	3.98	1.80	2.04	2.54	0.19	...	...	0.15
Nonfarm business income	4.65	2.69	4.06	3.36	6.89	13.55	25.85	8.32
Transfers and other unearned income	6.44	7.75	7.05	7.31	5.72	12.38	3.29	7.14
Other income	-6.21	0.10	0.01	-2.06	2.19	2.70	0.07	2.30
Per capita income[a] (Rs/year)	628.71	425.35	393.80	530.00	1,039.00	970.00	189.00	1,025.00
Per capita expenditure (Rs/year)	1,163.00	514.00	428.00	736.00	1,831.00	1,062.00	323.00	1,666.00
Household size	4.6	6.2	6.5	5.7	5.2	5.5	2.7	5.2

Source: 1982/83 and 1983/84 International Food Policy Research Institute/Tamil Nadu Agriculture University (TNAU) survey, North Arcot, India.

[a] In both periods, per capita income figures were lower than per capita expenditure figures. This was due to the valuation of income from crops, using farm gate prices and valuation of consumption, using market prices (Andersen and Jaramillo, forthcoming, p. 184, footnote of Table 6.2).

enable them to consume at least the minimum required calories for average activity levels.

Rural households in this study derive their income from various sources, but income from agricultural activities was the single most important source of income for all households (Table 89, columns 4 and 8). Net farm income and agricultural wages (labor wages) together accounted for 68 percent of the households' total income during the drought year and for 77 percent in 1983/84. During the drought year, farm income accounted for 37 percent of households' total income, followed by agricultural wages. This ranking was reversed in 1983/84 with agricultural wages accounting for 46 percent and net farm income accounting for 32 percent.

A breakdown of these income sources by calorie consumption reveals that, for the well-nourished households, especially during the drought

year, net farm income, accounting for 51 percent, was, by far, the single most important source of income. In 1983/84, it accounted for 41 percent, being barely more than agricultural wages, which accounted for 40 percent. For the malnourished households, however, agricultural wages were the most important sources of income during both years. They accounted for 35 percent of total household income in 1982/83 and 64 percent in 1983/84. The dramatic increase in the share of agricultural wages in total income in 1983/84 was due to improved employment opportunities in agriculture for the landless and small-farm operators. Since most of the landless depended on agricultural wages and small-farm operators supplemented their income by seeking employment on large paddy-farms (Ramasamy, Hazell, and Aiyasamy, forthcoming), the dominance of agricultural wages in total households income in 1983/84 must not be surprising. Although farm income was the second important source of income for the malnourished during the drought year, these households suffered farm income loss in 1983/84, due to their inability to recover their costs.

During the drought year, in addition to income from agricultural activities, all households had other sources of income. In the context of income ranking, income from road work and transfers were, respectively, the third and fourth sources of income across all caloric groups. Income from trade and craft, as well as income from nonfarm business, followed in importance. White collar wages and factory work also contributed to total income, although their contribution was marginal.

The income sources of the malnourished were less diversified in 1983/84 than in 1982/83. Furthermore, income sources that were less important (in terms of share in total income) during the drought year assumed more importance in 1983/84. For instance, nonfarm business income was the second most important source of income, followed by income from road work or transfers. This was mainly due to the sample composition of the malnourished rather than to a shift in employment source by the same households in both years. It is reiterated that the sample households in 1983/84 survey were not necessarily the same as those in 1982/83.

CONCLUSION

The results of 1982/83 survey data provide interesting insights into income source changes when drought hits, since the data was from villages most affected by the drought. During that year, although small-farm households and the landless were the most malnourished households, malnourishment among medium- and large-farm households was also of an alarming magnitude. In 1983/84, which was a normal rainfall year, only the landless and small-farm households were malnourished. The improvement in the nutritional situation of large- and medium-farm households was largely due to improved food production and the related direct and indirect employment and income.

The proportional distribution of malnourished households is found to increase with increases in off-farm income share. This pattern was observed especially in 1982/83. In 1983/84, the malnourished were still those households with over 60 percent of off-farm income share. Again, these were small-farm operators and the landless of which the landless were the majority.

For the malnourished households, agricultural wage earnings were the most important sources of income both in 1982/83 and 1983/84. These households also tend to have a larger size relative to those meeting at least 80 percent of RDA.

13. THE RELATIONSHIP BETWEEN NUTRITION AND INCOME SOURCES FOR THE RURAL POOR IN A SOUTHERN PHILIPPINE PROVINCE

Howarth E. Bouis

INTRODUCTION

This paper analyzes the sources of income for a sample of farm households in Bukidnon Province in the southern Philippines and their relation to preschooler and maternal nutrition. These households have been characterized as either specializing in corn or sugarcane production (see below), but how diverse are their sources of income? Does almost all of their income come from the production of these two crops? Are secondary crops grown to a significant degree? To what extent do backyard livestock production and fruit and vegetable gardening contribute to income? How important are off-farm sources of income such as agricultural wage labor and nonagricultural employment?

To the extent that income sources are diverse and especially to the extent that nonagricultural income sources are important, government policies that promote the development of rural-based economic activities not directly associated with crop or livestock production, could have a direct and immediate impact on the incomes of farm households. At the other extreme, where farmers depend almost entirely on production of one or two crops for their livelihood, government policies, at least in the short to medium term, would perhaps best be focused on policies which support increased productivity for those crops.

Finally, are particular sources of income associated with better preschooler and maternal nutrition? In particular, does production of food crops and a supposition of increased food security lead to better nutrition, or conversely, does dependence on cash crops and nonagricultural sources of income lead to worse nutrition?

THE DATA ON INCOME SOURCES AND PRESCHOOLER NUTRITION

Approximately 500 corn- and sugar-producing households were surveyed four times at four-month intervals during 1984 and 1985 in Bukidnon Province in Mindanao, an area primarily engaged in semi-subsistence corn production, before the establishment of a sugar mill in

1977.[40] The sample included smallholder landowner, tenant, and landless laborer households. Data were collected on landholdings, income sources, expenditure patterns, calorie intakes, and nutritional status. Analysis of these data provides a detailed household- and individual-level look at what happened to land tenure patterns, incomes, and nutrition in one case study area undertaking an export-led development strategy (Bouis and Haddad 1990a).

Any household cultivating an average of at least one hectare per round of any crop which produced any sugar at all, was placed in one of three groups, "sugar owner," "sugar owner/renter (mixed)," or "sugar renter," depending on the proportion of total land cultivated that was owned and rented in. All other households cultivating an average of at least one hectare per round were placed in one of four groups, "corn owner," "corn owner/tenant (mixed)," "corn tenant," and "corn other rent," depending on the proportion of total land cultivated which was owned, rented in on a share basis, or rented in on a fixed rate or another type of arrangement. Typically, land rented for sugar production was rented in on a fixed rate basis. For corn, the typical rental arrangement was for the tenant to pay a proportional share of the harvest to the landowner. The "corn other rent" group includes households that rented in land primarily on a nonproportional basis, usually at a fixed rent.

The households in the remaining three groups, which cultivated less than one hectare of land, are characterized as "landless," although this is not strictly true for about half the households in these three groups. If income from nonagricultural sources was greater than agricultural wage income, households were placed in a group designated "other occupation." If agricultural wages were greater than nonagricultural income *and* income from sugar wages were greater than agricultural wages from all other crops, households were designated as "sugar laborer." The remaining "corn laborer" households had sugar wages which were less than half of total agricultural wages.

Income and Income Sources

Table 90 presents selected characteristics which can be compared across the ten household groupings. The data show that the respondents are primarily a migrant population (typically from the Visayan Islands in the central Philippines). Those who own land tend to be older, to have migrated earlier, to have been married longer, and to have larger families than tenant/renter households. These same relationships hold when comparing tenant/renter households with landless households, and although the data are not shown in Table 90, they also hold when comparing large farms with small farms. The level of education is low, with respondents just having finished grade school on average.

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[40] 448 households were present and interviewed for all four survey rounds.

Table 90--Selected data for respondent households, by crop-tenancy group, Mindanao, Bukidnon, Philippines

Group	Number of Households	Age		Percent Born In Bukidnon		Years Ago Migrant To Bukidnon		Years Of Education		Years Married	Household Size	Average Hectares Cultivated Per Round	Per Capita Weekly Expenditure[a]	Per Capita Weekly Income[a]	Per Capita Average Net Worth[a]
		Husband	Wife	Husband	Wife	Husband	Wife	Husband	Wife						
													(pesos)	(pesos)	(pesos)
Corn owners	46	41.4	36.8	0.07	0.13	26	22	6.5	7.0	17	7.7	3.3	46.1	51.7	30,588
Corn owners/ share tenants	44	38.0	34.0	0.11	0.07	25	20	5.8	6.2	15	7.4	3.7	45.0	50.2	18,698
Corn-share tenants	91	34.7	31.3	0.14	0.22	22	19	5.6	6.2	12	6.4	2.0	39.9	30.7	9,744
Corn laborers	51	33.1	30.0	0.12	0.27	18	17	4.5	5.2	9	5.7	0.3	33.2	28.8	2,135
Sugar owners	41	44.6	38.9	0.02	0.07	26	25	5.3	6.3	20	9.0	6.3	62.1	75.9	62,656
Sugar owners/ renters	30	37.4	34.0	0.10	0.03	22	22	6.6	6.8	14	7.1	7.6	85.9	90.3	87,932
Sugar renters	31	37.0	32.3	0.06	0.06	21	20	6.0	6.6	14	7.3	3.0	43.5	46.5	13,079
Sugar laborers	54	32.8	30.2	0.06	0.20	17	18	4.7	5.2	11	6.2	0.2	33.0	28.7	2,201
Corn-other rent	18	34.5	30.6	0.17	0.28	22	20	6.4	7.3	12	5.7	1.9	46.1	38.1	13,324
Other occupation	42	35.6	31.9	0.10	0.26	18	19	6.8	7.2	11	6.0	0.3	43.8	42.9	7,975
Total Sample	448	36.6	32.8	0.10	0.17	21	20	5.7	6.3	13	6.8	2.6	45.4	44.9	21,371

Source: International Food Policy Research Institute/Research Institute for Mindanao Culture Survey, 1984/85.

[a] Round one constant (July 1984) pesos; ₱ 20.00 = U.S. $1.00.

As would be expected, incomes and expenditures of owner households are higher than for tenant/renter households and, in turn, are higher for tenant/renter households than for laborer households. At an exchange rate of P=20 for each U.S. $1, per capita incomes of landless laborer households are roughly $80 per annum, those of corn owner households about $130, and those of sugar owner households approximately $195.

Comparing like tenure groups across crops, while demographic variables are quite similar, the one exceptional difference is that sugar farms are larger than corn farms. If the nutritional status of preschoolers in sugar households is better than the nutritional status of children in corn households, is the difference explained by having more access to land or by higher incomes that are possible from sugar production? This turns out not to be a problem since, as will be seen in Table 94, sugar household children are not taller and do not weigh more than corn household children once they reach the ages of three and four.

Table 91 shows the percentage distribution of various sources of income, disaggregated by income quintile and by crop and tenure group. For corn households with access to land, profits from corn production account for only about a third of total income, although this percentage share is larger than for any other single category presented in the table. A very similar pattern holds for sugar households with access to land and profits from sugar production.

For both crop groups with access to land, income from nonagricultural sources is the second most important component of income, contributing a quarter of the total. Backyard livestock, vegetable, and fruit production is a more important component of income for corn households with access to land than for sugar households with access to land, partly due to more livestock production, which is a complementary activity to corn production.

Rice and corn production account for about 15 percent of income for sugar households with access to land. Crops other than sugar, rice, and corn do not figure prominently for these households. For corn households with access to land, rice and other crops provide significant proportions of income for owner and owner/renter households, but not for share tenant households.

Landless laborer households, whether corn or sugar, are the most dependent on a single source of income, agricultural wages, which comprise from two-thirds to three-fourths of total income. For these households, backyard production, at roughly 20 percent, is the second largest component of income, higher even than nonagricultural wages, which account for only 10 percent of income.

Table 91--Income sources by expenditure quintile and by crop-tenancy group, Mindanao, Bukidnon, Philippines

Group	Percent of Household Total Income from									
	Farm Production						Off-Farm			
	Sugar	Corn	Rice	Other	Backyard	Total	Agricultural Wages	Nonagricultural Wages, Business, Other	Total	Total
	(percent)									
Expenditure Group										
1	2	22	3	2	23	52	31	17	49	100
2	3	16	3	3	18	43	39	19	58	100
3	7	21	4	3	18	53	28	20	48	100
4	10	18	3	6	18	54	20	27	47	100
5	25	18	7	4	10	64	2	35	37	100
All	16	18	5	4	14	57	15	29	44	100
Crop-Tenancy Group										
Corn	0	29	5	7	19	60	17	23	40	100
Corn owners	0	25	5	13	22	65	4	31	35	100
Corn-mixed owners/tenants	0	44	9	8	16	77	8	16	24	100
Corn-share tenants	0	33	4	3	20	60	16	24	40	100
Corn laborers	0	6	0	1	17	24	65	11	76	100
Sugar	33	10	6	2	10	61	13	27	40	100
Sugar owners	42	12	5	3	9	71	3	26	29	100
Sugar-mixed owners/renters	33	8	10	2	9	61	2	36	38	100
Sugar renters	34	15	2	0	14	65	9	26	35	100
Sugar laborers	0	3	1	0	13	17	76	7	83	100

Source: International Food Policy Research Institute/Research Institute for Mindanao Culture Survey, 1984/85.

Data on Calorie Intakes

Table 92 presents average calorie adequacy ratios for various age groupings by expenditure group and by crop tenancy group. These ratios are computed by dividing actual calorie intakes (taken from the 24-hour recall of individual food intakes) by the recommended calorie intakes for the appropriate age and sex (Food and Nutrition Research Institute 1984). Only preschoolers for whom breast-feeding has already been stopped (90 percent of preschoolers in our sample were breast-fed) are included in the table, because data were not collected on calorie intake from breast milk.

Table 92 shows that preschoolers on average are consuming only about 75 percent of their recommended daily intakes, while adults are consuming slightly above their recommended levels. What is even more discouraging from the point of view of preschooler nutrition is that at the margin as income increases, the absolute increase in calorie adequacy ratios is slightly higher for adults than preschoolers,

Table 92--Average calorie adequacy ratios and percentage falling below 80 percent of caloric requirements, by type of family member, by expenditure quintile, and by crop-tenancy group, Mindanao, Bukidnon, Philippines

Group	Average Calorie Adequacy Ratio					Percent Falling Below 80% of Caloric Requirement				
	Preschoolers (0-4)	Children (5-14)	Adolescents (>14)	Mothers	Fathers	Preschoolers (0-4)	Children (5-14)	Adolescents (>14)	Mothers	Fathers
Expenditure Quintile:										
1	0.69	0.71	0.84	1.03	0.98	56	66	41	24	28
2	0.75	0.74	0.83	1.08	1.06	47	61	41	23	21
3	0.74	0.79	0.84	1.15	1.08	54	56	41	18	19
4	0.77	0.77	0.91	1.12	1.10	53	56	37	19	21
5	0.83	0.87	0.92	1.21	1.14	47	46	29	14	15
All	0.75	0.77	0.87	1.12	1.07	52	58	38	19	21
Crop-Tenancy Group										
Corn	0.76	0.77	0.87	1.12	1.06	63	58	38	20	23
Corn owners	0.82	0.78	0.89	1.19	1.10	56	56	33	15	18
Corn-owner/tenants	0.73	0.77	0.82	1.15	1.05	67	57	46	23	24
Corn-share tenants	0.77	0.76	0.89	1.11	1.05	61	58	36	19	22
Corn laborers	0.76	0.77	0.91	1.05	1.01	66	58	35	24	28
Sugar	0.72	0.75	0.89	1.10	1.10	66	59	37	20	18
Sugar owners	0.74	0.80	0.91	1.13	1.12	65	56	33	18	17
Sugar-owner/renters	0.76	0.77	0.91	1.15	1.15	61	53	35	13	15
Sugar renters	0.71	0.76	0.82	1.13	1.13	67	60	42	19	13
Sugar laborers	0.71	0.70	0.75	1.03	1.04	66	63	53	26	23

Source: International Food Policy Research Institute/Research Institute for Mindanao Culture Survey, 1984/85.

although the percentage increase is slightly better for preschoolers than adults. The extra calories available to higher income households are not going disproportionately to preschoolers, despite their being below recommended daily intakes.

Comparing calorie adequacy ratios across the various crop tenancy groups, preschoolers in corn households seem to do marginally better than in sugar households. While the difference is not large, it is still surprising in view of the higher incomes in sugar households. Preschoolers and mothers in corn owner households do especially well, relative to other groups.

Table 92 also shows the percent of respondents falling below 80 percent of their recommended daily calorie intakes. The absolute percentages mean little in the sense that there is wide variation in the daily intakes of even adequately-fed individuals, who on some days will consume below required levels. However, comparing these percentage figures across expenditure levels and age groups, they reflect the same pattern as the average calorie adequacy ratios. Preschoolers have much higher percentages of respondents falling below 80 percent of requirements than do adults, and these preschooler percentages do not improve much with income.

Data on Preschooler Nutritional Status

Table 93 presents data on Z-scores for height-for-age (ZHA), weight-for-age (ZWA), and weight-for-length (ZWL) for preschool children disaggregated by expenditure quintile and by age. The ZHA scores for preschoolers less than one year old indicate a very strong association between heights and income. Although data are not presented to substantiate such a conclusion, this pattern is probably in part a reflection of better maternal nutrition in high-income groups during pregnancy. As age increases and children are weaned, ZHA scores for all expenditure quintiles decline. However, they decline more rapidly for higher-income quintiles so that by the age of four, heights of higher-income children are only marginally better than heights of lower-income children. There appears to be little association between income and weight-for-length. ZWA scores show a pattern which is a mix of the patterns for the ZHA and ZWL scores.

Data to be Used for Analysis of Income Sources

The information contained in Tables 90 through 93 suggests two important conclusions for the analysis below of the effect of income sources on nutrition. First, access to land appears to be an important determinant of preschooler nutritional status. Accordingly, much of the analysis below controls for farm size (more precisely area cultivated; no distinction is made between owned land and tenanted land) by subdividing the sample into four groups: (1) large farms (greater than

Table 93--Height-for-age, weight-for-age, and weight-for-length for preschool children, by age and expenditure quintile[a], Mindanao, Bukidnon, Philippines

HEIGHT-FOR-AGE (ZHA)

Expenditure Quintile	Age in Years 0	1	2	3	4	All
1	-2.08	-2.75	-2.62	-2.44	-2.69	-2.57
2	-1.24	-2.37	-2.26	-2.30	-2.46	-2.22
3	-1.20	-2.03	-2.04	-2.13	-2.17	-2.02
4	-0.91	-1.97	-1.86	-2.28	-2.30	-2.02
5	-0.82	-1.88	-1.76	-1.94	-1.91	-1.80
All	-1.31	-2.24	-2.15	-2.24	-2.34	-2.16

WEIGHT-FOR-AGE (ZWA)

Expenditure Quintile	Age in Years 0	1	2	3	4	All
1	-1.82	-2.15	-1.77	-1.53	-1.61	-1.75
2	-0.90	-2.06	-1.69	-1.62	-1.52	-1.62
3	-1.24	-1.76	-1.45	-1.42	-1.39	-1.47
4	-1.44	-1.71	-1.47	-1.45	-1.41	-1.49
5	-0.86	-1.60	-1.39	-1.30	-1.33	-1.35
All	-1.25	-1.88	-1.57	-1.48	-1.46	-1.55

WEIGHT-FOR-LENGTH (ZWL)

Expenditure Quintile	Age in Years 0	1	2	3	4	All
1	-0.47	-0.81	-0.73	-0.48	-0.50	-0.60
2	-0.07	-1.06	-0.82	-0.61	-0.40	-0.64
3	-0.46	-0.83	-0.62	-0.45	-0.40	-0.55
4	-0.92	-0.81	-0.77	-0.46	-0.51	-0.65
5	-0.47	-0.80	-0.66	-0.38	-0.42	-0.54
All	-0.43	-0.87	-0.72	-0.48	-0.45	-0.60

[a] The heights and weights of preschoolers were measured in each round so that Z-scores for any one preschooler are typically included in the mean calculations for two columns. NCHS standards were used for ease of comparison with the other four IFPRI studies. The Food and Nutrition Research Institute (FNRI) in the Philippines has recently come out with a set of reference values based on a national sample of apparently healthy Filipino children. Healthy Filipino children are close to the NCHS standard during the first half of infancy, gradually deviating from it as age advances. It may then be expected that Z-scores based on the NCHS standards gradually decline with age.

4.0 hectares per survey round), (2) medium farms (between 2.0 and 4.0 hectares), (3) small farms (between 1.0 and 2.0 hectares), and (4) [quasi-] landless (less than 1.0 hectare; about half of these households have no access to land). Second, the analysis divides the preschoolers into two samples: (1) those who had been completely weaned by the fourth round of surveys (and hence had at least one observation for individual calorie intake as measured by a 24-hour recall of food intakes for each household member by the mother) and (2) those who were still being breast-fed during all four rounds.

The sample was restricted to the 406 (out of 448) households that had corn or sugar production as a primary source of income (the "other occupation" group in Tables 90 through 93 was eliminated). Seven hundred two preschoolers (less than 60 months of age in the first round of surveys) had observations for calorie intakes (if not being breast-fed) and for weight and height from 380 out of the 406 households. All of the data presented are averaged over four (or fewer) rounds for which data are available.

THE RELATIONSHIP BETWEEN INCOME SOURCES AND NUTRITION

Table 94 shows the frequency distribution of (completely) weaned and (currently) breast-fed preschoolers by three categories measuring nutritional well-being by farm-size. Comparing large, medium, and small farms in Table 94, the size of landholding does not appear to have a appreciable effect on calorie intakes, but having access to a threshold of at least one hectare of cultivated land does seem to have a significant effect. For households above this threshold, size of landholding would appear to have the strongest beneficial nutritional effect on height-for-age for preschoolers who are still being breast-fed. This same relationship is apparent for preschoolers who have been weaned, but the association is much weaker. Weight-for-age is highest for preschoolers on large farms, while there is little difference in weight-for-age for preschoolers in the medium, small, and landless groups.

Table 95 presents average total per capita expenditures by the same disaggregate categories as in Table 94. Controlling for farm size, improved weight-for-age for weaned preschoolers and improved height-for-age for weaned and breast-fed preschoolers are associated with higher incomes, with an apparently stronger effect at lower income levels. The opposite pattern is apparent for calorie intakes; increases in calorie intakes are more strongly associated with income at higher income levels.

The fact that frequency distributions across farm size groups in most cases in Table 94 are not dramatically different (looking down columns), while income levels roughly double between large-holder and landless groups, suggests that some factor or factors other than income are more important determinants of nutritional status. Tables 96 through 99

Table 94--Frequency distribution of preschoolers, by farm size and nutritional status category, Mindanao, Bukidnon, Philippines

Sample			Individual Calorie Intakes[a]				Weight-for-Age[b]				Height-for-Age[b]			
Weaned/ Breast-Fed	Farm Size	No. of Cases	>80 Percent	60-80 Percent	<60 Percent	All	>90 Percent	75-90 Percent	<75 Percent	All	>95 Percent	90-95 Percent	<90 Percent	All
Weaned	Large	160	39.0	31.0	30.0	100.0	18.0	60.0	22.0	100.0	24.0	42.0	34.0	100.0
	Medium	138	37.0	31.0	32.0	100.0	11.0	65.0	24.0	100.0	22.0	46.0	33.0	100.0
	Small	140	38.0	37.0	25.0	100.0	11.0	59.0	30.0	100 0	19.0	52.0	29.0	100.0
	Landless	158	28.0	34.0	38.0	100.0	12.0	58.0	30.0	100.0	13.0	47.0	40.0	100.0
Breast-fed	Large	20	Not Measured				65.0	30.0	5.0	100.0	75.0	25.0	0.0	100.0
	Medium	25					56.0	32.0	12.0	100.0	56.0	40.0	4.0	100.0
	Small	22					59.0	32.0	9.0	100.0	50.0	36.0	14.0	100.0
	Landless	39					64.0	26.0	10.0	100.0	64.0	23.0	13.0	100.0

Source: International Food Policy Research Institute/Research Institute for Mindanao Culture Survey, 1984/85.

[a] Calorie intake category defined as percent of standard of 2,580 calories per day per adult equivalent.

[b] Percent of age and sex-specific NCHS standard.

Table 95--Average total per capita expenditures per week, by farm size and nutritional status category (pesos), Mindanao, Bukidnon, Philippines

Sample			Individual Calorie Intakes			Weight-for-Age			Height-for-Age		
Weaned/ Breast-Fed	Farm Size	No. of Cases	>80 Percent	60-80 Percent	<60 Percent	>90 Percent	75-90 Percent	<75 Percent	>95 Percent	90-95 Percent	<90 Percent
Weaned	Large	160	77.1	63.1	50.7	59.6	70.2	54.4	62.5	74.7	54.3
	Medium	138	40.3	40.7	33.2	43.9	37.8	36.3	43.7	39.0	33.3
	Small	140	39.0	38.9	39.6	43.2	38.6	38.4	44.2	39.5	35.1
	Landless	158	33.3	29.1	29.7	37.1	31.0	27.0	37.3	31.5	27.1
Breast-fed	Large	20	Not Measured			69.4	33.7	41.5	65.6	32.4	..
	Medium	25				35.9	39.3	66.3	37.9	45.9	25.7
	Small	22				41.2	33.5	43.2	46.8	34.3	22.5
	Landless	39				31.2	27.3	28.9	32.2	28.3	22.3

Source: International Food Policy Research Institute/Research Institute for Mindanao Culture Survey, 1984/85.

investigate the extent to which source of income, and variables correlated with source of income, might account for the observed variance in preschooler nutritional status.

Table 96 shows the percentage distribution of various sources of income by categories of household and preschooler calorie intakes. While preschooler intakes are far below those of other household members in terms of adequacy levels, Table 96 shows that improvements in calorie intakes at the household level and for preschoolers (looking across individual rows comparing the household and individual data) are associated with similar levels and changes in sources of income, suggesting that preschoolers do not benefit differentially (in terms of calorie intakes) from a particular source of income as compared with other household members.

However, higher calorie intakes at both the household level and at the individual preschooler level do appear to be associated with higher shares of particular sources of income. For example, it comes as no surprise that a higher share of agricultural wage income is associated with lower calorie intakes since landless laborers, who depend overwhelmingly on this source of income (see Tables 90 and 92), have

Table 96--Income sources by household and preschooler calorie intakes[a], Mindanao, Bukidnon, Philippines

Indicator	Household Calorie Intakes			Preschooler Calorie Intakes		
	>100 Percent	80-100 Percent	<80 Percent	>80 Percent	60-80 Percent	<60 Percent
Percent of household total income from						
Farm income	58.0	54.0	53.0	57.0	56.0	54.0
Corn	22.0	20.0	27.0	24.0	23.0	26.0
Sugar	8.0	9.0	5.0	8.0	6.0	8.0
Rice	2.0	3.0	4.0	2.0	5.0	4.0
Other crops	5.0	2.0	2.0	4.0	3.0	2.0
Backyard[b]	20.0	19.0	15.0	20.0	20.0	15.0
Food crop	45.0	43.0	46.0	44.0	47.0	44.0
Cash crop	13.0	11.0	7.0	12.0	9.0	10.0
Off-farm income	42.0	46.0	47.0	43.0	44.0	46.0
Agricultural wage	20.0	27.0	34.0	22.0	27.0	32.0
Nonagricultural income	22.0	19.0	13.0	21.0	17.0	14.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: International Food Policy Research Institute/Research Institute for Mindanao Culture Survey, 1984/85.

[a] Subcomponents may not sum to totals since percentages for individual households are averaged.

[b] Backyard livestock production and fruit/vegetable gardening.

lower absolute incomes. Despite the fact that Table 96 does not control for absolute level of income, nevertheless note that there is a very strong positive association between nonagricultural income and calorie intakes, and perhaps surprisingly, no apparent association between income from food crops and calorie intakes.[41]

Do these higher calorie intakes translate into higher weight-for-age and height-for-age?; that is, do these same relationships hold if one disaggregates the data used to construct Table 96 by weight-for-age and height-for age categories instead? Tables 97 and 98, which disaggregate the data for the weaned and breast-fed preschooler samples respectively, show that the answer is no; in fact, these relationships have been reversed! Better preschooler weight-for-age, in particular, is associated with increased food crop income, while the relationship between nonagricultural sources of income and weight-for-age if anything is negative.

Data provided in Table 99 indicate a plausible explanation for this result. Preschoolers in households associated with high percentages of food crop income are sick less often than preschoolers in households associated with high percentages of income from nonagricultural sources. Regressions presented elsewhere (Bouis and Haddad) show that morbidity is a critical determinant of short-run anthropometric indicators.

No compelling evidence is presented here to explain why such a correlation exists, and in particular no effort is made to identify factors which interact in a causal relationship to account for this correlation. One possible explanation is that the community-level sanitation situations are better in corn and rice growing villages than in sugar growing villages in our particular sample, for reasons not at all connected with the predominant type of crop being grown in these villages.

However, the data on women's time allocation patterns and nutritional status given in Table 99 do show that different sources of household income are associated with sometimes substantial differences in how mothers allocate their time, which could be associated with morbidity levels. Mothers in "food crop" households (column one in Table 99) are able to substantially reduce their time away from home and in strenuous activities when they are pregnant and lactating, as compared with when they are neither pregnant nor lactating. This is in contrast with mothers in "nonfarm-employed" households (column four in Table 99) who adjust their time allocation patterns in the same direction, but to a

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[41] It is important to note here that this apparent lack of association is due to a negative association for large-holders (high relative and absolute incomes from cash crops and non-agricultural sources leads to high calorie intakes) which is canceled out by the expected positive association for the (quasi) landless groups. "Landless" households with small plots of land consume more calories than households that are strictly landless, as further analysis showed.

Table 97--Income sources by weight-for-age and height-for-age for households with preschoolers who have been completely weaned[a], Mindanao, Bukidnon, Philippines

Indicator	Weight-for-Age >90 Percent	Weight-for-Age 75-90 Percent	Weight-for-Age <75 Percent	Height-for-Age >95 Percent	Height-for-Age 90-95 Percent	Height-for-Age <90 Percent
Percent of household total income from						
Farm income	60.0	56.0	53.0	61.0	54.0	55.0
Corn	24.0	26.0	20.0	23.0	25.0	24.0
Sugar	6.0	7.0	7.0	10.0	7.0	7.0
Rice	4.0	3.0	3.0	5.0	2.0	4.0
Other crops	4.0	3.0	2.0	4.0	3.0	3.0
Backyard[b]	22.0	17.0	19.0	20.0	17.0	19.0
Food crop	50.0	46.0	43.0	48.0	44.0	46.0
Cash crop	10.0	10.0	10.0	13.0	9.0	10.0
Off-farm income	40.0	44.0	47.0	39.0	46.0	45.0
Agricultural wage	23.0	26.0	29.0	19.0	28.0	29.0
Nonagricultural wage	17.0	18.0	18.0	20.0	18.0	16.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: International Food Policy Research Institute/Research Institute for Mindanao Culture Survey, 1984/85.

[a] Subcomponents may not sum to totals since percentages for individual households are averaged.

[b] Backyard livestock production and fruit/vegetable gardening.

Table 98--Income sources by weight-for-age and height-for-age for households with preschoolers who are currently breast-fed[a], Mindanao, Bukidnon, Philippines

Indicator	Weight-for-Age >90 Percent	Weight-for-Age 75-90 Percent	Weight-for-Age <75 Percent	Height-for-Age >95 Percent	Height-for-Age 90-95 Percent	Height-for-Age <90 Percent
Percent of household total income from						
Farm income	51.0	51.0	46.0	53.0	51.0	38.0
Corn	19.0	26.0	15.0	21.0	23.0	16.0
Sugar	3.0	5.0	10.0	5.0	6.0	0.0
Rice	4.0	2.0	8.0	4.0	3.0	2.0
Other crops	2.0	1.0	0.0	2.0	0.0	0.0
Backyard[b]	22.0	17.0	13.0	20.0	19.0	20.0
Food crop	46.0	45.0	36.0	46.0	45.0	38.0
Cash crop	6.0	6.0	10.0	7.0	6.0	0.0
Off-farm income	49.0	49.0	54.0	47.0	49.0	62.0
Agricultural wage	37.0	33.0	38.0	35.0	33.0	49.0
Nonagricultural wage	12.0	15.0	16.0	11.0	16.0	13.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: International Food Policy Research Institute/Research Institute for Mindanao Culture Survey, 1984/85.

[a] Subcomponents may not sum to totals since percentages for individual households are averaged.

[b] Backyard livestock production and fruit/vegetable gardening.

Table 99--Averages of selected individual-level and household-level variables, by percent of income from food crops and percent of income from nonagricultural sources, Mindanao, Bukidnon, Philippines

Sample	Variable	Income from Food Crops			Income from Nonagricultural Sources		
		>60 Percent	25-60 Percent	≤25 Percent	>20 Percent	5-20 Percent	≤5 Percent
Weaned preschoolers	Calorie intake	1,905	1,942	1,868	2,019	1,887	1,822
	Weight-for-age	0.81	0.80	0.80	0.80	0.81	0.81
	Height-for-age	0.92	0.91	0.91	0.91	0.92	0.92
	Days sick[a]	1.60	1.59	1.74	1.72	1.48	1.70
	Diarrhea[b]	0.02	0.03	0.05	0.03	0.0[illegible]	0.04
	Fever[b]	0.15	0.17	0.21	0.20	0.17	0.16
Breast-feeding preschoolers	Weight-for-age	1.02	0.93	0.91	0.91	0.97	0.97
	Height-for-age	0.98	0.97	0.96	0.96	0.97	0.97
	Days sick[a]	1.78	2.12	2.58	2.00	1.79	2.51
	Diarrhea[b]	0.01	0.06	0.08	0.02	0.07	0.04
	Fever[b]	0.20	0.22	0.19	0.26	0.18	0.19
All households	Calorie intake	2,334	2,391	2,315	2,436	2,322	2,288
	Calorie availability	2,375	2,407	2,471	2,555	2,416	2,289
	Net worth	19,971	14,960	29,901	31,917	23,298	9,877
	Father's education	5.8	5.3	5.7	6.5	5.3	5.0
	Mother's education	6.1	6.0	7.1	7.1	5.6	6.3
	Farm size	4.09	2.53	2.94	3.57	3.64	2.40
	Total expenditure	44.7	40.7	51.5	57.2	43.7	35.4
Mothers	Pregnant						
	Time away[c]	173	214	239	218	262	156
	Time strenuous[c]	162	167	153	174	181	134
	Calorie intake	2,982	3,186	2,884	3,134	2,973	2,983
	Body mass index	2.19	2.14	2.13	2.18	2.16	2.10
	Lactating						
	Time away[c]	192	206	203	208	218	184
	Time strenuous[c]	171	184	130	134	169	177
	Calorie intake	2,749	2,706	2,657	2,700	2,670	2,733
	Body mass index	2.05	2.05	1.99	2.04	2.01	2.05
	Nonpregnant, non-lactating						
	Time away[c]	259	228	298	263	263	255
	Time strenuous[c]	201	191	190	168	224	197
	Calorie intake	2,917	3,013	2,825	3,040	2,891	2,832
	Body mass index	2.07	2.05	2.04	2.10	2.00	2.05

Source: International Food Policy Research Institute/Research Institute for Mindanao Culture Survey, 1984/85.

[a] Average in past two weeks.

[b] Percent of preschoolers in past two weeks.

[c] Minutes in past 24 hours.

smaller extent when they become pregnant.[42] Despite the fact that mothers from "food crop" households come from households with substantially lower incomes and smaller asset bases, their body mass indices during pregnancy and lactation are slightly better than for mothers from the economically better-off "nonfarm employed" households.

CONCLUSIONS

Sources of income for a sample of poor farm households engaged primarily in corn and sugar production in the southern Philippines were found to be much more diverse for economically better-off households with larger asset bases. Not only were cropping patterns more diversified for these richer households, but incomes from nonagricultural sources were particularly significant. Landless laborer households had the least diversified incomes, with agricultural wages accounting for about 70 percent of total income. Access to even small amounts of land for these households appears to appreciably improve preschooler nutrition.

Government policies that would give these households increased access to land and which would provide increased wage employment would be particularly beneficial to these households. Such a strategy can be contrasted with the alternative policy of attempting to exploit economies of scale through maintaining large operational farm units, or worse, consolidating small farms into larger units.

For the Philippine data set analyzed here, the effect of source of income on the marginal propensity to purchase calories was not a primary determinant of the weights and heights of preschoolers. In fact, it appears that the reverse of what is often hypothesized was the case; increases in calorie intakes for preschoolers seem to be higher at the margin out of nonagricultural income than out of food crop income. This is because nonagricultural income tends to be a much less important source of income for lower income households, where there is more competition for calories between children and parents, who require large amounts of energy (relative to purchasing power) for the strenuous work of earning income.

Rather the larger effects of source of income on nutrition would appear to be mediated through its effect on the time allocation patterns of household members and the differential energy expenditures required for earning income from alternative sources. Mothers in households engaged relatively heavily in food crop production were able to spend more time at home during (the nutritionally critical periods of)

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[42] Mothers from "nonfarm employed" households spend more time away from home than mothers from "food-crop" households despite the fact that their children are sick more often; that is, controlling for higher morbidity, the observed differences in time away from home for these two groups would have been even greater.

pregnancy and lactation and to be involved in about the same amount of strenuous activities as mothers in households engaged relatively heavily in nonfarm employment activities, despite the fact that after these "food crop" mothers stopped breast-feeding, they were engaged in more strenuous activities and spent about the same time away from home as "nonfarm-employed" mothers. This is possibly because other household members could more easily substitute their labor for the mother's labor in own-farm production during pregnancy and lactation, than they could take the place of the mother in various nonfarm employment activities.

Children from "food crop" households were sick less often than children from "nonfarm employed" households. Further research is needed to determine whether this is a random association, or whether a causal relationship might be involved through time allocation and activity patterns of various household members, and in particular the various activities of the mother.

14. INCOME SOURCES OF THE MALNOURISHED RURAL POOR IN THE PROVINCES OF ABRA, ANTIQUE, AND SOUTH COTABATO IN THE PHILIPPINES

Marito Garcia

INTRODUCTION

This paper examines the impact of sources of income and employment on selected indicators of welfare of households and of individuals within the household. The effects on food consumption, nutrition, and health resulting from the expansion of rural incomes are essential baseline information for setting policies intended to maximize the impact of development on poor households. Detailed sectoral data from rural areas make it clear that the rural sector is indeed nonhomogeneous, and that there are regions falling behind in economic growth, and households within these regions which fail to obtain resources for adequate food security and health. This paper traces and characterizes employment and income from various sources in a rural setting by disaggregating household groups into occupational and socioeconomic categories.

The data was collected in conjunction with an IFPRI study on food subsidies in the provinces of Abra, Antique, and South Cotabato in the Philippines. The survey, which was implemented in collaboration with the National Nutrition Council of the Philippines, was conducted on 840 households surveyed four times between May 1983 and September 1984. Only 792 households, with complete information on critical variables, were included in the present analysis. The survey methods used have been described elsewhere (Garcia and Pinstrup-Andersen 1987). Incomes were reported by source and by individuals from both farm and off-farm sources. Some 23 sources were identified in the original survey, which were aggregated into 11 categories for purposes of the present analysis. Food consumption data was collected using two methods: by 24-hour food weighing and by 7-day recall. The latter is used for the present analysis. Anthropometric data (weight and height) to assess the nutritional status were collected for all children under 7 years of age.

OCCUPATIONAL GROUPINGS AND INCOME SOURCES

The diversity of ecology in the three provinces under study allows us to identify relevant differences in sources of employment, livelihood, and demographic characteristics. Abra, in Northern Philippines, for example, is located in the higher elevations in a

mountainous region, while Antique, in Central Philippines, is a coastal region abutting a fertile fishing ground, and South Cotabato, in Mindanao Island, is located in a river basin. The resource potentials in each of these areas dictate the nature of economic activities and sources of households' livelihood. Abra's main products are maize, rice, vegetables, and tobacco, whereas Antique relies on fishing, due to its poor land and proximity to the sea, although some small patches of fertile coastal land are devoted to rice and coconut growing. South Cotabato is one of the main producers of maize used for fodder, and a good part of the land is also devoted to rice and coconut.

Thirteen occupational groups were identified when classifying the samples by the chief occupation of the household head. The occupational classification and distribution partly reflect the location of these groups. Thus, practically all the fishermen groups are from Antique, the coastal area, while maize farmers are typically from the South Cotabato area. However, since rice is grown in all the study provinces, the rice farmer group is a combination of farmers from all areas.

Table 100 presents the reported incomes of different occupational groups and contributions from farm and nonfarm sources. In this rural setting, it is evident that a large proportion of the household heads are engaged in nonfarming occupations. Nearly half of the main breadwinners were working for nonfarm wages, as traders, as salaried workers, or in urban jobs in cities or overseas. The average incomes across occupations vary significantly. Salaried workers in nonagriculture work earn nearly twice as much as rice farmers. Tenant farmers in cash crop farms, landless laborers in agriculture, and non-boat-owning fishermen have the lowest reported incomes among the occupational categories.

The distribution of income by sources for each occupational grouping provides a glimpse of the economic strategies being adopted by rural households. It is clear that various groups seek to maximize their available resources by maintaining rural agricultural operations (partly to ensure subsistence) while employing members who are underemployed for off-farm work within the village or in the cities. For example, among farmers who owned land, nearly one-third of all incomes were derived from off-farm sources, mainly wage work from rural or urban jobs. Conversely, those who reported off-farm wage work as their main occupation were also engaged in farm work as indicated by the 10-15 percent contribution of income from farming.

The literature generally refers to these groups as "worker-peasants" groups (Besteman 1989) who usually maintain a rural home and some agricultural land in the rural village, but have at least one member of the household with an off-farm source of income. These groups are differentiated from pure peasants whose sole income is from farm wages. A flexible combination of economic strategies was adopted by households in which absent family members help maintain the rural household by sending wages from distant jobs. In Antique, nearly 15 percent of the families had at least one member working in the Middle East or on

Table 100--Mean annual incomes by source, grouped by main occupation of household head, Abra, Antique, and South Cotabato Provinces, Philippines, 1983-84

Group	Sample Size	Per Capita Farm Income Mean		Per Capita Off-Farm Income: Off-Farm Wage Income Mean		Per Capita Off-Farm Income: Non-Wage Income Mean		All Income Per Capita Mean	
		(Pesos)	(percent)	(Pesos)	(percent)	(Pesos)	(percent)	(Pesos)	(percent)
Rice farmer, landowner	50	1,172	66.4	372	21.8	231	11.8	1,776[c]	100.0
Maize farmer, landowner	55	1,215	75.0	204	12.6	200	12.4	1,619	100.0
Other crop farmer, landowner	20	1,060	65.3	375	23.0	179	11.7	1,614	100.0
Tenant rice farmer	22	950	70.7	268	19.9	120	9.4	1,338	100.0
Tenant maize farmer	34	1,022	70.4	304	21.0	116	8.6	1,442	100.0
Tenant other crop farmer	13	745	69.0	183	17.1	133	13.9	1,061	100.0
Landless farm laborer	68	194	18.2	745	69.4	148	13.4	1,084	100.0
Wage earner, nonagriculture	204	302	19.4	1,114	70.4	175	10.2	1,591[b]	100.0
Salaried worker, nonagriculture	29	396	11.4	2,988	83.6	216	5.0	3,600[b,c]	100.0
Fisherman, boat owner	96	1,016[a]	77.6	171	13.2	133	9.2	1,320	100.0
Fisherman, non-boat owner	10	152[a]	14.0	873	80.8	66	5.2	1,091	100.0
Urban-based worker	54	229	10.4	1,902	83.5	160	6.1	2,291	100.0
Other occupation	122	510	28.1	601	33.7	712	39.2	1,823	100.0
All households	792	571	34.4	856	51.3	251	14.3	1,678	100.0

Source: International Food Policy Research Institute/National Nutrition Council Pilot Food Subsidy Project Survey, 1983/84.

[a] Income from fishing.

[b] Salaried nonagricultural worker versus wage nonagricultural earner, $p < 0.05$.

[c] Salaried nonagricultural worker versus rice farmer, $p < 0.05$.

merchant ships as sailors and mariners. Many of the very poor in these areas were frequently observed to send their adult daughter to work as domestic helper or as factory hand in cities. The proximity of these areas to major cities and growth centers combined with the relatively high levels of educational attainment among the rural households are key factors that contribute to such a strategy.

MALNUTRITION AND ACCESS TO LAND RESOURCES

In order to examine the role of access to productive resources to undernutrition, Tables 101 and 102 explore the relationship of farm size to caloric adequacy and to child nutrition. About 52 percent of the households owned land, while another 12 percent owned boats as major productive asset.

The average levels of underconsumption (particularly of those consuming below 60 percent of requirement) for the entire sample is quite high, reflecting the range of poverty in these provinces. Severe caloric inadequacy, however, is more pronounced among the smaller farm households. Nearly 38 percent of the farmers in the bottom tercile were consuming below 60 percent of the calorie requirements compared to 25 percent among those in the top tercile. Caloric inadequacy is, however, even higher among the landless households who depend on farming for livelihood, where 44 percent had adequacy below 60 percent. Nonfarm households consumed better than landless households with only a third of the households having adequacy below 60 percent. This confirms that a coping strategy by the nonfarm households, which relied on off-farm income sources for augmenting subsistence food crop, was more effective in achieving food security than simple reliance on small farm earnings or farm wages.

Landholdings are found to have no statistically significant different impact on the level of child malnutrition. The proportion of severely malnourished children (below 60 percent weight-for-age) is nearly similar for large and small farmers.

INCOME SOURCES, FOOD SECURITY, AND MALNUTRITION

Tables 103 and 104 compare the characteristics of households with adequate calorie intake versus those with deficiencies in terms of sources of incomes, demographic profile, absolute levels of incomes, and other socioeconomic characteristics.

The results indicate that overall income per capita affects calorie adequacy positively. Per capita income of households with calorie adequacy levels above 80 percent is about 67 percent higher than of those consuming less than 60 percent of the calorie requirements. This relationship has been confirmed in a multivariate analysis for the same

Table 101--Prevalence of malnutrition, by calorie deficiency, in different groups, Abra, Antique, and South Cotabato Provinces, Philippines, 1983-84

Group	Sample Size	Calorie Consumption > 80 Percent	60-80 Percent	< 60 Percent
	(N)	(percent of households)		
Farm households by farm size				
Small	150	23.0	39.6	37.4
Medium	164	15.9	52.3	31.8
Large	156	26.9	47.6	25.5
Nonfarm households	322	31.5	36.2	31.3
Landless farm households	148	13.2	42.6	44.2
Households by share of off-farm income to total income				
< 10 percent	396	19.9	46.3	33.8
10-30 percent	104	13.1	49.5	37.4
30-60 percent	89	23.5	35.3	41.2
> 60 percent	203	15.1	44.3	40.6

Source: International Food Policy Research Institute/National Nutrition Council Pilot Food Subsidy Project Survey, 1983/84.

Table 102--Prevalence of malnutrition, by anthropometric measures, in different groups, Abra, Antique, and South Cotabato Provinces, Philippines, 1983-84

Group	Sample Size	Households with Children Age 7-60 Months: Weight-for-Age > 80 Percent	60-80 Percent	< 60 Percent
	(N)	(percent of households)		
Farm households by farm size				
Small	150	63.2	35.6	1.3
Medium	164	70.2	28.7	1.1
Large	156	66.5	32.5	1.0
Nonfarm households	322	69.8	30.2	1.0
Landless farm households	148	57.1	40.6	2.3
Households by share of off-farm income to total income				
< 10 percent	396	65.8	33.3	0.9
10-30 percent	104	66.0	32.6	1.4
30-60 percent	89	67.2	32.0	0.8
> 60 percent	203	63.8	34.8	1.4

Source: International Food Policy Research Institute/National Nutrition Council Pilot Food Subsidy Project Survey, 1983/84.

Table 103--Income and employment sources of the malnourished rural poor, by calorie consumption indicator, Abra, Antique, and South Cotabato Provinces, Philippines, 1983-84

Indicator	Calorie Consumption >80 Percent	60-80 Percent	<60 Percent	Total Averages
Number of cases	144	356	292	792
Percent of total household income from				
Rice crops	14.1[a]	9.5	6.4[a]	9.2
Maize crop farming	5.9[b]	7.5	10.1[b]	8.1
Cash crop farming	6.2	6.9	5.2	6.2
Livestock	10.1	9.3	8.7	9.3
Fishing	11.4	12.6	6.9	10.3
Agricultural wages	3.2	5.1	10.5	6.7
Nonagricultural wages	10.5	14.3	16.4	14.3
Crafts work and small-scale business	22.5	21.1	21.2	21.3
Services and others	7.8	6.6	6.6	6.8
Transfers	6.2	6.4	6.2	6.1
Rentals	2.1	0.7	1.8	1.4
Total income per capita (pesos)	2,586[c]	1,869	1,549[c]	1,883
Farm size (average in hectares)	1.57	1.46	1.65	1.54
Percent in bottom tercile	26.9	47.6	25.5	33.3
Percent in middle tercile	15.9	52.3	31.8	34.7
Percent in top tercile	23.0	39.6	37.4	32.0
Households headed by (in percent of total)				
Women	20.0	29.6	50.4[d]	100.0
Men	45.3	18.7	36.0[d]	100.0
Total expenditures per capita (pesos)	2,392	1,820	1,456	1,820
Household size	5.6	6.3	7.1	6.9
Children less than 10 (percent)	33.2	33.0	31.0	32.4
Schooling years of household head	7.6	7.1	6.2	6.9
Schooling years of wife	8.5	7.6	6.4	7.5

Source: International Food Policy Research Institute/National Nutrition Council Pilot Food Subsidy Project Survey, 1983/84.

[a] Significantly different adequacy ratios ($p < 0.05$) for incomes from rice.

[b] Significantly different adequacy ratios ($p < 0.05$) for incomes from maize.

[c] Significantly different income per capita ($p < 0.05$) for households with < 60 percent adequacy versus > 80 percent adequacy.

[d] Significantly different adequacy ratios ($p < 0.05$) for men- versus women-headed households.

Table 104--Income and employment sources of the malnourished rural poor, by anthropometric status indicator, Abra, Antique, and South Cotabato Provinces, Philippines, 1983-84

Indicator	Weight-for-Age >80 Percent	60-80 Percent	<60 Percent	Total Averages
Number of cases	832	426	14	1,272
Percent of total household income from				
Rice crops farming	9.1	8.5	7.1	8.9
Maize crop farming	7.6	7.2	15.4	7.6
Cash crop farming	5.8	5.5	5.1	5.7
Livestock	9.1	8.7	11.8	9.1
Fishing	11.7	12.5	8.1	11.9
Agricultural wages	6.3	6.5	1.1	6.3
Nonagricultural wages	15.2	15.6	31.1	15.5
Crafts work and small-scale business	18.9	21.4	14.9	21.2
Services and others	7.6	7.5	0.0	7.4
Transfers, remittances	5.4	5.3	4.5	5.3
Rentals	3.3	1.3	0.9	1.1
Total income per capita (pesos)	1,877[a]	1,587	1,358[a]	1,744
Farm size (average in hectares)	1.4	1.3	1.1	1.4
Percent in bottom tercile	63.2	35.6	1.3	33.8
Percent in middle tercile	70.2	28.7	1.1	38.6
Percent in top tercile	66.2	32.5	1.0	27.5
Households headed by (in percent of total)				
Women	51.1	37.8	11.1[b]	100.0
Men	64.7	32.7	2.6[b]	100.0
Total expenditures per capita (pesos)	1,820	1,508	1,500	1,716
Household size	6.5[c]	6.7	7.4[c]	6.6
Children less than 10 (percent)	37.8	36.2	41.7	37.3
Schooling years of household head	7.2	6.8	6.3	7.0
Schooling years of wife	7.8	7.1	6.5	7.5

Source: International Food Policy Research Institute/National Nutrition Council Pilot Food Subsidy Project Survey, 1983/84.

[a] Significantly different income per capita ($p < 0.05$) for < 60 percent weight-for-age versus > 80 percent weight-for-age.

[b] Significantly different weight-for-age levels ($p < 0.05$) for men- versus women-headed households.

[c] Significantly different household size ($p < 0.05$) for < 60 percent weight-for-age versus > 80 percent weight-for-age.

data set which estimated an income-calorie elasticity of 0.32 (Garcia and Pinstrup-Andersen 1987).

With the disaggregation of income by source, the results indicate that some of the income sources of deficient households are different from the food-adequate households. Heavy reliance on maize implies lower average adequacy levels, while it is the opposite for those households who rely on rice farming. The differences could be vd (South Cotabato is a principal maize-growing area). It is, however, also the case that maize in South Cotabato is grown mainly as animal feed and the population consumes rice as its staple food. These cropping relationships also hold true when looking at child malnutrition indicators (Table 104). There is a significantly higher proportion of underweight children among those who rely heavily on maize production.

The calorie-deficient groups in general tend to rely on wage labor sources more than do the well-off groups. For instance, 10.5 percent of the incomes of severely deficient households are derived from agriculture wages compared to only 3.2 percent for the calorie-adequate groups. The proportion of the landless among the deficient households is 50 percent compared to 31 percent for those whose calorie adequacy is greater than 80 percent.

The better-off households tend to have higher expenditures per capita, are smaller in household size, and have higher levels of education compared to calorie-deficient households. Despite the generally lower incomes of the study households, average educational attainment is somewhat high, and, on average, higher for the wife than for the husband: Wives had an average schooling of 7.5 years, while husbands had 6.9 years. This higher educational attainment enabled these households to easily move into nonfarm occupations. Many women in the sample were engaged, for instance, in petty trading, salary work in nearby urban areas as clerks, or in sales and trade.

Women-headed households are a special category of households. Around 4 percent of the sample households are women-headed, as a result of death of the husband or husbands who have left the house for good. These households tend to be poor and are characterized by low levels of calorie adequacy compared to male-headed households. However, in households headed by men, Garcia (1990) found that the propensity to consume calories from incomes contributed by women tends to be higher than those contributed by men. It is, thus, essential to distinguish the behavioral responses of women in women-headed households from the responses of women in men-headed households. The former group is economically worse off, on average, which implies that consumption patterns are dictated more by the limits of inadequate resources in the household.

In terms of income and child-level malnutrition relationships, the pattern, although positive, does not appear to be as strong as the calorie-income relationship. It has been hypothesized that infection

and morbidity also play significant roles in child malnutrition, as their synergistic relationships with food intake affect child growth. Thus, the smaller impact of incomes on nutritional status may be a reflection of the important role of factors, such as child morbidity and infection, such that improved food availability does not translate into better child nutrition.

Households that rely heavily on maize farming and nonfarm wages tend to have malnourished children. The size of landholdings, however, does not show any differential effect on child malnutrition. Being landless, however, is associated with high levels of child malnutrition, as nearly 53 percent of households with malnourished children are landless compared to 29 percent landless for those with better-nourished children.

Household demographics clearly play a significant role in child nutrition. Households with at least one child below 60 percent weight for age have a size of about 7.4 compared to 6.5 for those with children above 80 percent weight-for-age. The difference is statistically significant at $p < 0.05$. Furthermore, having many young children in the household is associated with high probability of child malnutrition, which is probably caused not just by the competition for the household food resources but also for attention of and child care by parents and adults. Viis and Garcia (1991 forthcoming), using the same data set, found that children in the higher birth order are more predisposed to malnutrition than those in the lower birth order.

Years of schooling particularly of the mother are strong determinants of child nutrition. This has been observed even after controlling for income in a multivariate analysis employing the same data set (Viis and Garcia 1991).

Children in women-headed households are more likely to be malnourished than children in households headed by men. This parallels the results from the calorie adequacy analysis, and amplifies the poverty among such category of households.

SUMMARY AND CONCLUSIONS

A majority of the households examined in this paper do not rely on only one source of income. This appears to be the economic strategy adopted by the rural poor in the face of landlessness and poor access to productive resources. These households still keep their rural land and home and cope with poverty by sending one or two members of the family for employment elsewhere. Often, this is a feasible option because they have sufficient education to take on urban jobs. Although poor, they are, in general, literate, which is much like the rest of rural Philippines. Nearly half of the households in the sample reported having occupations which are basically nonfarm, although it is also clear that they do maintain their rural household and residence.

Being a large landowning farmer is associated with better food security. Where households rely mostly on farm wages as their main source of livelihood, food security is low. These groups are found to be worse-off compared to landless households who seek nonfarm jobs including crafts work, trading, and services. This implies that food security is a problem for those who remain in farms as agricultural labor. Food security is enhanced when they seek nonfarm employment sources either through petty trading, employment in services, or in small industries in the rural areas. Among the special groups that need attention are women-headed households who tended to have higher proportions of underconsumption.

Total income is positively associated with better food security, but less strongly with better child nutrition. Clearly, food is only one of the many factors that simultaneously affects child nutritional status. Health and morbidity status are other important determinants which show that better food availability can be negated by the adverse effects from infection in children.

APPENDIX 1

Table 105--Selected country indicators

Country	GNP Per Capita	Agriculture Share in GDP	Change in Agriculture Sector Share	Rural Population Share of Total Population	Income Share[a]	Prevalence of Preschooler Malnutrition[b]
	($)	(percent)	(percentage points)	(percent)		(percent)
Sub-Saharan Africa						
Benin	310	46	-13	61	0.66	(30) <80% w/a
Botswana	1,050	3	-31	79	0.09	(15) <80% w/a
Burkina Faso	190	38	-15	92	0.52	(42) <80% w/a
Burundi	250	59	NA	93	0.70	38.9
Cameroon	970	24	-9	54	0.50	
Central African Republic	330	41	-5	55	0.62	
Chad	150	43	1	70	0.61	
Congo	870	12	-7	59	0.27	
Cote d'Ivoire	740	36	-11	56	0.62	13.7
Ethiopia	130	42	-16	88	0.54	
Gabon	2,700	11	-15	57	0.29	
The Gambia	220	32	NA	80	0.44	
Ghana	390	51	7	68	0.69	31.4
Kenya	330	31	-4	78	0.44	
Liberia	450	37	10	58	0.65	
Madagascar	210	43	12	77	0.57	36.9
Malawi	160	37	-13	87	0.49	
Mali	210	54	-11	81	0.66	33.8
Mauritania	440	37	5	62	0.59	
Mozambique	170	50	NA	77	0.63	
Niger	260	34	-34	82	0.50	52
Nigeria	370	30	-24	67	0.62	(33) 5 states
Rwanda	300	37	-38	93	0.50	(31) <80% w/a
Senegal	520	22	-3	63	0.40	25.2
Sierra Leone	300	45	11	74	0.63	
Sudan	330	37	-17	79	0.49	(45) Northern Provinces
Tanzania	180	61	15	71	0.73	
Togo	290	29	-16	76	0.41	27.8
Uganda	260	76	24	90	0.82	24.3
Zaire	150	32	11	62	0.60	
Zambia	250	12	-2	47	0.33	
Zimbabwe	580	11	-7	74	0.24	13.6
North Africa/Mid-East						
Algeria	2,680	12	-3	56	0.32	
Egypt	680	21	-8	52	0.43	17
Jordan	1,560	9	NA	34	0.29	
Morocco	610	19	-4	53	0.42	19.7
Syria	1,640	27	-2	49	0.51	
Tunisia	1,180	18	-4	46	0.44	14
Yemen Arab Republic	590	28	NA	77	0.40	
Yemen, People's Democratic Republic of	420	16	NA	58	0.31	27.3
Asia 1						
Bangladesh	160	47	-6	87	0.58	61.6
India	300	30	-17	73	0.51	
Pakistan	350	23	-17	69	0.40	
Sri Lanka	400	27	-1	79	0.43	38.7

(Continued)

Continuation of Table 105

Country	GNP Per Capita	Agriculture Share in GDP	Change in Agriculture Sector Share	Rural Population Share of Total Population	Income Share[a]	Prevalence of Preschooler Malnutrition[b]
	($)	(percent)	(percentage points)	(percent)		(percent)
South Asia						
Bangladesh	160	47	-6	87	0.58	(61.6) <75% ref. median
Bhutan	150	51	NA	95	0.63	
India	300	30	-17	73	0.51	
Nepal	160	57	-8	91	0.68	
Pakistan	350	23	-17	69	0.40	
Sri Lanka	400	27	-1	79	0.43	38.7
East Asia						
China	290	31	-8	62	0.71	
Indonesia	450	26	-30	73	0.46	(54.8) <80% ref. median
Korea, Republic of	2,690	11	-27	31	0.44	
Malaysia	1,810	20	NA	60	0.50	
Papua New Guinea	700	34	-8	85	0.50	
Philippines	590	24	-2	59	0.49	(19) <75% w/a
Thailand	850	16	-16	79	0.29	28.6
Central America/ Caribbean						
Dominican Republic	730	17	-6	42	0.43	16.6
Costa Rica	1,610	18	-6	55	0.38	5
El Salvador	860	14	-15	56	0.28	
Honduras	810	22	-18	58	0.41	
Jamaica	940	6	-4	49	0.19	8.9
Mexico	1,830	9	-5	29	0.35	
Nicaragua	830	21	-4	42	0.52	25
Panama	2,240	9	-9	46	0.21	
South America						
Argentina	2,390	13	-4	15	0.66	
Bolivia	580	24	1	50	0.48	(18) <75% ref. median
Brazil	2,020	11	-8	25	0.46	
Chile	1,310	6	NA	15	0.50	
Colombia	1,240	19	-11	31	0.57	14.7
Ecuador	1,040	16	-11	45	0.40	
Paraguay	990	27	-10	54	0.52	
Peru	1,470	11	-7	31	0.39	22.6
Uruguay	2,190	13	-2	15	0.61	(9) <80% w/a (health center data)

Sources: Beverly A. Carlson and Tessa M. Wardlaw, A Global, Regional and Country Assessment of Child Malnutrition, UNICEF Staff Working Paper 7 (New York: UNICEF, April 1990); United Nations Administrative Committee on Coordination - Subcommittee on Nutrition, "Update on the Nutrition Situation—Recent Trends in Nutrition in 33 Countries" (Report compiled from information available to the ACC/SCN, United Nations, New York, 1989); World Bank, World Development Report (Washington, D.C.: World Bank, 1989).

Notes:

[a] Approximated share of agricultural income in total rural income in 1987 (Assumption: the rural population earns no industry income but does earn all agricultural income and the national average of services income.)

[b] Measured in terms of below -2 Z-scores of weight-for-age standard unless otherwise indicated.

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