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THE MEDIUM-RUN FOOD AND NUTRITION CONSEQUENCES OF AGRICULTURAL COMMERCIALIZATION: FINDINGS AND IMPLICATIONS IN KENYA

Eileen Kennedy*
Duncan Ngare**
Elizabeth Jacinto
Lawrence Haddad

International Food Policy Research Institute
1200 Seventeenth Street, N. W.
Washington, D.C. 20036
U.S.A.

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* Now at the United States Department of Agriculture, Washington, D.C.

** Now with *Social Science and Medicine*, Nairobi, Kenya.

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EXECUTIVE SUMMARY

The International Food Policy Research Institute was asked by the Government of Kenya, Central Bureau of Statistics, to conduct the present study. The current study builds on earlier studies conducted in South Nyanza in 1984/85 and 1986-87 by conducting a follow-up study in 1992 to assess the short- and medium-term effects of commercialization of agriculture on household income and food security, and the nutritional status of preschool-aged children.

In the short-run, this issue has been addressed by a number of publications, the most recent being the edited volume of case studies by von Braun and Kennedy (1994). Von Braun and Kennedy conclude that the income and food consumption effects of commercialization programs and policies were positive for most of the case study settings. Their conclusions on child nutrition were more neutral. Specifically, they find little evidence to support the hypothesis that improved income and food consumption due to commercialization translated into improved child nutrition.

All of the case studies in the von Braun and Kennedy volume were based on cross-section data. What is not clear from this comprehensive set of case studies is how cash-crop adopting households have fared in terms of income, household food security, and nutrition in the medium run. Were gains in income and food consumption due to commercialization short-lived? Did increased income from commercialization eventually translate into improved preschooler nutrition? Have the determinants of good nutrition changed for the different groups of households?

In attempting to answer these questions, the issue is raised of how to monitor such changes. Several options are available: monitor specific households and preschoolers, monitor specific households and their spinoff households, and monitor a community by drawing a random sample of household from it at each point in time.

Through being able to highlight the first two options, this report represents a first step towards answering some of these policy and methodological questions.

The research for this study was conducted in Nyanza Province, South Nyanza District in the southwestern part of Kenya. Nyanza Province has historically been a grain-producing area of Kenya, supplying basic staples for other parts of the country. Since the early 1970s, Nyanza has become part of the area known as the sugar belt of Kenya.

Of the 504 households in the baseline study in 1984/85, we have income and food consumption for 436 households in the 1986-87 sample and 198 households in the 1992 sample. The decline in household numbers is explained by migration and death. Of the 504 preschoolers in the baseline study in 1984/85, we were able to take anthropometric measures from 762 in the 1986-87 sample and 165 in the 1992 sample.

There are 198 households in the cohort sample. The cohort of preschoolers from 1984/85 is followed through to 1992. Children that were under one year of age in the 1984/85 survey are approximately 7 years old in the 1992 survey, while five-year-olds in the 1984/85 survey are approximately 13 years old in the 1992 survey. There are approximately 160 of the 1984/85 preschoolers in the cohort sample.

The empirical results clearly show that—in an environment when incomes are increasing in general for all household types—gains in income from commercialization have been maintained. For the farmers, there has been pressure on land ownership (smaller plots), a reduction in the variety of crops grown, and an increase in the area devoted to food crops. For the nonfarmers, incomes seem to have grown, implying good backward and forward linkages with agriculture. Contrary to that, however, is the fact that nonfarmer calorie intake decreased in the second period, despite increases in income. Even if overall calorie intake did not increase by much over the entire period, the diversity of the diet did. Morbidity remains a problem in the area—despite income gains—and this has kept preschooler anthropometry poor, although the income effects from early adopting sugar households seem to be particularly positive for preschooler Z-score weight-for-height.

Just as with the short-run analysis of agricultural commercialization, the medium-run story remains the same: increases in income do not seem to be translated into decreases in morbidity and improvements in preschooler nutrition. Commercialization, and the market liberalization that often accompanies it, should, in theory, hasten the de-linking of agricultural production decisions with consumption decisions. In the presence of well-functioning markets for goods and labor, labor and other resources can be combined so as to maximize profits, which can then be spent so as to maximize utility. However, evidence cited in Sections 4 and 5 indicates that increased income does not necessarily increase entitlements for health inputs, which are quasi-public goods. Markets simply may not exist for health care, drinking water, and good sanitation.

If the implications for public policy in terms of investment in nutrition in the South Nyanza District are fairly clear, the implications for monitoring are less clear. The two sets of implications we draw are: (1) that household-level indicators are not good proxies for preschooler-level indicators—even over time, and (2) although cohort data may be most appropriate for analysis of determinants of food security and nutrition, it is unlikely to be optimal for monitoring purposes.

On the first point, it is beginning to become more accepted that we must test the assumptions: (1) that the nutritional status of older household members is reflected in that of young children, and (2) that the socioeconomic factors associated with child nutritional status are similar to those associated with the status of older household members. The data reported here and elsewhere confirm that household-level indicators of food and nutrition security are not necessarily good preschooler-level indicators.

On the second point, while the cohort and noncohort analyses give similar profiles to the nutrition situation, they are not identical. The cohort analyses tend to be more complex in terms of patterns of increase and decrease over the two time periods, 1984/85 to 1986-87 and 1986-87 to 1992. The differences between the size and composition of the cohort group and the larger noncohort group are twofold in nature: first, households that have moved away are not in the cohort group, and second, spin-off households are not in the cohort group. Thus the cohort group is not a randomly selected subgroup of households. The advantages of the cohort for the analysis of determinants must be contrasted with the disadvantages of the cohort for monitoring.

Perhaps even more appropriate for this type of monitoring exercise would be a community panel survey; that is, sample survey data, collected at various points in time, from a set of representative households—but not necessarily the same households. The advantages for monitoring would be: (1) representativeness and (2) lower costs of identifying community panels as opposed to identifying the household or even preschooler panel. Some have found this community panel technique effective for monitoring and even for analytical purposes.

1. INTRODUCTION

What is the impact of agricultural commercialization on household income, household food security, and child nutrition? In the short-run, this issue has been addressed by a number of publications, the most recent being the edited volume of case studies by von Braun and Kennedy (1994). Von Braun and Kennedy conclude that the income and food consumption effects of commercialization programs and policies were positive for most of the case study settings. Their conclusions on child nutrition were more neutral. Specifically, they find little evidence to support the hypothesis that improved income and food consumption due to commercialization translated into improved child nutrition.[1] Indeed, they state: "Increased income and increased food availability contribute to solving the hunger problem but not the problem of preschool children's malnutrition, which results from a complex interaction of lack of food and morbidity" (pp. 374-375).

All of the case studies in the von Braun and Kennedy volume were based on cross-section data. What is not clear from this comprehensive set of case studies is how cash-crop adopting households have fared in terms of income, household food security, and nutrition in the medium run. Were gains in income and food consumption due to commercialization short-lived? Did increased income from

[1] The Guatemala case study (von Braun, Immink, and Hotchkiss 1989) is an interesting exception. Here, a portion of the increased household income due to agricultural commercialization was translated by community associations into improved community health care services.

commercialization eventually translate into improved preschooler nutrition? Have the determinants of good nutrition changed for the different groups of households?

In attempting to answer these questions, the issue is raised of how to monitor such changes. Several options are available: monitor specific households and preschoolers, monitor specific households and their spinoff households, and monitor a community by drawing a random sample of household from it at each point in time.

Through being able to highlight the first two options, this report represents a first step towards answering some of these policy and methodological questions.

2. THE KENYAN POLICY CONTEXT

The International Food Policy Research Institute (IFPRI) was asked by the Government of Kenya, Central Bureau of Statistics, to conduct the present study. The current study builds on earlier studies conducted in South Nyanza in 1984/85 (Kennedy and Cogill 1987) and in 1986-87 (Kennedy 1989) by conducting a follow-up study in 1992 to assess the short- and medium-term effects of commercialization of agriculture on household income and food security, and the nutritional status of preschool-aged children.

Large parts of Kenya are prone to drought. In 1984/85, Kenya and other Greater Horn countries experienced a major drought. Recovery followed in 1987, but 1992/93 witnessed a drought even worse than that of 1984/85 (UN ACC/SCN 1994). Normally, surplus regions such as the Rift Valley and marginally food deficit areas such as Nyanza were maize deficit.

National nutrition status data reflect these variations in food security and nutrition. A 1987 nationwide nutrition survey conducted by the Government of Kenya had indicated that nutritional status of preschoolers in South Nyanza was static, and possibly deteriorating (GOK 1987). The government wanted the present study to (1) determine if the same deteriorating patterns of nutritional status were apparent, using the South Nyanza sample that has been followed since 1984, and (2) use the panel data from the IFPRI studies to identify the major influences on preschooler nutritional status, and whether or not they had changed.

Since the 1987 national nutrition survey, the National Council for Population and Development and the Demographic and Health Survey group (DHS) conducted a nutrition survey in 1993. This most recent national survey indicates static or worsening nutritional conditions among children. The prevalence of stunting (less than 2 standard deviations in height-for-age) in 1987 was estimated at 32.2 percent. The 1993 survey found a corresponding figure of 33.7 percent. In absolute numbers, the stunting problem now affects 1.7 million preschool children compared to 1.3 million in 1987 (UN ACC/SCN 1994). The figures vary considerably, however, by region. Nyanza Province as a whole experienced a significant decline in the prevalence of stunting (from 40 percent to 31 percent).

The Government of Kenya assumed that the commercialization of agriculture would improve the welfare and, more specifically, the nutrition status of smallholder households by increasing household income. Proponents of cash crop production assume that household income will increase as a result of the transition from semi-subsistence to a more commercialized agriculture. In the present research, households were undergoing the transition from maize to sugarcane production.

Many developing countries, including Kenya, are pursuing a policy of stressing the increased production of export crops as well as food crops for domestic consumption (Burger 1994). Indeed, an emphasis on production of export crops has typically been one component of macroeconomic policies commonly called economic adjustment. The 1986 Agricultural Strategy (GOK 1986) stressed a dual policy of increased export and food crop production. However, critics of accelerated export/cash crop production have argued that national-level food security will

deteriorate because of falling domestic supplies. However, food crop production need not decline as export crop production increases. In a multicountry study, von Braun and Kennedy (1986) find that, in general, countries that have positive rates of growth in export crop production also have positive growth in food crop production. One conclusion from this work was that agricultural policies that benefit export/cash crop production also facilitate growth in food crop production.

However, national-level food availability is a poor predictor of food security at the community and household level (Kennedy and Bouis 1993). Countries that have achieved food self-sufficiency often have a significant proportion of their population with inadequate food intakes because these households do not have access to available food. In the case of Kenya, even in periods when overall per caput availability of calories was greater than 100 percent of requirements, 25 to 30 percent of the population were consuming less than 80 percent of their caloric needs (World Bank 1992).

Thus the availability of food at the national level is a necessary, but not a sufficient, condition for community- and household-level food security. Some of the most vocal criticisms of an export-oriented food policy have been related to the perceived effect on local and household food supplies.

There is no inherent reason why export crop production should have a negative effect on local food supplies. Expanded export crop production is likely to have an effect on local food supplies in one of two ways. To the extent that land is shifted out of basic staples and into export crops, the volume of marketed food supplies could decrease, which could, in turn, exert an upward pressure on food prices. If markets

are well integrated, higher food prices will eventually be offset by a movement of food supplies from other areas of the country or from food imports. Secondly, if incomes of agricultural producers and laborers increase as a result of more commercialized production, the demand for food will increase in the local area. The increased demand for food may occur simultaneously with declining marketed food supplies.

The potential negative effects of commercialization on household food security can be short- or longer-term. In the short-to-medium term, the decision to allocate land to a cash crop—particularly a nonfood cash crop such as sugarcane with a long growing cycle—can decrease the food supplies available to a household. If the household has other sources of off-farm income available, this money could be used to supplement food purchases. The worse case scenario is one where a household allocates a disproportionate share of available farmland to a nonedible cash crop with a long gestation period and is trapped when other income sources become less available. Evidence from the earlier IFPRI studies (Kennedy and Cogill 1987; Kennedy 1989) in South Nyanza has indicated that this has not happened to sugarcane farmers; these farmers have tended to have more diversified sources of income that other types of agricultural households.

3. DATA COLLECTION METHODS

3.1 Where

The research for this study was conducted in Nyanza Province, South Nyanza District in the southwestern part of Kenya. Nyanza Province has historically been a grain-producing area of Kenya, supplying basic staples for other parts of the country. Since the early 1970s, Nyanza has become part of the area known as the sugar belt of Kenya.

In 1977, a new sugar factory was established—the South Nyanza Sugar Factory (SONY). The SONY factory obtained approximately 2,500 hectares of land from local landowners to establish the factory and its nucleus estate. The majority of sugar, however, is produced by smallholders under contract to SONY. In 1984, the outgrowers' program included 6,000 contract farmers and approximately 6,000 hectares of land.

A primary objective of this research is to evaluate trends in nutritional status over time in the same survey area and in the same survey households. Thus the original thrust of the earlier studies—to comprehensively evaluate the effects of commercialization of agriculture on overall household welfare and on preschooler nutritional status—is not a primary objective of the 1992 study. Therefore, only a subset of sectors (the smallest geographical unit of government) from the original sample of 16 sectors was selected and resurveyed.

3.2 Who

Of the 504 households in the baseline study in 1984/85, we have income and food consumption for 436 households in the 1986-87 sample and 198 households in the 1992 sample. The decline in household numbers is explained by migration and death. Of the 504 preschoolers in the baseline study in 1984/85, we were able to take anthropometric measures from 762 in the 1986-87 sample and 165 in the 1992 sample. The decline in numbers of preschoolers is due to death, migration, and the unavailability of standards as children approach adolescence. These households and preschoolers are outlined in Figure 1.

There are 198 households in the cohort sample. The cohort of preschoolers from 1984/85 is followed through to 1992. Children that were under one year of age in the 1984/85 survey are approximately 7 years old in the 1992 survey, while five-year-olds in the 1984/85 survey are approximately 13 years old in the 1992 survey. There are approximately 160 of the 1984/85 preschoolers in the cohort sample.

3.3 What and How

Table 1 provides a summary of the data collection modules, to whom they were administered and in which rounds. The survey modules themselves are provided in the Appendix.

4. RESULTS

As indicated in Section 1, the empirical analysis is conducted in two parallel, but complementary, modes: (1) using all households in each study and (2) using only households and preschoolers present in each study. The former analysis is based on data collection from all the households in the first survey plus spinoff households, plus some completely new households. The latter analysis is based only on the same households and preschool children for which we have data in all three surveys or studies: 1984/85, 1986-87, and 1992.

The analysis will trace key variables across these survey years. Households will be classified by their primary crop growing characteristics into sugar, food, and nonfarm. Generally, this classification will be based on a household's status in 1984 (if, indeed, the household was in the sample in 1984) and, at other points, it will be contemporaneous. In the former situation, for example, even though a sugar household may have switched from sugar to food in 1986-87 or 1992, it will appear in the tables as a sugar household.

4.1 General Profile of Real Household Income Per Capita: 1984-1993

Table 2 presents trend data on household real income per capita for sugarcane and food producers. For both of these groups, mean real income per capita has increased between 1984 and 1993. The relative income gap between sugar and food farmers has decreased over this period. The fastest growing income earners are contained within the nonfarmer group.

Table 3 examines the sources of this income. The percent contributions of agricultural production (marketed and consumed) and off-farm income are similar for sugarcane producers in 1986-87 and 1992. However, for food producers, the percent of income from agricultural production used for home consumption has declined from 48 percent in 1986-87 to 31 percent in 1992. A much larger share of income in 1992—66 percent—comes from off-farm sources for food producers.

4.2 Cohort Profile of Real Household Income Per Capita: 1984-1993

Figure 2 profiles real per capita household income for the cohort subsample over the three survey years.[2] Unlike the general group of households, the cohort group's incomes do not rise steadily. The income per capita of both the sugar and food households rose between 1984/85 and 1986-87, and decreased between 1986-87 and 1992, but still remained above 1984/85 levels. Sugar household incomes have remained higher than the food households over the entire eight-year period. It seems as if income per capita differentials that existed in 1984/85 have persisted over the years. In addition, the year-to-year variability of household income is similar for the two household farm groups.

For the nonfarm households, even in the cohort group, income per capita has grown steadily over the eight-year period, and stands well above the sugar and food household per capita incomes. Nonfarm households have, on average, more income

[2] All survey year figures are averages of data from the 3-4 survey rounds conducted within each survey year. Averaging takes into account the seasonal nature of food demand, food production, and morbidity. In addition, averaging improves the validity and reliability of the three survey year data points, particularly for weight-based measures of infant and child undernutrition such as weight-for-height.

sources than farm households. Income diversification in poor rural households is either a reflection of a stagnant economy or a dynamic economy. For very poor communities, a reliance on a number of different income streams is an attempt to minimize risk, and is a reflection of missing or imperfect markets for insurance, credit, land, information, and the like, as well as a reflection of low agricultural productivity. On the other hand, for the relatively well-off, multiple-income sources reflect the wide scope for income-earning opportunities in a dynamic agriculture. Income diversification for the nonfarm households seems to have helped them avoid income declines and, indeed, to improve their income levels.

4.3 General Profile of Household Agricultural Production: 1984-1993

Maize has historically been the main staple in Kenya and much of this produced in South Nyanza. Table 4 presents a general profile of landholdings and cropping patterns over the 1984 to 1993 period.

For both sugar and food producers, land owned per capita remained constant between 1984/85 and 1986-87. However, the amount of land owned per capita declined by 1992 for both these groups. In addition, the mean number of crops produced also declined. However, the mean amount of land devoted to food crops has increased during the 1986-87 to 1992 period.

4.4 Cohort Profile of Household Agricultural Production: 1984-1993

Figure 3 profiles landownings in hectares per capita for the cohort households over the 1984-93 period by type of household in 1984 (sugar, food, nonfarm). Figure

3 illustrates the downward trend in landownings per capita for all three household types. This downward trend is particularly precipitous for food households (0.34 hectares per capita in 1986 to 0.18 hectares per capita in 1992). In the 1984 Philippine commercialization study, sugar farming was found to result in a concentration of landholdings among the large landowners (Bouis and Haddad 1990). It is not clear, however, if sugar production is the cause of the declines noted here, or whether the data reflect the fact that in 1992, the households contain older adults that have passed on some of their land to their older children.

4.5 General Profile of Household Food Expenditures: 1984-1993

Table 5 presents data on food expenditures. For sugarcane farmers, as with the income data, there are no dramatic differences in source of food expenditures between 1986-87 and the 1992. However, for food farmers, a higher proportion of food is purchased in the 1992 period as compared to 1986-87. These data for food farmers are consistent with the smaller landholdings and greater proportion of income they receive from off-farm sources.

Table 6 presents data on the distribution of food expenditures among food groups. For both sugar and food farmers, there has been a decreased emphasis on cereals and grains over time, and a greater emphasis on milk and other products. These changes are typically observed as incomes increase and there is a movement towards a more diversified diet.

Within the Cereal and Grains category, expenditures are also more diversified (Table 7). In particular, expenditures on bread are greater in 1992; this may be due to an increased demand for time convenience in food preparation.

4.6 General Profile of Household and Preschooler Calorie Intake Per Capita: 1984-1993

For the total sample of households, energy intake has increased over the period 1984-93 (Table 8). However, there appears to be more of an unequal distribution of that energy intake across households as witnessed by increases over time in the proportion of households meeting less than 80 percent of their calorie requirements (Table 9).

The adequacy of the preschooler's energy intake has deteriorated by approximately 10 percent in sugarcane households over the period 1984-1993 (Table 10). For preschoolers from food farm households, however, the energy adequacy of the child's diet is similar over the three survey periods. For the nonfarm households, preschooler calorie adequacy has increased.

4.7 Cohort Profile of Household Calorie Intake Per Capita: 1984-1993

Figure 4 illustrates household calorie intake per capita (based on repeated 24-hour recalls) for the three survey years. Household calorie intake per capita follows an inverse-U shape for all three household groups. This pattern reflects national-level and province-level patterns of food production, but not the results based on an analysis of all households in the three survey years, as in the previous subsection.

From the household income profiles, we might have expected the nonfarm households to escape this situation. Despite their income increasing over the 1986-87-1992 period, these nonfarm households could not maintain an entitlement to food during a drought period. This suggests that the food market integration could be improved in the South Nyanza area. Note also, that sugar households, despite being 10-20 percent better off in income terms than food households, consume similar amounts of calories. This may be a reflection of a tendency to purchase more expensive calories, although it could simply reflect an adequate calorie intake at the household level.

4.8 General Profile of Preschooler Morbidity: 1984-1993

Table 11 presents the total percent of time ill for preschoolers in the three survey years. The total percent of time ill for preschoolers from food-producing households has increased from 1984 to 1993. For preschoolers from sugarcane-producing households, the total time ill has not changed over the same time period. Total time ill in preschoolers does not show a response to increasing household income (Table 12). For the total sample, total time ill is slightly higher in 1992 than in the earlier periods. The highest total time ill is found in preschoolers aged 7 to 24 months (Table 13). This pattern is similar to that found in both 1984/85 and 1986-87.

4.9 General Profile of Preschooler Nutrition: 1984-1993

Over the 1984-1993 period, there has been a slight decline in the mean percent and Z-score height-for-age and weight-for-age in preschoolers across the total sample (Tables 14 and 15). There is more of a decline in weight-for-age than in height-for-age. In addition, the deterioration is greater for preschoolers from sugarcane households as compared to preschoolers from food producers.

Average anthropometric Z-scores do not, however, provide much information on the distribution of the Z-scores. When we examine the percentage of preschoolers less than 90 percent height-for-age or less than 90 percent weight-for-height or less than 80 percent weight-for-age, we observe sharper declines in anthropometric scores over time for preschoolers from all types of households (Table 16). It is worth noting that the rates of stunting (below 90 percent height-for-age) and low weight-for-age (less than 80 percent) were stable between the first two studies in 1984/85 and 1986-87. Most of the deterioration for this sample of households has occurred between 1986-87 and 1992. These data indicate that nutritional status of preschoolers has been deteriorating from the mid-1980s to the early 1990s. This finding is also consistent with the Government of Kenya reporting of the worsening nutritional status in South Nyanza throughout the 1980s.

The proportion of preschoolers falling below a specific anthropometric cut-off in 1992 does not differ dramatically by income quartiles (Table 17). For example, the proportion of children falling below 90 percent of height-for-age is relatively constant across the first three income quartiles. It is only in the upper income

quartile that the proportion of children less than 90 percent height-for-age drops significantly. Similar patterns are seen for weight-for-age and weight-for-height.

4.10 Cohort Profile of Preschooler Nutrition: 1984-1993

Figures 5-8 illustrate the profiles of preschooler nutrition status as represented by preschooler anthropometry on Z-score weight-for-height and height-for-age. The patterns in Figure 5 are similar to those for income per capita in Figure 2. For sugar and food households, weight-for-height peaks in 1986. Although Z-score weight-for-height does not drop off as quickly for food as for sugar households in the next period, the patterns are similar for both household types when we examine the percent of preschoolers with Z-score weight-for-height below -2 (Figure 6). For nonfarm households, weight-for-height patterns match the income patterns—a continuous increase from 1984/85 to 1986-87 to 1992. Figures 7 and 8 present analogous data on Z-score height-for-age. The u-shaped patterns observed in Figure 7 (and the inverse in Figure 8) are typical of a longitudinal analysis of height-for-age. What is interesting is that the sugar households are as sensitive as the food households to this secular trend, despite having greater levels of per capita income (see Figure 2).

5. EXPLAINING PRESCHOOLER OUTCOMES: A COHORT ANALYSIS

Descriptive data help to set the scene for an analysis of some of the questions asked in the introduction: Did increased income from commercialization eventually translate into improved preschooler nutrition? Have the determinants of good nutrition changed for the different groups of households?

This section aims to address these questions. First, we examine the determinants of preschooler nutrition as measured by Z-score weight-for-height and Z-score height-for-age in the three different time periods. We should not be surprised to see the relative importance of various determinants change over time as the preschoolers grow older. But how does impact of the household's classification into sugar, food, and nonfarm change over time?

Second, we construct two, two-way tables that split preschoolers into four groups: (1) 1987-86 - 1985/84 increase in Z-score and 1992 - 1987-86 increase in Z-score; (2) 1987-86 - 1985/84 increase in Z-score and 1992 - 1987-86 decrease in Z-score; (3) 1987-86 - 1985/84 decrease in Z-score and 1992 - 1987-86 increase in Z-score; and (4) 1987-86 - 1985/84 decrease in Z-score and 1992 - 1987-86 decrease in Z-score. Third, using a multinomial probit with three outcomes, we examine the determinants of a child being in group 1, in group 2 or 3, or in group 4 of the groups just described.

5.1 The Determinants of Preschooler Z-score Weight-for-Height and Z-score Height-for-Age in 1984/85, 1986-87, and 1992

Tables 18 and 19 provide snapshots of the determinants of Z-score weight-for-height, and Tables 20 and 21 provide snapshots of the determinants of Z-score height-for-age. The regressions reported in these tables use the following model:

Z-score = age of preschooler; sex of preschooler; height of mother; age of mother; education of parents; household income per capita; whether the household is classified as sugar, food, or nonfarm; household size; and percent of household members that are preschoolers.

Tables 18 and 20 present regression results where preschooler anthropometry is explained by, among other variables, the crop status of the household *in the survey year*. Tables 19 and 21 present regression results where preschooler anthropometry is explained by, among other variables, the crop status of the household *at the time of the first survey*.

Table 18 shows the determinants of preschooler weight-for-height in 1984/85, 1986-87, and 1992, and the means of the variables used in the regressions in those three survey years. First, note that the percent of preschoolers coming from sugar households increases from 34.2 percent in 1984/85 to 43.4 percent in 1986-87 to 65.6 percent in 1992. Second, note that in 1984/85, controlling for income per capita, being a preschooler from a sugar or food household has a positive impact on

Z-score weight-for-height as compared to being a preschooler from a nonfarm family. Third, note that in 1986-87, being a preschooler from a sugar or farm household had no impact on Z-score weight-for-height. Finally, note that in 1992, being a preschooler from a sugar or farm household had no impact on Z-score weight-for-height. In fact, in 1986-87 and 1992, the explanatory power of the Z-score weight-for-height equations is so poor that the adjusted R-squared is negative.

Table 19 repeats the last two regressions in Table 18, but substitutes the dummy variables designating sugar and food household in the survey year, with dummy variables that designate sugar and food households in the first study in 1984/85. Note that the regression coefficients on the original dummies become more significant the further we move away from 1984/85. For 1992, the results are most significant, with the largest improvements in preschooler Z-score weight-for-height status.

These results seem to indicate that the positive nutrition (Z-score weight-for-height) impacts of being an early sugar adopter are much stronger than those associated with being a late sugar adopter. Once new sugar adopters are added to the original sugar-adopting group, the impact on preschooler nutrition of sugarcane adoption is diluted, perhaps due to the decreasing returns to sugar adopting as the market becomes saturated. Similarly, as the group of households that were designated as food producers in 1984/85 becomes smaller due to the adoption of sugarcane, the impact on Z-score weight-for-height of being a food producer becomes insignificant. This is perhaps due to the remaining food farmers being less dynamic and having access to fewer assets than the new sugar adopters.

The results from the Z-score height-for-age regressions in Tables 20 and 21 are more difficult to interpret. In 1984/85, important determinants of Z-score height-for-age include mother's height (positive), the dependency ratio of the household (negative), and if the preschooler comes from a food farming household (negative). In 1986-87, only mother's height is weakly statistically significant (positive), and in 1992, only mother's height (positive) and household income per capita (positive) are significant.

Table 21 repeats the last two regressions in Table 20, but substitutes the dummy variables designating sugar and food household in the survey year with dummy variables that designate sugar and food households in the first study in 1984/85. The only real change in the results is that households designated as food farming in 1984/85 an even more negative impact on preschooler Z-score height-for-age than they did in 1984/85. The negative impact on preschooler Z-score height-for-age associated with coming from a food growing household in 1984/85 and 1992/9 is difficult to explain in the context of Kenya. One possible explanation is that the early adoption of sugar reduced women's workloads relative to the non-sugarcane households, thus promoting better nutrition before and during pregnancy, leading to improved preschooler heights at birth.

5.2 Classifying Preschoolers over 1984-93: Who Progressed, Who Did Not, and Why?

The previous section examined the determinants of preschooler growth within survey years, but what are some of the determinants of between year growth? This

section addresses this question by classifying preschoolers into growth achievers and nonachievers. Specifically, Tables 22 and 23 classify preschoolers into four groups: (1) 1987-86 - 1985/84 increase in Z-score and 1992 - 1987-86 increase in Z-score; (2) 1987-86 - 1985/84 increase in Z-score and 1992 - 1987-86 decrease in Z-score; (3) 1987-86 - 1985/84 decrease in Z-score and 1992 - 1987-86 increase in Z-score; and (4) 1987-86 - 1985/84 decrease in Z-score and 1992 - 1987-86 decrease in Z-score. Table 22 presents the data based on Z-score weight-for-height, and Table 23 presents the data based on Z-score height-for-age.

Of the 85 preschoolers represented in Table 22, 63 showed improved Z-score weight-for-height from 1984/85 to 1986-87. From 1986-87 to 1992, only 33 of the 85 preschoolers showed an increase in Z-score weight-for-height. There seems to be little relationship between increases in the first period and increases in the second period. Of the 22 preschoolers showing a first period decrease, nearly half of them show a second period increase. Of the 63 children showing a first period increase, only one-third show a second period increase. Of the 85 preschoolers for which we have cohort information on Z-score weight-for-height, only 23 show increases in both periods. Table 23 presents a similar story for Z-score height-for-age. Of the 147 preschooler children for which we have cohort information on Z-score height-for-age, only 27 show increases in both periods. Again, a first period decrease is a poor indicator of second period decrease and vice versa. In fact, of the 91 preschoolers that show a first period decrease, 57 show a second period increase. Of the 56 preschoolers that show a first period increase, only 27 of them manage to sustain it over the second period.

5.3 The Determinants of Preschooler Anthropometry over the Period 1984-93

Tables 22 and 23 are purely descriptive. We attempted to generate some multinomial logit regression results that try to explain why preschoolers fall in the particular cells in these tables.

The explanatory variables we tried in this regression included the change in household income between 1986-87-1984/85; the change in household income between 1992-1986-87; parents education in 1984/85; household size in 1984/85; household dependency ratio in 1984/85; crop dummy 1 (1=sugar in 1984/85, 0 otherwise); crop dummy 2 (1= food in 1984/85, 0 otherwise); switch dummy 1 (1 if household switched from food to sugar between 1984/85 and 1992, 0 if no switch); switch dummy 2 (1 if household switched from sugar to food between 1984/85 and 1992); and switch dummy 3 (1 if the household switched from nonfarm to sugar or food, 0 if no switch). Unfortunately, the model described here (and others that were tried) had very poor predictive power and the results are not reported in this document.

5.4 Summary of Results

To recap, the analysis followed a two-pronged approach: (1) monitor specific households and their spinoff households, and (2) monitor specific households and preschoolers across all three surveys. The results can be summarized as:

Area of Interest	Conclusion from...	
	Cohort Plus Spinoffs	Cohort Only
Household Income	• Income has increased for sugarcane and food producers. • Income gap has decreased between sugarcane and food producers. • Increasing share of food producer income is from off-farm sources.	• Income has increased strongly and then decreased less strongly for sugar and food farmers. Only for nonfarmers has income steadily increased.
Household Agricultural Production	• Land owned per capita has declined. • Number of crops grown has declined. • Area to food crops has increased.	• Decreased landholdings, with an especially large drop-off for food households.
Household Food Expenditures	• Greater percent of food farmers. food expenditures are purchased. • More diversified diets—all groups.	
Household and Preschooler Calorie Consumption	• Mean household calorie intakes have increased, but distribution has become more unequal. • Preschooler intakes have decreased slightly for sugar households, remained constant for food households, and risen slightly for nonfarm households.	• All three household groups exhibit strong increase and then a less strong decrease in household calorie consumption.
Preschooler Morbidity	• Constant for sugarcane households, increased slightly for food and nonfarm households.	
Preschooler Anthropometry	• Deterioration in preschooler anthropometry, not mitigated by income.	• Z-score weight-for-height increases then decreases less strongly for sugar households, increases then plateaus for food households, and increases consistently for nonfarm households. • Z-score height-for-age decreases then increases for all three household groups; only recovers fully for nonfarm households; all three groups equally sensitive to declines in Z-score height-for-age. • The positive impacts on Z-score weight-for-height of being an early sugar adopter are stronger than those associated with being a late sugar adopter.

6. IMPLICATIONS

The introduction to this report posed several questions: How have cash crop-adopting households fared in terms of income, household food security, and nutrition in the medium run? Were gains in income and food consumption due to commercialization short-lived? Did increased income from commercialization eventually translate into improved preschooler nutrition? Have the determinants of good nutrition changed for the different groups of households? Moreover, in attempting to answer these questions, the analysis was able to follow two strategies: (1) to monitor specific households and preschoolers, and (2) to monitor specific households and preschoolers and their spin-off households and preschoolers. This section takes the second question first, and looks at how the empirical results in Sections 4 and 5 begin to answer these complex questions.

6.1 Implications for Monitoring

If, as we argue in the following section, the implications for public policy in terms of investment in nutrition in the South Nyanza District are fairly clear, the implications for monitoring are less clear. The two sets of implications we draw are: (1) that household-level indicators are not good proxies for preschooler-level indicators—even over time, and (2) although cohort data may be most appropriate for analysis of determinants of food security and nutrition, it is unlikely to be optimal for monitoring purposes.

On the first point, it is beginning to become more accepted that we must test the assumptions: (1) that the nutritional status of older household members is reflected in that of young children, and (2) that the socioeconomic factors associated with child nutritional status are similar to those associated with the status of older household members. The data reported here and elsewhere (Haddad, Sullivan, and Kennedy 1991) confirm that household-level indicators of food and nutrition security are not necessarily good preschooler-level indicators.

On the second point, while the cohort and noncohort analyses give similar profiles to the nutrition situation, they are not identical. The cohort analyses tend to be more complex in terms of patterns of increase and decrease over the two time periods, 1984/85 to 1986-87 and 1986-87 to 1992. The differences between the size and composition of the cohort group and the larger noncohort group are twofold in nature: first, households that have moved away are not in the cohort group, and second, spin-off households are not in the cohort group. Thus the cohort group is not a randomly selected subgroup of households. The advantages of the cohort for the analysis of determinants must be contrasted with the disadvantages of the cohort for monitoring.

Perhaps even more appropriate for this type of monitoring exercise would be a community panel survey; that is, sample survey data, collected at various points in time, from a set of representative households—but not necessarily the same households. The advantages for monitoring would be: (1) representativeness and (2) lower costs of identifying community panels as opposed to identifying the household or even preschooler panel. Moser and Holland (1994), for example, find

this community panel technique effective, even for analytical purposes. They stress that the power of the technique can be considerable—despite the fact that the same households are not necessarily present in each survey—if core indicators at the household and community levels can be collected.

6.2 Implications for Agricultural Commercialization

The empirical results clearly show that—in an environment when incomes are increasing in general for all household types—gains in income from commercialization have been maintained. For the farmers, there has been pressure on land ownership (smaller plots), a reduction in the variety of crops grown, and an increase in the area devoted to food crops. For the nonfarmers, incomes seem to have grown, implying good backward and forward linkages with agriculture. Contrary to that, however, is the fact that nonfarmer calorie intake decreased in the second period, despite increases in income. Even if overall calorie intake did not increase by much over the entire period, the diversity of the diet did. Morbidity remains a problem in the area—despite income gains—and this has kept preschooler anthropometry poor, although the income effects from early adopting sugar households seem to be particularly positive for preschooler Z-score weight-for-height.

Just as with the short-run analysis of agricultural commercialization, the medium-run story remains the same: increases in income do not seem to be translated into decreases in morbidity and improvements in preschooler nutrition. Commercialization, and the market liberalization that often accompanies it, should, in theory, hasten the de-linking of agricultural production decisions with consumption

decisions. In the presence of well-functioning markets for goods and labor, labor and other resources can be combined so as to maximize profits, which can then be spent so as to maximize utility. However, evidence cited in Sections 4 and 5 indicates that increased income does not necessarily increase entitlements for health inputs, which are quasi-public goods. Markets simply may not exist for health care, drinking water, and good sanitation.

One indication of the high returns to investments in nonfood nutrition inputs as a complement to an agricultural commercialization strategy is the collective experience of the countries currently undertaking economic adjustment. One important plank of economic adjustment in predominantly rural societies is the commercialization of agriculture. Experience shows that the countries in Sub-Saharan Africa that experienced the least downward movement in nutrition indicators during adjustment were those in which health sector spending was maintained, at least as a percentage of the overall government budget (Sahn 1994). This phenomenon has also been noted in Sri Lanka and Hungary (Osmani 1994; Cornia 1994).

Moreover, the returns to investment in nonfood inputs into nutrition promise to increase due to a number of trends: (1) urbanization in the absence of strong family and formal safety nets places may increase the premium on good health faster than the premium on food security (Schultz and Tansel 1991); (2) increasing competition for water between production (both agricultural and industrial) and consumption, and the lack of water markets means that production and nutrition decisions related to water are increasingly linked at the community and household level (World Bank Water Demand Research Team 1993); (3) increasing rates of HIV/AIDS that devastate the

productive capacity of the poor in rural and urban areas, but, due to the political power of urban communities, may result in public expenditure being dragged away from rural development and preventative health care towards curative, urban health care (Brown, Webb, and Haddad 1994).

TABLES

Table 6—Distribution of food expenditures among food groups by activity group and survey year

Activity Group	Cereals and Grains	Roots and Tubers	Pulses and Vegetables	Fruits and Beverages	Fish, Meat, and Eggs	Milk and Milk Products	Cooking Ingredients and Others
Follow-up - 1986-87							
Sugar farmers	41.7	7.9	11.0	7.1	16.8	6.3	9.2
Food farmers	45.6	7.7	9.9	6.3	15.5	5.6	9.5
Nonfarmer	38.1	4.2	11.9	7.3	19.8	7.2	11.5
Total	41.8	6.6	10.9	6.9	17.4	6.3	10.1
Follow-up - 1992							
Sugar farmers	33.3	4.1	10.6	5.7	11.6	13.0	21.6
Food farmers	32.9	3.6	12.1	5.1	15.2	14.1	17.0
Nonfarmer	33.6	2.4	9.9	5.1	17.8	14.5	16.8
Total	33.3	3.4	10.9	5.3	14.9	13.9	18.5

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

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Table 7—Food expenditure on staples as a percentage of total food expenditures, by year and activity group

Staple	Sugar Farmer	Food Farmer	Nonfarmer	Total Sample
		(percent)		
Follow-up survey - 1986-87				
Maize flour	29.7	32.0	22.4	28.8
Maize kernel	5.8	5.7	6.0	5.8
millet	0.1	0.2	0.1	0.1
Mice	0.8	1.0	1.7	1.1
Wheat products	0.3	0.2	0.9	0.4
Doughnuts	0.3	0.3	0.5	0.4
Bread	1.5	1.6	3.5	2.0
Finger millet	1.2	0.8	0.8	1.0
Sorghum	1.1	1.0	0.7	1.0
Cakes and biscuits	0.0	0.0	0.1	0.0
Other cereals	0.0	0.0	0.1	0.0
English potatoes	0.2	0.1	0.4	0.2
Sweet potatoes	4.6	4.3	2.2	4.0
Cassava	1.0	1.0	0.7	0.9
Cassava flour	1.4	1.8	0.6	1.4
Grinder	2.1	2.1	2.2	2.1
Yams	0.0		0.0	0.0
All staples as a share to total food expenditure	50.1	52.1	42.9	49.2
Follow-up survey - 1992				
Maize flour	6.8	5.4	2.9	6.1
Maize kernel	18.6	18.6	17.1	18.5
Millet	0.8	0.4	0.1	0.6
Rice 0.8	0.9	1.8	0.9	
Wheat products	0.3	0.5	1.3	0.4
Doughnuts	0.4	0.2	1.2	0.4
Bread	3.6	4.0	8.2	4.0
Finger millet	0.6	0.5	0.9	0.6
Sorghum	2.1	1.7	0.3	1.8
Cakes and biscuits	0.0	0.0	0.3	0.1
Other cereals				
English potatoes	0.4	0.2	0.4	0.4
Sweet potatoes	1.5	1.7	1.7	1.6
Cassava	0.5	0.5	0.0	0.5
Cassava flour	1.2	0.7	0.1	1.0
Pulses	3.9	3.2	1.7	3.6
All staples as a share to total food expenditure	41.5	38.5	38.0	40.5

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 8—Household caloric intake, cohort sample, by activity and survey year

Activity Group	Baseline Study 1984/85		Follow-up Study 1986-87		Follow-up Study 1992	
	N	Mean	N	Mean	N	Mean
Sugar farmer	158	2,712	175	2,730	143	2,876
Food farmer	187	2,669	156	2,645	75	2,732
Nonfarmer	51	2,571	77	2,760	12	2,723
Cohort sample	396	2,674	408	2,703	230	2,821

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 9—Percentage of caloric-deficient households, cohort group, by activity group and survey year

Activity Group	Baseline Study 1984/85			Follow-up Study 1986-87			Follow-up Study 1992		
	80 and Below	81-100	Above 100	80 and Below	81-100	Above 100	80 and Below	81-100	80 and Above
	(percent)								
Sugar farmer	27 (43)[a]	27 (43)	46 (72)	29 (50)	30 (53)	41 (72)	36 (51)	13 (18)	52 (74)
Food farmer	31 (58)	28 (52)	41 (77)	30 (47)	29 (46)	40 (63)	36 (27)	20 (15)	44 (33)
Nonfarmer	31 (16)	33 (17)	35 (18)	19 (15)	35 (27)	45 (35)	42 (5)	17 (2)	42 (5)
Cohort sample	30 (117)	28 (112)	42 (167)	27 (112)	31 (126)	42 (170)	36 (83)	15 (35)	49 (112)

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

[a] The number of households are in parentheses.

Table 10—Preschoolers caloric adequacy, total sample by activity and survey year

Activity Group	Baseline Study 1984/85 N	Baseline Study 1984/85 Percent Adequacy	Follow-up Study 1986-87 N	Follow-up Study 1986-87 Percent Adequacy	Follow-up Study 1992 N	Follow-up Study 1992 Percent Adequacy
Sugar farmer	205	67	533	59	228	61
Food farmer	266	58	399	59	125	60
Nonfarmer	82	47	333	56	15	62
Total	553	59	1,265	58	368	61

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 11—Percent of time ill, preschoolers aged 6 to 72 months, total sample, by activity and survey year

Activity Group	Percent Time Ill	
	Mean	N
Baseline study - 1984/85		
Sugar farmer	28.57	450
Food farmer	28.89	536
Nonfarmer	25.79	171
Total	28.31	1,157
Follow-up study - 1986-87		
Sugar farmer	29.12	584
Food farmer	28.83	430
Nonfarmer	28.02	368
Total	28.74	1,382
Follow-up study - 1992		
Sugar farmer	29.86	487
Food farmer	35.39	241
Nonfarmer	25.63	34
Total	31.42	762

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 12—Percent of time ill, preschoolers aged 6 to 72 months, total sample, by per capita income quartile and survey year

Per Capita Income Quartile	Percent Time Ill	
	Mean	N
Baseline study - 1984/85		
First	28.08	278
Second	27.61	324
Third	30.37	288
Fourth	27.09	258
Total	28.30	1,148
Follow-up study - 1986-87		
First	26.21	370
Second	29.77	353
Third	29.99	267
Fourth	30.13	337
Total	28.91	1,327
Follow-up study - 1992		
First	29.98	173
Second	35.11	188
Third	28.09	209
Fourth	31.28	179
Total	31.05	749

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 13—Percent of time ill of preschoolers aged 6 to 72 months, by age, activity, and survey year

Activity Group	Age							
	7-24 Months		25-36 Months		37-60 Months		61-72 Months	
	Mean	N	Mean	N	Mean	N	Mean	N
Baseline study - 1984/85								
Sugar farmer	34.41	158	29.24	96	24.69	166	17.09	30
Food farmer	33.84	193	27.10	118	27.22	184	18.23	41
Nonfarmer	27.87	68	28.26	35	23.93	53	17.18	15
Total	33.09	419	28.09	249	25.74	403	17.65	86
Follow-up study - 1986-87								
Sugar farmer	31.40	190	27.60	125	28.75	192	26.86	77
Food farmer	35.20	117	28.64	92	25.26	160	26.32	61
Nonfarmer	32.17	125	29.38	72	24.64	132	23.61	39
Total	32.65	432	28.37	289	26.47	484	25.96	177
Follow-up study - 1992								
Sugar farmer	32.14	156	41.23	79	24.22	174	26.37	78
Food farmer	41.99	66	45.92	42	28.26	93	30.00	40
Nonfarmer	34.29	10	32.14	4	25.00	12	12.50	8
Total	35.04	232	42.51	125	25.60	279	26.64	126

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 14—Mean percent height-for-age, weight-for-age, and weight-for-height of children aged 6 to 72 months, total sample, by activity and survey year

Activity Group	Baseline Study 1984/85			Follow-up Study 1986-87			Follow-up Study 1992		
	Height-for-Age	Weight-for-Age	Weight-for-Height	Height-for-Age	Weight-for-Age	Weight-for-Height	Height-for-Age	Weight-for-Age	Weight-for-Height
Sugar farmer									
Mean	95.07	89.35	98.29	93.96	88.71	99.95	93.27	82.31	100.41
N	434	443	445	552	586	577	277	381	364
Food farmer									
Mean	94.57	88.00	97.72	93.85	88.93	100.20	94.21	84.60	100.83
N	507	524	528	400	431	417	146	185	182
Nonfarmer									
Mean	94.99	88.71	97.71	94.65	90.57	100.39	95.31	91.67	96.12
N	164	166	166	349	371	357	19	23	22
Total									
Mean	94.83	88.63	97.94	94.11	89.28	100.14	93.67	83.40	100.38
N	1,105	1,133	1,139	1,301	1,388	1,351	442	589	568

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 15—Z-score for height-for-age, weight-for-age, and weight-for-height of children aged 6 to 72 months, total sample, by activity and survey year

Activity Group	Baseline Study 1984/85			Follow-up Study 1986-87			Follow-up Study 1992		
	Height-for-Age	Weight-for-Age	Weight-for-Height	Height-for-Age	Weight-for-Age	Weight-for-Height	Height-for-Age	Weight-for-Age	Weight-for-Height
Sugar farmer									
Mean	-1.26	-1.02	-0.24	-1.07	-1.54	-0.08	-1.69	-1.65	-0.11
N	434	443	445	586	552	577	277	381	364
Food farmer									
Mean	-1.38	-1.14	-0.30	-1.05	-1.56	-0.05	-1.43	-1.45	-0.06
N	507	524	528	431	400	417	146	185	182
Nonfarmer									
Mean	-1.27	-1.07	-0.30	-0.90	-1.36	-0.02	-1.20	-0.82	-0.43
N	164	166	166	371	349	357	19	23	22
Total									
Mean	-1.32	-1.08	-0.27	-1.02	-1.50	-0.05	-1.58	-1.56	-0.10
N	1,105	1,133	1,139	1,388	1,301	1,351	442	589	568

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 16—Prevalence of stunting, wasting, and low weight-for-age in preschoolers aged 6 to 72 months, total sample, by activity group and survey year

Activity Group	Height-for-Age		Weight-for-Height		Weight-for-Age	
	Below 90 Percent	90 Percent and Above	Below 90 Percent	90 Percent and Above	Below 80 Percent	80 Percent and Above
	(percent)					
Baseline study - 1984/85						
Sugar farmer	16	84	14	86	21	79
	(71)[a]	(363)	(62)	(383)	(94)	(349)
Food farmer	21	79	19	81	29	71
	(104)	(403)	(102)	(426)	(152)	(372)
Nonfarmer	18	82	20	80	25	75
	(29)	(135)	(34)	(132)	(42)	(124)
Total sample	18	82	17	83	25	75
	(204)	(901)	(198)	(941)	(288)	(845)
Follow-up study - 1986-87						
Sugar farmer	22	78	12	88	20	80
	(123)	(429)	(71)	(506)	(120)	(466)
Food farmer	23	78	16	84	23	77
	(90)	(310)	(66)	(351)	(99)	(332)
Nonfarmer	18	82	12	88	20	80
	(62)	(287)	(44)	(313)	(74)	(297)
Total sample	21	79	13	87	21	79
	(275)	(1,026)	(181)	(1,170)	(293)	(1,095)
Follow-up study - 1992						
Sugar farmer	38	62	21	79	45	55
	(105)	(172)	(77)	(287)	(173)	(208)
Food farmer	34	66	22	78	38	62
	(49)	(97)	(40)	(142)	(71)	(114)
Nonfarmer	11	89	18	82	22	78
	(2)	(17)	(4)	(18)	(5)	(18)
Total sample	35	65	21	79	42	58
	(156)	(286)	(121)	(447)	(249)	(340)

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

[a] The number of households are in parentheses.

Table 17—Prevalence of stunting, wasting, and low weight-for-age in preschoolers aged 6 to 72 months, total sample, by income per capita quartile and survey year

Activity Group	Height-for-Age		Weight-for-Height		Weight-for-Age	
	Below 90 Percent	90 Percent and Above	Below 90 Percent	90 Percent and Above	Below 80 Percent	80 Percent and Above
	(percent)					
Baseline study - 1984/85						
First (bottom)	20	80	18	82	25	75
	(52)[a]	(211)	(49)	(223)	(68)	(202)
Second	22	78	19	81	29	71
	(68)	(246)	(61)	(262)	(92)	(230)
Third	18	82	17	83	26	74
	(48)	(224)	(49)	(232)	(73)	(207)
Fourth (top)	13	87	14	86	20	80
	(32)	(215)	(36)	(218)	(51)	(201)
Total	18	82	17	83	25	75
	(200)	(896)	(195)	(935)	(284)	(840)
Follow-up study - 1986-87						
First (bottom)	26	74	15	85	21	79
	(89)	(258)	(54)	(301)	(78)	(288)
Second	18	82	16	84	22	78
	(60)	(271)	(54)	(293)	(78)	(278)
Third	22	78	13	88	20	80
	(56)	(196)	(33)	(231)	(56)	(218)
Fourth (top)	20	80	10	90	21	79
	(62)	(255)	(32)	(296)	(71)	(265)
Total	21	79	13	87	21	79
	(267)	(980)	(173)	(1,121)	(283)	(1,049)
Follow-up study - 1992						
First (bottom)	39	61	17	83	41	59
	(42)	(67)	(23)	(111)	(56)	(81)
Second	40	60	20	80	43	57
	(42)	(64)	(28)	(114)	(64)	(85)
Third	39	61	21	79	48	52
	(45)	(69)	(32)	(124)	(75)	(81)
Fourth (top)	23	77	29	71	35	65
	(26)	(85)	(38)	(92)	(50)	(91)
Total	36	65	22	78	42	58
	(155)	(285)	(121)	(441)	(245)	(338)

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

[a] The number of households are in parentheses.

Table 18—Z-score for weight-for-height (using 1985, 1987, and 1992 dummy variables)

Variables	1984/85			1986-87			1992		
	Mean	β	t-Statistic	Mean	β	t-Statistic	Mean	β	t-Statistic
Dependent									
Weight-for-height Z-score	-0.58			-0.18			-0.389		
Independent									
Mother's height	159.36	-0.05	-1.78	159.4	0.01	0.556	161.98	0.002	0.069
Mother's schooling	3.24	0.05	1.17	3.24	-0.06	-1.55	3.44	-0.037	-0.745
Father's schooling	5.75	-0.04	-0.85	5.75	-0.005	0.13	7.49	0.007	0.578
Real expenditure of the household	209.39	2.54×10^{-5}	0.03	240.79	1.29×10^{-4}	0.15	717.67	-1.20×10^{-4}	-1.047
Sugar household	0.34	0.69	1.71	0.43	0.36	1.001	0.66	0.096	0.156
Food household	0.49	0.64	1.72	0.41	0.35	0.956	0.28	-0.077	-0.122
Household size	11.63	-0.001	-0.03	10.79	0.008	0.28	12.89	-0.014	-0.564
Percent of children (< 15)	54.82	-0.01	-0.69	92.97	0.001	0.811	2.10	-0.114	-0.906
Age (months) of child	14.78	-0.16	-3.42	32.32	0.04	0.568	113.52	0.272	0.988
Square of child's age	309.95	0.004	3.02	1,151.53	-4.11×10^{-4}	-0.44	12,997.87	-0.001	-0.946
Sex of child	0.63	-0.24	-0.83	0.63	-0.28	-1.006	0.607	0.218	0.651
F		1.798			0.521			0.436	
Adjusted R-squared		0.105			-0.075			-0.115	
Residual SS		72.97			57.47			59.481	
N		76			76			61	

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 19—Z-score for height-for-age (using only 1985 dummy variables)

Variables	1984/85			1986-87			1992		
	Mean	β	t-Statistic	Mean	β	t-Statistic	Mean	β	t-Statistic
Dependent									
Weight-for-height	0.581			-0.182			-0.389		
Independent									
Mother's height	159.358	-0.047	-1.784	159.414	0.011	0.482	161.979	0.004	0.155
Mother's schooling	3.237	0.053	1.166	3.237	-0.057	-1.489	3.443	-0.038	-0.801
Father's schooling	5.750	-0.036	-0.853	5.750	0.004	0.118	7.492	0.006	0.478
Real household expenditure	209.392	2.54×10^{-4}	0.026	240.786	-6.06×10^{-5}	-0.070	717.671	-1.38×10^{-4}	-1.237
Sugar household	0.342	0.687	1.711	0.342	0.620	1.842	0.361	0.792	1.947
Food household	0.487	0.636	1.717	0.487	0.616	1.905	0.459	0.772	1.929
Household size	11.632	-0.001	-0.032	10.789	0.004	0.118	12.885	-0.019	-0.770
Percent of children (< 15)	54.820	-0.007	-0.694	92.974	-0.002	1.121	2.101	-0.132	-1.094
Age (months) of child	14.778	-0.164	-3.415	32.319	0.025	0.400	113.523	0.196	0.751
Square of child's age	309.945	0.004	3.021	1,151.527	-2.49×10^{-4}	-0.274	12,997.869	-8.06×10^{-4}	-0.715
Sex of child	0.632	-0.245	-0.826	0.632	-0.271	-1.034	0.607	0.145	0.453
F		1.79778			0.815			0.854	
Adjusted R-squared		0.105			-0.028			-0.027	
Residual SS		72.972			54.927			54.791	
N		76			76			61	

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 20—Z-score for height-for-age (using 1985, 1987, and 1992 dummy variables)

Variables	1984/85			1986-87			1992		
	Mean	β	t-Statistic	Mean	β	t-Statistic	Mean	β	t-Statistic
Dependent									
Height-for-age	1.374			-1.792			-1.393		
Independent									
Mother's height	160.155	0.041	1.792	160.203	0.032	1.674	162.839	0.082	4.418
Mother's schooling	3.311	-0.053	-1.125	3.261	0.022	0.558	3.358	-0.010	-0.251
Father's schooling	5.856	0.045	1.020	5.828	0.017	0.449	6.954	0.010	0.786
Age of mother	337.334	-9.93×10^{-5}	-0.054	357.724	-6.669×10^{-4}	-0.494	36.547	0.031	1.550
Real household expenditure	232.358	7.02×10^{-4}	0.781	255.778	4.482×10^{-4}	0.685	691.158	2.24×10^{-4}	1.952
Sugar household	0.379	-0.525	-1.333	0.440	-0.032	-0.099	0.651	-0.206	-0.444
Food household	0.432	-0.653	-1.746	0.388	0.078	0.233	0.275	-0.126	-0.258
Household size	11.114	-0.049	-1.416	10.418	-0.023	-0.813	12.752	8.45×10^{-4}	0.041
Percent of children (< 15)	55.625	-0.023	-2.108	84.570	6.81×10^{-4}	0.420	2.111	0.088	0.732
Age (months) of child	25.870	-0.064	-2.191	42.835	0.077	2.191	123.793	0.030	0.266
Square of child's age	945.603	8.41×10^{-4}	1.714	2,108.110	-6.72×10^{-4}	-1.746	15,584.267	-1.76×10^{-4}	-0.393
Sex of child	0.530	0.135	0.510	0.530	-0.071	-0.324	0.514		
F		2.018			1.663			2.595	
Adjusted R-squared		0.085			0.056			0.244	
Residual SS		262.229			182.170			143.157	
N		132			134			109	

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 21—Z-score for height-for-age (using 1985 dummy variables)

Variables	1984/85			1986-87			1992		
	Mean	β	t-Statistic	Mean	β	t-Statistic	Mean	β	t-Statistic
Dependent									
Height-for-age	1.374			-1.792			-1.393		
Independent									
Mother's height	160.155	0.041	1.792	160.203	0.032	1.690	162.839	0.073	3.953
Mother's schooling	3.311	-0.053	-1.125	3.261	0.018	0.466	3.358	-0.018	-0.454
Father's schooling	5.856	0.045	1.020	5.828	0.018	0.488	6.954	0.146	1.161
Age of mother	337.334	-9.93×10^{-5}	-0.054	357.724	-5.60×10^{-4}	-0.409	36.547	0.038	1.990
Real household expenditure	232.358	7.02×10^{-4}	0.781	255.778	4.26×10^{-4}	0.646	691.158	2.65×10^{-4}	2.397
Sugar household	0.379	-0.525	-1.333	0.373	-0.042	-0.133	0.404	-0.327	-0.999
Food household	0.432	-0.653	-1.746	0.440	-0.060	-0.192	0.404	-0.867	-2.626
Household size	11.114	-0.049	-1.416	10.418	-0.020	-0.716	12.75	0.012	0.609
Percent of children (< 15)	55.625	-0.023	-2.108	84.570	7.32×10^{-4}	0.457	2.111	0.091	0.778
Age (months) of child	25.870	-0.064	-2.191	42.835	0.078	2.209	123.793	0.051	0.470
Square of child's age	945.603	8.41×10^{-4}	1.714	2,108.110	-6.79×10^{-4}	-1.764	15,584.269	-2.60×10^{-4}	-0.603
Sex of child	0.530	0.135	0.510	0.530	-0.073	-0.334	0.514	0.325	1.409
F		2.018			1.647			3.425	
Adjusted R-squared		0.085			0.055			0.212	
Residual SS		262.229			182.412			132.754	
N		132			134			109	

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 22—Categorization of preschoolers by gain of loss in Z-score weight-for-height over the periods 1984 to 1986 and 1986 to 1992

Number of Preschoolers...	First Period Decrease Decrease in Weight-for-Height Between 1984 and 1986	First Period Increase Increase in Weight-for-Height Between 1984 and 1986	Row Total
Second period decrease: Decrease in weight-for-height between 1986 and 1992	18	23	41
Second period increase: Increase in weight-for-height between 1986 and 1992	4	40	44
Column Total	22	63	85

Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

Table 23—Categorization of preschoolers by gain of loss in z-score height-for-age over the periods 1984 to 1986 and 1986 to 1992

Number of Preschoolers...	First Period Decrease Decrease in Weight-for-Age Between 1984 and 1986	First Period Increase Increase in Weight-for-Age Between 1984 and 1986	Row Total
Second period decrease: Decrease in height-for-age between 1986 and 1992	56	19	75
Second period increase: Increase in height-for-age between 1986 and 1992	35	37	72
Column Total	91	56	147

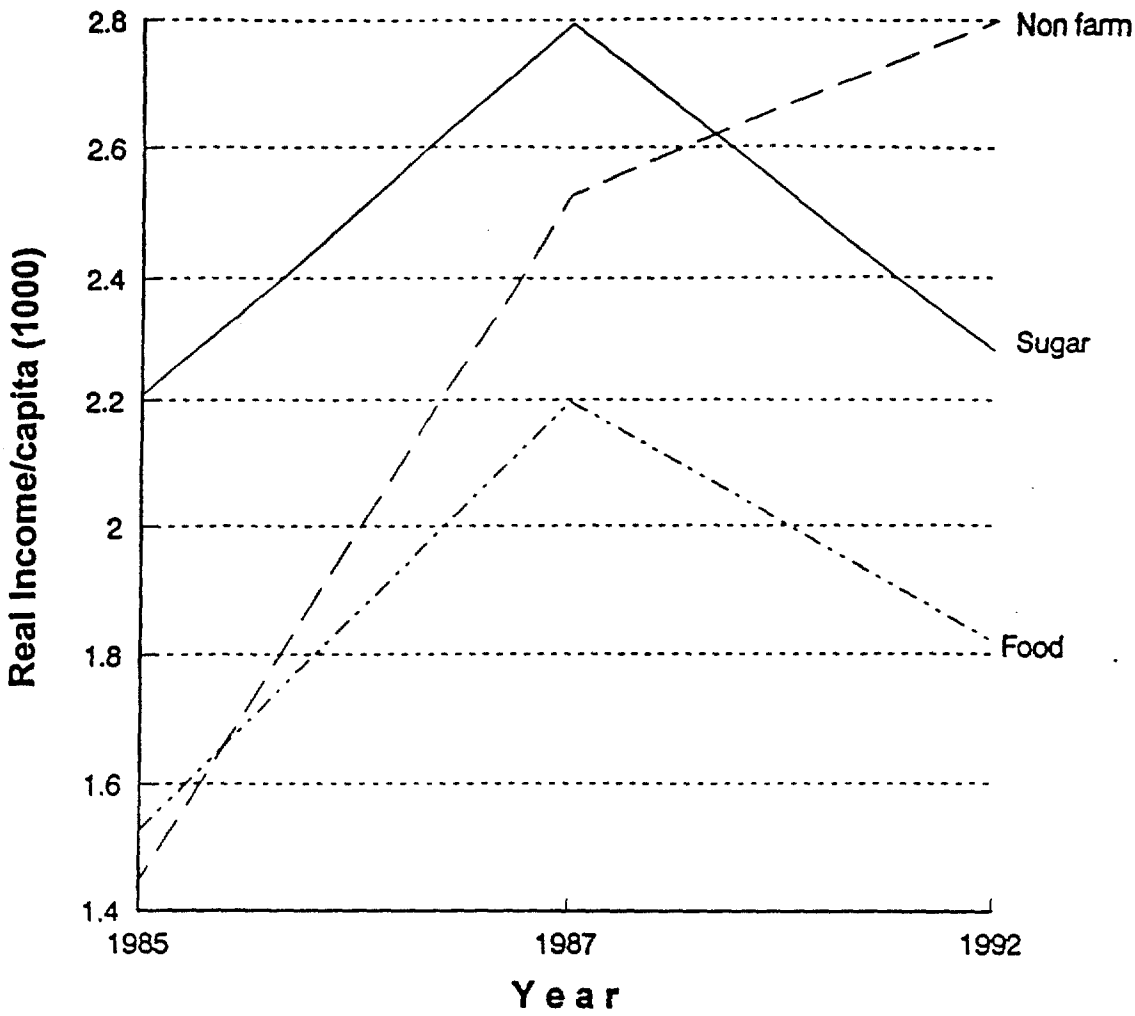
Source: All data are from International Food Policy Research Institute (IFPRI) surveys in 1984/85, 1986-87, and 1992 in South Nyanza, Kenya.

FIGURES

Figure 1—Composition of samples in 1984/85, 1986-87, and 1992

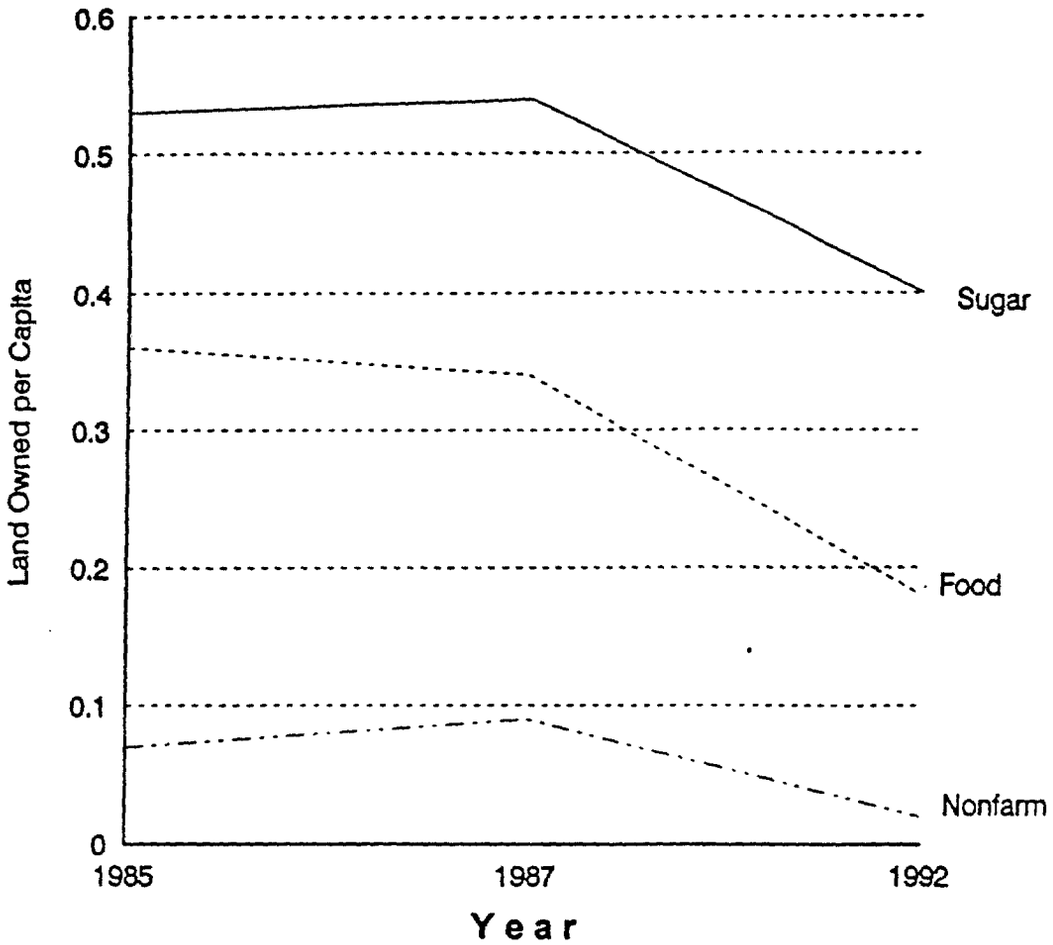
In 1984/85	504 households (1,171 preschoolers)				
In 1986/87	462 resurveyed households (762 resurveyed preschoolers)	+	155 new households (380 new preschoolers)		
In 1992	316 twice-resurveyed households (496 twice-resurveyed preschoolers)	+	111 once-resurveyed households (240 once-resurveyed preschoolers)	+	21 new households (9 new preschoolers)

Figure 2—Real household income per capita, by survey year



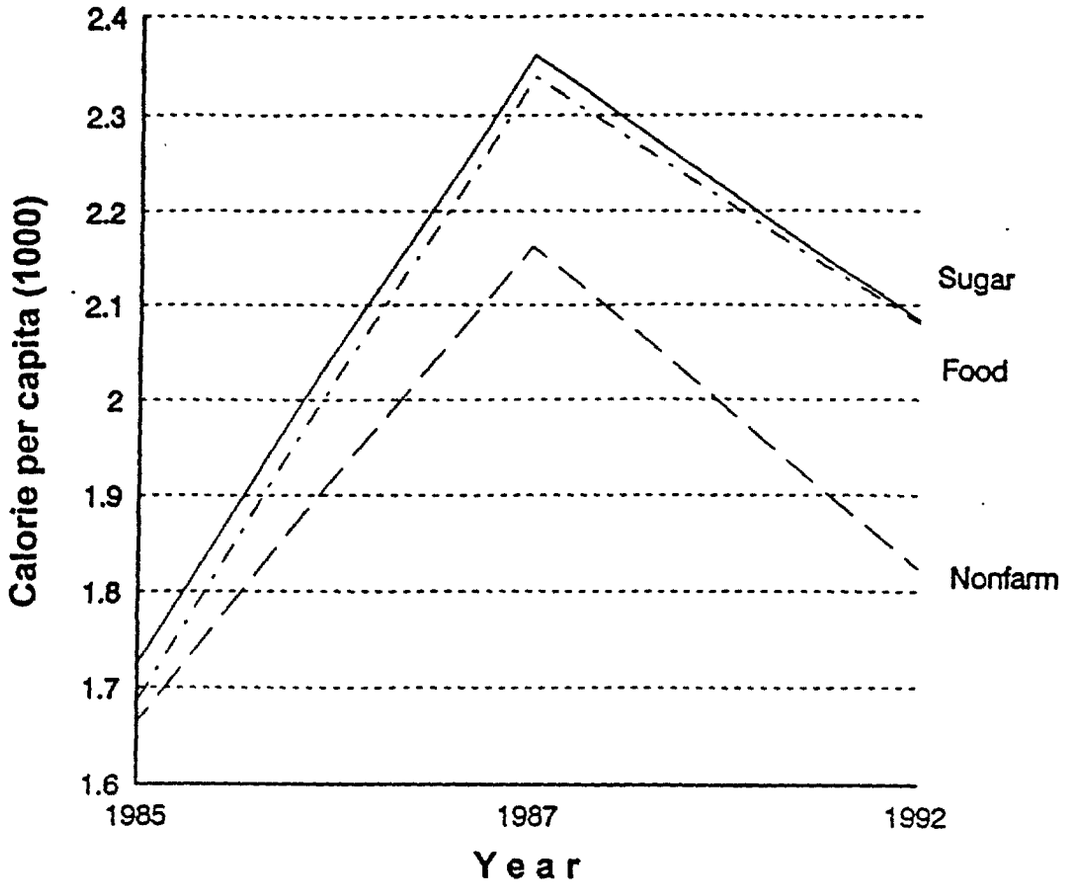
Note: Households are classified based on the 1984/85 baseline study.

Figure 3—Land owned per capita per year



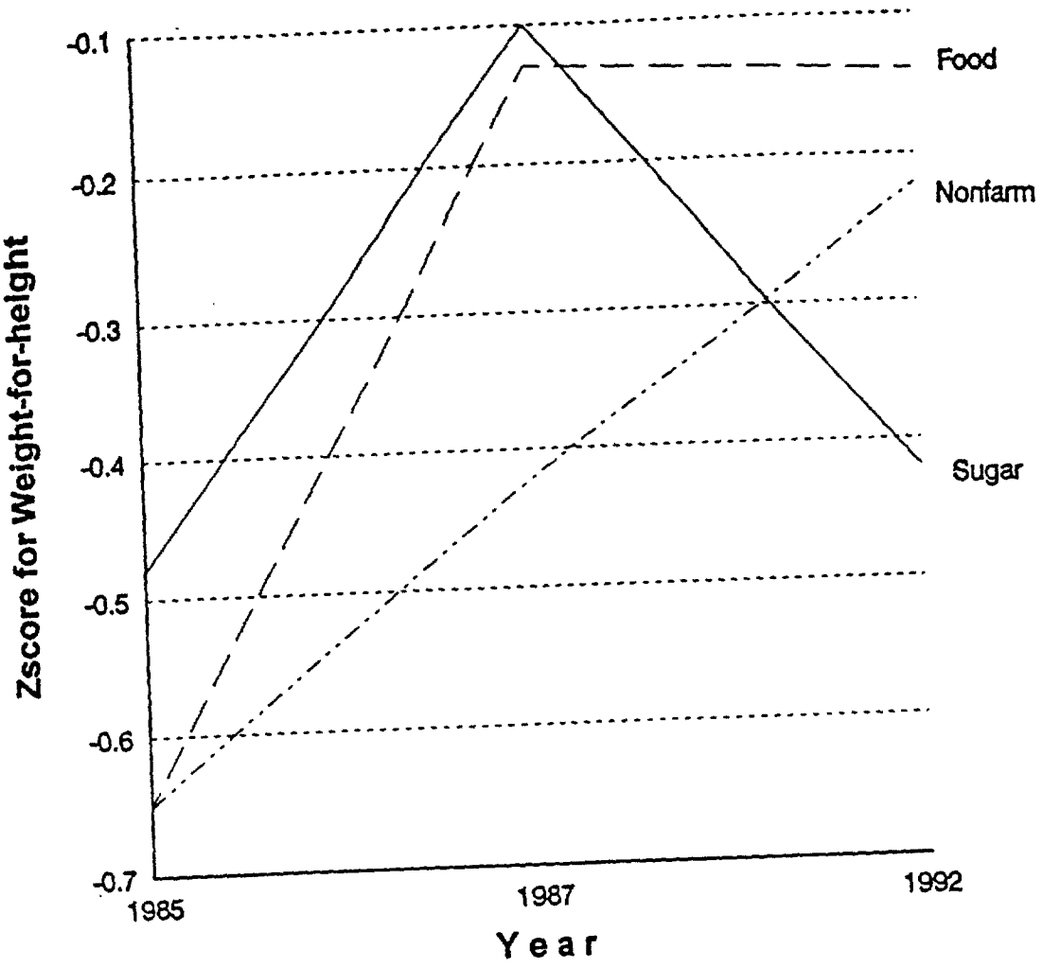
Note: Households are classified based on the 1984/85 baseline study.

Figure 4—Household calorie per capita by year



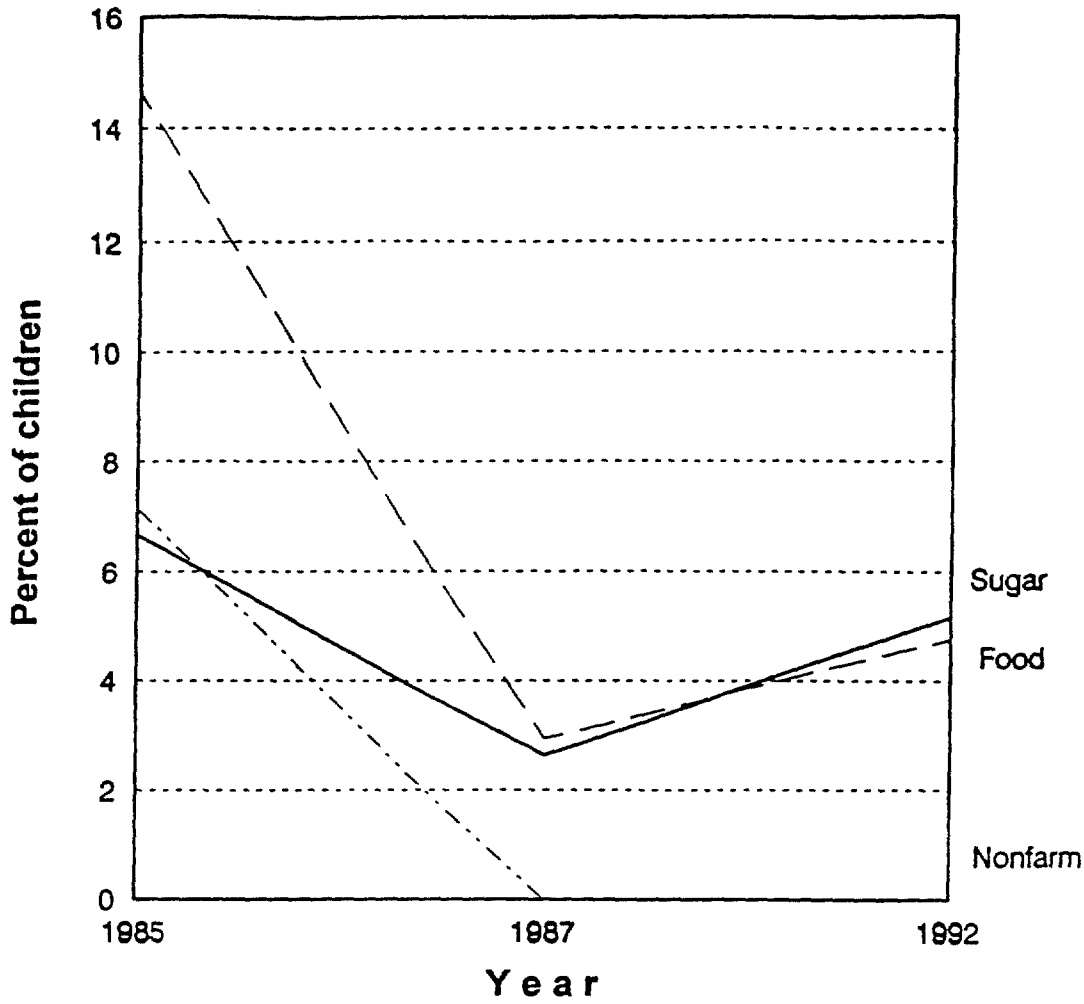
Note: Households are classified based on the 1984/85 baseline study.

Figure 5—Z-score for weight-for-height of preschoolers, by study year



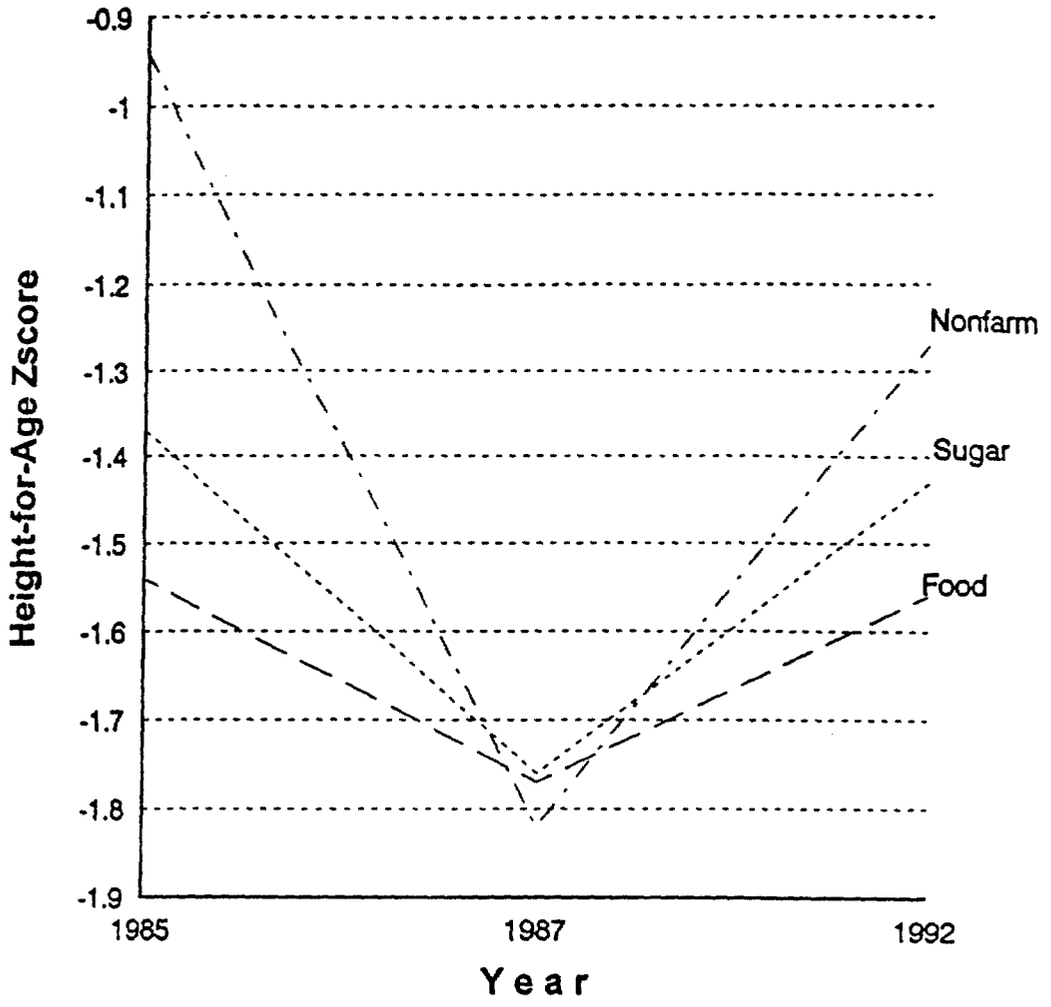
Note: Households are classified based on the 1984/85 baseline study.

Figure 6—Percent of children with Z-score weight-for-height < -2



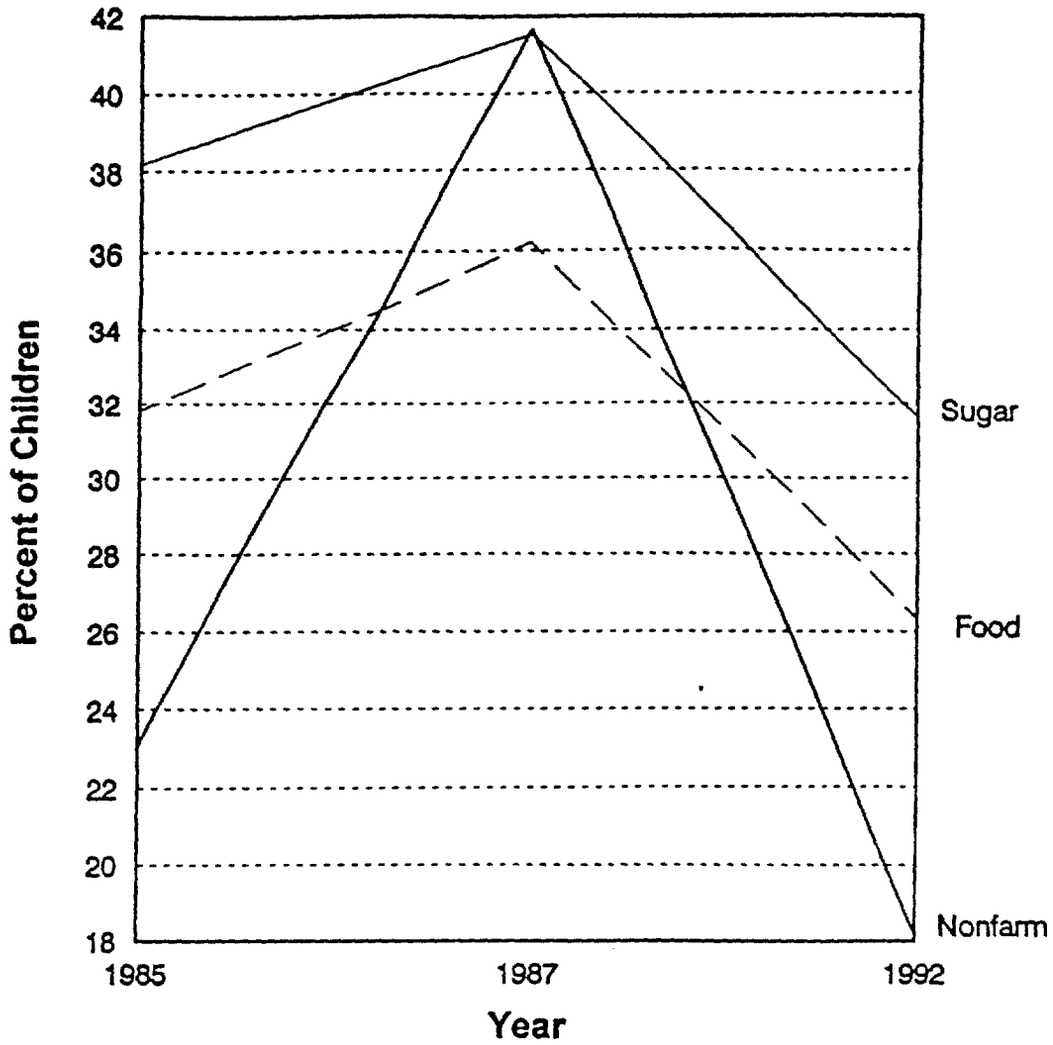
Note: Households are classified based on the 1984/85 baseline study.

Figure 7—Z-score for height-for-age by year



Note: Households are classified based on the 1984/85 baseline study.

Figure 8—Percent of children with Z-score height-for-age < -2



Note: Households are classified based on the 1984/85 baseline study.

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APPENDIX:

1992 QUESTIONNAIRE

CBS/JKUCAT/IFPRI SOUTH NYANZA SURVEY 1992

Enumerator's name: _____ ID:_____

Household ID: _____ Sublocation:_____ Sector ___

Zone: _____ Land Registry No: _____

Field edit	_____	Editor	_____	Date	_____
Spot Check	_____	Checker	_____	Date	_____
Office Edit	_____	Editor	_____	Date	_____
Coding	_____	Coder	_____	Date	_____

Form No.	Data Entry	Verification	
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Form 1 - continued

HOUSEHOLD NO:

ID	Name	Birthdate DD / MM / YY	Age in yrs	Sex 1=M 2=F	Present in HH? 1=Yes 2=No	Relationship to head 1987	Relationship to head 1992	Child's Mother ID	Husband ID	Eating Unit ID	✓
__ __		__ __/__ __/__ __	__ __	__	__	__	__	__ __	__ __	__	
__ __		__ __/__ __/__ __	__ __	__	__	__	__	__ __	__ __	__	
__ __		__ __/__ __/__ __	__ __	__	__	__	__	__ __	__ __	__	
__ __		__ __/__ __/__ __	__ __	__	__	__	__	__ __	__ __	__	
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__ __		__ __/__ __/__ __	__ __	__	__	__	__	__ __	__ __	__	
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__ __		__ __/__ __/__ __	__ __	__	__	__	__	__ __	__ __	__	

AGE IN YEARS

Write down the number of years completed, e.g., a person who is 18 years and 10 months old would have age in years=18. A 6 month old baby would have 0 years.

RELATIONSHIP TO HEAD OF HOUSEHOLD

1 Head
2 Wife/Spouse
3 Daughter
4 Daughter/Son-in-law
5 Son
6 Grandchild
7 Other relative
8 Other non-relative
9 Co-wife

CHILD'S MOTHER ID/ HUSBAND ID

Write down actual ID even if mother/husband is currently not present in the household as long as her/his name appears on this list or in the list of new members.

Form 1 - HOUSEHOLD COMPOSITION: Persons present in 1985/87 study

The following are the list of people who were present in this household when the earlier study was carried out. For each of the following people, could you please indic whether they are still part of the household? *(Note to enumerator: You may use the last column to check off the women eligible for interview.)*

HOUSEHOLD NO:

ID	Name	Birthdate DD / MM / YY	Age in yrs	Sex 1=M 2=F	Present in HH? 1=Yes 2=No	Relationship to head 1987	Relationship to head 1992	Child's Mother ID	Husband ID	Eating Unit ID	✓
__ __		__/__/__	__ __	__	__	__	__	__ __	__ __	__	
__ __		__/__/__	__ __	__	__	__	__	__ __	__ __	__	
__ __		__/__/__	__ __	__	__	__	__	__ __	__ __	__	
__ __		__/__/__	__ __	__	__	__	__	__ __	__ __	__	
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__ __		__/__/__	__ __	__	__	__	__	__ __	__ __	__	
__ __		__/__/__	__ __	__	__	__	__	__ __	__ __	__	

AGE IN YEARS

Write down the number of years completed, e.g., a person who is 18 years and 10 months old would have age in years=18. A 6 month old baby would have 0 years.

RELATIONSHIP TO HEAD OF HOUSEHOLD

1 Head
2 Wife/Spouse
3 Daughter
4 Daughter/Son-in-law
5 Son
6 Grandchild
7 Other relative
8 Other non-relative
9 Co-wife

CHILD'S MOTHER ID/ HUSBAND ID

Write down actual ID even if mother/husband is currently not present in the household as long as her/his name appears on this list or in the list of new members.

Form 2 - HOUSEHOLD COMPOSITION: Additional household members

If there are people who have been added to your household who have not already been mentioned, please tell us who they are: *(Note to enumerator: You may use the last colum to check off the women eligible for interview.)*

HOUSEHOLD NO:

_ _ _ - _

ID	Name	Birthdate DD / MM / YY	Age in yrs	Sex 1=M 2=F	Present in HH? 1=Yes 2=No	Relationship to head 1987	Relationship to head 1992	Child's Mother ID	Husband ID	Eating Unit ID	✓
50		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
51		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
52		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
53		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
54		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
55		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
56		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
57		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
58		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
59		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	

AGE IN YEARS

Write down the number of years completed, e.g., a person who is 18 years and 10 months old would have age in years=18. A 6 month baby would have 0 years.

RELATIONSHIP TO HEAD OF HOUSEHOLD

1 Head
2 Wife/spouse
3 Daughter
4 Daughter/Son-in-law
5 Son
6 Grandchild
7 Other relative
8 Other non-relative
9 Co-wife

CHILD'S MOTHER ID/ HUSBAND ID

Write down actual ID even if mother/husband is currently not present in the household as long as her/his name appears on this list or in the list of new members.

Form 2 - continued

HOUSEHOLD NO:

_ _ _ - _

ID	Name	Birthdate DD / MM / YY	Age in yrs	Sex 1=M 2=F	Present in HH? 1=Yes 2=No	Relationship to head 1987	Relationship to head 1992	Child's Mother ID	Husband ID	Eating Unit ID	✓
60		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
61		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
62		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
63		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
64		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
65		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
66		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
67		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
68		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	
69		_ _/_ _/_ _	_ _	_	_		_	_ _	_ _	_	

AGE IN YEARS

Write down the number of years completed, e.g., a person who is 18 years and 10 months old would have age in years=18. A 6 month baby would have 0 years.

RELATIONSHIP TO HEAD OF HOUSEHOLD

1 Head
2 Wife/spouse
3 Daughter
4 Daughter/Son-in-law
5 Son
6 Grandchild
7 Other relative
8 Other non-relative
9 Co-wife

CHILD'S MOTHER ID/ HUSBAND ID

Write down actual ID even if mother/husband is currently not present in the household as long as her/his name appears on this list or in the list of new members.

Form 3 - HOUSEHOLD COMPOSITION: Persons who have left household

HOUSEHOLD NO:

_ _ _ - _

For each of the people no longer present in the household, could you indicate what has happened to each of them:
(Note to enumerator: Please write down reason and cause of death in the space provided as actually reported).

ID	Reason not in household	Code for Reason	Cause of death	Code for Cause	Year Died	Age Died
_ _	Name:	_ _ If "01" answer --→		_ _	19 _ _	_ _ yrs/ _ _ mos/ _ _ days
_ _	Name:	_ _ If "01" answer --→		_ _	19 _ _	_ _ yrs/_ _ mos/_ _ days
_ _	Name:	_ _ If "01" answer --→		_ _	19 _ _	_ _ yrs/_ _ mos/_ _ days

REASON NOT IN HH

01 Died
02 Living with other relatives
03 Got married; living in another household
04 Working away from household
05 Student living away
06 Temporarily living away
07 Divorced or separated
08 Deserted the household or ran away
99 Other

CAUSE OF DEATH

01 Measles
02 Fever/Malaria
03 Respiratory Infection
04 Diarrhea
05 Accident
06 Giving birth
07 Killed by someone
08 Drowned
09 Killed themself
10 Malnutrition (may say not gaining weight)
11 Would not eat
12 Evil curse
13 Old age
14 Heart problem
99 Other, specify

Form 4 - HOUSEHOLD CHARACTERISTICS

HOUSEHOLD NO.	NAME OF RESPONDENT	ID
_ _ _ - _	_____	_ _

ENUMERATOR ID	INTERVIEW DATE
_ _	_/_/_

1. Is this a female-headed household?	1 Yes 2 No	___
2. Is head of household away from home more than he is at home?	1 Yes 2 No	___
3. Where is the head of household?	1 Local 2 Kisumu 3 Nairobi 4 Homa Bay 5 Mombasa 6 Other parts of Kenya 7 Outside Kenya 8 Don't know 9 Others, specify: _____	___
4. Based on information we obtained from you in the last interview, there are: a. ____ adult males (15 yrs and older) b. ____ adult females (15 yrs and older) c. ____ children (between 6 and 15 years) d. ____ preschoolers (below 6 years)		a. _ _ b. _ _ c. _ _ d. _ _
5. Based also on the last interview, there are ____ students currently living away from home?		_ _
6. How many years of schooling has the head of household had?		_ _

Form 4 - continued

7. Can the head of household read a letter or newspaper?	1 Yes 2 With difficulty 3 No	__
8. Is this household currently under contract to SONY to grow sugarcane?	1 Yes 2 No	__ If '2', skip to 10.
9. When did this household first begin growing sugarcane for SONY?	(Enter month and year -- the earliest possible year is 1977)	__ __/__ __ M M / Y Y
10a. What is the total amount of land the household owns (in acres)? b. What is the total amount of land the household rents out or leases (in acres)? c. What is the total amount of land the household rents for its own use (in acres)? d. Of the total amount of land you currently hold, how much of the land is under cultivation (in acres)?		a. __ __ . __ b. __ __ . __ c. __ __ . __ d. __ __ . __
11a. How many heads of cattle, excluding oxen, do you own? b. How many oxen do you own?		a. __ __ b. __ __
12. Where do you get your primary drinking water from in the dry season?	1 Still pool 2 Stream/river 3 Spring 4 Well 5 Covered rain water 6 Public pipes 7 Inside tap 8 Outside tap 9 Uncovered rain water 0 Other	__

Form 4 - continued

13. Do you ever collect water from your roof?	1 Yes 2 No	___
14. How long does it take an adult woman to walk one way to the water supply?	(Write down response as actually reported) _____	___ ___ (in hours)
15. Observe if the family has a latrine.	1 Yes 2 No	___
16. What materials are the head of the household's home built with? a. Walls b. Roof c. Floor	1 Mud 2 Brick 3 Stone 4 Concrete 5 Tin 6 Corrugated tin 7 Grass/weeds 8 Wood 9 Other	a. ___ b. ___ c. ___

Form 5 - HOUSEHOLD AGRICULTURAL PRODUCTION

HOUSEHOLD NO:

List all plots of land, crops grown and production information from the last harvest (short rains season)

Plot No.	Person Responsible		Crop Grown		Plot Size (in acres)	Total Production		Amount Sold		Amount Retained	
	Name	ID	Name	Code		Unit	Quantity	Unit	Quantity	Unit	Quantity

UNIT CODES

1 = Kilogram
2 = Ton
3 = 50-kg Sack
4 = 90-kg Sack
5 = Bales
6 = 20-liter Tin
7 = Actual count
8 = Basket
9 = Granary
10 = Other, specify: _____

Form 6 - NON-FARM INCOME

HOUSEHOLD NO.	EATING UNIT
_ _ _ - _	_

List all non-farm income received since January 1, 1992

NON-FARM INCOME - SOURCES	CODE	VALUE (in KSh)
Sale of capital and household assets	0 1	_ _ _ _ _ _
Income from permanent employment	0 2	_ _ _ _ _ _
Income from casual employment	0 3	_ _ _ _ _ _
Money from relatives including remittances	0 4	_ _ _ _ _ _
Other gifts including bride price, dowries, agreement fees	0 5	_ _ _ _ _ _
Sales from trading and home crafts	0 6	_ _ _ _ _ _
Miscellaneous (pensions, rent, renting equipment)	0 7	_ _ _ _ _ _
Non-factory loans received	0 8	_ _ _ _ _ _
Factory loans received	0 9	_ _ _ _ _ _
Income from renting/leasing land	1 0	_ _ _ _ _ _
Income from renting animals	1 1	_ _ _ _ _ _
Women's informal arrangements	1 2	_ _ _ _ _ _
Other, specify:	1 3	_ _ _ _ _ _
	_ _	_ _ _ _ _ _
	_ _	_ _ _ _ _ _
	_ _	_ _ _ _ _ _

Form 7 - FARM INCOME

HOUSEHOLD NO.	EATING UNIT
_ _ _ _	_

FARM INCOME - SOURCES	CROP CODE	VALUE (in KSh)
Sale of sugar to Factory	6 _	_ _ _ _ _ _ _
Specific Crop Sales (List Crop)		
1.	_ _	_ _ _ _ _ _ _
2.	_ _	_ _ _ _ _ _ _
3.	_ _	_ _ _ _ _ _ _
4.	_ _	_ _ _ _ _ _ _
5.	_ _	_ _ _ _ _ _ _
6.	_ _	_ _ _ _ _ _ _
Sale of cattle/cattle products	7 _	_ _ _ _ _ _ _
Sale of other livestock	_ _	_ _ _ _ _ _ _
Sale of milk	9 0	_ _ _ _ _ _ _
Sale of eggs	7 6	_ _ _ _ _ _ _
Sale of poultry	7 6	_ _ _ _ _ _ _
Other sales, specify:	_ _	_ _ _ _ _ _ _

CROP CODES

CEREAL & PRODUCTS
01 = Maize - Local
02 = Maize - Hybrid
03 = Sorghum
04 = Finger Millet
06 = Rice
07 =
08 =
09 = Other

ROOTS & TUBERS
10 = Sweet Potatoes
11 = English Potatoes
12 = Cassava
13 = Plantain
14 = Yams
15 = Taro
16 = Yams
17 =
18 =
19 = Other

PULSES
20 = Pigeon Peas
21 = Cowpeas
22 = Groundnuts
23 = Sunflower
24 = Sesame
25 = Beans
26 = Green Gram

LEAFY VEGETABLES
31 = Cassava Leaves
32 = Cabbage
33 = Okra
34 = Pumpkin Leaves
35 = Amaranthus
36 = Sukuma Wiki
37 = Dek, Akeyo
38 =
39 =

OTHER VEGETABLES
40 = Gourds
41 = Onions
42 = Pumpkins
43 = Tomatoes
44 = Green Beans
45 = Carrots
46 = Cauliflower
47 = Green Peppers
48 = Boo
49 = Other

FRUITS
50 = Bananas
51 = Lemons
52 = Mangoes
53 = Paw Paw
54 = Oranges
55 = Guavas

FRUITS cont'd.
56 = Pineapple
57 = Avocado
59 = Other

CASH CROPS
60 = Sugarcane
61 = Cotton
62 = Tobacco
63 = Chillies
64 = Coffee
65 = Non-contract sugarcane
66 = Trees
67 = Nape Grass
68 = Sisal
69 = Other

LIVESTOCK
70 = Cattle
71 = Cattle-improved dairy
72 = Goats
73 =Donkey
74 = Chicken
75 = Ducks
76 = Poultry/Eggs
77 = Oxen - Reudhi Mabuoch
78 = Sheep
79 = Other

Form 8 - Continued

HOUSEHOLD NO: _ _ _ - _	EATING UNIT: __

FOOD ITEM	✓	ITEM CODE	PURCHASED LAST WEEK				OWN-PRODUCTION		
			QUANTITY	UNIT CODE	TOTAL COST	FREQ	QUANTITY	UNIT CODE	FREQ
Groundnuts		1304	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Cowpeas		1305	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Other		1399	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Vegetables									
Tomatoes		1401	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Onions		1402	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Pumpkins		1403	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Grean Beans		1404	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Carrots		1405	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Cauliflower		1406	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Green bananas		1407	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Cabbage		1408	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Sukuma Wiki		1409	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Bo		1410	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Pumpkin Leaves		1411	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Dek. Akeyo		1412	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Cowpea Leaves		1413	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Mto		1414	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Osuga		1415	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Other _____		1499	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Fruits									
Bananas, ripe		1501	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Mangoes		1502	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Pawpaw		1503	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _

UNIT CODES

01 = 500 Gram Tin (KIMBO/COWBOY)
02 = 1 Kg Tin
03 = 2 Kg Tin
05 = 4 Oz Dish
06 = 8 Oz Dish
07 = 16 Oz Dish
08 = 32 Oz Dish/Kettle
09 = 20 Liter Tin
11 = 1 Milliliter
12 = 1 Teaspoon
13 = 1 Tablespoon
14 = 1 Kilogram
15 = 1 Treetop Bottle(800 ml)
16 = Actual Count, "1"
17 = Soda Bottle
18 = Packet
19 = Shopping Basket
20 = 50 Kilogram Sack
21 = 90 Kilogram Sack
22 = Grams
23 = Hand
24 = Bunch
25 = 250 grams
98 = Unknown quantity

FREQUENCY

1 = Once a week
2 = 2 times a week
3 = 3 times a week
4 = 4 times a week
5 = 5 times a week
6 = 6 times a week
7 = 7 times a week
8 = Every other day
9 = Every 2 weeks/ Twice a month
10 = Once a month
11 = Every 2 months
12 = Every 3 months
13 = Occasionally

Form 8 - Continued

HOUSEHOLD NO: _ _ _ - _	EATING UNIT: __

FOOD ITEM	✓	ITEM CODE	PURCHASED LAST WEEK				OWN-PRODUCTION		
			QUANTITY	UNIT CODE	TOTAL COST	FREQ	QUANTITY	UNIT CODE	FREQ
Pineapples		1504	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Lemons		1505	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Oranges		1506	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Avocadoes		1507	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Guavas		1508	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
			_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Other		1599	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Fish									
Omena		1701	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Talapia (Nge-ge)		1702	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Nile Perch		1703	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Okoko		1704	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Other		1705	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Meat									
Beef Mixed		1801	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Beef Liver-Matumba		1802	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Pork		1803	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Chicken		1805	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Mutton/Goat		1806	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Steak		1807	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
White Ants		1808	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Milk/Milk products									
Cow Milk/KCC		1901	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _
Yogurt-Mola		1903	_ _.__	_ _	_ _ _ _._ _	_ _	_ _.__	_ _	_ _

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Form 8 - Continued

HOUSEHOLD NO: _ _ _ - _	EATING UNIT: __

FOOD ITEM	✓	ITEM CODE	PURCHASED LAST WEEK				OWN-PRODUCTION		
			QUANTITY	UNIT CODE	TOTAL COST	FREQ	QUANTITY	UNIT CODE	FREQ
UHT		1906	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Commercial Baby Foods		1912	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Other		1999	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Fats & Oil									
Kimbo/Cowboy		2001	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Ghee		2002	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Blue Band		2003	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Other		2005	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Eggs									
Chicken		2101	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Other		2199	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Beverages,Non-Alc.									
Tea		2201	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Coffee		2203	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Soda		2205	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Other		2299	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Sugars									
White Sugar		2301	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Raw Cane		2302	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Jaggery		2303	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Other		2399	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Condiments									
Sauces		2401	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _
Salt		2501	_ _.__	_ _	_ _ _ _ _._ _	_ _	_ _.__	_ _	_ _

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HOUSEHOLD NO:	EATING UNIT
_ _ _ - _	_

FOOD ITEM	✓	ITEM CODE	PURCHASED LAST WEEK				OWN-PRODUCTION		
			QUANTITY	UNIT CODE	TOTAL COST	FREQ	QUANTITY	UNIT CODE	FREQ
Cereals & Grains									
Maize Kernels		1 1 0 1	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Maize Flour		1 1 1 4	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Millet		1 1 0 2	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Millet Flour		1 1 1 5	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Rice		1 1 0 3	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Wheat Products		1 1 0 5	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Doughnuts/Mandazi		1 1 0 6	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Bread		1 1 0 7	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Biscuits-Sweets		1 1 0 9	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Biscuits-Crakers		1 1 1 0	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Finger Millet		1 1 1 1	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Sorghum		1 1 1 2	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Other		1 1 9 9	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Roots & Tubers									
English Potatoes		1 2 0 1	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Sweet Potatoes		1 2 0 2	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Cassava		1 2 0 3	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Cassava Flour		1 2 0 6	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Other		1 2 0 7	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Pulses									
Roscoco		1 3 0 1	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Beans, other		1 3 0 2	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _
Peas		1 3 0 3	_ _ - _	_ _	_ _ _ _ - _ _	_ _	_ _ - _	_ _	_ _

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