FUNCTIONAL CLASSIFICATION OF UNDERNOURISHED POPULATIONS IN GUATEMALA: DESCRIPTION OF THE SOCIAL, ECONOMICAL, ENVIRONMENTAL AND NUTRITIONAL CHARACTERISTICS OF LABOURERS' FAMILIES RESIDING IN COFFEE PLANTATIONS

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ABSTRACT

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Functional Classification of Undernourished Populations in Guatemala: Description of the Social, Economical, Environmental and Nutritional Characteristics of Labourers' Families Residing in Coffee Plantations.

Efforts have been made in Central American countries to define the nature and size of the nutrition problem with more regional and population specificity, to orient the selection of types, the size and geographical location of government programmes. This work describes the nutritional status, social, economical and environmental characteristics of agricultural labourers and their families residing on coffee plantations in Western Guatemala, and present an analysis of seasonal effects on children's growth.

The results show very marked growth retardation in children 6 to 59 months. Socio-economic problems are related to the low level of the legal minimum wage and the lack of other income-generating activities for adults. Isolation limits their possibilities for making full use of government programmes in health, education and social security and other private services, such as open markets and lower price shops, available in nearby towns. Problems of quantity and quality of water, crowding, excreta and trash disposal and control of domestic animals contribute to the burden of infection with its final effects on nutritional and health status. The analyses of socio-economic variables, commonly used in cross-sectional surveys, and their relationship with various indexes of nutritional status show that most of them do not discriminate specific characteristics related to poorer nutritional status within the farms. Only differences in total family cash income, type of estate work of the head of the household, and use of shoes by the head of the household are statistically significant, but the size of the differences are not of practical importance for planning purposes.

It is concluded that, for action programmes, families residing in coffee plantations can be regarded as an homogeneous group. In the light of the present political, social and economic constraints in Guatemala, a series of action programmes are suggested to improve living conditions in these populations.

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I. BACKGROUND

A. Political committment and food and nutrition planning.

It has become fashionable in developing countries to express concern about existing levels of malnutrition and to organize technical groups, within governments, to deal with food and nutrition activities.

In order to have a better understanding of the main reasons behind these steps, it is necessary to point out the existence of a variety of governments in the Third World with distinct ideological positions ranging from left revolutionaries to right reactionaries, where the understanding of the nature of the nutrition problem and the reasons leading to strong political and economic support for effective measures or the lack of it are, closely linked with the pattern of social and economic development which is seen as desirable.

As an example, politicians and technical groups in Countries seeking a rapid redistribution of national wealth and power can point to the existence of malnutrition as another argument to increase the support for programmes directed to meet the basic needs of the most deprived groups. Thus, economic support in nutrition planning is likely to be given in those countries to integrated efforts of rural development reaching the most deprived in dispersed rural communities or to special programmes increasing the income and political participation of the urban poor.

However, in Countries where sustained economic growth regardless of distribution is the still major objective of development, committment is often only possible for programmes directed towards amelioration of malnutrition by technical interventions,

such as distribution of high protein foods, nutrition education, fortification of food products, none of which divert large sums of resources from productive investments nor entail a redistribution of wealth and existing power.

Furthermore, those types of solutions are not only of interest to politicians in so far as they distract attention from more fundamental changes in the society necessary to achieve improvements in living conditions of deprived groups, but they also enable them to present themselves to bilateral and international agencies as governments concerned with directing efforts for the deprived and malnourished. This latter trend is going to be more important in coming years, as bilateral and international agencies are exercising recently more pressures to reduce and/or discontinue foreign aid to countries unwilling to resolve the problems of the poor.

Although the selected patterns of development of Third World nations are mainly responsible for their existing levels of malnutrition, one also has to recognize that the past focus of research activities in nutrition and the rationale behind the initial efforts of international agencies to organize applied nutrition programmes have misled some developing countries with regard to the selection of relevant programmes to reduce the size of the nutrition problem.

For example, nutrition studies focussed their attention, for many years on relating the presence of malnutrition to one specific factor such as food and hygienic habits, housing conditions, low income, lack of high protein foods, low schooling of the mother, water supplies, early weaning or family size. Thus, local politicians and administrators often had as many explanations

of the cause of malnutrition as the number of scientist consulted. Thus, in countries with little concern for the deprived, such a situation was ideal as not only did the range of alternatives and contradictions by experts not oblige them to take immediate actions but, as happened in most countries, governments were likely to select those technical solutions compatible with their pattern of development, high protein supplements to children and mothers, nutrition education, fortification of foods.

On the other hand, as children and mothers are more likely to reflect the impact of low levels of food consumption and low utilization of energy and nutrients, malnutrition was also defined as a problem of demographic groups and not as the result of the apalling social and economic conditions surrounding the entire family. It followed that actions selected were those protecting individuals and not those oriented to eradicate the underlying factors and processes determining deprivation in families.

Malnutrition is the result of several factors affecting a family rather than a single one. Nowdays there is more agreement, among development economists and scientists, that malnutrition is more likely to be found in families unable to produce and/or buy enough food, also lacking all or some of the basic services to assure full utilization of consumed foods and with restricted knowledge about the nutritional properties of some foods and the importance of adequate hygienic practices. In summary, those groups of families negatively affected or not sharing the benefits of the selected strategy of development.

This leads to a better understanding that child malnutrition should be interpreted as an indicator of underlying social and

economic problems, instead of as the problem itself. As a consequence, there is greater realization that the planning of effective actions in food and nutrition has to identify and classify families and communities in terms of the social and economic factors and processes determining their quality of life, and should enable the prediction of likely responses of types of families to given policies and intervention programmes.

As there is growing interest in food and nutrition activities and one may find a variety of political conditions and several internal and external pressures to attack the problem effectively in developing countries, it is important to examine the main objectives of food and nutrition activities in various types of developing nations.

For example, in Countries like Costa Rica and Panama, where the concern for poor groups has been translated into effective programmes, a process of food and nutrition planning will mainly assist in the selection of alternative programmes for the poor, the geographical allocation of resources within a programme and the effective delivery of services for the most deprived. The planning exercise will also be useful to ascertain the likely impact in living conditions of policies and programmes not specifically directed to affect the poor. As there is already a strong political committment to improve living conditions of deprived groups, which has been translated into economic resources to programmes, it is unlikely that further political support to eradicate poverty and malnutrition can be obtained or that, greater amount of funds for programmes will be allocated, solely as a result of the nutrition planning process.

On the other hand, the major objective of a review of food and nutrition activities in countries with less concern for deprived groups may be entirely different. Although a permanent review of activities in food and nutrition may also assist in these countries to a more rational allocation of funds among alternative programmes, to a more realistic geographical location of programmes and effective delivery of services for poor groups; its primary objective is to expose periodically to politicians, technical and pressure groups, the size, trends and nature of malnutrition, the lack of response to the traditional uneffective measures and the unavoidable fact that measures directed to a better redistribution of resources have to occur if poor and undernourished families are to be given, in the short or medium term, some of the basic goods and services compatible with minimum adequate living conditions.

The review of food and nutrition activities in those countries may become a tool for politicians to negotiate, with groups exercising economic and political power, the need to review their selected pattern of development. Thus either as a result of changes in attitude towards poor groups or merely as a mechanism to avoid, in the short term, more drastic changes in the distribution of means of production and existing power structures, there may exist the possibility of devoting larger amounts of funds to interventions likely to improve the quality of life of deprived groups.

Even in Countries where the influence of the private sector has led to inegalitarian form of development, policy disagreement between the Government and the private sector may open up possibilities for identifying and designing actions relevant for improv-

ing the conditions of urban and rural poor families.

On the other hand, in countries with governments enjoying popular support and less influenced by economic pressure groups, some legislation relevant for the deprived may never be enforced as a result of, for example, internal or foreign threats to withdraw capital from basic areas of development.

The role of nutritionist and planners engaged in food and nutrition activities in developing countries is to define correctly the nature of the nutrition problem and to understand and take advantage of political circumstances leading to a reduction of the number of families living in poverty.

B. The definition of the nutrition problem for planning purposes.

1. The role of national nutrition surveys

National nutritional evaluations have been used in the past to define the type and magnitude of nutritional deficiencies and to point out those factors believed to be determining the nature of the problem.

These assessments have been organized in developing countries with a series of objectives broadly summarized below, that may overlap in various degrees.

a. Political. Description of the global nutritional situation to motivate political leaders and other pressure groups about the extent and nature of the problem and the need to enunciate new or evaluate present policies and programmes and their impact on nutritional status.

b. Planning. Analysis of variables affecting or related to nutrition for planning of nationwide strategies. The

choice of relevant interventions, identification of geographical regions of high priority, selection of beneficiaries and evaluation of interventions.

c. Surveillance and evaluation. The establishment of a permanent information system usually requires data to improve our knowledge of nutrition and related factors and to validate indicators of nutritional status and associated social and economic factors determining malnutrition. Nutritional evaluations have been used to monitor the impact of various interventions upon for example the prevalence of growth retardation.

d. Training. Nutritional evaluations have provided opportunities for in-service training of junior and national counterparts in data collection, analysis and planning techniques.

e. Research. The assessments have provided guidelines to research institutions for prioritizing goals in a realistic manner by providing hypotheses regarding causality, effectiveness of interventions and pointing out the need for future research at the individual, family and community level.

In spite of the strong emphasis given in the national food and nutrition surveys to describing malnutrition as a problem of children and mothers, and their very general statements about the nature of the problem which have led to the selection of irrelevant solutions and, the lack of a description of the nature of the nutrition problem by geographic and population type specificity, one should point out that they also have created awareness, among international and bilateral agencies, local politicians and administrators, of the extent and social consequences of nutritional deficiencies. As a result of the information available and depending

upon the specific political interest of a Country in attacking the nature of malnutrition effectively, a range of activities has been initiated, such as the introduction of food and nutritional objectives in strategies of national development, the organization of national food and nutrition committees, the implementation of legislation affecting the distribution of income and/or means of production and food distribution programmes.

While in most countries written statements derived from national assessments have not been translated into the enforcement of laws or economic support for programmes, others have allocated large amount of funds to activities identified by surveys as relevant for improving nutritional status. However even in the latter countries, as available data was based on a small number of cases from a national sample and could not be disaggregated to regions, subregions and/or categories of population, the national nutrition surveys were not useful with regard to selecting geographical location and specific populations of action programmes to improve nutrition. Thus, interventions have been implemented in the absence of an adequate description of the populations for whom distinct causal factors may have led to the development of deprivation and malnutrition.

Furthermore Payne has suggested that the traditional food and nutrition surveys more frequently led planners and nutritionists in developing countries to propose programmes which were not relevant to an effective attack on the nature of the nutrition problem and, in some cases those actions have increased the number of individuals suffering from deprivation (1). Hakim and Solimano (2) have reviewed and criticized the assumptions on

which previous efforts to integrate nutritional components into national development plans in poor countries were based. Abercrombie (3) has suggested the importance of identifying the various types of poor people one finds in developing countries as a first step to combat poverty effectively.

2. The definition of the nature of the nutrition problem in functional classification projects.

Joy (4) introduced in food and nutrition planning the concept of functional classification of undernourished groups, as a planning tool to improve the process of selecting and monitoring the effect of relevant programmes aimed to reduce poverty and malnutrition in various categories of population in a Country. The first (4) and subsequent communications of functional classification (5, 6) clearly stated that the problem of malnutrition was a reflection of poverty of families and communities, and not the problem of particular demographic groups.

A functional classification identifies, within a Country, categories of groups of people (functional groups) sharing a similar pattern of living, types of social, economic and cultural problems and available resources. Families belonging to the same functional group are expected to respond and be affected in a similar manner by policies and programmes.

For example, the price policy with respect to staple foods in Costa Rica may affect directly several functional groups in various ways. Small farmers, who produce most of the maize and black beans consumed in the Country, are going to be positively affected in their incomes as a result of an increase by the government in the present supporting price of those commodities. A

similar increase in rice, a product mainly cultivated in medium and large size farms, is not going to have an important effect in the income of the rural poor.

On the other hand, the present geographical location of low price shops in large cities and towns in Costa Rica, is such that the impact of government measures to improve the purchasing power of poor groups, through these shops, benefits only the unemployed, underemployed and lower income families in the industrial and service sectors. A further effort to open shops in dispersed rural communities will enable agricultural labourers engaged in various types of crop production, small farmers and the underemployed and unemployed in the agricultural sector to benefit from these government programmes.

Examples of functional groups could be agricultural labourers residing in banana plantations, agricultural labourers in sugar cane farms, farmers dedicated to basic grains with less than, for example, 1.4 hectares of land, labourers in the industrial sector below a certain level of income.

A functional classification is a planning process that entails the identification of functional groups in a Country; it enumerates the families in various groups by geographical and administrative location, describing the social, economic and cultural factors and processes determining their living conditions. Thus, a functional classification is a permanent process of data collection and analysis where existing and prospective policies and programmes that affect the living conditions of poor groups are reviewed, in terms of their likely impact on various functional groups defined in geographical and administrative terms.

The process of defining the functional groups in a Country is of paramount importance, not only for the success of the exercise in its technical aspects, but mostly in the application of results to increase the allocation of resources to activities for the poor, the selection, design and evaluation of alternative interventions.

It is desirable that a group of government officials, representing various disciplines and sectors, and with ample experience and knowledge about poor groups and government efforts to overcome deprivation, should work with a technical group in charge of the data collection and analysis to define the initial functional groups. Very early in the process of definition of functional groups other planners and administrators in various sectors responsible for programmes for the deprived, should be consulted about the relevance of the groups as initially selected. While the groups are being defined, a detailed review of existing data sources needs to be conducted to ascertain the possibility of gathering the required data on the groups finally selected (7).

Such a procedure is the initial and basic step of a real food and nutrition planning process as it ensures that those engaged in food and nutrition activities are participating right from the initial steps of an integrated planning process. Experiences of three functional classification projects in Central America, will illustrate in the next sections the importance of incorporating those officials in charge of programmes for the deprived, in the subsequent application of results.

Chambers (8) has discussed, in similar terms, the appropriateness of identifving, at early stages of programmes the

various kinds of beneficiaries of community development efforts, as a basic means of securing that the most deprived are going to be positively affected. On the other hand, the same author has proposed a series of similar criteria, to those use for defining functional groups, to identify target groups to serve as guidelines for the evaluation of community development programmes.

Although in agreement with Chambers' approach, a functional classification process with its analysis of the political, social, economic and cultural factors and processes at the national, regional and functional group level, provides the necessary national framework to understand the final impact of community development programmes in specific target groups of families.

The definition of functional groups is pragmatic and should be influenced by the possibility of linking them with policies and programmes. Priority is given, when one is selecting those groups of greater interest for action programmes, to large groups known to have sizeable problems of poverty. One can class groups of families in rural areas by their occupational position: agricultural labourers, farmers, non-agricultural labourers. Agricultural labourers can be then subdivided by the type of product in which they are engaged as labourers, whether in banana estates, in sugar cane plantations or in cattle farms. On the other hand, farmers can be subdivided by size of land holdings and type of products. Non-agricultural labourers can be classed as workers in the industrial and service sectors and then, further subdivided within the sector, by levels of family income or the type of employment of the head of the household.

A functional classification requires as a first step, the organization of an information system to identify and monitor the most important functional groups in the Country, to quantify their numbers, state of health and nutrition, geographical and administrative location and the type and size of their social and economic problems.

While in the past, the data used for food and nutrition planning, that is the national surveys, was collected and presented as a one shot cross-sectional exercise, the functional classification approach of planning calls for a permanent on-going system of data collection and analysis to support and feed back into the planning process. One would expect, if programmes are reaching their target families, that the groups initially defined and given priority will change as will the size and type of problems associated to specific functional groups. Such changes can be identified only by a permanent system of data collection and analysis.

There is a wealth of data available in developing countries that is seldom used to support planning activities. The data sources include periodic or cross-sectional surveys conducted by universities, private groups or government offices, studies by bilateral and international agencies and data systems available in most government ministries and other offices in the public sector. Slight modifications in the latter type of data source, complemented with other type of studies, that will be discussed in the following sections, can provide the necessary data to support most planning efforts.

Figure 1

Types of data for different steps of functional classifications*

Types of data	Steps
1. Agricultural census. 2. Administrative divisions of the Country. 3. Current regional division.	Regional division of the Country.
1. Population, housing and agricultural censuses. 2. Socioeconomic survey. 3. Community descriptions.	General characteristics of the regions.
1. Socioeconomic family surveys. 2. Population census. 3. Descriptive profiles of functional groups.	Definition of the functional groups and estimation of their size by regions and subregions.
1. Descriptive studies on community life and profiles of functional groups. 2. Socioeconomic surveys. 3. Census information (population, housing and agriculture)	Identification and selection of programmes for various functional groups.

* Modified from reference (7)

Planning activities in food and nutrition do not require special data systems but the same data which are necessary to orient relevant programmes attacking the nature of deprivation in various sectors. Figure one, elaborated after the experience of the data system component of the functional classification in El Salvador (7), illustrates the role of various sources of data in the steps leading to the identification, estimation of size, geographical location and the description of the characteristics of regions and functional groups in El Salvador.

The information system component in a functional classification should be flexible enough to provide sets of data for planning relevant actions defining the nature of poverty at the family and community level, and to provide after wards regional aggregates of functional groups and their respective social and economic problems. Essential in the information system component is the ability to locate in geographic and administrative terms the functional groups. This is not only important to orient the geographical location of programmes for targeted groups but for understanding existing differences that may arise within a functional group, that is heterogeneity, explained by particular geographical location.

The first step in a functional classification exercise is to define the functional groups, then to determine their size in various geographical-administrative defined areas and finally to identify the existing social, economic and cultural characteristics, and particularly those determining deprivation, that can be modified through existing and/or new structures delivering services in the public sector. It is also relevant to have estimates of the nutri-

tional conditions of some demographic groups, within each functional group, so as to ascertain the detrimental impact on health and nutrition imposed by existing social and economic conditions and for monitoring the changes in these conditions, for various functional groups and/or areas of the country.

Figure two, derived from the experience of El Salvador (7), summarizes the steps and most logical sequence likely to be followed in the elaboration of a data system component of a functional classification, leading at the end in step 11, to its major objective, that is the appraisal of the likely effect on levels of deprivation and malnutrition of various policies and programmes on functional groups described in geographical and administrative terms.

Thus, functional classification projects can provide governments with adequate data for a more rational allocation of resources in programmes attacking the nature of the nutrition problem in various functional groups.

The emphasis given to defining correctly the nature of malnutrition and poverty in functional groups, has led to a series of misunderstandings about the scope of functional classification exercises. Sometimes it is understood only as a data package, separated from the components of policy and programme appraisal, selection, design and evaluation of impact of interventions in food and nutrition planning.

In fact, the diagnosis of the extent and nature of malnutrition in type of families, located geographically and administratively, is just the initial step of an integrated planning approach whose main objective is the permanent review of the likely

Figure 2

Suggested sequence of steps in the elaboration of a functional classification*

1. Political decisions and allocation of resources to programmes for the deprived.
2. Integration of multidisciplinary intersectoral team.
3. Definition of functional groups.
4. Review of available information and literature.
5. Rapid reconnaissance of the Country.
6. Definition of regions and subregions.
7. Characterization of functional groups by regions and subregions with census information.
8. Nutritional and socioeconomic evaluation of functional groups.
9. Preliminary data analyses.
10. Community descriptions and typical profiles of functional groups.
11. Analyses of data. Identification, selection and evaluation of programmes.

(*) Modified from reference (7)

impact in various functional groups of existing and potential policies particularly those intended to improve the living conditions of poor groups.

On the other hand, the process of functional classification is sometimes considered as one approach to elaborate a nutritional surveillance system. In as much as the present concepts of nutritional surveillance (9, 10) allow for the identification and monitoring of functional groups, for estimating their numbers, their health and nutritional conditions and the type and size of social, economic and environmental factors defining deprivation; then one can regard nutrition surveillance systems as an initial step in a process of food and nutrition planning utilizing a functional classification approach. This is in agreement with the point of view expressed in Habicht et al (9) about the role of nutrition surveillance systems in food and nutrition planning.

It is also believed that in functional classification exercises it is essential to correlate data of nutritional status with that of social and economic factors to identify the impact of policies and the relevant programmes for a given functional group. While the availability and analyses of such type of data is desirable, and will improve our understanding of the likely impact of various policies and programmes, it is not by any mean essential. The wide range of factors and processes affecting nutritional status and the problems related to obtain valid estimates of dependent and independent variables at the individual, and sometimes at the group level, make the isolation of one factor responsible for malnutrition an almost impossible task.

Functional classification approaches are not primarly concerned with obtaining such correlations but rather with ascertaining the size of those problems known to be related to malnutrition and poverty in various functional groups in distinct regions and the extent of nutritional and health problems. However, not only the factors which, by themselves, relate to poverty and malnutrition are important, but also what is their interrelationship in particular functional groups. Their interaction leads to the establishment of social and economic processes which have to be understood if one is interested in planning more effectively the delivery of services at the local level. Thus, use has to be made of different types and kinds of data sources, as illustrated in figure one, in order to arrive to a better understanding of problems and likely solutions.

In Costa Rica the data base of the functional classification project is such as to enable the carrying out, if necessary, of this type of correlation at the individual level (11). However, the experience in El Salvador has demostrated that various sources of data, not collected in exactly the same families or sample frames, can be more than adequate in this type of Country to arrive at reasonable conclusions about the likely impact of various policies and programmes on levels of malnutrition and poverty in various functional groups (12).

C. Prevalence of malnutrition in Central America.

1. The use of indicators of nutritional status.

Nutritionists have devised several methods to ascertain the nutritional condition of individuals and communities in developing nations. The existence and levels of malnutrition have been

evaluated using food balance sheets, food consumption surveys, anthropometric measurements, clinical examinations and biochemical methods. As they measure different aspects and stages of the condition, estimations of the extent of malnutrition in the same population using different methods, may provide different results.

National surveys have usually had the objective of determining the type and magnitude of nutritional deficiencies. On the other hand, research activities have focussed attention on describing the clinical conditions of malnourished children and their biochemical characteristics and on measuring the responses to specific treatments in paediatric wards and nutrition rehabilitation centres. Other studies have been designed to explore how specific changes in communities such as for example, food supplements, water supplies or nutrition education produce measurable effects in indicators of nutritional status of children and mothers.

The recent view is that malnutrition in children and mothers arises from a variety of underlying social and economic factors causing deprivation in families, and that solutions lie in the ability to provide poor families and communities with basic goods and services. This has led to greater interest in using nutritional indicators to identify the poorest regions and groups of families as well as to evaluate the impact of comprehensive efforts to improve their living conditions (8).

Measurements of growth retardation are probably the most useful indicators of deprivation. They reflect several aspects such as the impact of economic factors affecting food available in the household; eg. income, prices, national or local

production, and the determinants, of the level of consumption by particular individuals within a family such as food habits and mother's time. They are also an indication of the result of inadequate housing and water supplies in determining the utilization of consumed energy and nutrients. As discussed in previous sections, the type and size of factors to be attacked by specific intervention programmes can be identified and quantified by quantitative or descriptive socio-economic data sources usually available in the Country.

Biochemical and clinical indicators may provide, to a certain extent, the same kind of information. However, levels of nutrients in tissues and fluids may also reflect adaptative mechanisms exercised by organisms exposed to low energy and nutrient intake. On the other hand, clinical symptoms and signs seldom arise solely from nutritional deficiencies. More often they result from other disease conditions presenting a similar clinical picture.

The cost of standarizing techniques in anthropometric studies, equipment, data collection procedures and processing, is usually lower than in other methods. Less biasses are introduced in samples through lack of families responses and the size of between and within observer errors is considerably reduced after standardization exercises are conducted. Although anthropometric measurements are easier to interpret in protein-energy malnutrition, if one is looking for vitamin and mineral deficiencies, rather than indicators of social and economic factors affecting families, then other indicators must to be selected.

The objective of collecting and using indicators of

nutritional status can orient the final selection of those to be used in anthropometric studies. Traditionally, classifications such as that of Gomez et al (13), although proposed as a tool for predicting risk of mortality in children entering paediatric wards, have been used, with little discrimination, for other purposes. Weight for height, proposed as a better alternative than weight for age to ascertain current nutritional condition of individuals who have suffered malnutrition and for evaluating the response of undernourished children to food and other treatments, have also been used in a very indiscriminate manner (14).

Age dependent indicators of growth, such as weight for age (W/A) and height for age (H/A), are likely to be more useful than age independent indicators such as weight for height (W/H), when measuring the impact of social and economic factors in different regions and/or functional groups, or in ascertaining secular changes in growth. Age dependent indicators in children capture the effect of factors and processes which influence family food consumption and utilization from before and throughout the mothers pregnancy and after the childs birth up to the age when he is measured. Recent changes in factors and processes affecting family life, but not yet reflected in children's W/A and H/A, can be monitored by the quantitative and qualitative socioeconomic data collected in the data system component of functional classifications.

The use of W/H for evaluating regional and functional group differences in social and economic conditions in poor countries, can be extremely misleading as those factors and processes may have affected children's height, particularly during

pregnancy and the first two years of life (15). Greater resistance to infections and a higher consumption of energy and nutrients from the family diet enables a large proportion of those children to gain some weight as they grow older and, although they are height retarded, they tend to have a W/H relationship similar or slightly lower to that of normally growing children. Thus, regions and groups of families with greater problems of height retardation and the worst living conditions, may be ranked when W/H is used as better off than others where children's height has not been severely affected and poverty may not be as widespread.

However, within a deprived community, when screening those children in most immediate need of for example, food supplements, W/H is a more adequate as an indicator than any age dependent measure.

Thus, age specific comparisons of children in various categories of available classifications or, analyses of distributions of weights and heights can provide a better insight into the differences in living conditions among regions and/or functional groups. The same analytical approach can be followed in ascertaining changes over time as a result of comprehensive policies and programmes where baseline anthropometric data can be compared with that collected after a period of time in another cohort of children drawn from a similar sample frame.

Cut-off points to interpret anthropometric data have been proposed (13, 16, 17) and they are, like many classifications, very arbitrary. It is important to realize that in any normally growing population a proportion of for example, 8% of children are going to be below the eight percentile of the distribution.

The acceptable level of growth retardation in a Country is related to the selected objectives of development and size of effort devoted to improve the living conditions of poor groups. However, the specific cut-off points and the norms from developed countries used when comparing regions, functional groups or changes in situations over time, are not of great importance as long as they remain the same.

Controversy arose in the past about the use of growth patterns from developed nations to ascertain growth retardation in data obtained in children from developing nations. As the review article by Habicht et al. (18) shows, environmental factors are likely to be more important in explaining differences in attained anthropometric measurements than possible genetic differences in growth potential in children from developed and developing countries.

The findings of several studies on risk of mortality and levels of growth retardation are reviewed to illustrate the potential use of growth as an indicator of social and economic factors affecting families and communities.

The classification developed by Gomez et al (13) was elaborated with the objective of predicting mortality in various types of malnourished children admitted in paediatric wards. Puffer and Serrano (19), in the Pan American study of mortality in childhood, also pointed out the relative importance of growth retardation as a cause of mortality in children. Sommers and Lowenstein (20) demonstrated in Bangladesh that children with an arm circumference/height relationship below the ninth percentile of the value found in a reference population had a 3.4 times higher risk of mortality than those above the 50th percentile. For those children between

the 10th and 49th percentile the risk was only 1.5 times greater. The pattern was observed at different ages but was inversely related to age of the children. More recent and perhaps practical evidence for use in interpreting anthropometric data from cross-sectional studies is derived from Indian children from the Punjab studied by Kielman and McCord (21). These authors collected information on anthropometric and demographic events in 3000 children aged 1 to 36 months. Weight was collected every month up to 12 months of age, every 2 months from 12 to 21 months and every 3 months from 21 to 36 months. Children were classified in the following age groups, 1 to 5, 6 to 11 and 12 to 36 months and in the nutritional categories of less than 60% weight for age, 60 to 69%, 70 to 79% and 80% and more. Mortality records for a year, after the anthropometric measurement were taken, were checked and assigned to the age and weight for age groups. Mortality again was inversely related to age; the younger the children the greater the risk of death. .n average child mortality was 2 times greater with each 10% decrease below the 80% W/A from the Harvard standard. The risk of mortality (probability of death/child/year) in children 1 to 5 months under 60% of W/A was 0.025; 5.8 times greater. In children 6 to 11 months the risk of mortality for those below 60% of W/A was 0.177 as opposed to 0.009 for children above 80% of W/A and in children 12 to 36 months the respective figures for those below 60% and above 80% W/A were 0.037 and 0.003. The authors (21) clearly point out the need to determine if the amount of differential risk is present in other regions and cultural settings. More recently Chen et al. (22) have studied the usefulness of W/A, W/H, H/A, arm circumference for age and arm circumference for height to

predict risk of mortality in the subsequent 24 months in Bangladesh children aged 13 to 23 months. Higher mortality risk were detected in the more severely malnourished children in all the anthropometric indexes examined. The data on W/A and arm circumference for age were the most useful indexes to predict mortality during the following 24 months. W/H was more useful to detect mortality in the short term, first 6 months, than the other anthropometric tools but not for the following 24 months. A threshold level below which the risk of mortality increased sharply was noticed in all the anthropometric measurements analyzed as shown in figure 4. If one estimates from their data those levels, they correspond roughly to 88% H/A, 72% in W/H and 67% of W/A. Although the predicting value of mortality of H/A is lower than W/A and W/H, it is important to notice that a greater proportion of children are below the threshold level in H/A distribution, than below the critical levels in the other two anthropometric indexes in most malnourished populations in developing countries.

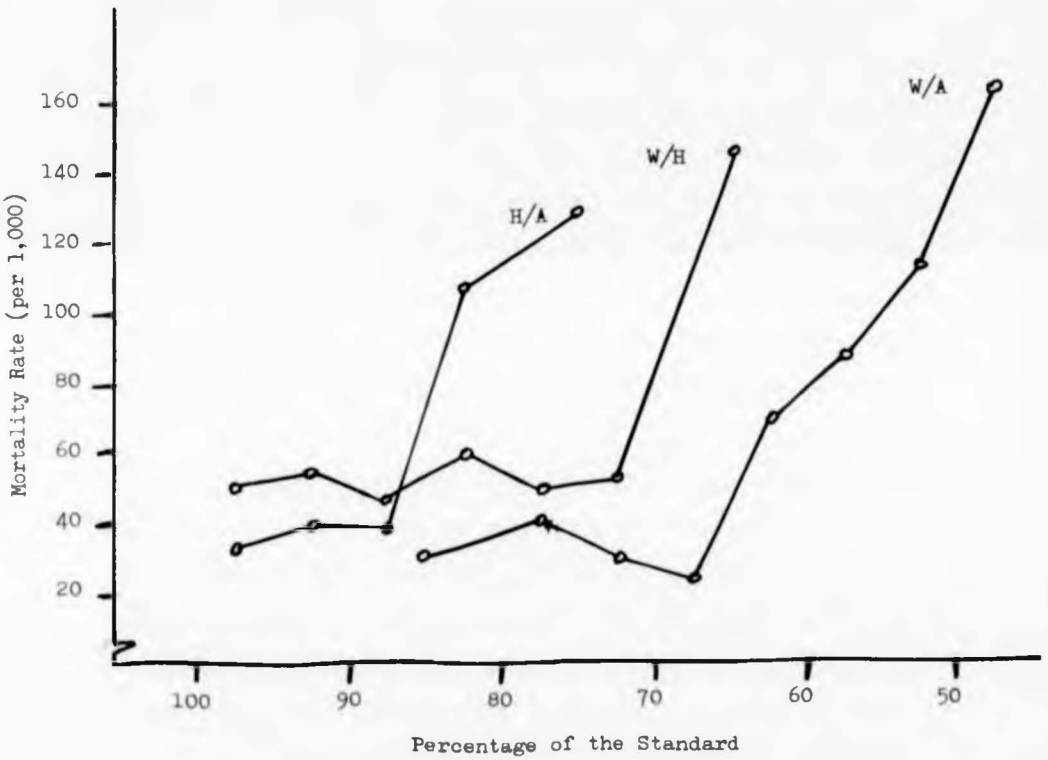
In conclusion, growth retardation may not only be the best and less expensive way to ascertain malnutrition in a community but it is also an excellent indicator that summarizes the detrimental impact of a variety of social and economic factors and processes affecting families and communities.

2. Definition and magnitude of the nutrition problem.

The majority of children under five years of age living in Central America suffer from chronic protein-energy malnutrition (23). While 57% of Costa Rican children were classified as malnourished, according to Gomez et al. (13) in 1966, 82% were found in the same conditions in Guatemala in 1965 (23). Information from

Figure 3

Mortality rates associated with different percentages of weight for age (W/A), weight for height (W/H) and height for age (H/A)



Taken from reference (22).

national anthropometric studies conducted in El Salvador in 1976, Guatemala in 1977 and Costa Rica in 1978 (12, 24, 25) suggest that there has been a decrease in the proportion of children in second and third degree malnutrition (13). However, in El Salvador, if one corrects the anthropometric data by the growth of population in the period between the surveys, a greater number of children are presently suffering from growth retardation than in the past (12).

The biological repercussions of chronic protein-energy malnutrition are vast; for example the prevalence of morbidity and the high rates of infant and child mortality 1-4 years may be, to a large extent, the outcome of poor nutritional status (19, 26). The effect of malnutrition on work capacity and mental development (27, 28) are also being studied and initial findings suggest that both may be affected by nutritional status. These possible consequences have overwhelming importance for the social and economic goals of poor countries.

Although the result of chronic protein-energy malnutrition are reflected in indicators of health, the fundamental causes are as has been previously discussed of social nature. The lack and/or inequitable use of resources in Central America is the major reason why children and other members of a family are unable to achieve optimal health and physical growth.

The existence and clinical characteristics of malnourished children seen in paediatric wards in Central America was reported (29) in the 1940's. The Institute of Nutrition of Central America and Panama (INCAP) was founded in 1949 and conducted clinical and field studies, to investigate possible solutions to the nutrition problem. The studies were done in communities in

rural Guatemala and did not provide a clear picture of the nutrition problem for the entire country or for other Central American countries. Thus, the governments of Central America and INCAP organized the national food and nutrition evaluations of 1965-1967 (23) whose objectives, were to investigate the type, magnitude and severity of nutritional disorders, to identify remedial activities and to orient the applied nutrition activities conducted by each government (30). Subsequent research projects conducted by INCAP in Guatemala, the nutrition assessments in Honduras in 1975 (31), Nicaragua in 1976 (32) and Guatemala in 1976 (33) provided a wealth of data on type of nutritional deficiencies, severity of the disorders, causal and/or associated factors and outlined the possible nutritional effects of various types of action programmes.

3. Geographical distribution of malnutrition and prevalence in various functional groups.

Very few studies have been conducted in Central America, with the objective of defining the geographical distribution of malnutrition and risk of malnutrition in various groups of population. Villarejos et al. (34) reported differences in growth patterns in large samples of children from urban and rural areas of Costa Rica. Children from urban areas had greater heights and weights than their rural counterparts. The same results were obtained by Valverde and Rawson in anthropometric and food consumption studies in a smaller sample of children from a urban center and rural villages in Costa Rica (35).

Risk factors and processes for malnutrition were studied with respect to categories of population in a population engaged in their own agricultural activities and/or employed seasonally or

permanently and living outside coffee farms in Costa Rica in 1974 (36). The objective was to identify the major factors associated with malnutrition and the characteristics of that portion of the population at greatest risk of suffering from malnutrition. Occupation of the father or head of household was highly related to the nutritional status of the children in the family. Access of families to less than 1.4 hectares of land was the major variable associated with malnourished children. It operated indirectly through other variables such as mothers working outside of the home, suboptimal care of children by mother surrogate, borrowed house plot and deficient physical environment and lack of and/or deficient management of available resources.

In further work in four rural subsistence villages of eastern Guatemala (37), the relationship between occupation of the head of the household as well as quantity of land owned and/or rented by the family and the nutritional status of 2 and 3 year old children was studied. Children of skilled workers and merchants had a lower prevalence of moderate and severe malnutrition, according to Gomez et al. (13), when compared with children whose fathers were salaried agricultural labourers and farmers. Among the farmers, families controlling less than 1.4 hectares of land had a relative risk of having malnourished children 2.3 times greater than those with access to 3.5 hectares or more. The differences in prevalence of malnutrition were statistically significant ($p < 0.05$).

D. Functional classification projects in Central America.

Three countries with different political committments to improve living conditions of deprived groups and size of economic resources allocated to reduce the extent of malnutrition and poverty,

have been engaged in the development of a data system components for a functional classification; El Salvador, Costa Rica and Guatemala. Those experiences of organizing data collection systems about functional groups are described in the following sections.

A series of differences among the three projects related to the organization and sharing of responsibilities have influenced not only the procedure of data collection, but more importantly its integration and final utilization in planning efforts of social and economic development.

The experience of El Salvador is a classic example of a project conceived and organized from outside the Country which, regardless of how much subsequent efforts are made to integrate the results and procedures into the local activities, this is seldom successfully completed. For example, almost the entire funding of the El Salvador project came from outside; as very little funds were obtained from the local government, the entire procedure of defining areas and groups of population, definition of the relevant variables, sampling, data collection and elaboration of reports were the exclusive responsibility of international experts. Although the political response and funds allocated to improve living conditions of poor groups are mainly the result of the govenment strategy of development, the truth is that the wealth of data provided by the project has not ever been used even to review their present programmes in, for example, the social sectors.

The reasons behind the organization of the data system in Costa Rica has been entirely different. As pointed out in more detail in the respective section describing the project, local politicians and administrators were concerned about the impact on

poor groups of vast amounts of funds allocated to the provision of basic services for deprived urban and rural groups. Thus, the government organized the Nutrition Information System (SIN) to meet the objective of identifying areas with greater levels of malnutrition and monitoring the impact of several programmes included in a National Food and Nutrition Programme. The national group composing SIN defined its own objectives, based on a rough initial description of data needs of different programmes, and proceded to select a suitable methodology to meet its objectives.

The functional classification approach of data collection was selected by Costa Ricans as the most appropriate for their purposes and, with local funds and personnel they proceded to elaborate the data system component. Although at some stages, technical and economic support has been given by bilateral and international agencies, the exercise of definition of their objectives, selection of functional groups, their revision with planners and administrators of various sectors, the data collection and analyses, review and coverages of existing programmes has been, an operation run by nationals. Furthermore, the technical group in charge of organizing the data system has close connection with the government body financing the extension of services in various sectors, directed to improve the living conditions of the most deprived groups of Costa Ricans.

In the Guatemalan case, the Secretariat of Planning had previously organized a technical unit to initiate a food and nutrition planning process. The members of the Unit determined the need to design a nutrition surveillence system to support the activities of programme selection, design and evaluation. The organization of a data system describing functional groups, was

selected and field activities of data collection started in September 1979. The project is funded by the Government of Guatemala but, the procedures of data collection and analyses have been contracted with INCAP. However, as a result of past experiences, special attention has been given to discussing in a joint Secretariat of Planning and INCAP committee, the definition of the relevant functional groups, the variables to be collected and the sampling and data collection procedures. Although somewhat different from Costa Rica, the Guatemalan project can be regarded as a local activity with involvement at some technical stages of international agencies.

1. The functional classification project in El Salvador

A study to elaborate the diagnosis for a functional classification was conducted by the Government of El Salvador and INCAP in 1976 (12). The organization of the project was described in the previous section.

El Salvador has very well defined agricultural regions dedicated to the cultivation of cash crops as coffee, cotton, sugar cane and beef in large plantations located in the center and coastal areas and the cultivation of basic grains takes place in small plots of low quality land located in the Northern mountains.

The principal agricultural regions and subregions of the Country were defined, based on geographic and agricultural information on land use, providing a good approximation to similar patterns of living and problems in various parts of the Country.

The next task consisted in defining the administrative limits of regions and subregions*.

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* El Salvador is administratively divided in 14 departments, 26 municipios and 2057 cantones.

Existing maps of land use were compared with those of municipal boundaries producing the final definition of land use in geographical and administrative terms. The rural areas of the country were divided into three agricultural regions: a) a region of subsistence agriculture (corn and beans growing area), b) a region of intensive agriculture dedicated to the cultivation of cotton and sugar cane and cattle raising, and c) a coffee growing region. An urban region was also defined, consisting of towns with 10,000 or more inhabitants.

Based on geographical location or on population size the regions were further subdivided, as shown in Table 1, into eleven subregions and both regions and subregions served as sample frames for subsequent surveys and for the aggregation of census data.

Figure 4 illustrates the location of regions and subregions in various parts of the Country. As explained before the administrative boundaries of each region and subregions were clearly defined. Functional groups were defined with the aid of the information on occupation from the population census and they were quantified, as well as their related characteristics, by regions and subregions*.

The type of data collected in each region was:

a) Quantitative data on nutritional status.

b) Quantitative data on socioeconomic factors associated to nutritional status.

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* The computer files are available even at the smallest administrative unit, the canton, for any desirable way of aggregation.

Table 1

Regions and subregions included in the functional classification project of El Salvador

Regions	Subregions
Coffee	Western Central Eastern
Subsistence	Northern Central Coastal
Intensive	Central Coastal
Urban	(40,000 and more inhabitants) large-size cities (15,000 to 39,999 inhabitants) medium-size cities (10,000 to 14,999 inhabitants) small-size cities

c) Qualitative or descriptive data on styles of life, health and nutrition problems in communities of the defined regions.

Weight and height was collected in 6000 children 6 to 59 months of age from 148 communities during household visits to identify the extent of differences in prevalence of malnutrition among the defined regions and, in categories of population. The urban sample included only children living in slums of the capital city of San Salvador.

The quantitative data on socioeconomic factors causal and/or related to malnutrition included a socioeconomic survey in a subsample of families whose children were included in the anthropometric studies, and in addition the elaboration of 120 socioeconomic variables from the national housing and population censuses.

The objective of the socioeconomic survey, at the family level, was to identify those categories of population within the regions most affected by malnutrition as well as to explore the association of malnutrition with socioeconomic characteristics of rural families by region.

The population and housing censuses were the source of information used to define and characterize the functional groups and provided data for each of the 2057 cantones of El Salvador concerning total population, sex and age distribution, civil status, family size, occupation, literacy, school attendance, educational attainment, infant and child mortality, fertility, house ownership, sources of water supply, excreta disposal and home industries. Each variable was further subdivided for example in the case of water, from connected piped systems, wells, rain, river, etc., and total

Figure 4

Location of agricultural subregions and urban population in El Salvador

1-1) Northern subregion of marginal agricultural exploitation
1-2) Central subregion of marginal agricultural exploitation
1-3) Coastal subregion of marginal agricultural exploitation
2-1) Central subregion of intensive agricultural exploitation
2-2) Coastal subregion of intensive agricultural exploitation
3-1) Western subregion of coffee exploitation
3-2) Central subregiom of coffee explotation.
3-3) Eastern subregion of coffee exploitation
4-1) Urban groups

* Taken from reference (7)

numbers and percentages were available for each variable and its respective subdivision by cantones.

This permits the aggregation of data by municipios, subregions, regions or any other desired criteria, eg. the areas of influence of health posts, primary schools, agricultural extension agencies, etc. Thus the size of different action programmes and necessary resources to eliminate or to reduce malnutrition by regions, subregions or groups of communities and families were more easily visualized.

Descriptive non-quantitative anthropological studies, employing the techniques of participant observation and the use of key informants were conducted in each region focussing on the sociocultural factors related to health and nutrition at the community level and to a lesser degree, to the family level. The areas covered by the anthropological reports are illustrated in Table 2.

The information collected was integrated in a report submitted to the Government of El Salvador (12) where both problems and alternative actions by region were defined. A description of the methodology, the lessons learned, the process of integrating the sources of data and the main results of the investigation have been the subject of scientific communications (7, 15). The anthropometric data collected in different villages of the country have been used to validate indicators of nutritional status for different regions of El Salvador presently integrated into the monitoring system of nutritional status operating in the Ministry of Health (38, 39).

2. <u>The functional classification project in Costa Rica</u>

Costa Rica has one of the lowest prevalences of malnutri-

Table 2

Outline of the reports on community studies*

I. SUBSISTENCE PATTERNS

- A. Economic activities and land tenure practices.
- B. Community economics and services.
- C. Household economics.

II. FOOD AND NUTRITION

- A. Food processing and storage.
- B. Diet and eating habits.
- C. Infant's and children's diets.
- D. Beliefs and attitudes related to food.

III. HEALTH AND HYGIENE

- A. Environmental sanitation.
- B. Personal hygiene of mother and children.
- C. Use of available medical facilities.
- D. Associated beliefs and practices.

IV. CHILD BEARING AND CHILD REARING

- A. Male-females relations and reproduction.
- B. Pregnancy and child bearing.
- C. Child rearing practices.

V. COMMUNICATION, EDUCATION, CHANGE AND INNOVATION.

- A. Communication.
- B. Education and related opportunities.
- C. Change and innovation.

* Taken from reference (7)

tion in developing countries, as shown by the fact that only 8.0% of children under five years of age were found with second and third degree malnutrition in 1978 (25). A series of government programmes through the years, in various areas of social development, have produced positive effects in living conditions of urban and rural populations as demonstrated, among others, by indicators of health and education; infant mortality rate of 26 per thousand and illiteracy rate of 10 percent. However the government was concerned in 1973 about gaps between rich and poor groups and the remaining levels of deprivation in some areas and groups of population in the country. As a result, a new mechanism of redistribution of income, the Family Allowance Programme, was created through a special tax affecting middle and high class families. These funds were used to finance government activities with the objective of reduce and/or eliminate poverty in sectors of population traditionally neglected from strategies of social and economic development. The programme has been operating since 1975 and the total budget to be invested in activities for deprived sectors in 1979 was around £40,000,000.

Such large resources, and the need to identify more rational ways to allocate them, gave birth to the Nutrition Information System (SIN), a government office created in 1977, under the Office of Information of the Presidential House (OICP), with the objectives to set up an information system useful for different Ministries and Government offices identifying the relevant programmes, their geographical location and population specificity necessary to reduce problems of deprivation and malnutrition. Furthermore the information system will provide information on the dynamics of

malnutrition and deprivation, at different periods of time, as a result of changes produced by government interventions and/or other actions.

SIN, among other activities, initiated the elaboration of a data system component for a functional classification project in September 1978 (11) consisting of two types of exercises; a first attempt to provide data on functional groups in a rather short period of time and secondly the set up of a system, using existing mechanisms of data collection, for monitoring the size, geographic and administrative location, social, economic and nutritional characteristics of functional groups. The data system to monitor functional groups is to be used by different ministries and government offices to ascertain the size and geographical location of existing social and economic problems, the nutritional implications of their various activities and for evaluating in the coming years, the changes in both the prevailing social and economic problems and in nutritional and health conditions derived from implemented actions in the various functional groups.

a) Initial description of functional groups

This section of the data system on functional groups has as an objective to provide, in a short period of time with existing and easily analyzed data, information on important functional groups in Costa Rica, their size, their geographical and administrative location, social, economic and cultural characteristics and associated nutritional problems. The first step, consisted in the definition, with the aid of experienced professionals with knowledge of regions and types of population existing in Costa Rica of the provisional functional groups displayed in Table 3.

Table 3

Functional Groups defined in Costa Rica.

1. Labourers in banana and african palm plantations.
2. Labourers in coffee plantations.
3. Labourers in sugar plantations.
4. Labourers in beef cattle plantations.
5. Labourers in dairy cattle plantations.
6. Labourers in basic grain farms.
7. Other agricultural labourers.
8. Farmers with less than 1.4 hectares of land in coffee.
9. Farmers with 1.4 to 3.4 hectares of land in coffee.
10. Farmers with 3.5 or more hectares of land in coffee.
11. Farmers with less than 1.4 hectares of land in sugar.
12. Farmers with 1.4 to 3.4 hectares of land in sugar.
13. Farmers with 3.5 or more hectares of land in sugar.
14. Farmers with less than 1.4 hectares of land in basic grains.
15. Farmers with 1.4 to 3.4 hectares of land in basic grains.
16. Farmers with 3.5 or more hectares of land in basic grains.
17. Farmers with less than 1.4 hectares of land in other agricultural products.
18. Farmers with 1.4 to 3.4 hectares of land in other agricultural products.
19. Farmers with 3.5 hectares of land in other agricultural products.
20. Professionals, technicians and other related occupations.*
21. Unemployed in urban areas.
22. Unemployed in rural areas.
23. Urban slum dwellers.

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* This group will be further subdivided by sector of employment and if possible by level of income.

These functional groups are presently the subject of further studies and the list may be increased or reduced as new data, especially that derived from the data system monitoring the functional groups will be available. Once the groups were defined the second step has consisted in assigning nutritional risk to the children from families belonging to the defined groups. Use has been made of the national anthropometric and socioeconomic surveys of 1978, conducted on a national sample of 3,000 families, where data on the occupation of the head of the household and the nutritional status of their children can be related. The preliminary results of this activity are shown in Table 4. Prevalences of second and third degree malnutrition of 20.0% and 17.4% are observed in labourers in sugar cane and banana plantations respectively while, in non-agricultural workers the prevalence is 7.5%, for labourers engaged in dairy products 6.1% and, no cases were found in children whose parents were engaged in cattle raising activities of their own.

The national population, housing and agricultural censuses have been used to estimate the numbers of families in the various functional groups, their geographical and administrative location and the type and magnitude of existing social and economic problems. However, as the occupations used in the population census are not entirely useful to characterize the functional groups displayed in Table 3, a series of processes have been conducted with the original computer tapes to identify and obtain the social and economic characteristics of some functional groups from the agricultural census. Special computer programmes have been used in order to link the information on social and economic characteristics

Table 4

Percentage of children from different functional groups in various categories of weight for age

Functional Groups	No. of cases	CATEGORIES OF GOMEZ				Total
		Normals	First Degree	Second Degree	Third Degree	
Labourers sugar cane	30	33.3	46.7	20.0	0.0	100.0
Labourers banana plantations	86	44.2	38.4	16.3	1.1	100.0
Farmers basic grains	107	43.9	43.0	12.2	0.9	100.0
Labourers cattle farms	96	40.6	46.9	12.5	0.0	100.0
Farmers coffee	81	53.1	34.6	11.1	1.2	100.0
Semiproletarium	124	41.9	47.6	9.7	0.8	100.0
Unemployed	164	50.6	39.0	10.4	0.0	100.0
Labourers other products	79	53.2	36.7	6.3	3.8	100.0
Labourers basic grains	42	47.6	42.9	9.5	0.0	100.0
Labourers coffee	44	45.4	45.4	9.1	0.0	100.0
Labourers african palm	23	43.5	47.8	8.7	0.0	100.0
Non agricultural workers	889	56.5	35.2	7.9	0.4	100.0
Labourers dairy products	40	67.5	25.0	7.5	0.0	100.0
Farmers other products	66	65.1	28.8	6.1	0.0	100.0
Farmers cattle	38	50.0	50.0	0.0	0.0	100.0
Other occupations	26	61.5	38.5	0.0	0.0	100.0

from the population and housing censuses for those individuals belonging to the functional groups identified in the agricultural census. An additional description of these problems and the way they have been overcome is now available in a report describing the workplan to elaborate the functional classification in Costa Rica (11). As in the case of El Salvador, most variables from the population, housing and agricultural censuses have been elaborated at the smallest level of administrative unit, the census segment*, for other future desirable aggregations.

Finally for this part of the data system but to be used in the monitoring of functional groups as well, non-quantitative anthropological studies, improved after the experiences gained in El Salvador are now being conducted in the various functional groups (11). They will describe those social, economic and cultural factors, interactions and mechanisms, not likely to be collected in quantitative socioeconomic studies, closely related to their state of poverty, health and nutrition and will also identify programmes and ascertain their likely acceptance and impact in the various functional groups.

b) <u>The monitoring of the functional groups</u>.

The data system component of the functional classification dealing with the monitoring of functional groups will make use of the following sources of data collected periodically:

i) Heights collect every year by the Ministry of Education in all children 6 to 8 years in

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* Costa Rica is administratively divided in 7 "provinces", 80 "cantones" and 411 "distritos". The census uses those divisions and also smaller ones as "lugar poblado" (village) and census segment, this latter usually composed of around 30 families.

age entering first grade of primary school (around 100% coverage for the entire country).

ii) Weights of children below 5 years in age collect every 6 months by the Rural Health (PSR) and Community Health (PMC) Programmes with a total coverage of rural areas by 1979 and urban ones by 1981.

iii) Information updated every year by the field workers of the PSR and PMC on occupation (functional group) of the head of households and the demographic, social, economic and environmental characteristics of each family.

iv) Information provided by PSR and PMC regarding distance to main roads, neighbour towns and cities, services at the village level (lugar poblado), resources and community organizations.

v) Information collected every 4 months, in a national sample of 7,000 families, on levels of employment and income for different functional groups by the Ministry of Labour and Social Security. There is the possibility to add other questions on food consumption, prices and expenditures so as to predict the likely impact of agricultural policies in food consumption for various functional groups.

vi) Social, economic, demographic, environmental and agricultural data for the various functional groups collect every 10 years on each

family of the country by the Bureau of Statistics and Census.

The information in i, ii, iii and iv is of census nature and computer files with all variables will be kept at the census segment and village level for future aggregation. The data obtain from the PSR and PMC under ii and iii will be easily related at the individual level; ie. the nutritional status of children with the occupation of the head of household and the social, economic environmental demographic and agricultural characteristics of the family.

Thus the system will provide every six months information at the village and/or functional group on nutritional status of children under five years in age. Every year there will be also data on the size of the functional groups, geographical location, social, demographic, environmental and agricultural characteristics and the nutritional status of their children. The survey on school children will provide information, every year, on changes in growth patterns at the village level, if desirable, and this data of nutritional status can be also related to the functional groups. Seasonal effects on levels of employment and income can be monitored for various functional groups every 4 months and the possibility to predict at least every 2 years the likely impact of agricultural policies such as low price shops and supporting prices for staple foods in different functional groups is presently under consideration.

Finally with slight modifications in the questions dealing with occupation of the head of household and the use of the same identification of individuals in the population, housing

and agricultural censuses, it will be possible to obtain information for the various functional groups every 10 years in all the topics cover by the 3 national censuses.

Regarding changes in health and nutrition indicators, the different sources of data above discussed will provide permanent information on the geographical-administrative distribution of malnutrition in Costa Rica and the prevalence of malnutrition in children from different functional groups even at the smallest administrative unit. Information will be also available for other health indicators as morbidity and mortality disaggregated again at the smallest administrative unit. On the other hand, it is possible to ascertain, by geographical location and/or functional group, the size of social, economic and other problems determining deprivation, its modification as a result of action programmes and the likehood of producing changes in indicators of health and nutrition as a result of comprehensive actions aimed at improving living conditions of deprived segments of population in various areas of country.

Thus the system not only is able to provide information to orient the present activities but at least, on a yearly basis, it will supply data regarding changes in indicators of health and nutrition and the remaining size of various problems determing deprivation in distinct geographical-administrative areas and/or functional groups in Costa Rica.

3. The functional classification project in Guatemala.

The Government of Guatemala set up a Nutrition Planning Unit within the Secretariat of Planning in 1977. The Unit is mainly responsible for the preparation of a government statement on Food

and Nutrition, the elaboration of a Food and Nutrition Plan and the coordination of the activities in various sectors once the Food and Nutrition Plan is implemented. The Unit has as another task the elaboration of an information system component for a Functional Classification of Undernourished Populations in Guatemala (40).

The situation regarding availability of information for functional classification purposes is somewhat different than in El Salvador and Costa Rica. First, coverages of services such as schools and health posts are not adequate for rural areas, particularly for the more dispersed groups of population. The Health services are not as aggressive as in Costa Rica, regarding periodic visits to all the household or in collecting data from the families living in their area of influence.

On the other hand, most data from the national population and housing censuses is not useful as the earthquake of 1976 modified the conditions related to housing and demography. Furthermore, the agricultural census was not conducted with the population and housing censuses in 1974. Thus there is no possibility to determine with existing data the size, geographical location of functional groups or to describe their social, economic, environmental and nutritional problems. There are however, other surveys on prices, incomes and expenditures that can be useful in a permanent system of data collection.

The Nutrition Planning Unit, with the technical assistance of INCAP, initiated in September 1979 anthropometric and socioeconomic surveys in seven ecological defined regions of Guatemala with the purpose to identify, using the regions as sample frame

the size of the functional groups, the major social, demographic, economic, environmental conditions of the families and the nutritional status of the children (40). Activities contemplated for 1980 include anthropological studies on the functional groups to be defined and if possible, a validation of nutritional data collected in health services to ascertain its potential use in a permanent nutrition surveillance system, as was the case in El Salvador (38, 39).

As populations residing in coffee growing regions seem to be a functional group with very high prevalence of malnutrition in Central American countries (15, 35, 41) the present study initiates the process of elaborating a functional classification of undernourished population in Guatemala, by describing the living conditions of families and the nutritional status of children residing in coffee plantations located in the Western coffee growing region of Guatemala. Particular attention is given to the use of various frequently used social and economic indicators in identifying subsets of families, within the functional group; that may have higher prevalence of malnutrition and to ascertain the possible effects on nutritional status of children imposed by the various seasonal events important in the community and family life.

Thus, four distinct type of studies were conducted in coffee farms located in the Western Coffee growing region of Guatemala in order to determine:

a. The prevalence of malnutrition among children residing in coffee farms.

b. The social and economic characteristics of families residing in coffee farms.

c. The relationship between family income, other family social and economic characteristics and the nutritional status of children.

d. The effect of the rainy and dry seasons on children's growth.

e. The effect of the coffee harvest on children's growth.

Section II reviews available information on growth retardation in coffee farms, the effects of seasonal variations on health and nutrition and the studies addressing the effect of income on food consumption and growth retardation.

II. REVIEW OF THE LITERATURE

The most profitable agricultural product in Central America is coffee that is grown in very fertile land belonging to the richest members of the society. Most coffee farms have "colonos" that is permanent settlers living with their families on the land owned by the coffee plantation. They receive free housing in exchange for working for the plantation according to the owners needs. A second type of worker is the "cuadrillero" who migrates temporarily 2 to 3 months from their place of residence to the coffee farms during the time of the harvest season; September until December. Surrounding the coffee plantations there are always a number of small and large towns whose economic activities are very dependent on the needs of the plantations. Some families living in these towns work for the coffee farms. Such people do not receive any concessions such as for example a free house inside the farm, education for the children, medical care.

A. Growth retardation in coffee growing regions

Although a considerable proportion of the rural populations in Central America live in coffee growing regions, for example 18% of the rural population in El Salvador, data on nutritional and socioeconomic conditions of these families was not available until 1975.

Anthropometric studies conducted in villages surrounding coffee plantations in Costa Rica indicate that the prevalence of second and third degree malnutrition, among children under five years in age, was higher in those villages than in children from a nearby more urbanized town (35) and from the national sample of children studied in 1966 (23). The social, economic and cultural

studies from the villages identified a series of socioeconomic factors highly associated with the prevalence of malnutrition within the community among others, occupation of the head of the household, size of land holding, family size, mother's labour and environmental conditions (36).

A total of 1043 children aged 6 to 59 months, living within and outside coffee farms, were included in the anthropometric surveys conducted in various regions of El Salvador in 1976. Information on W/A and H/A indicated that the prevalence of growth retardation was significantly higher in children residing in the coffee growing region than in other studied regions (15).

Anthropometric data gathered in 1977, before the initiation of a comprehensive longitudinal study in coffee plantations located in Western Guatemala (41), showed that 44.9% of children were suffering from second and third degree malnutrition while the percentage of children from a national sample of rural population in the same categories was 32.4% in 1976 (24).

However, more recent preliminary data from the functional classification project in Costa Rica does not rank children from families residing in coffee farms as worse off than children from other functional groups (11).

B. Seasonal variations and effects on health and nutrition

The relationship between seasonal variations, food consumption on families, adults and children; patterns of various diseases and changes in weights of adults and children have been examined in developed and developing countries. While in developed nations, seasonal effects are related to winter, autumn, summer and spring; in developing countries seasonal effects are associated with rainy

and dry periods or with harvest, pre-harvest and post-harvest months. The present section reviews the evidence on seasonality and nutritional status measured as either food consumption, changes in weight or patterns of disease.

The effect of seasonal variations in human growth; winter, spring, summer and autumn has been the subject of research in developed countries since the last two decades of the last century. Orr and Clarke reviewed the evidence from 12 studies conducted in European children until 1930 concluding that a greater increase in height was observed from March to June and a minimum one during the winter months. It was also noted that maximum and minimum periods in weight gains did not correspond to those of height gains (42). From their own studies, the authors concluded that the greater gains in height were observed during the spring, March to June, and height gain was minimal during the autumn, October to December. During the period of maximal height gain, 25% of children lost weight (42).

Recently Shull et al. pointed out that in 23 studies on seasonal variation and growth in developed countries, 15 demonstrated that the periods of greatest growth are the spring and summer months, 3 reported greatest growth during the winter and five claimed that no seasonal effect on growth occurred (43).

The behaviour of some individuals when seasonal changes in growth occurred for an entire group of children, has been analyzed in developed Countries by Bransby (44) and Marshall (45). In the data collected by Bransby in 1941 and 1942 (32), 27 to 29% of children had their smallest increment and 33 to 36% their greatest increment when the entire group achieved the minimum and

maximum growth. Marshall estimated centiles of growth for periods of three to six months concluding that a gain of 3 to 4 cms. per year is normal for periods ending in December and January but the same value could be below the 10th percentile for periods ending in March and June (45). The author also reported that a good proportion of children did not follow the pattern of maximal and minimum gains observed in the entire group (45).

Most investigations from developing areas have been conducted in African countries and they have stressed differences in morbidity, food consumption and growth patterns during rainy and dry periods or harvest, post-harvest and pre-harvest months.

Descriptive studies provide information on periods of shortage of foods and effect on food consumption related to the agricultural cycles of staples (46, 47, 48) and cash crops as pointed out by Satge et al. quoted by Annegers (49). Annegers (49) and Sai (50) have also pointed out the detrimental effect on food consumption of a bad crop in the previous year.

Sai (50), Davey (51), Fox (52) and Rutishauser (53) have communicated quantitative results on increased consumption of energy and protein during the harvest and post-harvest months for families and individuals.

Rutishauser (53), Rowland et al. (54) and Schofield (55) have drawn attention to the effect of rainy and dry periods on food consumption in Africa. Higher energy and protein intakes were noted in Ugandan children one and three years old when food was plentiful, July to September, than during the dry period January to March, when supplies are limited, the rainy periods of October to December and April to June. The reverse is observed in children

2 years in age. Schofield, analyzing food consumption data from various African countries, concluded that energy intake was higher in dry than in wet periods (55), a finding supported by Rowland et al. (54) in an analyses of food consumption of Gambian children during wet and dry periods.

With respect to indicators of health, McGregor (48) communicated that 2/3 of the deaths during the first year of life in Gambian children occurred during the wet months; July to October, and a quarter in August alone. The peak of measles and malaria in Uganda (56) and gastroenteritis in South Africa (57) occurred during the wet months and was followed by a peak of admissions of children with malnutrition. Spalding et al. (58) observed a peak of admissions of cases of malnutrition during the wet months in Gambia and Rowland et al. (54) communicated, for the same country and period, a higher number of days of illness and 82% of all infant deaths.

Fox (52) and Hunter quoted by Annegers (49) in Gambia and Davey in Ghana (51) have reported weight changes in adults and children closely related to the agricultural cycle, with weight gains during and after the harvest periods and losses during the "hungry months" of the pre-harvest period. However, Serre quoted by Annegers (49) and Sloof (59) did not find differences in food consumption (49) and children's growth (49, 59) during wet and dry periods. The latter author (59) suggested that the lack of seasonal effects may be explained by the existence of 2 harvests per year. Many people also generated income from other activities, being less dependent on seasonal agricultural fluctuations.

Marsden and Marsden (60), McGregor et al. (61) and

Rowland et al. (54) have studied the effect on children's growth of rainy and dry periods. Marsden and Marsden concluded that the weight gain was poorer from June to September as a result of a combination of seasonal effects, particularly the rains (60). However during the same period, food is more scarce than in any other month of the year and the authors did not control for age in the 2 cohorts of children studied, born in different periods of the year.

McGregor et al. (61) estimated weight gains in Gambian children during the following periods: a) 15 November to 14 February (Dry); b) 15 February to 14 May (Dry); c) 15 May to 14 August (Wet) and d) 15 August to 14 November (Wet). Children born in period (b) gained weight well until the end of the first rainy period (c). The ones born in the early part of the dry season (a) had a sharp check in growth soon after they enter the wet months (c). Weight gains after the first year were good in the dry months and poor in the wet ones. The minimal period of weight gain was observed in the last period of the wet season (d). When the weight gains of the different cohorts are controlled by age the same pattern emerged; more depressed growth in the winter months. Rowlands et al. (54) reported lower weights in Gambian children during the wet than the dry months in data analyzed cross-sectionally.

Robson (62) concluded, from a series of longitudinal analysis of growth in well-fed children from different genetic stocks and environments in Tanganyka that seasonal patterns of growth occurred in well fed children living in Tanganyka independent of climate, elevation and race.

Less abundant data is available for seasonal effects on

health, food consumption and growth from other developing areas.

Descriptive studies have provided information on the po sitive effect in food consumption as a result of the maize harvest in a subsistence population and labour opportunities during the harvest in cotton and coffee growing regions of El Salvador (12). The same studies reported an increase of malaria in the coastal cotton region during the winter months, May to October, with a decline in August when plantations are fumigated to minimize crop damage. The incidence of diarrhea noticeably increases in May, with the early rains in the coffee growing regions. Chest colds, sore throats, influenza and diarrhea also increases during the coffee harvest, September to December when there is a strong north wind and the population of the farm is doubled as a result of migratory labourers.

Rawson and Valverde (36), making anthropological observations, concluded that mothers' labour during the coffee harvest in Costa Rica may have a detrimental effect on the nutritional status of preschool children, as they are left home with older siblings who lack motivation or training to take care of them. The same observations were made in a descriptive study of the coffee growing region of El Salvador (12).

Dietary information from rice growing areas of Bangladesh showed higher energy intakes, following the harvest, than in the pre-harvest period (63). Food consumption information from the North Arcot District in India have been reported by Rao et al. (64) and Sundaraj et al. (65). Although frequency of consumption of foods were related to seasonal availability, as a result of the harvest period, none of the studies claimed statistical differences in energy and protein intakes for the various periods of the year.

Trowbridge and Newton gathered anthropometric information in a series of samples of children from a coastal community in El Salvador (66), severely affected by malaria, concluding that growth retardation was greater during the rainy season. Trowbridge and Valverde (38) showed that the peak of cases in second and third degree malnutrition, reported from government clinics in El Salvador, occured at the initiation of the winter months and was followed by the peak of reported cases with clinical malnutrition. The incidence of diarrhea followed a similar pattern, closely associated to that of malnutrition (39). More diarrheal events are reported prior to the peak of cases in 2 and 3 degree malnutrition, just after the beginning of the rainy season. Incidentally, the initiation of the rainy season coincided with periods of food shortages described for the subsistence, cotton and coffee growing regions (12).

Mata (67) found no relationship between the peak incidence of cases of marasmus, the most prevailing type of severe malnutrition in the highlands of Guatemala, and seasons of the year. However, the greater number of children with kwashiorkor was observed during the rainy months of June to September when food is not scarce. The peak incidence of edematous protein-energy malnutrition is associated to measles, diarrhea and respiratory infections as they occur more frequently at the end of the dry and beginning of the rainy season, just before the peak of edematous cases of protein-energy malnutrition (67).

Alaudin-Choudbery (68) reported that in adult females in Bangladesh, weight stayed stable during the first six months of the year but the weight obtained in July dropped 5% in the lean month

of September and, after the harvest in November, weight begin to rise again.

Standard et al. (69) followed children from birth to four years of age in an agricultural area of Jamaica and showed that no differences in growth during wet and dry periods occurred. The authors concluded that such a finding is to be expected in an area where malaria has been eradicated and no marked seasonal climatic differences exist.

Hauck et al. (70) reported that in children 7 to 14 years of age, studied from 1952 to 1954 in Thailand, greater weight gains were detected during the winter season from May to November and no clear seasonal patterns of greater gains in height emerged. The authors concluded that seasonal variations in food supplies, work activity related to the agricultural cycle and occurrence of illness, as drinking water is obtained from canals and fish ponds during the dry season, may account by the differences in weight gain.

Kielmann and McCord (21) studied seasonal effects in 3000 children 1 to 36 months with different levels of growth retardation in India. The risk of mortality was 5 times greater from January to June than from June to December in children with weights below 70% of the Harvard median. However, the risk of death is independent of season in children with weights above 80% of the standard. Food is scarce in the pre-harvest months of January to March and although the wheat harvest from late March to mid May provides food; adults and older children are the entire day in the fields leaving infants and toddlers with siblings who are only a few years older. Peak incidence of diarrhea, high temperatures and cases of dehydration are recorded during the harvest season. As no differences in

environmental sanitation are found among families with well and undernourished children, the authors suggest that in the former group good nutrition protects them from seasonal attacks of diarrhea and other diseases (21).

The evidence from developing countries demonstrates that there are distinct effects on weight and height gains according to season. When maximal group gains in height are recorded, minimal weight gains are also detected. Only a quarter and a third of children had their minimal and maximal height gains respectively, in the same period as minimal and maximal group gains.

Most studies from developing countries have addressed separately the impact of wet and dry months and harvest, pre-harvest and post-harvest periods on health and nutrition. Rainy and pre-harvest months are usually associated in isolation with peaks of incidence of disease and lower energy and nutrient intake respectively. However, in most areas of the developing world, where studies on seasonality have been conducted, rainy months with higher incidence of disease coincide with the lean or hungry pre-harvest months. Thus, either as a result of lower intakes of energy and nutrients and/or less efficient utilization of energy and nutrients, one is likely to find important seasonal effects in poor agricultural communities of developing countries.

C. Income, food consumption and growth retardation

Family income is considered the major determinant of poverty and malnutrition in developing countries. It does not only influence the quantity and quality of food products bought by families through the purchasing power of families but, factors as formal and informal education of parents affecting consumption by demo-

graphic groups as children and those influencing food utilization as housing conditions, water supplies, excreta and trash disposal and other environmental characteristics.

The evidence on family income or other combined indexes incorporating this variable, and food consumption in families and children and indicators of growth retardation is reviewed in the present section.

Orr reported data on food expenditure of families with various levels of income in Great Britain in 1936, concluding that it was only when at least 10 shillings per head were spent on foods in families with income levels of 20 to 30 shillings per head that they were able to buy a satisfactory diet (71). Orshanky et al. (72) communicated in 1957 from the United States that food consumption per head and dietary adequacy tended to increase with increasing incomes. Futrell et al. (73) found that in black children in Mississipi energy and nutrient intake did not vary with income. Abdel-Ghany et al. (74) reported that there was in the United States in 1965-1966 a significant relation between the composition of food bought by households and the levels of education and income.

Bengoa et al. (75) reported a series of studies on food consumption, monthly income and expenditure on foods in five income groups in Venezuela. The quality and quantity of foods consumed varied with levels of income as well as the total amount of income allocated to the purchase of foods. Lower energy and nutrient intakes were found in the lowest income group, 1286 calories, and an expenditure of 1.06 Bolivares per day. On the other hand, energy requirements were fully met by families in the highest level of income where 2.21 Bolivares were spent daily on foods. The same families also consumed greater amounts of animal products, wheat products

and fresh vegetables.

Industrial workers from Nagpur, India (76) spent 57% of their total budget on foods in 1941-1942 and half of that was allocated to buy cereals.

Households in Fariabad, India, where monthly total expenditure ranged from 5 to 10 Rupees per head in 1954, allocated 81% to foods and 50% to cereals (77). The families spending 61 Rupees allocated 39% to foods and only 7.3% to obtain cereals. As income rose, expenditure on cereals declined and the amount of money allocated to milk, vegetables, fish and eggs increased (77).

The same results on family income, levels of energy and nutrient intake by families, amount of resources allocated to foods and type of products purchased by families have been obtained in Uttar Pradesh and Madras State, India (78, 79), New Guinea (80), urban middle class families in Chile (81), urban families in Valladolid, Spain (82), urban and rural households in Korea (83), in a suburb of Manila, Philippines (84), in Sao Paulo, Brasil (85), in rural areas of Central American Countries (86) and in various regions of India (87).

The relationship between income and energy and nutrient intakes of individuals has been examined in adult males and females in Delhi and Uttar Pradesh, India where differences between income groups are important (88, 89). Pregnant women in Coimbatore India from a high income group had a calorie and protein intake of 2408 and 59 g. while their low income counterparts had calorie and protein intakes of 1624 and 34 g. respectively (90). Feeding practices in children 0 to 12 months from three income groups in Coimbatore also shows that a greater variety and quality of weaning

products are given to children in the highest income group (91).

Income is also an important determinant of food consumption in children under 24 months in Punjab, India (92) and in under fives from rural areas of Central America (86).

Lack of association was reported when energy and protein intakes in families were correlated with family income in villages with adequate energy intake in Brasil (93).

In summary, the studies on family income and food consumption show that families with low incomes spend a very high proportion of their total income on foods. As income increases, the proportion of total income allocated to food is less but the total quantity of food is higher and the quality of products better. When there is a further increase in income, the proportion of calories from cereals and other staples drops and there is a higher consumption of animal and processed products.

There are also several studies addressing the effect of income on various anthropometric measurements. Boys and girls aged 5, 9, 13 and 16 years from high socioeconomic classes in Edinburgh were taller and heavier than children from lower social classes (94). Children 1, 3 and 5 years in age from various European Countries from high social classes, were heavier and taller than those from lower classes (95). However, a slight correlation was found in English and Scottish school children between height and family income (96). Systematic differences in children up to 7 years in age were found in the United States, when children in the top and low 15% of the distribution of income were compared. White children from low and high income groups had a difference of 1.59 cm. and 1.42 cm. in height for boys and girls respectively (97).

Family income and the outcome of pregnancy have been studied in various developing countries. Higher weight gains, haemoglobin and plasma protein levels in mothers and heavier and LONGER new born children were reported for Indian pregnant women from a middle-income group when they were compared with mothers from a low income group (98). Similar findings regarding income and the outcome of pregnancy have been communicated from China (99), Ghana (100), India(101, 102) and Argentina (103).

The effect of family income and growth in children under five has been studied in Ceylon (104), India (105 -108), Costa Rica (34, 36), Guatemala (109), rural areas of Central America (86), Colombia (110-112), Brasil (113), Ethiopia (114) and Nigeria (115). They all showed greater weights and/or heights in children from high income groups.

Girls at six years from 2 social classes in Colombia had a difference of 8.3 cm. in height that decreases to 6.5 cm. at 20 years. Differences of 2.75 Kg. in weight at six drops to 1.46 Kg. at 20 years (116). In Coimbatore, India, differences between high and low income children of 7 cms. in height and 2.0 Kg. in weight have been also communicated (117). At 10 years of age, boys from the higher income families were 11.2 cm. taller and 4.7 Kg. heavier that their counterparts from low income families (118). Evidence available from Chile since 1936 on weight and heights of children and levels of income have shown that at 14 years of age, children from high income groups were 12 Kg. heavier and 10 cm. taller than children from the lowest income group (119). In 1941, differences of 13 cms. in height and 11.5 Kg. in weight between the same 2 groups of income at 14 years were also detected (119). Rana reported

differences in weights and skinfolds of industrial labourers in Pakistan (120) related to levels of per capita income.

Differences in the outcome of pregnancy (121) or attained weight and/or heights in preschool children (122-125) were not observed in other studies. However some of these reports point out that most children came from low income families where there was not a wide range in levels of income (121-123).

Of all the studies on income and children's growth reviewed, none have controlled by levels of mortality in various income groups a factor that may enhance the relationship between income and nutritional status.

III. OBJECTIVES AND HYPOTHESES

The objectives of this thesis are:

A. To gather information on nutritional status of children living in coffee farms in the Western departments of Guatemala.

B. To describe the socioeconomic conditions of families residing in coffee farms.

C. To identify the socioeconomic characteristics of families which are most strongly associated with poor nutritional status of their children.

D. To determine the prevalence of malnutrition in various categories of families living on coffee farms.

E. To study the relationship between family income and the nutritional status of their children.

F. To determine the effect of the rainy and dry seasons and of the coffee harvest on the nutritional status of children.

The following hypotheses will be tested:

A. The prevalence of malnutrition in coffee farms is higher than the prevalence of malnutrition in rural areas of the whole country.

B. The prevalence of malnutrition in coffee farms is different in distinct categories of families residing in the farms.

C. Differences in family income are related to the nutritional status of the children.

D. The rainy season has a more detrimental effect on children's growth than the dry season.

E. The coffee harvest has a detrimental effect on the nutritional status of children living inside coffee farms.

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D. The rainy season has a more detrimental effect on children's growth than the dry season.

E. The coffee harvest has a detrimental effect on the nutritional status of children living inside coffee farms.

IV. MATERIAL AND METHODS

A. Prevalence of malnutrition and socioeconomic conditions of families with children living in coffee farms.

The study population was living on coffee farms located in the western coffee producing area of Guatemala. The sample frame included all coffee farms located in the counties (municipios) of the departments of Suchitepequez, Retalhuleu, San Marcos, and the municipio of Pochuta, which belongs to the department of Chimaltenango. There were a total of 174,887 inhabitants of coffee farms representing 24.2% of all persons living in those municipios in 1973 (126). A list of all coffee farms was obtained from the National Association of Coffee Producers (ANACAFE) and their population was determined using the national population census of 1973 (126).

A total of 29 sample sites (farms) were selected with the probability of selection based on population. Weight and height data was collected in 966 children of both sexes 6 to 59 months of age. Weight was collected with a 25 Kg. capacity Salter spring type balance, with steps of 0.1 Kg.. LENGHT was measured in a wooden infantometer with intervals of 0.1 cm. Children were weighed and measured without clothing or shoes. Those under 24 months of age height were measured in a supine position, while those over 24 months of age, stood up to be measured. A socioeconomic questionnaire was used to collect information in all families whose children were included in the anthropometric study. The anthropometric data was compared with the growth data from normal children from Iowa, U.S.A. (127), cases out of acceptable ranges discarded* (2%) and the results of information of W/A, H/A and W/H are presented for the entire group and for categories of population.

* Cases out of age ranges, cases missing some information, weights and heights values with coding errors.

Results from the socioeconomic survey describe first the socioeconomic conditions of families with children under five years of age, and then relate that information to the nutritional status of their children.

B. Effect of the rainy and dry season on nutritional status of children.

Data from an ongoing longitudinal study conducted in 13 coffee farms located in the western coffee producing region of Guatemala was examined (41). The study population includes 9,000 inhabitants of Indian extraction whose head of families work as permanent agricultural labourers for the farms.

Anthropometric information from children 3 to 60 months of age is available for all children living in the communities and is gathered every three months from 0 to 24 months of age and every six months from 24 to 60 months. Anthropometric examinations are performed by trained anthropometrists within two weeks of each target age. A beam scale with steps of 0.1 Kg. is used for determining weight and an infantometer with steps of 0.1 cm. for recording height. Children are measured without clothing or shoes. While below 24 months of age they are measured in a supine position and height in older children is determined in a vertical position.

The anthropometric data includes children 3 to 60 months of age measured from June 1, 1977 until August 30, 1978. Thus information for a given child is available for 2 or 3 different months depending of his age.

The dry season in Guatemala includes the months of November until April and the rainy season from May to October. The following analyses were performed:

1. Cross-sectional analyses

Weight measurements during the dry and wet months were aggregated and W/A was estimated using the Iowa standards (127), and the criteria suggested by Gomez et al. (13).

2. Longitudinal analyses

A total of 13 age periods of increments in weight and in height were aggregated according to the date of the examination. The age intervals are, 3 to 6 months, 6 to 9 months, 9 to 12 months, 12 to 15 months, 15 to 18 months, 18 to 21 months, 21 to 24 months, 24 to 30 months, 30 to 36 months, 36 to 42 months, 42 to 48 months, 48 to 54 months, 54 to 60 months. For children under 24 months of age the effect of the "rainy season" was studied in examinations conducted in June 1977 and September 1977, July 1977 and October 1977 and May 1978 and August 1978. In order to study the effect of the "dry season" in children under 24 months of age, the following periods of anthropometric examinations were considered, November 1977 and February 1978, December 1977 and March 1978 and January 1978 and April 1978. The period that includes both dry and rainy months is called "intermediate" and included examinations conducted in August 1977 and November 1977, September 1977 and December 1977, October 1977 and January 1978, February 1978 and May 1978, March 1978 and June 1978 and April 1978 and July 1978. For children 24 to 60 months the effect of the "rainy season" was examined aggregating the data collected in June 1977 and December 1977 and February 1978 and August 1978. The "dry period" includes examinations performed in September 1977 and March 1978, October 1977 and April 1978, November 1977 and May 1978, December 1977 and June 1978. The "intermediate period" include examinations where there were 3 rainy

and 3 dry months, July 1977 and January 1978 and January 1978 and July 1978.

C. Effect of the coffee harvest on nutritional status of children.

The coffee harvest is the main economic activity on the farms and provides an opportunity for resident and migratory workers to increase their incomes as parents and all children over 10 years of age participate in picking beans. The collection of coffee takes four months and there is not an exact date of initiation since the process begins whenever the seeds begin to mature. September, October, November and December are regarded as the harvest months although some activities may begin earlier in August and may end as late as January. To isolate the effect of the coffee harvest on nutritional status of children, longitudinal anthropometric information collected from June 1, 1977 until October 30, 1978 was employed. The data collection procedures utilized for weight and height were described in section IV B. The data was analyzed as follows:

1. Cross-sectional analyses

Weight data was examined cross-sectionally for every month of the study period for the following age categories, 3, 6, 9, 12, 15, 18, 21, 24, 30, 36, 42, 48, 54 and 60 months. Information collected for each individual was evaluated in terms of W/A and compared with categories of weight suggested by Gomez et al. (13).

2. Longitudinal analyses

As the information is of longitudinal nature, the following analyses of increments of height and weight for the age intervals and distinct periods of the year shown in Table 5 were done.

Table 5

Increments in weight and height included in the longitudinal analyses

Increments Age groups	Name of the Variables Height	Weight
a) Six months minus 3 months	DH1	DW1
b) Nine months minus 6 months	DH2	DW2
c) Twelve months minus 9 months	DH3	DW3
d) Fifteen months minus 12 months	DH4	DW4
e) Eighteen months minus 15 months	DH5	DW5
f) Twenty one months minus 18 months	DH6	DW6
g) Twenty four months minus 21 months	DH7	DW7
h) Thirty months minus 24 months	DH8	DW8
i) Thirty six months minus 30 months	DH9	DW9
j) Forty two months minus 36 months	DH10	DW10
k) Forty eight months minus 42 months	DH11	DW11
l) Fifty four months minus 48 months	DH12	DW12
m) Sixty months minus 54 months	DH13	DW13

a. Children 0 to 24 months

For all children to 24 months of age, including DH7 and DW7, means and standard deviations for DH1, DH2, DH3, DH4, DH5, DH6, DH7, and for DW1, DW2, DW3, DW4, DW5, DW6, DW7 were aggregated according to the following dates of examination: June and September 1977, July and October 1977, August and November 1977, September and December 1977, October 1977 and January 1978, November 1977 and February 1978, December 1977 and March 1978, January and April 1978, February and May 1978, March and June 1978, April and July 1978, May and August 1978, June and September 1978, and July and October 1978.

Means and standard deviations for the seven increments of weight and the seven increments of height were obtained, aggregating the data according to "Strong", "Moderate" and "No effect" of the harvest season as follows:

Strong effect: Increments of weight and of height for examinations performed in August and November 1977, September and December 1977 and October 1977 and January 1978.

Moderate effect: Increments of weight and of height for examinations conducted in June and September 1977, July and October 1977, November 1977 and February 1978, December 1977 and March 1978, June and September 1978 and July and October 1978.

Little or no effect: Increments of weight and of height for examinations performed in January and April 1978, February and May 1978, March and June 1978, April and July 1978 and May and August 1978.

b. Children from 24 to 60 months

Means and standard deviations were estimated for DH8,

DH9, DH10, DH11, DH12, DH13 and for DW8, DW9, DW10, DW11, DW12, and DW13 for each of the following dates of examination: June and December 1977, July 1977 and January 1978, August 1977 and February 1978, September 1977 and March 1978, October 1977 and April 1978, November 1977 and May 1978, December 1977 and June 1978, January and July 1978, February and August 1978, March and September 1978, April and October 1978.

The means and standard deviations for the six increments of weight and for height were then aggregated to isolate the effect of the harvest in the following manner:

Strong effect: Increments of weight and height for examinations performed in June and December 1977, July 1977 and January 1978 and August 1977 and February 1978.

Moderate effect: Increments of weight and of height for examinations performed in September 1977 and March 1978, October 1977 and April 1978, November 1977 and May 1978, March and September 1978 and April and October 1978.

Little or no effect: Increments of weight and of height for examinations performed in December 1977 and June 1978, January and July 1978 and February and August 1978.

D. Family cash income and nutritional status of children

Data concerning family cash income and anthropometry of children was collected for the population previously described (41). Information concerning wages paid to all permanent workers and their relatives during the year of 1977 was collected from the salaries book in every farm. Income is expressed in two ways: the first employs the traditional approach of dividing the total cash income by the number of members of the family as of June 30,

DH9, DH10, DH11, DH12, DH13 and for DW8, DW9, DW10, DW11, DW12, and DW13 for each of the following dates of examination: June and December 1977, July 1977 and January 1978, August 1977 and February 1978, September 1977 and March 1978, October 1977 and April 1978, November 1977 and May 1978, December 1977 and June 1978, January and July 1978, February and August 1978, March and September 1978, April and October 1978.

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1977. The second way of expressing income is by consumption units, correcting for the family structure as follows. A consumption unit is an adult male who receives a value of one. The other members of the family receive a fraction of a unit, according to their energy needs in relation to the adult male. This approach is based on the fact that poor families used almost all income in food expenditures.

The income variables were related to the nutritional status of children. The procedure of anthropometric data collection and editing was described in Section IV B and information includes all children from 3 to 60 months of age. As some children were evaluated more than once, only the first anthropometric examination from June to December 1977 was selected for the present analyses. Data was analyzed cross-sectionally and categories of W/A, H/A and W/H were elaborated. Continuous and discrete analyses for age categories were done to examine the relationship between family income and nutritional status.

V. RESULTS

A. Prevalence of malnutrition in children residing on coffee farms.

The age and sex distribution of children included in the anthropometric studies presents no important differences as displayed in Table 6.

1. Weight for age

Information on W/A is presented in Table 7 by age groups. A total of 11.8% of children had normal W/A, 50.2% were suffering from first degree malnutrition, 32.9% were in second degree and 5.1% had a W/A deficit greater than 40%, that is, third degree malnutrition.

The highest proportion of children with normal W/A is observed in the 6 to 11 month interval as well as the lowest prevalence of both second and third degree malnutrition; 18.9%. The ages where malnutrition is higher is from 12 to 23 and 24 to 35 months. A total of 44.8% of children 12 to 23 were suffering from second (40.5%) and third degree (4.3%) malnutrition. At 24 to 35 months, 37.7% were in the second degree and 8.4% were in the third degree categories. At the older ages of 48 to 59 months, the percentage of children in second and third degree malnutrition decreases to 29.4%. All comparisons of prevalence of malnutrition between children either 12 to 23 or 24 to 35 months of age against 6 to 11 months and 48 to 59 months are highly significant ($p < 0.01$). The prevalence of malnutrition observed in children 6 to 11 months as compared to that of 48 to 59 months is also significant ($p < 0.05$). The levels of prevalence of malnutrition among children 36 to 47 months are not significantly different from those of children 12

Table 6

Distribution of the sample by sex and age

SEX	AGE GROUPS (MONTHS)					
	6-11	12-23	24-35	36-47	48-59	TOTAL
Males	50	118	103	118	107	496
Females	56	114	112	87	101	470

Table 7

Nutritional status of children 6-59 months

using Gomez classification by age groups

Age Groups (months)	Number of cases	Percentage of children				
		Normal	First Degree	Second Degree	Third Degree	Total
6-11	106	27.4	53.8	15.1	3.8	100.1
12-23	232	9.9	45.3	40.5	4.3	100.1
24-35	215	9.3	44.7	37.7	8.4	100.1
36-47	205	11.2	48.3	35.6	4.9	100.1
48-59	208	9.1	61.5	26.0	3.4	100.1
All groups	966	11.8	50.2	32.9	5.1	100.1

to 23 and 24 to 35 ($p > 0.05$), but differ significantly from those of children 6 to 11 months ($p < 0.01$) and 48 to 59 months ($p < 0.05$).

Regarding sex, 42.4% of females were in second and third degree while in males the prevalence was lower, 33.8% ($p < 0.05$).

2. Height for age

Results of H/A are presented in Table 8. Only 12.0% of children were found to have a normal height, defined as 95% or more of the age-sex specific reference population. Almost one third had a height from 90 to 94% of the reference population. Of the 56.8% of children suffering height retardation (less than 90% of the reference population), 36.7% were between 85 to 89% and 20.1 were below 85% of the reference population. The analyses of height data, by age groups, presents interesting results. As observed in weight for age, younger children have less problems of height retardation than other age groups. However, at such young age as 6 to 11 months only 34% had a height within the acceptable normal limit of 95% or more of the reference population. As children grow older, a greater proportion of them fall below the limits of height retardation. For example, 47.0% of children 12 to 23 months are below 90% of H/A, 64.2% at 24 to 35 months, 63.9% from 36 to 47 months, and 69.8% from 48 to 59 months. In the oldest age group, 48 to 59 months, only 5.3% of children have a height similar to the normal range observed in children from developed countries.

The proportion of children 6 to 11 months of age suffering from height retardation differs significantly from any other age group analyzed ($p < 0.01$) and the proportion of children 12 to 23 months differs from that of all older age groups ($p < 0.01$). Other comparisons are not significant ($p > 0.05$). In males, 55.7%

Table 8

Nutritional status of children 6 to 59 months of age by age groups using height for age

Age Groups (months)	Number of cases	PERCENTAGE OF CHILDREN Percentage from standard				
		95 and more	94-90	89-85	Less 85	Total
6-11	106	34.0	41.5	17.9	6.6	100.0
12-23	232	14.2	38.8	37.1	9.9	100.0
24-35	215	8.8	27.0	37.7	26.5	100.0
36-47	205	8.3	27.8	35.6	28.3	100.0
48-59	208	5.3	25.0	46.2	23.6	100.0
All groups	966	12.0	31.2	36.7	20.1	100.0

were height retarded and 58.0% of females were in the same category ($p > 0.05$).

3. Weight for height

The results of W/H by age groups are shown in Table 9. Taking the cut-off point of 90% of actual weight for the respective height of the child, as the value where children's weight begins to be inadequate for their height (thin children), it is observed that 22.0% children are thin over all age groups. The highest proportion of thin children is observed in 12 to 23 months old where 34.9% of children are below 90% of W/H and, among them, 5.6% have W/H values under 80% of the standard. The group ranking second with problems of W/H is age 24 to 35 months where 23.2% children are below 90% of W/H. The proportion of thin children in the 36 to 47 month period is very similar to that observed in children 6 to 11 months, while from 48 to 59 months it is only 12.0%. No differences are found when the proportion of children 6 to 11 months below 90% of W/H are compared with those for 24 to 35 and 36 to 47 months ($p > 0.05$). There are significant differences between children 6 to 11 months against 12 to 23 months ($p < 0.01$), 12 to 23 against 24 to 35 ($p < 0.05$) and 36 to 47 against 48 to 59 ($p < 0.01$).

The comparison of the proportion of children 24 to 35 months of age below 90% of W/H to that of children 48 to 59 months is also significant ($p < 0.05$).

When results are analyzed by sex, 23.4% of males are below 90% of W/H and in females the proportion is 20.4% ($p > 0.05$).

Table 9

Nutritional status of children 6 to 59 months of age by age groups using weight for height

Age Groups (months)	Number of cases	PERCENTAGE OF CHILDREN PERCENTAGE FROM STANDARD				
		100 and more	99-90	89-80	Less 80	Total
6-11	106	32.1	48.1	16.0	3.8	100.0
12-23	232	13.4	51.7	29.3	5.6	100.0
24-35	215	21.4	55.3	20.9	2.3	99.9
36-47	205	26.3	56.6	16.1	1.0	100.0
48-59	208	21.6	66.3	11.5	0.5	99.9
All groups	966	21.7	56.3	19.4	2.6	100.0

B. Socioeconomic characteristics of families with children residing on coffee farms

Five types of socioeconomic variables derived from the socioeconomic form were elaborated and cover the following areas: occupation, demographic characteristics of the families, the process of ladinization, permanent employment on the farm, and variables describing the environment of the house.

The total sample of families were classified according to the occupation of the head of the family in four categories:

1. Specialized occupations: carpenter, merchant, driver, mason, etc.
2. Apprentices in specialized occupations and in non-agricultural activities: apprentice carpenter, apprentice mason, apprentice driver, gardener, janitor, etc.
3. Salaried agricultural workers (jornaleros).
4. Others: heads of families working outside of the farm, unemployed, injured or retired.

The distribution of the sample in these categories of occupation is presented in Table 10. The majority of the heads of families 73.1% worked as salaried agricultural workers, 16.4% were dedicated to specialized activities, 4.9% have occupations as apprentices of specialized activities or were engaged in non-agricultural tasks and 5.6% had other occupations.

The age distribution of heads of families is presented in Table 11. The majority are in the interval of 20 to 29 years, 34.5%; 32.0% are between 30 to 39 years of age, less than 1% are under 20 years, and only 4.8% are 50 years or more.

Table 10

Distribution of families according to the occupation of the head of the family

OCCUPATION	NUMBER OF CASES	PERCENTAGE
Specialized	159	16.4
Apprentices and non-agricultural activities	47	4.9
Salaried agricultural workers	706	73.1
Others	54	5.6
TOTAL	966	100.0

Table 11

Age distribution of heads of families with children residing on coffee farms

AGE GROUPS OF HEADS OF FAMILIES (YEARS)	NUMBER OF CASES	PERCENTAGE
Less than 20	7	0.7
20-29	342	35.4
30-39	309	32.0
40-49	174	18.0
50 or more	46	4.8
Unknown*	88	9.1
TOTAL	966	100.0

* Cases where the informant was not able to provide accurate information.

The majority of families are composed of five or more members, total of 80.5%, 12.7% have exactly four, and only 6.8% are formed by 3 or fewer persons.

Regarding the distribution of number of children under five years of age living in the same house, 23.7% of families had only one child, 47.7% had two, 17.0% three and 6.6% four or more.

The measurement of the process of "ladinization"* includes the ability of the head of the household to speak an Indian dialect, the use of shoes, and the ability to write and read Spanish. A total of 57.4% of informants reported that the heads of the families spoke an Indian dialect while 42.6% did not. Only 37.7% of heads of families were able to read and write, 60.0% were not and in 2.3% of the cases the informants did not give a definite reliable response. A total of 87.6% of heads of families were reported to have shoes while 12.4% were not.

The information on heads of families working permanently on the farm indicates that 10.1% did not have permanent work and 89.9% did. Information on years of permanent work of heads of families on the farm in which they were residing during the period of the survey is presented in Table 12. A total of 16.6% had less than one year of permanent work, 13.7% had been working from 1 to 4 years, 16.9% from 5 to 9 years and 52.8% for 10 or more years. Only 33.8% of families reported that another member of the family beside the head also had permanent employment on the farm. The distribution of families over number of members working permanently on the farm is presented in Table 13. A total of 66.4% have no members other

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* In this process native Indian families begin to accept western cultural practices ("ladino") and to abandon their own traditional life ways.

Table 12

Percentage of heads of families with different periods of permanent work in the coffee farms

Time with permanent work (years)	Number of cases	Percentage
Less than one	160	16.6
1 to 4	132	13.7
5 to 9	163	16.9
10 and more	511	52.8
TOTAL	966	100.0

Table 13

Percentage of families with different number of members working permanently on the coffee farm

Number of family members other than the head with permanent job	Number of cases	Percentage
None	640	66.4
One	189	19.6
Two	89	9.2
Three and more	46	4.8
TOTAL	966	100.0

than the head of the household working permanently for the farm, 19.6% have one, 9.2% have 2 and 4.8% 3 or more members.

The availability of employment during the harvest season is reflected by the fact that 81.8% of families had the head and another member working during the harvest, while in 16.0% only the head of the household was employed. Table 14 shows the distribution of families over number of members besides the head of the household employed during the harvest of coffee beans. Sixteen percent of families have no other members employed in this period, 64.4% had one or two, 14.8% three or four and 2.6% five or more.

The last type of socioeconomic variable studied in the families with children under five years of age is that of characteristics of the household. The first variable to be explored was the type of floor and results are displayed in Table 15. A total of 28.3% of families reported brick, cement or wood floors, while 69.7% reported dirt floors. The type of material predominating in the walls is presented in Table 16. A total of 21.3% of the houses had walls of brick and block, 62.3% of adobe and bahareque, 14.0% of "lepa" and sugar palm and 2.4% of other materials.

The different types of sources of water supply were also studied. Table 17 shows that 11.5% of the houses had piped water in the house; 58.8% had piped water but the faucets were outside of the house, 17.4% of families used water from wells and 9.9% from either rivers, lakes or rain.

Regarding excreta disposal, Table 18 shows that 6.6% of families have private facilities connected to drainages, 25.5% use latrines, and 62.2% have no services of excreta disposal and defecate in some sections of their own plots or in nearby fields.

Table 14

Percentage of families with different number of members working during the harvest season

Number of members working during harvest	Number of cases	Percentage
Unknown*	21	2.2
None	155	16.0
1 and 2	622	64.4
3 and 4	143	14.8
5 or more	25	2.6
TOTAL	966	100.0

* Cases where the informant was not able to provide accurate information.

Table 15

Percentage of families with different type of floor

Type of floor	Number of cases	Percentage
Brick, cement or wood	273	28.3
Dirt floor	674	69.7
Others	19	2.0
TOTAL	966	100.0

Table 16

Percentage of families with different type of wall

Type of wall	Number of cases	Percentage
Brick and block	206	21.3
Adobe and bahareque	602	62.3
Lepa and sugar palm	135	14.0
Other	23	2.4
TOTAL	966	100.0

Table 17

Percentage of families with different type of water supply

Type of water supply	Number of cases	Percentage
Piped water in the house	111	11.5
Piped water outside the house	568	58.8
Wells	168	17.4
River, lake, rain	96	9.9
Unknown (not specified)	23	2.4
TOTAL	966	100.0

Table 18

Percentage of families with different type of excreta disposal

Type of excreta disposal	Number of cases	Percentage
Private and connected to public drainage or septic well	63	6.6
Latrine	242	25.0
Don't have	601	62.2
Others	60	6.2
TOTAL	966	100.0

C. Socioeconomic characteristics of the families and nutritional status of children

The results of W/A by categories of occupation are presented in Table 19. The highest proportion of normal children, using the criteria developed by Gomez et al (13) is found in specialized occupations, 20.1%, and the lowest in salaried agricultural workers, 9.5%. A total of 32.1% of children whose heads of families had the better jobs on the farms were suffering from second and third degree malnutrition. The percentage of children of apprentices and heads of families in non-agricultural activities suffering from second and third degree malnutrition was slightly lower, 25.5%, while for salaried agricultural workers and other occupations it was 40.1% and 38.9% respectively.

The only statistically significant difference in the prevalence of moderate and severe malnutrition is between children of apprentices and heads of families in non-agricultural activities and those of salaried agricultural workers ($p < 0.05$). The analyses of information on H/A, as illustrated in Table 20, shows that 18.9% of children from families whose head of the household had a specialized job, had a normal height, 12.8% of children from families of apprentices and non-agricultural activities, 10.5% of salaried agricultural workers and 11.1% of children of heads of families in other occupations. The percentage of children suffering height retardation (less than 90% of H/A) was 47.1% in specialized occupations, 53.2% in apprentices, in salaried agricultural workers 59.8% and 50.0% in other occupations. The percentage of children with height retardation in families with specialized occupations is significantly different from that of children from salaried agri-

Table 19

Nutritional status of children 6 to 59 months using Gomez classification by categories of occupation

Categories of Occupations	Number of Cases	Percentage of children				
		Normal	First Degree	Second Degree	Third Degree	Total
Specialized	159	20.1	47.8	29.6	2.5	100.0
Apprentices and non-agricultural activities	47	12.8	61.7	25.5	0.0	100.0
Salaried agricultural workers	706	9.5	50.4	33.9	6.2	100.0
Others	54	16.7	44.4	37.0	1.9	100.0
TOTAL	966	11.8	50.2	32.9	5.1	100.0

Table 20

Nutritional status of children 6 to 59 months using height for age by categories of occupation

Categories of Occupation	Number of Cases	Percentage of children				
		Percentage from standard				
		95 and more	94-90	89-85	less than 85	Total
Specialized	159	18.9	34.0	33.3	13.8	100.0
Apprentices and non-agricultural activities	47	12.8	34.0	31.9	21.3	100.0
Salaried agricultural workers	706	10.5	29.7	37.8	22.0	100.0
Others	54	11.1	38.9	37.0	13.0	100.0
TOTAL	966	12.0	31.2	36.7	20.1	100.0

cultural workers ($p < 0.01$). No other comparisons are significantly different ($p > 0.05$).

The analysis of W/H is presented in Table 21. No important differences are observed in prevalence of thin children (that is less than 90% of W/H) among the distinct categories of occupations ($p > 0.05$).

An analysis was conducted to explore whether the number of children under five years of age living in the same house was related to the nutritional status of the children. Table 22 shows that the prevalence of malnutrition levels II and III is very similar in families with 1, 2, 3 and 4 or more children under five years of age. None of those differences are statistically signifieant ($p > 0.05$). In the case of H/A, the prevalence of children with height retardation was 55.6% in families with only one child, 56.0% in families with 2 children, 61.6% in those with 3 children, and 56.2% in families with 4 or more children. Again the differences are not statistically significant ($p > 0.05$). The analyses of information on W/H show that the prevalence of children under 90% of W/H is 22.0% in families with one child, 23.0% in those with two children, 23.2% in families with 3 children and the lowest, 10.9% in families with 4 or more children. All comparisons on prevalence of thin children between families with 4 or more children under five and families with one, two and three children are significant ($p < 0.05$).

The relationship between number of members in the family and the nutritional status of children was also explored. Families with 3 members or less had 40.0% of their children in second and third degree malnutrition, 33.3% were found in those families with

Table 21

Nutritional status of children 6 to 59 months using weight for height by categories of occupation

Categories of Occupation	Number of Cases	Percentage of children Percentage from standard				
		100% and more	99-90	89-80	less than 80	Total
Specialized	159	24.5	54.1	18.9	2.5	100.1
Apprentices and non-agricultural activities	47	19.1	68.1	12.8	0.0	100.0
Salaried agricultural workers	706	21.1	56.2	19.8	2.8	99.9
Others	54	24.1	53.7	20.4	1.8	100.0
TOTAL	966	21.7	56.3	19.4	2.6	100.0

Table 22

Nutritional status of children 6 to 59 months using Gomez classification by number of children under five years of age living in the house

Number of children living in the house	Number of cases	Percentage of children				
		Normal	First Degree	Second Degree	Third Degree	Total
One	277	11.2	52.0	32.9	9.0	100.1
Two	461	12.8	49.5	32.5	5.2	100.0
Three	164	11.0	45.7	36.0	7.3	100.0
Four or more	64	9.4	59.4	28.1	3.1	100.0
TOTAL	966	11.8	50.2	32.9	5.1	100.0

exactly four members and 38.5% in families with five or more members. None of these differences are significant ($p > 0.05$). The results of H/A present a similar pattern. A total of 51.5% of children were suffering height retardation in families with 3 or less members, 52.9% were found in families with 4 members and in those with 5 or more members the prevalence was 58.0%. All differences are not significant ($p > 0.05$). The results of W/H follow the same pattern as the ones of W/A and H/A, 25.8%, 25.3% and 21.1% of children below 90% of W/H were found in families with 3 or less, exactly four, and five or more members respectively ($p > 0.05$).

The information on the ability of the head of the household to read and write and the nutritional status of their children is presented in Table 23. In families where the head could read and write, 13.6% of children had a normal W/A, 49.1% were in first degree malnutrition, 32.6% suffered from second degree malnutrition and 4.7% were in third degree. The distribution of children where the heads of the household could not read and write was not very different since 9.1% were normal and 51.8, 33.4 and 5.7% were in first, second and third degree respectively. In H/A, 59.3% of children whose heads of household could not read and write were height retarded while the prevalence in those families where the head could read and write was 55.2% ($p > 0.05$). The same pattern is observed in W/H where 21.8% and 22.1% of children were below 90% of W/H in those families where the head of household could not and could read and write, respectively. The ability of the head of the household to speak a local dialect, as an indicator of ladinization, and the nutritional status of children was also studied. Table 24 shows that when the children are classified according to

Table 23

Nutritional status of children 6 to 59 months using Gomez classification according to the ability of the head of the household to read and write

Head of household reads and writes	Number of cases	Percentage of children				
		Normal	First Degree	Second Degree	Third Degree	Total
Yes	580	13.6	49.1	32.6	4.7	100.0
No	386	9.1	51.8	33.4	5.7	100.0
TOTAL	966	11.8	50.2	32.9	5.1	100.0

Table 24

Nutritional status of children 6 to 59 months using Gomez classification and the ability of the head of the household to speak an indian dialect

Head of household speaks an Indian dialect	Number of Cases	Percentage of children				
		Normal	First Degree	Second Degree	Third Degree	Total
Yes	411	9.0	52.5	33.6	4.9	100.0
No	555	13.9	48.5	32.4	5.2	100.0
TOTAL	966	11.8	50.2	32.9	5.1	100.0

Gomez et al (13) there is no difference in their nutritional status whether the head of the household speaks an Indian dialect or not ($p > 0.05$). The results of height retardation show that the prevalence in children whose head of family speaks a dialect is 60.8% while in those who don't is 53.9% ($p > 0.05$). Significant differences in W/H are not found either, when children are classified by this socioeconomic indicator ($p > 0.05$).

A lower prevalence of moderate and severe malnutrition is observed in the children whose head of family did wear shoes as compared to those who did not, 36.8% against 46.6% respectively ($p < 0.05$). A similar pattern is reflected in H/A where the children whose head of the household wears shoes had a prevalence of height retardation of 55.3% against 67.5% in those children whose head of household did not ($p < 0.05$). The same, is observed in W/H since there are only 15.8% of children below 90% of W/H in those families where the head of household wears shoes while in the other families the prevalence of children below 90% of W/H is 22.8%. However, the difference is not significant ($p > 0.05$).

Variables related to employment availability at the farm for the head and other members of the family were also studied in relation to the nutritional status of children. The fact that the head of the household had permanent work on the farm was not related to the nutritional status of the child. A total of 37.9% of children with moderate and severe malnutrition were found in families where the head of the household had permanent employment. The corresponding value for children in families where the head of household did not have permanent employment was 38.8% ($p > 0.05$). The analysis of H/A shows that 57.3% of children had height retarda-

tion in the households where the head of the household had permanent employment while in those families where he did not, the prevalence was 53.1%. The values for children below 90% of W/H are 21.5% for families where the head was employed during the whole year and 25.5% where he was not ($p > 0.05$).

In families where other members beside the head of the household had permanent employment, the prevalence of Gomez grades II and III was 40.2% while in those where only the head of the family had a permanent job the prevalence was 36.9% ($p > 0.05$). The data on H/A yields similar results; 56.8% of children were found to have height retardation in families with more than one member working permanently on the farm, while in those families where only the head of the household was employed, the prevalence of children with height retardation was 56.9% ($p > 0.05$).

Information on W/H indicates that 20.8% of children from families with only the head of the household permanently employed were below 90% of W/H, while in the other families the prevalence was 22.5% ($p > 0.05$). The availability of employment for other members of the family during the harvest season was also studied. In families where only the head of the household worked during the harvest, the prevalence of second and third degree malnutrition was 30.3% while in those where other members worked, the prevalence was 39.6% ($p < 0.05$). The results of H/A shows that 45.1% of children were height retarded in families where no other members participate in the coffee harvest, while in the families where other members pick coffee the prevalence was 59.1% ($p < 0.01$). However, no differences are found when the anthropometric data is analyzed by W/H since both groups had exactly 22.0% of children below 90% of W/H.

The characteristics of the household were also related to the nutritional status of the children. There were 32.2% of children in second and third degree malnutrition living in houses with floors made of brick, cement, or wood. The prevalence found in houses with dirt floors was 40.8% ($p < 0.01$). A total of 52.4% of children were found to be height retarded in houses with floors of cement, brick or wood, while the corresponding prevalence for children from houses with dirt floors was 58.7% ($p > 0.05$). Information on W/H follows the same pattern since 22.0% of children where the floors were built of cement, brick or wood were below 90% of W/H while in those families where there were dirt floors the prevalence was 22.1%.

A total of 36.0% of children from houses with piped water in the house were classified in second and third degree malnutrition, as shown in Table 25. In families where the water was piped but the main source of supply was a spigot outside of the house, the prevalence of II and III degree malnutrition was 36.7%. In those families where the water comes from wells, 41.7% of children were suffering from moderate and severe malnutrition, while in those where water was obtained from rivers, lakes or rain, the prevalence was 41.2%. None of these differences are significant ($p > 0.05$).

The data on H/A follows a similar pattern; 52.2% of children in families with an internal piped water system were height retarded, 58.3% in families with piped systems outside the house, 54.7% in families with wells, and 57.1% in families where water was obtained from rain, rivers or lakes. Differences are not statistically significant ($p > 0.05$). When the data on W/H is analyzed it is

Table 25

Nutritional status of children 6 to 59 months using Gomez classification by source of water supply

Source of water supply	Number cases	Percentage of children				
		Normal	First Degree	Second Degree	Third Degree	Total
Piped water in the house	111	19.8	44.1	28.8	7.2	99.9
Piped water outside of the house	568	10.7	52.6	31.5	5.1	99.9
Wells	168	13.1	45.2	37.5	4.2	100.0
Rivers, lakes or rain	119	7.6	51.3	37.0	4.2	100.0
TOTAL	966	11.8	50.2	32.9	5.1	100.0

observed that 18.9% of children from families with piped systems in the house were below 90% of W/H, 20.1% were found in families with piped water outside of the house, 31.0% of children were below 90% of W/H in families using wells, and 21.8% in families with water from rivers, rain or lakes. When the prevalence of W/H retardation in children from families using wells is compared with those of children from families with intradomiciliary piped water inside of the house and piped water outside of the house, the differences are significant ($p < 0.05$).

D. Effect of the rainy and dry season on nutritional status of children

The results on W/A according to Gomez et al. (13) for children 3 to 24 months of age for the dry and rainy months are shown in Table 26. All comparisons of prevalence of second and third degree malnutrition for the dry and rainy months in the eight age groups compared, gives no significant statistical differences ($p > 0.05$). There is not any pattern across age groups of consistent higher prevalences of II and III degree malnutrition in rainy or dry months. The results for older children, 30 to 60 months are displayed in Table 27. Although one of the comparisons, children at 54 months is statistically significant ($p < 0.05$), no specific pattern emerge in the other age groups.

The results for increments in weight and in height during the rainy, dry and intermediate periods are displayed in Tables 28 and 29 for children 3 to 24 months and 24 to 60 months respectively. The increments in weight and in height are not affected by the rainy and dry season. Most comparisons for the 13 increments in both weight and height during the rainy and dry seasons are not statis-

Table 26

Nutritional status of children 3 to 24 months using Gomez classification during the rainy and dry season

Age Groups	Season*	Number of Cases	Percentage of children** Normal	First Degree	Second Degree	Third Degree	TOTAL
Months:							
3	Rainy	96	49.0	42.7	6.2	2.1	100.0
3	Dry	120	45.8	39.2	13.3	1.7	100.0
6	Rainy	107	32.7	49.5	17.8	0.0	100.0
6	Dry	85	34.1	40.0	21.2	4.7	100.0
9	Rainy	101	12.9	52.5	31.7	3.0	100.1
9	Dry	92	14.1	62.0	20.6	3.3	100.0
12	Rainy	88	4.5	43.2	46.6	5.7	100.0
12	Dry	126	9.5	45.2	42.9	2.4	100.0
15	Rainy	87	5.8	39.1	48.3	6.9	100.1
15	Dry	137	8.0	47.4	41.6	2.9	99.9
18	Rainy	103	1.0	45.6	48.5	4.8	99.9
18	Dry	122	5.7	41.0	53.3	0.0	100.0
21	Rainy	81	3.7	46.9	45.7	3.7	100.0
21	Dry	112	4.5	34.8	54.5	6.2	100.0
24	Rainy	73	2.7	38.4	54.8	4.1	100.0
24	Dry	109	2.8	43.1	51.4	2.8	100.1

* Rainy: May-October, 1978. Dry: November, 1977 - April 1978.

** All comparisons of prevalences of malnutrition II and II are not significant ($p > 0.05$).

Table 27

Nutritional status of children 30 to 60 months using Gomez classification during the rainy and dry season

Age Groups	Season*	Number of Cases	Categories of Gomez Percentage of children				
			Normal	First Degree	Second Degree	Third Degree	TOTAL
Months:							
30	Rainy	73	8.2	42.5	46.6	2.8	100.1
30	Dry	105	5.7	43.8	46.7	3.8	100.0
36	Rainy	76	1.3	55.3	40.8	2.6	100.0
36	Dry	91	3.3	42.9	50.5	3.3	100.0
42	Rainy	68	7.4	44.1	48.5	0.0	100.0
42	Dry	92	6.5	59.8	33.7	0.0	100.0
48	Rainy	69	5.8	49.3	44.9	0.0	100.0
48	Dry	117	3.4	60.7	35.0	0.9	100.0
54	Rainy	79	6.3	63.3	29.1**	1.3	100.0
54	Dry	97	5.2	47.4	47.4	0.0	100.0
60	Rainy	69	4.4	47.8	47.8	0.0	100.0
60	Dry	97	9.3	50.5	38.1	2.1	100.0

* Rainy: May-October, 1978. Dry: November 1977-April 1978

** The comparison of prevalence of second and third degree malnutrition at 54 month of age is statistically significant ($p < 0.05$)

Table 28

Increments on weight and height in children 3 to 24 months during the rainy and dry season

Increment (months)	Season	Weight (kg.)			Height (cm.)		
		Cases	Mean	S.D.	Cases	Mean	S.D.
6-3	Rainy	33	1.14	0.48	29	4.91	1.63
6-3	Dry	36	1.11	0.49	36	4.28	1.74
6-3	Intermediate	84	1.11	0.48	83	4.87	1.61
9-6	Rainy	65	0.54	0.36	65	3.71	1.58
9-6	Dry	66	0.52	0.38	64	3.42	1.60
9-6	Intermediate	157	0.54	0.37	159	3.49	1.61
12-9	Rainy	95	0.37	0.64	90	2.50	1.26
12-9	Dry	113	0.41	0.63	107	2.64	1.25
12-9	Intermediate	223	0.34	0.60	211	2.61	1.24
15-12	Rainy	112	0.33	0.66	113	2.21	1.16
15-12	Dry	142	0.34	0.60	140	2.27	1.20
15-12	Intermediate	267	0.31	0.63	266	2.23	1.18
18-15	Rainy	132	0.53	0.50	137	2.34	1.17
18-15	Dry	161	0.50	0.49	159	2.27	1.20
18-15	Intermediate	283	0.50	0.50	287	2.26	1.22
21-18	Rainy	131	0.32	0.63	127	1.86	1.20
21-18	Dry	154	0.30	0.63	150	1.87	1.19
21-18	Intermediate	247	0.32	0.63	241	1.90	1.16
24-21	Rainy	105	0.47	0.62	105	1.98	1.24
24-21	Dry	116	0.48	0.65	117	1.76	1.23
24-21	Intermediate	194	0.50	0.61	200	1.94	1.22

All comparisons for weight and for height are not significant ($p > 0.05$).

Table 29

Increments in weight and height in children 24 to 60 months during the rainy and dry season

Increment (months)	Season	Weight (kg.)			Height (cm.)		
		Cases	Mean	S.D.	Cases	Mean	S.D.
30-24	Rainy	56	1.07	0.46	62	3.37	1.55
30-24	Dry	98	1.04	0.50	104	3.22	1.66
30-24	Intermediate	63	1.05	0.61	63	3.29	1.71
36-30	Rainy	48	0.77	0.48	56	2.60	1.31
36-30	Dry	53	0.83	0.50	60	2.43	1.33
36-30	Intermediate	40	0.74	0.42	44	3.15	1.29
42-36	Rainy	40	1.12	0.53	37	2.72	1.07
42-36	Dry	55	0.95	0.51	54	2.53	1.18
42-36	Intermediate	45	0.92	0.61	43	2.69	1.25
48-42	Rainy	52	0.76	0.48	53	2.55	1.23
48-42	Dry	71	0.74	0.55	75	2.65	1.22
48-42	Intermediate	45	0.79	0.47	46	2.86	1.06
54-48*	Rainy	45	0.90	0.46	47	2.30	1.11
54-48	Dry	70	0.79	0.46	79	2.29	1.26
54-48	Intermediate	45	0.55	0.37	45	2.32	0.91
60-54	Rainy	46	0.79	0.52	42	2.42	1.33
60-54	Dry	69	0.79	0.51	67	2.39	1.36
60-54	Intermediate	28	0.71	0.74	26	2.63	1.15

* Only the difference in increments in height at 54-48 months for rainy and dry versus intermediate is significant ($p < 0.01$)

tically significant. There is not for either weight or height a specific pattern of better growth during a given season across age groups. The only significant difference is found at the 54-48 month interval for weight where the intermediate season differs from the rainy and dry ones ($p < 0.05$).

E. Effect of the coffee harvest on nutritional status of children

Results of W/A for children 3 to 24 months during the harvest and non-harvest months are displayed in Table 30. The distribution of children in second and third degree malnutrition is very similar during the examinations performed in the harvest and non-harvest months ($p > 0.05$). The same pattern is observed when the information for children 30 to 60 months is examined as presented in Table 31. None of the comparisons of prevalence of second and third degree malnutrition are significant ($p > 0.05$).

The data on increments in weight and in height for children under 24 months of age is shown in Table 32. The values of weight and height gains, achieved in the trimestral intervals during the harvest and non-harvest periods are very similar and not statistically significant ($p > 0.05$). The same holds true for the gains in weight and height in older children, 24 to 60 months, displayed in Table 33. None of the possible comparisons between "strong effect" and "no effect" of the harvest on children's growth were statistically significant ($p > 0.05$). As in the rainy and dry comparisons, no specific pattern of better growth in a given period is observed across age groups. When the results of "moderate effect" of the harvest are compared with the ones of "none" and "strong" effect, the difference at 42-36 months is statistically significant ($p < 0.05$).

Table 30

Nutritional status of children 3 to 24 months using Gomez classification measured during harvest* and non-harvest months**

Group	Period	Number of Cases	Categories of Gomez Percentage of Children				
			Normal	First Degree	Second Degree	Third Degree	Total
3	Harvest	71	50.7	42.2	5.6	1.4	99.9
3	Non-harvest	166	45.8	39.2	13.2	1.8	100.0
6	Harvest	42	45.2	38.1	11.9	4.8	100.0
6	Non-harvest	208	30.3	49.5	18.3	1.9	100.0
9	Harvest	97	13.4	58.8	22.7	5.1	100.0
9	Non-harvest	191	19.9	56.0	23.0	1.1	100.0
12	Harvest	90	14.4	42.2	41.1	2.2	99.9
12	Non-harvest	206	5.8	47.6	42.2	4.4	100.0
15	Harvest	95	8.4	42.1	45.3	4.2	100.0
15	Non-harvest	204	6.9	46.1	41.7	5.4	100.1
18	Harvest	91	5.5	40.7	50.5	3.3	100.0
18	Non-harvest	206	2.9	44.2	50.5	2.4	100.0
21	Harvest	68	4.4	47.1	45.6	2.9	100.0
21	Non-harvest	184	3.8	38.6	52.2	5.4	100.0
24	Harvest	70	5.7	44.3	47.1	2.9	100.0
24	Non-harvest	177	3.4	38.4	54.2	4.0	100.0

* Harvest months: September, October, November, December 1977 and September-October, 1978.

** Non-harvest months: June, July, August, 1977. January, February, March, April, May, June, July, August 1978.

*** None of the comparisons of prevalence of second and third degree malnutrition are significant ($p > 0.05$)

Table 31

Nutritional status of children 30 to 60 months using the Gomez classification measured during harvest* and non-harvest** months

Age Group	Period	Number of Cases	Categories of Gomez Percentage of Children				
			Normal	First Degree	Second Degree	Third Degree	Total
30	Harvest	67	1.5	41.8	55.2	1.5	100.0
30	Non-harvest	165	7.3	41.8	46.1	4.8	100.0
36	Harvest	70	1.4	51.4	44.3	2.9	100.0
36	Non-harvest	153	2.0	45.1	50.3	2.6	100.0
42	Harvest	79	10.1	51.9	36.7	1.3	100.0
42	Non-harvest	151	6.0	53.6	39.7	0.7	100.0
48	Harvest	85	4.7	55.3	40.0	0.0	100.0
48	Non-harvest	156	3.8	53.2	42.3	0.6	99.9
54	Harvest	90	8.9	54.4	36.7	0.0	100.0
54	Non-harvest	146	5.5	52.0	41.8	0.7	100.0
60	Harvest	69	8.7	53.6	36.2	1.5	100.0
60	Non-harvest	162	6.2	48.2	45.0	0.6	100.0

* Harvest months: September, October, November, December 1977 and September, October 1978.

** Non-harvest months: June, July, August 1977. January, February, March, April, May, June, July, August 1978.

Table 32

Increments on weight and height in children 3 to 24 months during different periods of effect of the coffee harvest

Increment (months)	Effect of the harvest	Weight (Kg.) Cases	Mean	S.D.	Height (cm.) Cases	Mean	S.D.
6-3	None	126	1.09	0.50	122	4.75	1.66
6-3	Moderate	19	1.29	0.55	19	4.70	1.77
6-3	Strong	7	0.85	0.46	7	4.56	1.35
9-6	None	181	0.53	0.37	181	3.42	1.58
9-6	Moderate	60	0.54	0.36	61	3.86	1.60
9-6	Strong	47	0.52	0.38	46	3.50	1.65
12-9	None	245	0.36	0.60	230	2.58	1.28
12-9	Moderate	103	0.41	0.66	98	2.57	1.22
12-9	Strong	83	0.31	0.60	80	2.65	1.17
15-12	None	274	0.29	0.63	271	2.17	1.21
15-12	Moderate	141	0.38	0.63	142	2.29	1.16
15-12	Strong	106	0.32	0.63	106	2.32	1.12
18-15	None	292	0.49	0.50	290	2.29	1.22
18-15	Moderate	168	0.52	0.50	172	2.21	1.20
18-15	Strong	116	0.52	0.49	121	2.34	1.17
21-18	None	244	0.30	0.62	239	1.88	1.16
21-18	Moderate	174	0.31	0.65	166	1.87	1.22
21-18	Strong	114	0.34	0.62	113	1.90	1.16
24-21	None	184	0.45	0.64	184	1.86	1.23
24-21	Moderate	139	0.51	0.61	142	1.88	1.23
24-21	Strong	92	0.54	0.60	96	2.00	1.33

No comparisons between "none", "moderate" and "strong" effect of the harvest are significant ($p > 0.05$).

Table 33

Increments on weight and height in children 24 to 60 months during different periods of effect of the coffee harvest

Increments (months)	Effect of the harvest	Weight (kg.)			Height (cm.)		
		Cases	Mean	S.D.	Cases	Mean	S.D.
30-24	None	81	1.09	0.51	87	3.30	1.50
30-24	Moderate	48	1.03	0.55	49	3.30	1.50
30-24	Strong	88	1.02	0.52	93	3.28	1.68
36-30	None	53	0.71	0.46	61	2.72	1.31
36-30	Moderate	25	0.92	0.50	27	2.44	1.26
36-30	Strong	63	0.79	0.47	72	2.76	1.37
42-36	None	62	1.01	0.56	60	2.60	1.22
42-36	Moderate	22	0.75	0.48	22	2.66	1.09
42-36	Strong	56	1.05	0.55	52	2.67	1.17
48-42	None	73	0.75	0.48	75	2.63	1.18
48-42	Moderate	31	0.77	0.61	34	2.81	1.25
48-42	Strong	64	0.77	0.49	65	2.66	1.17
54-48	None	72	0.76	0.46	75	2.30	1.10
54-48	Moderate	27	0.64	0.42	33	2.21	1.34
54-48	Strong	61	0.78	0.46	63	2.35	1.06
60-54	None	61	0.77	0.61	56	2.56	1.29
60-54	Moderate	33	0.75	0.45	33	2.15	1.32
60-54	Strong	49	0.78	0.58	46	2.52	1.31

All comparisons for weight and height between none, and strong effect of the harvest are not significant ($p > 0.05$)

The comparisons at 42-36 months of age between moderate and none and strong effect of the harvest for weight are significant ($p < 0.05$)

F. Family cash income and nutritional status of children

The correlation coefficients between family annual income per capita (FAIPC), family annual income per consumption unit (FAIPCU) and the three indexes of nutritional status, weight for age, height for age and weight for height by age groups are displayed in Table 34.

Taking all the age groups combined, there is a highly significant ($p < 0.01$) relationship between both FAIPC and FAIPCU and W/A. The relationship between FAIPC and H/A for all age groups combined is also significant ($p < 0.01$) as well as that between FAIPCU and H/A ($p < 0.001$). However, the correlations between W/H and FAIPC or FAIPCU are not statistically significant ($p > 0.05$).

When the same data are analyzed by age groups there are significant correlations between W/A and both FAIPC and FAIPCU at 9 months ($p < 0.05$) and at 54 months for FAIPC ($p < 0.01$) and FAIPCU ($p < 0.05$). With regards to height, correlations are significant at 9 months for both FAIPC and FAIPCU ($p < 0.01$) and at 24, 48 and 54 months ($p < 0.05$). Of all the age specific correlations for W/H only one, at 42 months, is significant ($p < 0.05$).

Table 35 show the distribution of children 3 to 60 months of age in the various Gomez categories by quartiles of FAIPC. The children from families whose incomes were in the "low" and "very low" quartiles have a prevalence of second and third degree malnutrition higher than those of children whose families were in the highest quartiles of income. The differences are significant at ($p < 0.05$) for "very low" and at ($p < 0.01$) for children in the "low" quartile of income.

The data on growth retardation, as measured by H/A over quartiles of income displayed in Table 36, do not show significant

Table 34

Correlations between family annual income per capita (FAIPC), family annual income per consumption unit (FAIPCU) and different indexes of nutritional status by age groups of children

Age Groups (months)	Number of cases	Weight for age		Height for age		Weight for height	
		FAIPC	FAIPCU	FAIPC	FAIPCU	FAIPC	FAIPCU
3	31	-.109	-.045	-.134	-.048	-.043	-.036
6	47	.076	.178	.063	.208	.070	.098
9	44	.376*	.328*	.429**	.415**	.068	.079
12	51	-.065	-.050	-.031	-.023	-.083	-.069
15	41	-.005	-.096	-.192	-.254	.211	.144
18	40	.190	.220	.167	.157	.117	.164
21	38	.043	-.010	.077	.048	-.026	-.067
24	34	.170	.131	.338*	.335*	-.123	-.176
30	52	.103	.096	.081	.081	.091	.078
36	49	-.022	-.048	.038	-.015	-.091	-.067
42	69	.201	.063	.073	-.078	.258*	.194
48	57	.187	.194	.263*	.263*	-.072	-.067
54	64	.339**	.306*	.303*	.266*	.179	.167
60	57	.144	.217	.179	.066	.003	.050
All Children	674	.105**	.119**	.129**	.141***	.029	.049

1. Income is expressed in US$
2. Nutritional status in the 3 indexes is expressed as a percentage of the age specific median of Iowa Standards.

* Significant at $p < .05$
** Significant at $p < .01$
*** Significant at $p < .001$

Table 35

Nutritional status of children 3 to 60 months of age using Gomez classification by quartiles of FAIPC

Quartiles of FAIPC	Number of cases	PERCENTAGE OF CHILDREN				
		Normal	First Degree	Second Degree	Third Degree	Total
Very low	168	8.3	45.8	43.5	2.4	100.0
Low	169	10.1	40.2	45.6	4.1	100.0
Middle	169	12.4	47.3	37.9	2.4	100.0
High	168	10.7	57.1	30.4	1.8	100.0
TOTAL	674	10.4	47.6	39.3	2.7	100.0

Table 36

Nutritional status of children 3 to 60 months of age using height for age by quartiles of FAIPC

Quartiles of FAIPC	Number of cases	Percentage of children				
		Percentage from standard				
		95% and more	94 - 90	89 - 85	less than 85%	Total
Very low	168	2.4	25.0	39.3	33.3	100.0
Low	169	4.7	20.7	46.2	28.4	100.0
Middle	169	4.7	27.2	40.8	27.2	100.0
High	168	5.4	28.6	47.6	18.5	100.0
TOTAL	674	4.3	25.4	43.5	26.8	100.0

differences in prevalence of height retardation (children under 90% height for age) by quartiles of the distribution of family incomes ($p > 0.05$). However, it is important to notice that 33.3% of children from the lowest quartile of family income are below 85% H/A, while the proportion of children in the highest quartile of FAIPC is only 18.5% ($p < 0.01$).

The distribution of children in various categories of W/H over quartiles of FAIPC is displayed in Table 37. The proportion of thin children in the "very low" and "low" quartiles is significantly different from that of children in the "high" quartile of FAIPC ($p < 0.01$), as well as that between children in the middle quartile of income and those children in the high quartile of FAIPC ($p < 0.05$).

Categories of W/A by quartiles of FAIPCU are presented in Table 38. Differences in the proportion of children with second and third degree malnutrition in the very low quartile of FAIPCU and that of children in the middle and high quartiles of FAIPCU are significant ($p < 0.05$) as well as that of children in the low and high quartiles ($p < 0.01$).

The information on prevalence of height retardation over quartiles of FAIPCU is displayed in Table 39. Differences in the proportion of children under 90% of H/A in the low and high quartiles of FAIPCUare significant ($p < 0.05$).

Table 40 present the data on W/H over quartiles of FAIPCU. The proportion of thin children in the very low quartile of income is statistically different from that of children in the middle ($p < 0.01$) and high ($p < 0.05$) quartiles of FAIPCU.

In order to explore in more iepth the relationship between

Table 37

Nutritional status of children 3 to 60 months of age using weight for height by quartiles of FAIPC

Quartiles of FAIPC	Number of cases	Percentage of children: Percentage from standard				
		100% and more	99 - 90	89 - 80	less than 80%	Total
Very low	168	37.5	42.3	19.0	1.2	100.0
Low	169	33.7	46.2	18.9	1.2	100.0
Middle	169	39.1	49.7	11.2	0.0	100.0
High	168	41.1	48.8	10.1	0.0	100.0
TOTAL	674	37.8	46.8	14.8	0.6	100.0

Table 38

Nutritional status of children 3 to 60 months of age using Gomez classification by quartiles of FAIPCU

Quartiles of FAIPCU	Number of cases	PERCENTAGE OF CHILDREN				
		Normal	First Degree	Second Degree	Third Degree	Total
Very low	168	8.3	44.0	43.5	4.2	100.0
Low	169	8.9	40.2	48.5	2.4	100.0
Middle	169	11.9	53.0	33.9	1.2	100.0
High	168	12.4	53.3	31.4	3.0	100.0
TOTAL	674	10.4	47.6	39.3	2.7	100.0

Table 39

Nutritional status of children 3 to 60 months of age using height for age by quartiles of FAIPCU

Quartiles of FAIPCU	Number of cases	Percentage of children Percentage from standard				
		95% and more	94 - 90	89 - 85	less than 85%	Total
Very low	168	1.8	25.6	41.1	31.5	100.0
Low	169	5.3	17.8	43.2	33.7	100.0
Middle	169	4.2	28.6	41.7	25.6	100.0
High	168	5.9	29.6	47.9	16.6	100.0
TOTAL	674	4.3	25.4	43.5	26.8	100.0

Table 40.

Nutritional status of children 3 to 60 months of age using weight for height by quartiles of FAIPCU

Quartiles of FAIPCU	Number of cases	Percentage of children Percentage from standard				
		100% and more	99 - 90	89 - 80	less than 80%	Total
Very low	168	35.1	42.9	20.2	1.8	100.0
Low	169	33.1	49.7	16.6	0.6	100.0
Middle	169	41.7	48.2	10.1	0.0	100.0
High	168	41.4	46.2	12.4	0.0	100.0
TOTAL	674	37.9	46.8	14.8	0.6	100.0

income and nutritional status at various ages, the children were divided into four categories of FAIPC; that is less than 200 dollars, 200 to 299, 300 to 399 and 400 and more and in 2 age subgroups, 30 or less and from 36 to 60 months of age.

Table 41 shows that there was not a significant difference in any of the three indexes of growth retardation by levels of FAIPC in children 3 to 30 months ($p > 0.05$). However, as displayed in Table 42, there are important differences in growth retardation in children aged 36 to 60 months by level of income. The prevalence of children under 75% of W/A in families with a FAIPC of less than 200 US$ and from 200 to 299 is different from that of children in households with FAIPC higher than US$ 400 ($p < 0.01$). The difference in the proportion of children under 90% of H/A in families below US$ 200 FAIPC and over US$ 400 is also significant ($p < 0.05$). The proportion of thin children in families under US$ 200 of FAIPC differs from that of children with FAIPC between US$ 300 to US$ 399 and from that of US$400 of FAIPC and more ($p < 0.05$). The differences in weight for age and weight for height between children with FAIPC of US$ 200 to US$ 299 and US$ 400 and more are also significant ($p < 0.05$).

Table 41

Growth retardation measured by weight for age, height for age and weight for height by levels FAIPC in children 3 to 30 months of age

FAIPC U.S.$	Number of cases	Indexes of growth retardation. Percentage of children		
		Weight for age Under 75%	Height for age Under 90%	Weight for Height Under 90%
less than 200	55	47.3	67.3	25.4
200 - 299	109	46.8	61.5	25.7
300 - 399	103	38.8	66.0	14.6
400 and more	112	37.5	63.3	15.2
TOTAL	379	42.0	63.6	19.5

Table 42

Growth retardation measured by weight for age, height for age and weight for height by levels FAIPC in children 36 to 60 months of age

FAIPC U.S.$	Number of cases	Indexes of growth retardation. Percentage of children		
		Weight for age under 75%	Height for age under 90%	Weight for height under 90%
less than 200	45	55.6	91.1	20.0
200 - 299	96	47.9	81.2	11.6
300 - 399	76	39.5	79.0	5.3
400 and more	78	28.2	74.4	3.8
TOTAL	295	41.7	80.3	9.2

VI. DISCUSSION

The occupational structure in the coffee farms demonstrate that the majority of head of families, 73.1%, were landless salaried agricultural workers ("jornaleros-colonos") residing in houses owned by the plantation. Although other occupational groups as administrative clerks, drivers, supervisors, carpenters, plumbers are found in the coffee plantations, and regarded as occupations of more prestige within the farm, the reality is that in terms of access to food and other goods, prices, housing conditions, medical attention, environmental sanitation, schooling and others they are not a group which is very distinct from the "colonos". Thus not only because of the high concentration of one occupational group in the coffee farms but also because of the similarity of living conditions of the remaining families whose head of households are in other occupational categories in the plantations, one can regard families residing in coffee farms as a functional group, sharing the same problems of poverty and poor environment leading to deprivation and malnutrition and likely to respond similarly to intervention programmes, or to any measures affecting the general level of economic activity in coffee production.

In order to complete the functional classification exercise in coffee growing regions of Guatemala, studies on nutritional status and of social, economic and cultural characteristics of populations living in towns surrounding coffee plantations should be conducted. A wider variety of occupations and more heterogenity of problems and respective solutions are to be found in these communities whose economic activities are heavily influenced and dependent on the needs of coffee plantations. It is likely that within these towns

one may find subgroups of families with various risks of malnutrition requiring, as in the case of subsistence communities (36, 37), distinct strategies in terms of programmes. However, a series of services not available for coffee farms may be available to these populations largely dedicated to activities in the service sector. Thus it will not be unlikely that problems of growth retardation are less severe in these than in families residing inside of the plantations. The nature of problems of deprivation, health and nutrition in families residing in coffee plantations emerge as a result of the lack of access to means of production and in the existing legislation regarding minimum wages and labour conditions. Although coffee is the most profitable export product in Guatemala; the wealth derived from this activity is concentrated in the hands of few owners and not shared by most families engaged in its production.

Clearly the short and medium term solutions to the problem of deprivation and malnutrition in Guatemala could only be achieved through an effective national policy intended to redistribute wealth and the means of production, modifying as a result, the existing composition of groups exercising political power. In practice, governments in the last 25 years have been determined to maintain the current power and economic structures. They have provided on a small scale, largely ineffective social services for specially deprived sectors of the population. Within these political constraints for a more rapid improvement in living conditions of families residing in coffee farms, and with the present framework for action laid out by the government, a series of activities have been identified as feasible and which are likely to contribute to

improvements in nutrition and health conditions, although they are unlikely to be particularly effective in attacking the nature of the nutrition problem in coffee plantations. These possible programmes are discussed in detail at the end of this section.

The levels of employment in coffee farms, both permanently and seasonally, are relatively high when compared with other areas of Guatemala. However, as mentioned before the problem is that the very low wages do not allow a family to fulfill their basic needs of food and others.

Along with the problem of low minimum wages for most heads of families; (£0.75 day); and the lack of opportunities to get involved in agricultural activities of their own there are also other issues affecting the purchase power of families. There is a small variety of foods and goods available either in the two or three small stores in the farms or brought by merchants from outside. Prices, however are mostly at least double those found in small stores and markets in nearby towns. Only corn is an exception as it is obtained at wholesale prices, during the corn harvest, stored on the plantations, and sold at the same low price most times with credit facilities given by the farm throughout the year.

There is an overwhelming problem of overcrowding that needs to be analyzed from various angles. Houses, only one fifth of which are in good condition, are inside of the plantations and sites and structures are provided by the owners. Thus any national scheme to improve housing conditions should deal with the delicate issue of ownership of the site and structure of the house. The first problem is that houses are very close to one another lacking privacy and space for hygienic and other family needs. Second,

houses are a one room structure, 5 for 7 meters, most of them with dirt floors where adults and children sleep together with no windows or source of ventilation other than the front door. Cooking also takes place in the same room and a heavy humid atmosphere provides a considerable proportion of CO_2 with possible effects on eye infections, respiratory diseases and particularly low birth weight. Other environmental conditions contribute to the existing problems of health. Water supplies come from old piped systems from rivers in the mountains. However, in most sites in the mountains where water is being drawn, it is already contaminated. Furthermore as water is usually collected by mothers and children from public fawcets and taken home for use during the entire day, there are also many other possibilities for further contamination at the household level. The size of potential sources of contamination is illustrated by the fact that 62.2% of families used surrounding areas of their house site to defecate; there is not any adequate system of trash disposal and dogs, pigs and chickens, are allowed inside or in the close surroundings of the houses.

There is in almost all farms the traditional system of medical care where a physician paid by the plantation visits the farms one day a month to see very ill patients. The cost of medicines usually is paid by the patients and if it is too high a loan is obtained from the farm administration that is discounted from their fortnightly salaries. Government medical care services are only available in large towns far from the plantations. No preventive medicine at all is available for these communities. Although families are large, family planning services are not available at the farm level but in the health posts in the towns. Despite the massive radio

campaigns by the national family planning programme, little success has been achieved in persuading Indian populations to practice family planning methods in rural Guatemala.

Illiteracy is an overwhelming problem facing coffee farms as it is in most rural areas of Guatemala. Only around one third of the adults were able to read and write, most of them with great difficulty. The problem is far from being solved or even reduced for younger generations, as farms only provide the first 2 or 3 grades of primary school. Those children who manage to finish third grade at ten or eleven years of age, are immediately incorporated into the labour force of the farm, helping their parents in their agricultural tasks; learning the job with no pay until they turn 16 years old. Elementary schools, with upper grades are located in middle size and high schools in large towns, usually a 2 to 3 hours walk from the farm. Transportation by bus or other means are not available in most farms and when it is, the fares are very high for families who want to send their children to school daily.

The anthropometric data collected demonstrate that a high proportion of children were suffering from growth retardation particularly when age dependent indicators are utilized. Although anthropometric information on children collected from different functional groups by similar sample frames and techniques will only be available by the end of this year, it is already clear that the prevalence of second and third degree malnutrition (13) observed in children from coffee farms is higher than that found in a national sample survey, conducted in 1976 (24). Clearly the problems of growth retardation in children residing in coffee plantations in

Guatemala are by far greater than those observed in children from coffee growing regions of El Salvador (15) and Costa Rica (35).

The anthropometric data from children residing in coffee farms, corroborate the dietary information from children collected in the longitudinal study conducted by INCAP in the 13 coffee farms (41). Cultural practices, heavily influenced by economic constraints, make this area of the world one with a very long period of breast feeding. Very few foods are introduced and consistently consumed by children under one year of age. At 18 months, even if the mother becomes pregnant again, most children in coffee farms are breast fed and their major energy and nutrients source is mother's milk. The weaning food available at home usually given to young children is "tortilla" whose texture does not make it a suitable food for meeting a reasonable proportion of the energy and nutrient needs of young children. Furthermore, the previous nutritional status of lactating women, their energy and nutrient intake during the period of milk production, and the increments in weight and in height from 3 to 6 months, suggest that their milk output may not entirely satisfy children's needs, during the first six months of life and, for sure, not thereafter.

Older children are able to consume more quantities of corn in the form of "tortillas", beans, noodles, vegetables and other products that are part of the adult's diet and, as they have considerable retardation in height by 3 years, a greater proportion of them begin to fall within acceptable levels of weight for age and, of course, weight for height at older ages.

The analyses of data on socioeconomic characteristics of families, as they relate to the nutritional status of children,

W/A, H/A and W/H also indicates the homogenity of families residing in coffee plantations as a functional group. The family socio-economic indicators, utilized in the present study, have been successfully related to nutritional status in other types of communities (23, 36, 37). However, in the coffee farms only income, occupation of the head of the household and the use of shoes discriminate statistically the prevalence of malnutrition in distinct groups. The use of a classifications of nutritional status using weight for height and height for age by Waterlow (128) when related to family socioeconomic indicators did not provide different results from those of W/A, H/A and W/H. The use of combined socioeconomic parameters and more elaborated statistical approaches, to discriminate groups with distinct risks of malnutrition, were not attempted as they may not be of great use in the process of functional classification. The findings suggest that families living in coffee farms are rather homogeneous in their styles of life, health and nutritional status, as the system does not allow for stratification with those marked differences in housing, environmental sanitary conditions, medical care, education, community organization which separate distinct groups with different risks of malnutrition, as is the case in other types of community.

The responses on the process of ladinization provides useful data on present and future acceptance of change. Indians are regarded by other cultural and ethnic groups in Guatemala as low class. The majority of the population living in coffee farms are Indians themselves or descendents of Indians who migrated to the coffee farms during this century from different geographical areas

of the highlands of Guatemala (41). Distance, time, their occupational conditions as wage earners and social pressures have forced them to abandon most of their original traditions. Communication in dialect with members of their family and neighbours is perhaps one of the few remaining ties with their original Indian culture. It is possible that in most families where the head of household was reported as not speaking a dialect, he does in fact do so. Children from these families, when they grow up, will consider themselves "ladinos" and will perhaps accept and adopt changes more rapidly than Indian families.

Quantitative results and observations in different parts of the world have indicated that seasons may have different effects in food consumption patterns and ultimately in the nutritional status of children (51, 52, 61). The present study addresses two questions regarding growth in different periods of the year, the rainy and dry seasons and the harvest and non-harvest periods.

Analyses of past studies of children's growth in different seasons have been conducted using a cross-sectional approach, that is measuring the nutritional status of children of a given age, not precisely the same children, in the same communities in different seasons of the year. This approach may not isolate the effect of a given period on growth as it does not separate the specific period where the nutritional insults occurred.

The results for growth retardation, using the Gomez classification, for the rainy and dry and harvest and non-harvest comparisons shows no differences in nutritional status of children for either rainy versus dry or harvest versus non-harvest. The analyses of longitudinal data on increments in weight and in height for the

specific periods do not show either any specific pattern of growth when the rainy versus the dry and the harvest versus the non-harvest periods are compared. The results on effect of the harvest on growth are not in agreement with the assumptions based on non-quantitative observations from Costa Rica and El Salvador (12, 36). One tentative explanation is that Indian mothers in coffee farms in Guatemala, as opposed to their counterparts in Costa Rica and El Salvador, do not leave small children at home during the harvest, but take them to the coffee fields. A second one is that the already existing high levels of malnutrition and deprivation in the coffee farms all year around, make a more difficult task to isolate periods of the year where worse living and health conditions are reflected in more arrested growth. Finally mechanisms as all year round low price of corn, loans by the plantations and other ways of indebtness may help to make the seasonal effect more chronic throughout the year.

There is a relationship between family income, measured either as FAIPC or FAIPCU and continous and discrete analyses of the various indexes of growth retardation. Although no differences in growth by levels of income are found in children 3 to 30 months, income plays an important role in nutritional status at older ages, 36 to 60 months.

The following factors may explain the differential impact of income on height and weights at various age groups in coffee farms. Income affects growth by determining the existence of environmental factors affecting food utilization, by its effect on the purchasing power of the family and in other factors such as level of formal and informal education of the mother and exposure to adequate food

and hygienic practices in children's feeding.

Most families studied, regardless of their level of income, live in similar environmental conditions and their children are similarly exposed to various diseases. Levels of formal and non-formal education does not in the coffee farms vary with income. On the other hand, children in coffee farms are breast fed for a very long period of time and their energy intake from other foods besides breast milk is very low at young ages; a mean of 121 calories with a standard deviation of 177 at 12 to 18 months and a mean intake of 505 calories with a standard deviation of 237 calories in children 18 to 24 months (41). After they are weaned their participation in the family diet becomes more important 893 ± 290 calories at 36 to 42 months and 1021 ± 296 calories at 48 to 54 months. Thus, the greater participation in total family diet of older children may limit the possibility that lower income families will provide adequate quantities of foods to their children as compared to higher income families within the farms.

No differences in the analyses of growth retardation and family income expressed as FAIPC or corrected by family composition as in FAIPCU are found. The analytic procedure followed of selecting families with children to study growth, precluded the possible better discrimination of FAIPCU as most families were classified in the same quartiles by either of the two indicators of family income.

The practical implications of collecting information on family income to ascertain the existence of subsets of families with higher risk of malnutrition within certain functional groups, particularly agricultural labourers and farmers deserve a further discussion.

It is very unlikely that in cross-sectional surveys design to characterize functional groups there will be the permission from plantation owners to obtain the income data of labourers from their administration records, as was the case in the present study. If one decides to collect the data directly from the families one is bound to find great reluctance from most informants in the sample to provide that kind of data and when obtained, it is difficult to ascertain its accuracy. The same pattern of lack of reliability and accuracy is likely to be found in surveys determing income of farmers in developing nations.

Thus, other variables such as the main activity of the head of the household, within the plantations, or the size of land holding and main crops in farmers may provide the same kind of discrimination as income does, but they are more easily to collect accurately over the entire sample.

However, in other functional groups as labourers in the industrial and service sectors in urban areas, family income may be a more important variable to discriminate differences in living conditions within a functional group than in coffee farms. Families are less reluctant to provide the data, it is more easily recall and salaries can be check in other sources of data, if necessary, as the records from the social security system.

The practical implications of real changes in purchasing power of poor families in food consumption of families and particularly children, have not been extensively studied. Although estimates from elasticities of income and demand may provide an adequate approximation to changes in food consumption, as a result of modifications in purchasing power of families, the only study with good records where direct cash was given to poor families with various

levels of income and responses in family food consumption were estimated is that of Mellor and Lele in India quoted by Berg (129). The allocation of additional income to various types of expenditures such as food, clothing and housing varied with the initial level of income. The lower the levels of initial income, the higher the percentage of the additional income allocated to food -76% of extra income in the low income group-. In the lowest initial income group, 55% out of the 76 extra money allocated to foods was spent on staple foods. The study however, does not have data on changes in intake of children (129).

The general belief among nutritionists, not necessarily based on hard data, is that improvements in food consumption at the family level are not going to be reflected in improvements in energy and nutrient consumption of children, as adults in poor families take a larger part of the food available than would be warranted by relative physiological needs.

Levinson (92) estimated income elasticities of consumption in a group of children 6 to 11, 12 to 17 and 18 to 24 months in age in Punjab, India. Changes in energy intake thus calculated were very low; 8% of initial energy intake as a result of doubling the income in families of children 18 to 24 and 4% in children 12 to 17 months. The elasticities for children were low, when compared with those derived from available studies for all age groups in rural India.

However, the few studies addressing the question of improvements in family consumption and increases in intakes of children in the same families show different results (130-132).

Selowsky concluded from analyses of diets of families, children 10 to 14 and 1 to 4 years in age that although at the lowest levels

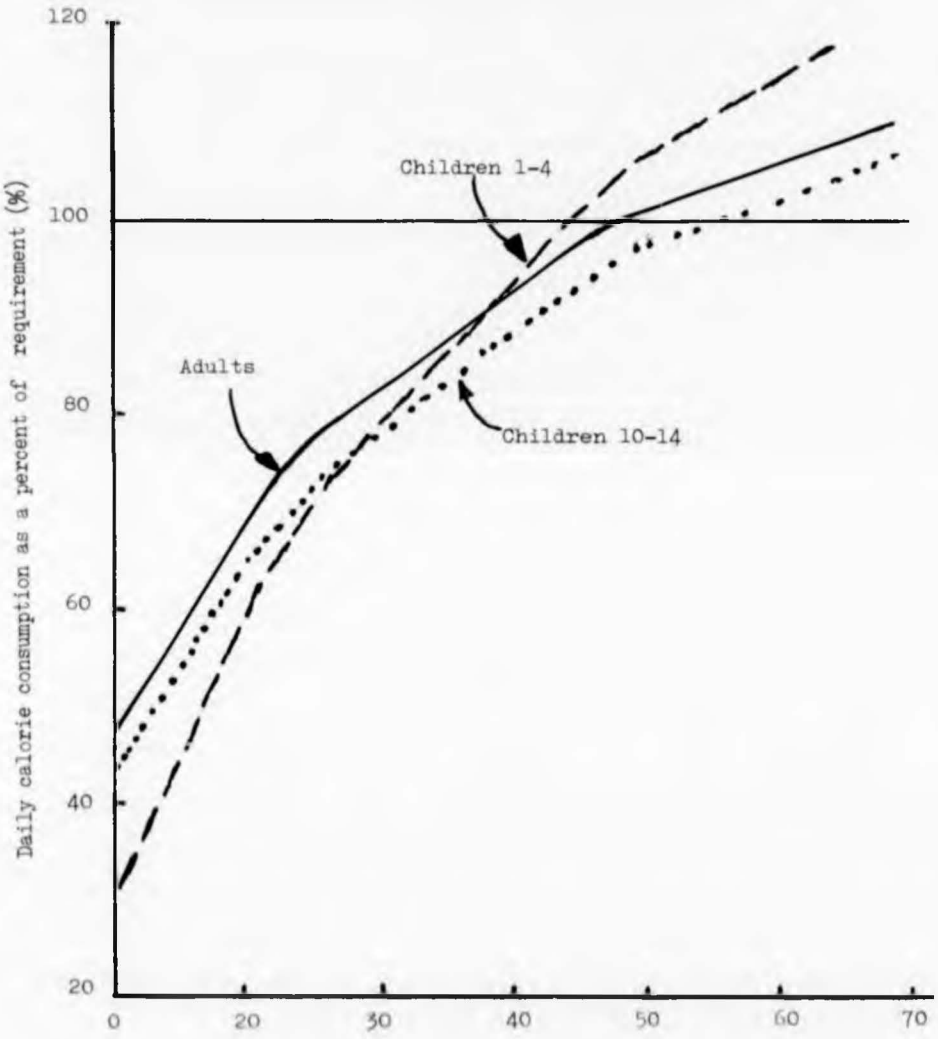
of income both older children 10 to 14 and their families fulfill a higher percentage of their energy requirements than children 1 to 4 years; as income increases young children are able to meet 100% of energy requirement at lower levels of income than the families and the older children. Thus, children 1 to 4 from low income families will benefit more, in relative terms, from an increase in purchasing power than will adults (130). Selowsky's conclusions are presented graphically in Figure 5.

Flores et al. (131), in an analysis of diets of families and children in rural Guatemala have also reported that energy deficits, in relation to requirements, were greater in children 1 to 4 years than for the family as a whole. Although the correlation coefficient between family and children's energy intake in Guatemala was significant, they concluded that an increase in the consumption of staples in families may lead to greater consumption for adults than for children. However, an increment in the family diet of those foods regarded as suitable for children, does lead to more significant increases in children's intakes than in adults.

Large amounts of corn and black beans were distributed free to labourers residing in coffee plantations in Guatemala (132). Increases in energy and protein intakes were recorded in adult males, adult females, children under 24 months in age, 24 to 47 and 48 to 72 months. The increases in energy and protein intakes in children under 24 were higher, with respect to their initial intakes, than in other age groups. While in adults and children 24 to 47 and 48 to 72 months the total increase in energy and protein was explained by the additional consumption of the two staples, the increase for the younger children were the result of additional

Figure 5

Calorie consumption by age groups in urban India



*Taken from reference (130)

consumption of other food items, not the two staples, regarded as more suitable for them. The authors concluded that the foods given acted as income supplements and while some family members consume them directly, some of the liberated income was also oriented to acquire other foods more suitable for young children (132). Thus, it seems likely that as a result of changes in purchasing power of poor families both adult and children's diets are likely to improve in both quantity and quality.

Finally the following activities are discussed as possible alternatives of improve living conditions in coffee farms. However, for most actions to be successfully implemented, it is required that populations are organized by the national programme of community development and that the government and farm owners agree in settling their different views regarding responsabilities for the welfare of the population living inside coffee farms.

A. Minimum wages

The minimum wage for coffee farm workers is £0.75 per day, a salary that precludes the possibility of adequate family energy and nutrient intake. Wages should take into account the price of minimum cost diets. INCAP, based on information on food consumption in rural areas, elaborated minimum cost diets taken into account not only the energy and nutrient needs but the existing food consumption patterns and preferences and the adequate consistency of diets, particularly for children. Enforcement of adequate salary scales, strict legislation for violating the law and permanent control by the Ministry of Labour and Social Security are the key activities for a successful programme. Salary scales need to be revised at least in the light of increase food prices at least every two years.

B. Cooperative shops

Prices paid to local or outside merchants by farm residents for most commodities are one and half or two times higher than in small or medium size towns. Experiences in El Salvador demonstrate that shops may be set up and run by cooperatives of farm residents and that they serve not only for achieving low prices but as a saving mechanism (12). The initial capital can be provided by a loan from the owner or the government. Alternatively, but less desirably, the service can be operated by the farm administration as is the case with the supply of corn to the workers.

C. Land Rental

Farms usually have uncultivated land that, in a few cases, are rented to the workers for cultivation of corn and other staples. Most farm workers and their families have the time and want to cultivate their own corn from May to August, in order to secure their needs of this product for four or five months every year. Most owners do not provide land to their workers and legislation and particular control by the Ministry of Labour and Social Security can improve the possibilities of residents to increase their incomes. Costs of inputs as fertilizer, seeds and agricultural tools can be substantially reduced if sold in the cooperative shop.

D. Food distribution programmes

May, June, July and August are months when less food is available as money made in the previous harvest season has been expended. Furthermore, families usually use more corn than what is provided by the farm and in April the price of corn, if bought on the market due to national shortages, is increased. National food distribution schemes for coffee farms should be implemented

mainly in this period of the year and should also include adequate weaning foods.

E. Development of other labour opportunities

Some jobs can be performed by women at home or inside the coffee farm during non-harvest months. For example, rolling cigars and sewing were important sources of income made by women in a coffee growing region of Costa Rica, during this time of the year (36).

F. Extension of school services

A reasonable location of public school buildings can overcome the present lack of upper primary grades and high school in the area. A national programme, of course, can not afford to provide the services to each farm. However, if one takes as an example the area known as the central farms in the INCAP study, buildings located in a farm called San Francisco, 45 minutes walk to the furthest farm, can provide services to a population of 5000 inhabitants living in 8 surrounding farms.

G. Nurseries for under five's

Taking small children to the coffee fields is not only a health hazard for them but, a constraint for older members of the family to pick up more coffee and thus getting higher wages. Day care services for under fives, run by local trained girls, can be easily organized by the owner and by the community. The increase in productivity of its own labour force and less dependence on migratory workers are important economic incentives for the owners to support this activity.

H. Simplified medical care system

Most farm owners bring a physician once a month to their farm. Medicines are either paid by the owner or a special loan to

be paid with future salaries is given to the worker. Based on previous experiences the INCAP research team developed a simplified medical care system with emphasis on preventive measures that has been operating in the 13 coffee farms for the past two years. Once INCAP research activities end in two years, the service will continue to be given in the area and the cost of the system will be absorbed by the owners. Other farms are interested in getting together a similar system and more recently the National Association of Coffee Producers (ANACAFE) have organized medical care services in coffee farms located in the Eastern Coffee Growing region of Guatemala. It is to be expected that in the near future coffee owners, the Ministry of Labour and Social Security and the Ministry of Health will coordinate their efforts to provide preventive and curative medical services to the majority of coffee farm workers.

I. Environmental sanitation

A great deal of knowledge has been accumulated regarding different type of improvements to available water supply systems in coffee farms in 1978 and 1979, by the INCAP group. With technical assistance provided by INCAP, potable water is now available for the 10,000 inhabitants of the farms. Some projects benefiting 350 farm residents have cost as little as £200 worth of material. The highest cost was £4000 in a farm with 1600 residents where the whole system as requested by the owner was renewed. Experiences in programmes to improve sanitary conditions in their properties such as latrines, trash disposal and control of animal and insects paid for by the farm owners is also available in the same project (41).

J. Housing

New houses with reasonable space between them need to be built in most farms. However, even those farms with severe problems of over-crowding can make use of the existing structures and need not get involved in a complete new housing scheme. As a result of the earthquake of 1976, low cost house models were developed. However, legal matters, such as the ownership of land and property need to be resolved and the cost and size of the effort requires international aid, local government as well as owners support and community organization.

The list of activities above discussed is by no means exhaustive, as it only attempts to outline a package of programmes, each of them observed in practice in some part of Central America.. Notwithstanding the political limitations of these all could be implemented with the objective or reducing deprivation and malnutrition in populations living inside coffee farms in Guatemala.

In relation to the hypotheses tested, the prevalence of malnutrition in children living on coffee farms is higher than in a national sample of villages studied in 1977 and in subsistence communities of Eastern Guatemala (24, 37). However, the national survey initiated in September 1979 will provide definite data about the distribution of malnutrition in functional groups in Guatemala.

The results support the initial assumption that the occupation of the head of the household on the coffee farm, can be used to identify specific subsets of families, which have more problems of deprivation and malnutrition.

Family income is related to greater problems of growth

retardation in children. However, the effect is easier to detect in older age groups when the contribution of breast milk to total energy and nutrient intake has ended and the children have to participate in the sharing of total calories available for the family.

Finally, the effect of the rainy or dry months and the harvest, pre-harvest and post-harvest seasons on children's growth was not detected. It may be that positive and negative effects cancel one another in given periods as for example most non-harvest months are usually dry and higher incomes during the harvest coincide with rainy periods, or that families have developed mechanisms to spread throughout the year the acute impact of seasonal variations in children's growth.

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