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FOOD CONSUMPTION AND PRODUCTION SYSTEMS IN THE CASSAVA PROGRAM - MANABI

RESULTS OF THE FOOD CONSUMPTION AND NUTRITION

BASELINE SURVEY FOR

THE CASSAVA COMMODITY PROGRAM

THE RESEARCH, EXTENSION AND EDUCATION PROJECT

BASELINE SURVEYS

REPORT NO. 3

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Nutrition and Agriculture Cooperative Agreement[1]

Fundacion para Desarrollo Agropecuario

Office of Nutrition US Agency for International Development

University of Kentucky

University of Arizona

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EXECUTIVE SUMMARY

1. While not as poorly nourished as the children in the other sample areas, the children of members of the Associaciones de Productores y Procesadores de Yuca (APPYs) do show some growth failure. This appears to be worse in participating households, but the small number of children in the sample of non-participating households makes any comparison difficult. Participating and non-participating households appear to be similar in other respects, however.

2. The diet is heavily dependent on purchased rice. Several subsistence crops, most importantly bananas and plantains, provide significant energy in general, and are more important in some families than in others. Consumption of animal products is especially low. Most of the animal products consumed are from home production. Although families heavily dependent on rice seem to be poorer and less able to meet household energy requirements, in general, reliance on subsistence production is not related to the ability of families to meet energy requirements, or to nutritional status.

3. The relationship between economic status and consumption suggests that improving income would have a positive effect on food consumption and nutritional status.

4. The aim of the cassava program is to increase household incomes through the development of rural organizations for the processing and sale of cassava. From these data it appears that the project is reaching the target population, families at greater risk for nutritional problems. If the project is successful it would have an impact on food consumption in these families through increasing income. However, some attention should be paid to the proportion of the diet that comes or could come from home production. Bananas and plantains already play an important part in subsistence production and their cultivation could be promoted in those ecological zones where it is feasible. A large number of the vegetables that are consumed are purchased. There may be some potential for the promotion of vegetable production at the household level.

5. As incomes rise, the provision of information and nutrition education would be desirable to aid families in improved selection of purchased foods. It was observed in this research, and in other research efforts in the coastal regions of Ecuador, that much of the grocery shopping is actually done by men. It appears important then, to aim information and educational efforts at men as well as women.

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I. BACKGROUND

The Research, Extension and Education (REE) Project has been supported since 1988 by the Fundación para Desarrollo Agropecuario (FUNDAGRO) with funds from USAID/Quito. The REE project seeks to improve the standard of living of small farmers in Ecuador by supporting agricultural research aimed at their problems, the extension of existing technology to small farmers and the education of professionals in agricultural research, and extension. REE project activities are organized into commodity programs with Research Extension Liaison Units (RELUs) for each commodity headed by a program coordinator. Currently, the commodities of interest include dairy production in the highlands and coffee and cassava production in coastal areas.

As part of REE project activities, several agro-socioeconomic studies have been conducted in selected areas of milk, coffee and cassava production. FUNDAGRO and the Institute Nacional de Investigaciones Agropecuarias (INIAP) have carried out diagnostic studies in the milk producing areas of Carchi, Pichincha, and Cotopaxi, as well as in the coffee producing areas of the provinces of Pichincha, Esmeraldas, Manabí, El Oro, and Loja and in the cassava producing areas of Manabí. Several other data collection activities have been carried out as part of the planning and implementation of the dairy production program since the original diagnostic surveys. In addition, recent agronomy and animal science graduates fulfilling their year of social service under the auspices of FUNDAGRO have carried out studies of the agro-socioeconomic situation in several areas focusing on the level of technology used by producers.

The Manabí Cassava Project is a joint effort of INIAP, the Centro Internacional de Agricultura Tropical (CIAT), and the Fundación para el Desarrollo Agropecuario. The purpose of the project is to improve the production, processing and commercialization of cassava in Ecuador.

Cassava is a product that has multiple uses, and has potential for both domestic and international markets. With proper treatment, it is used for human consumption. In addition, it can be used as a raw material for the production of starch, and in recent years it has been made into a flour that is used by manufacturers of balanced feed for livestock and for shrimp. Its potential importance in this latter area is substantial.

During 1987-88, INIAP and CIAT began a long term effort to collect data from agriculturalists participating in the cassava project in the province of Manabí. The purpose was to establish

a data base that could be used to monitor the progress of this project. Quarterly visits to agriculturalists have been made. Some essential data on production and marketing is collected during each visit, but in addition, each visit focusses on more specific aspects of the farm enterprise. For example, the first visit to agriculturalists collected data on the following: land tenure, spatial location of plots, harvest of cassava and other crops, spatial arrangements and densities of crops planted, farming systems, and land, credit, labor, and price constraints. The second visit focussed on such topics as harvest of cassava and other crops, sources of cassava clones and maize seed, dates of planting and harvest of principal crops, labor availability, marketing and storage of maize, inputs utilized for major crops, and labor requirements for the major crops. The third visit focussed more closely on the production process of the major crops, the disease and pest constraints on production, and on the implications of inputs, cultivation methods, and planting and harvesting dates on the production of the major crops. These data are being used to monitor the progress of the project, as well as to provide information useful to the institutions that are involved in the design of technological packages that will be useful to producers.

In 1989, FUNDAGRO and the Cooperative Agreement on Nutrition and Agriculture (CANA) worked with INIAP and CIAT to add a nutritional component to the data base being assembled on the agriculturalists participating in the cassava project. To insure the availability of food consumption and nutrition data for evaluation purposes and for adequate comparisons between participants and non-participants, and also to round out the information obtained through the existing baseline studies, the food consumption and nutrition baseline was incorporated into the wave of socio-economic data collected in January and February of 1989. The purpose of the expanded baseline survey was to determine the nutritional situation of producers at this point of the project so that, in the future, monitoring and evaluation of the impact of the projects can be carried out in a precise and objective manner. These nutritional data were collected in a similar way to the procedures used in the baseline studies of the milk and coffee programs of the Research, Extension and Education Project so that the data from among all of these would be comparable.

INIAP and CIAT are responsible for the analysis of the data being collected on the production aspects of this project. Several initial reports on this work have been produced (see Chavez 1988; Orlando Diaz 1989; Romanoff & Toro 1986). In the following pages we will briefly summarize some of the most important findings. We will do so to provide a context for the nutritional data. The analysis of this information is the responsibility of FUNDAGRO and CANA; for this reason, this baseline report is devoted almost exclusively to topics related

to food consumption and nutrition. Those interested in more detail on the farming systems and production aspect of the cassava project should consult the publications of INIAP and CIAT.

A. OBJECTIVES OF THE NUTRITION BASELINE STUDY

The food consumption and nutrition component of the baseline data collection had the following main objectives:

1. Provide data on food consumption patterns and nutritional status of participants and non-participants in the programs as baseline data in future project monitoring and evaluation activities.

2. Provide comparative data on food consumption and nutritional status for communities and types of farmers within communities to allow for targeting of project activities to those communities and households at greatest nutritional risk.

3. Provide information on patterns of dietary deficiencies for use in identifying potential dietary problems to be addressed in future program planning.

4. Provide information on dietary patterns and salient linkages between production and food consumption for the design of socially and culturally appropriate interventions.

II. METHODOLOGY

The baseline studies were carried out with a sample of cassava producers in a number of communities in the province of Manabí. Most respondents were drawn from farmers participating in the multi-wave baseline and monitoring research designed and conducted by CIAT and INIAP personnel with FUNDAGRO support. This sample includes 49 households in which a household member is a member of one of the Asociaciones de Productores y Procesadores de Yuca (APPY) participating in the cassava processing program and 25 households that do not have an APPY member. The total sample, then is 74 households. Of these, 43 contained children 60 months of age or younger and they were included in the nutritional status assessment.

A. THE INTERVIEW SCHEDULE

The baseline surveys of food consumption and nutritional status were conducted using a combination of interview techniques and anthropometrics. Household food consumption interviews were conducted with women household heads and were based on a one week recall of all foods entering the household through household production, hunting and gathering, gifts, and purchase. In addition, a twenty-four hour recall of food use for the households and food intake of children under 60 months of age were also conducted. The interview schedule also contained a census of household members during the preceding week, estimates of household production of products likely to be under the control of women, including milk, eggs, animals and garden products, a one month recall of illnesses within the family and for children under 60 months of age, and a brief reproductive history.

One week recalls of food consumption and prices within households were selected to provide information on dietary patterns and estimate dietary adequacy. In other research (DeWalt 1981, Thompson et al. 1985) we have found this a cost and time efficient method of estimating household food use for restricted periods of time. When compared with estimates of household nutrient requirements drawn from information collected through a household census, this method allows for the construction of an index of household nutrient adequacy useful in comparisons of dietary adequacy among households and communities for a given point in time. It does not necessarily provide data for precise measures of nutrient intake for individual families or individuals. A twenty-four hour recall of household food use provides a somewhat more precise measure of nutrient intake for shorter periods of time, but is less reliable given daily

variations in food intake. A one week recall of household food conducted at one point in time will not provide information on seasonal variation of food intake.

These data on weekly food utilization were used to calculate average daily energy consumption for each household. Caloric adequacy of household diets was evaluated through comparison of consumption values to FAO/WHO (1973) requirements. Information on household demographic composition was used in conjunction with the age- and sex- specific FAO/WHO norms to determine the total energy needs for each household. Household energy intakes were then expressed as a percentage of estimated needs, thus providing a measure of caloric adequacy of household diets.

Dietary data derived from weekly recalls will tend to overestimate consumption levels as waste and unused food portions are not taken into account. Given this methodological bias, 100% of predicted needs should not be seen as the threshold for household caloric adequacy. Indeed, households with caloric consumptions of 100-110% of estimated needs should still be considered nutritionally at risk.

Estimates of nutritional status were derived from anthropometric data from all children in sample households under 60 months of age. Weights were collected using portable dial-face spring scales suspended from any suitable anchor in the house. Heights and lengths were collected using a board with a metal meter tape embedded in it an a sliding head board. Mid-arm circumferences were collected using non-stretchable, insertable arm tapes.

Heights and weights for the children of all three sample were standardized against the NCHS norms using Z-scores (standard scores) (Hamill et al., 1979). Data on nutritional status are presented in terms of 1) height for age, 2) weight for age, and 3) weight for height. In addition, mid-arm circumferences for the children were standardized against US age- and sex-specific references presented in Frisancho (1974). Generally speaking, children who are less than 2 SDs below their appropriate US medians (i.e. $Z < -2.0$) are deemed to be at nutritional risk (Frisancho, 1986). A copy of the schedule used to collect the information is found in Appendix A. The interview schedule was designed to be used with the woman who usually manages food in the household. Specifically it dealt with linkages between farm production and the food consumption, nutritional status and health of the family. It also included information on family demographics, a reproductive history, and household socioeconomic indicators. In addition, anthropometric data (height, weight, and mid-arm circumference) were collected on children under 60 months of age as a measure of household nutritional status.

The same interview schedule was used in the baseline studies of all of the REE projects. The interview schedule went through several pretests and revisions before being approved by the Program Board of FUNDAGRO.

B. DATA COLLECTION

Interviewers participated in a one day training program/workshop at the outset of the baseline research period. Interviewers were drawn from among the coordinators of the program and INIAP staff. Food consumption and anthropometric data, obtained primarily from women, were collected by trained nutritionists from the School of Nutrition of the Escuela Politécnica de Chimborazo (in Riobamba). The interviews were conducted in a two week period in late January and early February of 1989. Households were from communities in the southern part of the province of Manabí.

III. PRODUCTION ISSUES

The recent formation of Associations of Producers and Processors of Cassava (APPYs) has served as groups with which the various institutions involved in trying to improved cassava production and processing can work. These various associations have further been linked through the formation of the Union of Associations of Producers and Processors of Cassava (UAPPY). The sample being used by INIAP and CIAT is derived from lists of producers maintained by the UAPPY.

The initial data from the monitoring of the cassava project in Manabí in 1987-88 focussed on 64 agriculturalists. These individuals were from seven communities in two distinct regions in which cassava is grown -- some from humid areas (defined as those above 1000 mm of rainfall per year) and some from the dry lowlands (defined as areas below 1000 mm of rainfall per year). In 1988-89, the sample was expanded to include one more community and the total number of agriculturalists interviewed increased to 98. Participants of the REE project who were chosen as members of the sample were determined from the list maintained by the UAPPY. Non-participants who became part of the sample were neighbors of the people who were members of an APPY. Approximately 70% of the sample were participants, with the other 30% being non-participants. (Further information on sampling procedures may be found in Chávez 1988.) Information in the following is from this larger sample of cultivators.

Those people in the sample had a total of 1918.7 hectares in 1989. Only about 13% of this area was planted in cassava, but this is equivalent to about 1.4% of the total area in cassava in the province of Manabí. About 25% of the cassava is planted as the only crop in a field; much more common is the interplanting of cassava with other crops. Intercropping with maize was practiced by 45% of respondents, and another 14% intercropped cassava with peanuts. Thus far, production has been on a very small scale; producers planted an average of about 1.86 hectares each (Orlando Diaz 1989:5).

The INIAP/CIAT work has found that approximately 44% of the cassava produced is destined for the APPY processing plants. Another 37% is used on the farm for livestock feed. These overall figures mask substantial variation that exists in the different producing communities. For example, in one of the communities (Colón) that is close to urban market centers, most of the cassava is sold fresh for direct human consumption. In a community that is quite far from market centers (Pan y Agua), about 60% of the cassava is fed to livestock on the farm and the other 40% consumed by the family members.

Luzuriaga carried out a survey of the clones of cassava planted in 1975; he found that the major variety sown was called Taureña, a white variety sown by about 72% of producers (1976:16). The more recent data collected show that Taureña is currently sown by only 27% of cultivators. Most farmers now plant a variety called Tres Meses that has a rose-colored skin (66% of producers).

Preliminary analyses indicate that there is substantial interest among farmers in cultivating cassava as a cash crop, especially if it can be planted in association with maize. Among the constraints identified by farmers are the lack of good quality land, weather problems, lack of credit and the need for reliable market channels.

IV. FOOD CONSUMPTION AND NUTRITION

A. HOUSEHOLD CHARACTERISTICS

Tables 1 shows household characteristics for participants and non-participants in the yuca sub-project. There is no significant differences between the samples in family size, age or education. Participating households tend to have more pigs.

B. KEY FOODS

Figure 1 shows the average proportion of total energy represented by foods in the diet in this program region. Thirty-one percent of all energy comes from the consumption of rice. More than households in any of the other REE project areas, these families also rely heavily on banana and plantains as a source of energy (about 15% of energy intake). As a group bananas and plantains are the second most important food. Legumes provide only about 5% of energy and cassava provides about 4% of energy. Animal products provide about 5% of energy. On the average, vegetables and fruits provide about 4% of energy. The foods contained in the category "other", mostly fats and oils and processed foods, provide about 22% of energy.

Table 2 compares the diets of participants and non-participants with respect to dietary components. The only significant difference between participants and non-participants is in use of vegetables, with participants consuming significantly more than non-participants ($t= 2.79$, $p <.01$). Non-participants appear to meet a smaller proportion of energy needs, 107% as compared with 123% for participants, although this difference is not statistically significant. The figures for proportion of energy met is similar to the figures calculated for the sample drawn for the coffee program baseline, and a little below those for the dairy program sample.

TABLE 1: HOUSEHOLD CHARACTERISTICS, CASSAVA PROGRAM PARTICIPANTS COMPARED WITH NON-PARTICIPANTS

	Participants (N=49)	Non-Participant (N=25)	t
Age	44.5	48.8	-1.28
Education	11.2	11.6	- .23
Age of Spouse	45.3	46.7	- .24
Family Size	7.2	6.7	.67
Household Items (MSL)	2.7	2.5	.45
Food expenditure/week	S/7071	S/6400	.81
Animals Owned			
Chickens	17.3	12.0	1.49
Pigs	4.4	1.8	2.25*
Cattle	1.7	3.8	-1.25
Production			
Eggs/week	20.8	13.5	1.7
Milk/day (L)	1.5	1.4	.14
Cheese/week	.7	1.3	- .47

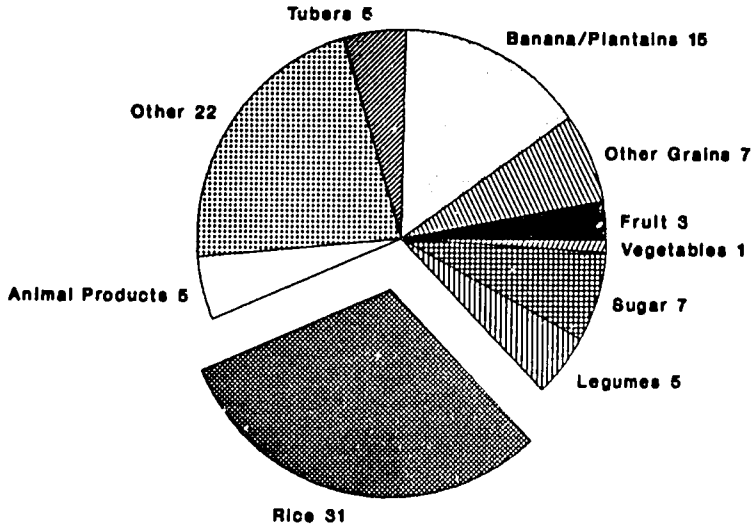
* $p < .05$

TABLE 2: FOOD CONSUMPTION IN CASSAVA SAMPLE PARTICIPANTS COMPARED WITH NON-PARTICIPANTS

	Participants (N=49)	Non-Participants (N=25)	t
Percentage of Household energy requirement met	1.2	1.1	1.23
Percent diet from			
All grains	38%	36%	- .84
Rice	31	30	- .37
Banana/Plantain	15	17	1.09
Legumes	5	3	-2.65**
Vegetables	1.5	1.1	-2.79**
Cassava	3.7	3.2	- .66
Animal products	7.7	7.5	- .13
Subsistence Prod.	25	27	.30

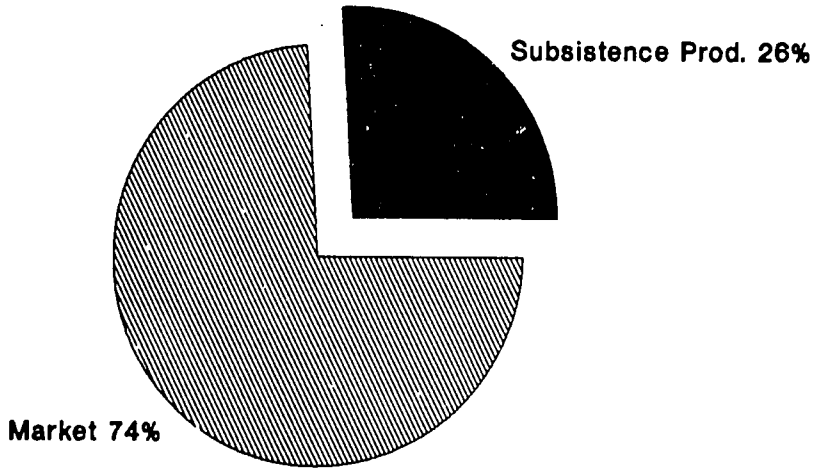
** $p < .01$

FIGURE 1: Percentage of Total Energy From Key Food Groups - Cassava Program



Percent of total energy

FIGURE 2: Proportion of Diet From Subsistence Production - Cassava



Percentage of total energy

C. SUBSISTENCE PRODUCTION

Families in the cassava program sample rely much less heavily on foods produced in the households than the dairy program sample. Only about 26% of energy comes from home production (Figure 2). This is about half of what is provided by subsistence production in the highland sample but somewhat more than is provided by subsistence production in the coffee program sample (Figure 3). The main food provided through home production is plantain, with about 56% of consumption coming from home production. Reliance on home subsistence is significantly related to the consumption of plantains and bananas ($r=.31$, $p<.05$). Some families consume up to 35% of energy from plantains and bananas. Furthermore, the proportion of plantain and banana consumption coming from home production is the strongest predictor of the percentage of energy coming from home production ($r=.76$, $p< .001$).

Virtually all of the cassava consumed comes from home production. Although, as noted above, on the average cassava accounts for only about 4% of energy, some families consume as much as 13% of their energy intake as cassava.

About 80% of the chickens and 24% of the eggs consumed come from home production. Home production of milk accounts for about 70% of consumption. However, the amount of consumption of these foods of animal origin is quite low. Fruits also come primarily from home production, while only a small part of vegetable consumption comes from home production (a few families produce tomatoes and cucumbers). The rest of the vegetables consumed, including green beans, cabbage, carrots and radishes are primarily purchased.

FIGURE 3: Proportion of Diet from Subsistence Production - Comparison

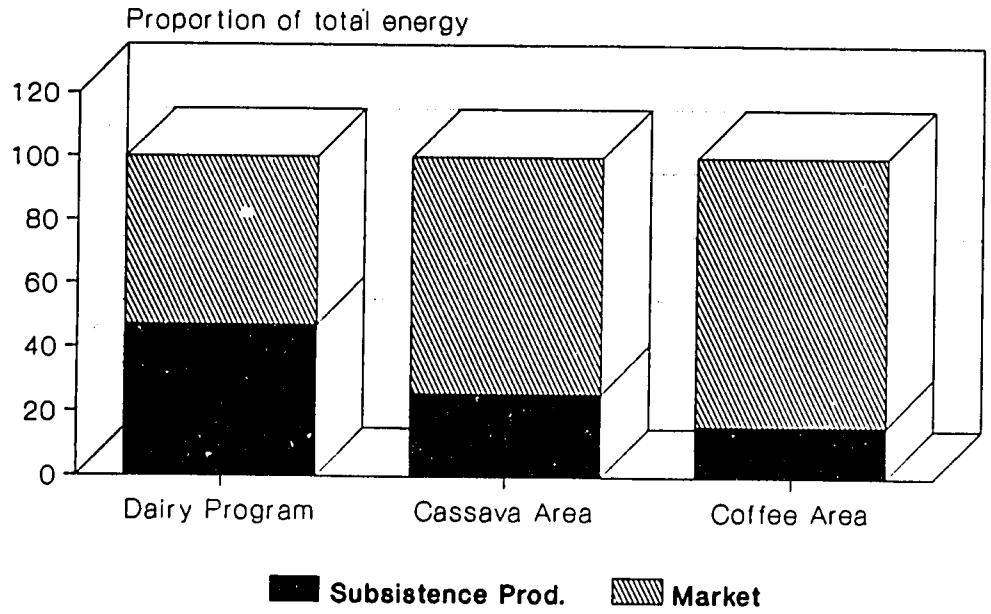
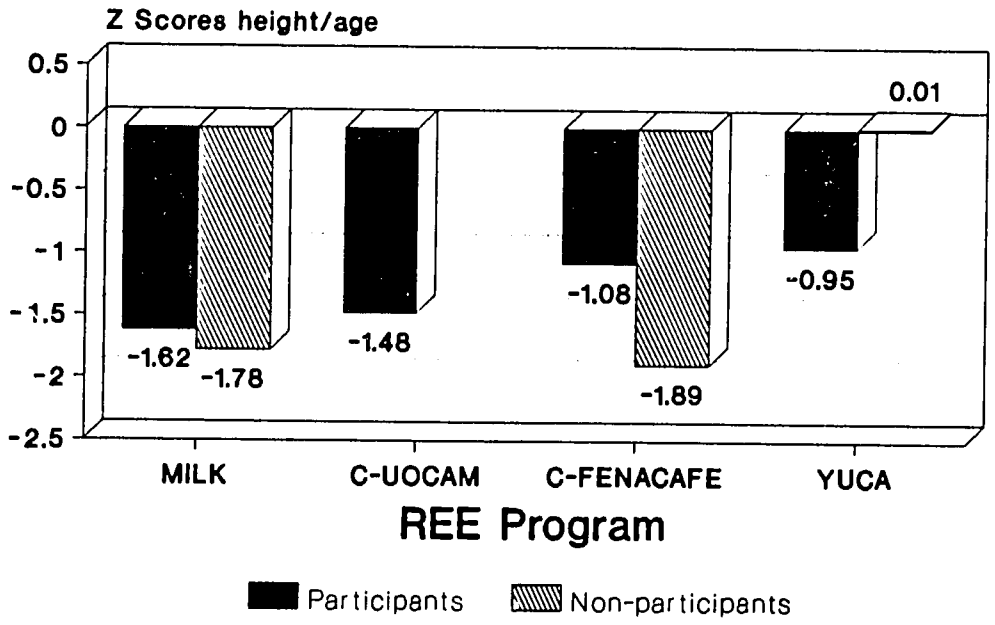


FIGURE 4: Weight/Age by Program Comparison of Mean Z-Scores



Based on camparisons with NCHS standards

D. PREDICTORS OF FOOD CONSUMPTION PATTERNS

Table 3 presents zero order correlations between the proportion of the family energy needs met in the week previous to the interview and several dietary components and economic status.

Table 3: Correlations Between Proportion of Energy Needs Met Selected Variables

	Proportion of Energy Needs Met
Prop. of diet from cereals	-.40***
Prop. of diet from legumes	.16
Prop. of diet from cassava	-.14
Prop. of diet from animal	-.03
Prop. of diet from subsistence	.17
Material Style of Life scale	.28*

* $p < .01$; ***$p < .001$

Families that rely more heavily on cereal grains, primarily rice, for their food intake are significantly less likely to meet their requirements. At the same time, families that rely more on subsistence production are somewhat more likely to meet household requirements, but this is not statistically significant. Economic status (MSL) is a better predictor of ability to meet requirements.

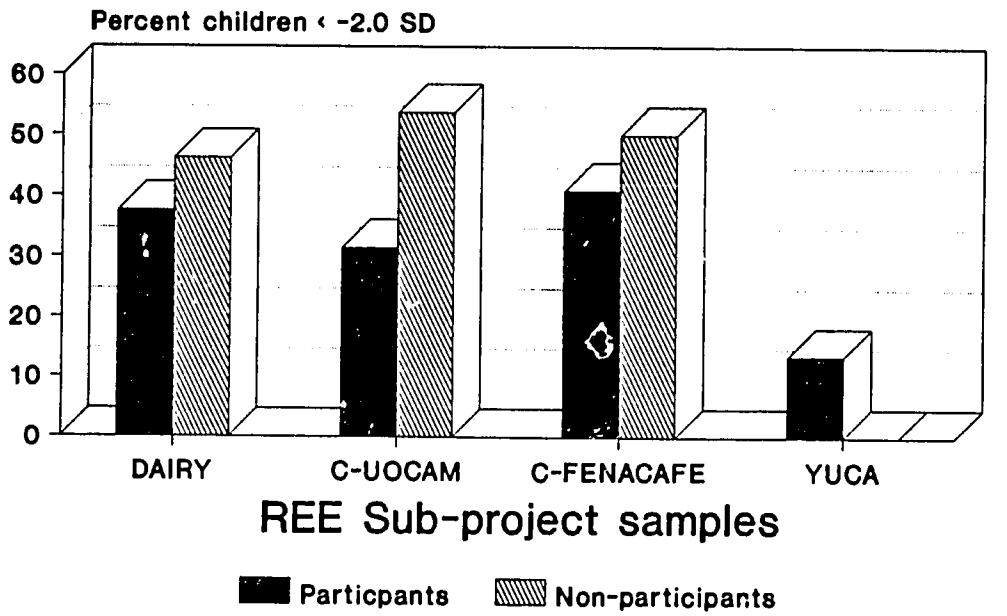
E. NUTRITIONAL STATUS

Detailed analyses of nutritional status for the cassava sample are hampered by the small sample size (n=43). Nonetheless, it is clear that the level of undernutrition is markedly less than in the other two samples (Figures 4 and 5). Reductions in both stature and weight are significantly less than in the coffee and dairy samples, whereas arm circumference measures fall intermediate between coffee and dairy. However, it should be noted that the average height/age of children in this sample is on average 1.34 standard deviation below the standard (Table 3). Average weight for age is one standard deviation below. Close to 40% of the sample is below two standard deviations below the median of the standard population for height

(Figure 4). This suggests that these children are on average poorly nourished.

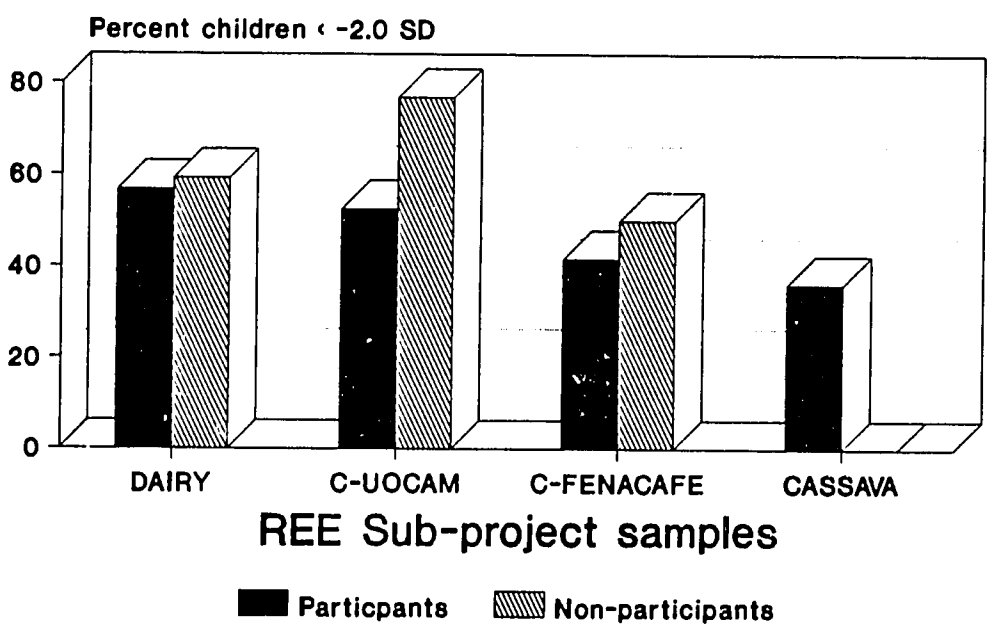
No dramatic gender differences are evident (Table 5). Comparisons of participants vs. non-participants are made in Table 6, but little inference can be made since non-participants are represented by only 4 individuals.

FIGURE 5: Weight for Age BY Program Percentage Under -2.0 SD



Based on NCHS standards.

FIGURE 6: Height for Age by Program Percentage Under -2.0 SD



Based on NCHS standards.

Table 4: Anthropometric[1] Characteristics: Cassava Sample

Measure	n	Mean z-score	SD
Height/age	40	-1.34	1.40
Weight/age	41	-0.82	1.06
Weight/Height	39	+0.13	0.89
Arm circumference	43	-0.44	0.92

[1]Height-for-age, weight-for-age and weight-for-height were standardized relative to NCHS standards. Arm circumference measures were standardized relative to age and sex-specific US means reported in Frisancho (1974)

Table 5: Anthropometric Characteristics, Cassava Program: Males vs. Females

	Males			Females			
Measure	n	mean	SD	n	mean	SD	t
Height/age	22	-1.61	1.24	18	-1.02	1.55	1.33
Weight/age	22	-1.04	1.10	19	-0.57	0.98	1.45
Weight/Height	21	+0.16	1.06	18	+0.10	0.67	0.19
Arm circum.	24	-0.56	0.97	19	-0.26	0.84	1.15

Table 6: Anthropometric Characteristics, Cassava Program: Participants vs. Non-Participants

	Participants			Non-Participants			
Measure	n	mean	SD	n	mean	SD	t
Height/age	36	-1.45	1.40	4	-0.42	1.18	1.40
Weight/age	37	-0.91	1.06	4	+0.01	0.79	1.68
Weight/Height	35	+0.12	0.94	4	+0.26	0.43	0.31
Arm circum.	39	-0.43	0.93	4	-0.50	0.95	0.14

F. PREDICTORS OF NUTRITIONAL STATUS

Table 7 presents some of the relationships between measures of nutritional status and some selected variables.

Table 7: Zero Order Correlations Between Measures of Nutritional Status and Selected Variables (N=39)

	Wt/age	Ht/age	Wt/Ht
MSL	.29	.35*	.07
Prop. requirements met	.26	.43*	-.06
Prop. diet from cereals	-.37	-.34	.17
Prop. diet from animal	.16	.35*	-.18
Prop. diet from subsis.	-.23	-.11	.07
Age of child	-.27	-.32	.04

* $p < .05$

Economic status of the family is clearly related to nutritional status. Also, not surprisingly, the degree to which the family was able to meet their energy requirements in the week before the interview is the most important predictor of height attainment. There is also a relationship between consumption of animal products which may in fact be related to the relationship between economic standing and nutritional status. Finally, as in the coffee program sample (also a coastal sample), age of the child is negatively related to nutritional status. It appears

that children under the age of 60 months become more poorly nourished as they grow older.

V. CONCLUSIONS AND RECOMMENDATIONS

While not as poorly nourished as the children in the other sample areas, the children of APPY members do show some growth failure. This appears to be worse in participating households, but the small number of children in the sample of non-participating households makes any comparison difficult. Participating and non-participating households appear to be similar in other respects, however.

The diet is heavily dependent on purchased rice. Several subsistence crops, most importantly bananas and plantains, provide significant energy in general, and are more important in some families than in others. Consumption of animal products is especially low. Most of the animal products consumed are from home production. Although families heavily dependent on rice seem to be poorer and less able to meet household energy requirements, in general, reliance on subsistence production is not related to the ability of families to meet energy requirements, or to nutritional status.

The relationship between economic status and consumption suggests that improving income would have a positive effect on food consumption and nutritional status.

The aim of the cassava program is to increase household incomes through the development of rural organizations for the processing and sale of cassava. From these data it appears that the project is reaching the target group, families at greater risk for nutritional problems. If the project is successful, it would have an impact on food consumption in these families through increasing income. However, some attention should be paid to the proportion of the diet that comes or could come from home production. Bananas and plantains already play an important part in subsistence production and their cultivation could be promoted in those ecological zones where it is feasible. A large number of the vegetables that are consumed are purchased. There may be some potential for the promotion of vegetable production at the household level.

As incomes rise, the provision of information and nutrition education would be desirable to aid families in improved selection of purchased foods. It was observed in this research, and in other research efforts in the coastal regions of Ecuador, that much of the grocery shopping is actually done by men. It appears important then, to aim information and educational efforts at men as well as women.

REFERENCES CITED

Chávez, Napoleón

1988 Reporte Anual de Actividades: Planificación y Ecónomia Agrícola. INIAP Estación Experimental Portoviejo.

DeWalt, Kathleen
1983 Nutritional Strategies and Agricultural Change. UMI Press.

Díaz, Rafael Orlando
1989 Establecimiento de una Base de Datos. Grupo Interinstitucional de la Costa, Manabí, Ecuador.

FAO/WHO
(1973) Energy and protein requirements. WHO technical report series no. 522. WHO: Geneva.

Freire, WB & WF Waters
(1988) Diagnostico de la situacion nutricional: la identicacion de poblaciones en riesgo nutricional en el Ecuador. FUNDAGRO.

Frisancho, AR
(1974) Triceps skinfold and upper arm muscle size norms for assessment of nutritional status. American Journal of Clinical Nutrition 27: 1052-1057.

Frisancho, AR
(1986) Anthropometric standards for evaluating growth and nutritional status using the Frameter. Health Products: Ann Arbor, MI

Hamill, PVV, TA Drizd, CL Johnson, RB Reed, AF Roche, & WM Moore
(1979) Physical growth: National Center for Health Statistics percentiles. Am. J. Clin. Nutr. 32:607-629.

Instituto Nacional de Estadistica
(1986) Encuesta Nacional Nutricion y Salud, 1984: Informe General. Ministerio de Salud: Lima, Peru.

Luzuriaga, V.H.
1976 Descripción Agronómica del Proceso del Cultivo de Yuca en el Ecuador. Publicación miscelánea No. 33, Departamento de Economía Agrícola. INIAP, Ecuador.

Martorell, R & J-P Habicht

(1986) Growth in early childhood in developing countries. In: F. Falkner & JM Tanner (Eds.) Human Growth: A Comprehensive Treatise (2nd Edition), Volume 3. Plenum: New York. pp. 241-262.

Romanoff, S and G. Toro (Eds.)
(1986) La Yuca en la Costa Ecuadoriana y sus perspectivas agrindustriales. INIAP: Quito, Ecuador.

Thompson, Karen, Kathleen DeWalt, and Billie DeWalt
1985 Food Consumption and Nutrition in Three Highland Honduran Communities. INTSORMIL report #3.

WHO (1979) Measurement of Nutritional Impact. WHO: Geneva.

WHO (1983) Measuring Change in Nutritional Status. WHO: Geneva.