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COFFEE BASED PRODUCTION AND FOOD SYSTEMS IN MANABI AND SELECTED AREAS OF THE COAST OF ECUADOR

RESULTS OF THE BASELINE SURVEY FOR

THE COFFEE PROGRAM

THE RESEARCH, EXTENSION AND EDUCATION PROJECT

BASELINE SURVEYS

REPORT NO. 2

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Nutrition and Agriculture Cooperative Agreement[1]

Office of Nutrition US Agency for International Development

University of Kentucky

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Fundacion para Desarrollo Agropecuario

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TABLE OF CONTENTS

EXECUTIVE SUMMARY vii
. vii

I. BACKGROUND 1

II. METHODOLOGY 3

A. THE FIELD STUDY 3

1. The Questionnaire 3

2. Field Personnel 3

3. Sample Size 4

III. PRODUCTION SYSTEMS 5

A. SOCIOECONOMIC CHARACTERISTICS 5

B. LAND TENURE AND USE 5

C. PRINCIPAL CROPS 9

1. Coffee production and sales 9

2. Maize production and sales 9

D. LIVESTOCK PRODUCTION 10

E. YIELDS 12

F. UTILIZATION OF LABOR IN COFFEE PRODUCTION 12

G. PRINCIPAL PROBLEMS OF PRODUCTION IN GENERAL . . . 13

1. Pests and Diseases 13

2. Weeds 14

H. CHEMICAL INPUTS 14

I. IMPLEMENTS OF PRODUCTION 14

J. INCOME 14

K. MARKETING 15

L. CREDIT 17

M. TECHNICAL ASSISTANCE 18

N. KNOWLEDGE OF DEVELOPMENT INSTITUTIONS 18

O. TECHNOLOGY OF COFFEE PRODUCTION 19

1. Characteristics of the Crop 19

2. Weeds and Forms of Control 21

3. Pests and Diseases 22

4. Harvest and Initial Processing 23

Q. PREDICTORS OF COFFEE YIELDS AND FARMERS' INCOME . 23

R. SUMMARY AND CONCLUSIONS 24

IV. FOOD CONSUMPTION AND NUTRITIONAL STATUS 26

A. OBJECTIVES 26

B. METHODS 26

C. PATTERNS OF FOOD CONSUMPTION 28

1. Esmeraldas/ Pichincha 28
. 35

1. Household Characteristics 36

Nutritional Status 40

Production / Consumption Linkages 45

V. RECOMMENDATIONS 49

REFERENCES CITED 51

LIST OF TABLES

Table 1	Page 11	Farm Animals for Total Sample
Table 2	Page 13	Main pests and diseases
Table 3	Page 14	Main weeds found in crops of coffee producing areas
Table 5	Page 17	Marketing Problems
Table 6	Page 17	Credit availability, by source
Table 7	Page 19	Identification of development institutions
Table 8	Page 21	Other crops present in the coffee plantations
Table 9	Page 22	Main weeds, pests and diseases in coffee plantations
Table 10	Page 23	Predictors of total incomes
Table 11	Page 30	Percentage of households using key foods in preliminary survey zones
Table 12	Page 32	Sources of key foods in preliminary survey zones
Table 13	Page 33	Energy contributions of key foods
Table 14	Page 38	General household characteristics, coffee samples: Participants vs non-participants
Table 15	Page 39	General household characteristics, coffee sample: UOCAM vs FENACAFE
Table 16	Page 41	Anthropometric characteristics: Coffee sample
Table 17	Page 42	Anthropometric characteristics, coffee sample: UOCAM vs FENACAFE
Table 18	Page 42	Anthropometric characteristics, coffee sample: Participants vs non-participants
Table 19	Page 43	Anthropometric characteristics, coffee sample: Males vs females.
Table 20	Page 45	Percentage of households consuming banana by group and source.

LIST OF FIGURES

Figure 1	Page 7	Amount of Land Held/Coffee Program
Figure 2	Page 7	Land Planted Last Six Months/Coffee Program
Figure 3	Page 8	Amount of Land Worked Participants vs. Non-Participants
Figure 4	Page 8	Principal Crops/Coffee Program
Figure 5	Page 16	Main Income Sources/Coffee Program
Figure 6	Page 16	Main Income Sources Participants and Non-Participants
Figure 7	Page 20	Distribution of Coffee Varieties/ Coffee Program
Figure 8	Page 37	Proportion of Diet From Key Foods/Coffee
Figure 9	Page 37	Proportion of Diet From Subsistence Production - Coffee
Figure 10	Page 44	Height/Age Disaggregated by Age - Dairy and Coffee Regions
Figure 11	Page 44	Weight/Age Disaggregated by Age - Dairy and Coffee Regions
Figure 12	Page 47	Household Clusters Energy - Sources and Adequacy/Coffee Program Region
Figure 13	Page 47	Weekly Per Capita Household Energy From Rice - Coffee Program Region
Figure 14	Page 48	Weekly Per Capita Household Energy From Banana - Coffee Program Region

EXECUTIVE SUMMARY

In general, differences between participants and non-participants in these projects are sufficiently small such that the samples should serve as reliable baselines.

The socieconomic data shows that the family heads in the study areas are of middle age, with a mean of 53 years of age. Formal instruction in the majority of cases is from three to six grade of primary education. Agriculture is their primary occupation.

The size of holdings differ substantially among individuals in the sample, but the mean is of 15 ha per farmer. In addition to legal possession of the land, there are other tenure arrangements in the region particularly untitled possessions, rental and sharecropping. In fact, 44% of the farmers do not own the land they work.

The production systems of the areas surveyed are characterized by their complex mix of crops and animals, used both for home consumption and the market. Coffee is the main crop in the production systems of the study areas, followed by maize, bananas, and cassava. Only 4% of the individuals contacted had not planted coffee, and only 6% had not planted maize.

The arabica typica variety predominates (86%), followed by the arabica caturra (29%, which is usually planted in addition to typica and is expanding gradually). Coffee plantationa are old, with a mean age of 27 years for the first plot and 16 years for the rest of plots. Coffee is grown alone by 71% of the farmers. The rest of farmers intercrop it with bananas, plantain, citrus and other crops.

Animal production is both for domestic consumption and for sale. The most important animals in the system are chicken, pigs, and beef cattle. Maize, in contrast to coffee, is grown not only for the market but also for home consumption. Thus 56% of the farmers who produce maize do not send it to the market.

The main problems of agricultural production are physical: bad weather, lack of rains, poor soils. Biological problems are next in importance, particularly those that affect the coffee crop: diseases such as Quemazón, Mal de Hilachas, Gusano Cogollero, and weeds such as Paja, Bejuco and Escoba. Yet, very few coffee growers control weeds, pest and diseases. Apparently this is due to insufficient knowledge about available control measures.

Farmers income comes principally from agricultural production, especially from the sale of coffee and maize. The average income in 1987 was 983,042 sucres. Participants in the FUNDAGRO sponsored

Coffee Program had higher incomes from coffee production than non-participants. The reverse is hold true for income derived from other crops and from the sale of animals and other animal products: non-participants show higher income than participants.

Coffee production is predominantly a family activity. About two thirds of the farms sampled used family labor to grow this crop. In both family and contract labor there is a high participation of females. Thus, in Manabi it was found that of the 60% who reported family laborers, females were employed almost as frequently than males; and of the 63% who reported hired laborers, about two-fifths had employed women.

Although computed coffee yields are higher than the national average, it is evident that in all the study areas the level of technology of coffee production is extremely low. The practices outlined here are confirmed by the opinions of producers and technicians familiar with the area, who observe that it is common to seed the coffee plants, leave them to grow on their own and return to them only at harvest time. Since the majority of coffee growers in the sample are low resource farmers, one could justify their poor management practices on their lack of money, especially when considering practices which require high expenses such as chemical control of pests and the use of additional manual labor for harvesting by "pepiteo." However, one is disconcerted when learning that the same is true even in times of good prices for coffee, when they receive a larger amount of profit from this activity. They apparently do not invest their resources to improve cultivation and believe that, somehow, their coffee plantation will keep producing indefinitely. Thus, the poor cultivation practices and poor initial processing of the coffee results in low quality and reduced prices in the market.

Growth indicators for small children, particularly for toddlers, as well as the disaggregated data on consumption are highly suggestive of chronic seasonal malnutrition for those with inadequate resources. The limiting factor is dietary energy which might be made more readily available to the poorest of the poor through targeted food subsidies.

While there are no significant differences between participants and non-participants, the families in the UOCAM program region have poorer food consumption and nutritional status than those in the FENACAFE program.

While the population is highly reliant on purchased foods, farm production provides an essential source of dietary energy for households at nutritional risk. Extension efforts which might focus on coffee, need to give attention to crop diversity particularly for resource poor farmers in the FENACAFE target area. Promoting crop diversity might help provide a buffer against seasonal variabilities in resources, income and market access as well as the fluctuations in the market in the project commodity.

I. BACKGROUND

The Research, Extension and Education (REE) Project has been implemented 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 and coffee production. FUNDAGRO and the Instituto 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, Manabi, El Oro, and Loja. 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. These studies have been carried out in Machachi, Salcedo, and Jipijapa.

To insure the availability of data for evaluation purposes and for adequate comparisons between participants and non-participants, and also to round out the information obtained through more localized research efforts noted above, an agro-socioeconomic baseline survey was designed. The purpose of the baseline surveys was to determine the situation of producers at the initiation of the various programs so that, in the future, monitoring and evaluation of the impact of the projects can be carried out in a precise and objective manner. The baseline surveys were designed to address questions concerning production, the use of technology and food consumption in the project areas. This report is a description and analysis of the baseline study of the coffee producers Manabi and parts of Pichincha and El Oro.

The baseline survey had the following specific objectives:

1. to assess the current level of production for coffee and other commodities in the coffee farming system for program participants and non-participants.

2. to describe current production practices and assess the level of use of technology for participants and non-participants.

3. to assess the socioeconomic status of small coffee producers in participating and non-participating communities.

4. to assess food consumption and nutritional status among participants and non-participants.

II. METHODOLOGY

A. THE FIELD STUDY

The Fundacion para el Desarrollo Agropecuario (FUNDAGRO) and the Cooperative Agreement on Nutrition in Agriculture (CANA), with the collaboration of other Ecuadorian organizations, implemented baseline studies in those areas where there were actual or expected interventions as part of the implementation of the Agricultural Research, Extension and Education (REE) Project. In the Coffee Program, a formal survey was carried out once the project had started and there was a way to distinguish between collaborating and non-collaborating farmers. A relatively structured questionnaire was applied to collect quantitative or quantifiable information. The general strategy is outlined below:

1. The Questionnaire

The questionnaire had two complementary sections (Appendix 1). The first was used with the person in charge of agricultural production in a family farm (which could be a man or a woman) and, the second, with the woman who administered the home. The first section discusses themes relating to the agrarian structure, agricultural properties and production in general. The second section deals with the ties between production at the farm level with food consumption and nutritional status of the family. The strategy was to design a basic model questionnaire that can be utilized with all of FUNDAGRO's projects. This basic questionnaire is then supplemented with focussed sections that relate to specific commodities, such as coffee, milk and cassava.

Previous to their application, the questionnaire was tested in the field and the necessary refinements were made.

2. Field Personnel

Prior to each phase of the field research, a one day training workshop for the interviewers was carried out. The basic team was composed of the field coordinators and the extension personnel that were collaborating with each project. The interview for each one of the programs was accomplished in about two weeks. The field phase was started in October of 1988 and ended in January of 1989.

Field work depended on the participation of 18 interviewers, including personnel from the National Federation of Coffee Cooperatives (FENACAFE), the Union of Peasant Organizations of Manabi (UOCAM), and students from Manabi's Technical University (UTM), who were doing their year of rural service in the Coffee Program. For the interviews of rural women, the Nutrition branch of the Polytechnic School of Chimborazo (ESPOCH) facilitated the collaboration of four students.

3. Sample Size

One hundred nine (51% of the sample) farmers in communities associated with the UOCAM and 103 (49%) producers in the areas under the influence of FENACAFE were interviewed. In the first area 75 respondents were members of UOCAM and in the second, 73 were members of the cooperatives associated with FENACAFE [1].

The majority of the respondents interviewed (71%) belong to the Jipijapa region, though the sample includes coffee growers from the rest of Manabí and from other Ecuadorian provinces. The ratio between participants in the technical assistance provided by FUNDAGRO through UOCAM or FENACAFE and non-participants is 2 to 1. Thus 141 or 67% are participants and 71 or 33% are non-participants.

The UOCAM sample was drawn from the following communities: San Pablo, San Vicente, Cangahua, Aguapato, La Susana, El Retiro, Palmital, Las Piñas, San Antonio, Pila, and El Corozo.

The FENACAFE sample was drawn from the following cooperatives: Vargas, El Ramo, Marinos, Dolores, San Benito, Cabo de Hacha, Cristóbal Colón, Salitre, Mariscal Sucre, Paniagua, Albajacol, Buenos Aires, Los Andes, La Sainilla, Rió Chico, Santa Lucia, La Crucita, Palmital, Palmerita, Jerusalem, Porvenir, La Tuna, Cillaruma, Cononza, Cana, Panamá, Tierras Coloradas, Agua Dulce, Yambaco, Punta Alta, Chavelo, Pata de Pájaro, Taina, Tablada de la Yegua, Monteoscuro, Guaijas, Chamucame, Esterotongora, Chigue, Tongora, Balsa Tumbada, La Majagua, San Lorenzo, Tablones, Mineral, Palo Quemado, and Entrada a los Naranjos.

[1]A sample survey of FENACAFE members and a comparable non-member population was carried out in 1987 (for details, see Seligson 1988 a and b).

III. PRODUCTION SYSTEMS

A. SOCIOECONOMIC CHARACTERISTICS

The average age of the coffee growers interviewed is 53 years old; 86% of the total are in the range of 30-70 years of age. Their level of education is extremely low. Forty-three producers or 20% have no formal education. One hundred fifty-four or 73% have studied from the first to the sixth grade, which leaves 7% with some experience at the middle level. The average number of years of education is 3.6 and the standard deviation is 3.10. These results are similar to those obtained in the study carried out by Seligson (1987) among a sample of FENACAFE members, a comparable group of farmers. Overall, FENACAFE members had a higher literacy rate and formal education than non-members.

As expected, almost all have agriculture as their primary or secondary occupation. Of those interviewed, 191 were independent farmers or ranchers and 8 (4%) were agricultural laborers.

B. LAND TENURE AND USE

The majority of the coffee growers in the sample are small producers. The average grower holds 16 ha, with a standard deviation of 33.6. As seen in Figure 1, only 3.3% hold more than 100 ha and 47% less than 5 ha.

However, not all of the land they hold is their own; 93 coffee growers or 44% do not have their own land, 20% have less than 5 ha and 86% less than 30 ha. The average farmer has 15 ha of his/her own land (standard deviation of 36.7). Some 29 coffee growers rent part of the land they work, in amounts ranging from .35 to 30 hectares. Meanwhile 76 or 36% only have land in their possession and 2% sow others' lands as a sharecropper.

With regard to the number of parcels of land that represent the total of the cultivated lands for each coffee grower, the data from the interviews show that 52% have between 2 and 3 parcels; 83% have between 1 and 5 parcels. In the six months preceding the interview, 2.8% of the farmers had not cultivated their land (Figure 2). On the other hand, close to 67% had cultivated from 0.25 to 10 ha. The average cultivated area is 7.5 ha, with a standard deviation of 23.3.

The UOCAM sub-sample was made up of farmers who worked land of smaller size categories than those of either the FENACAFE or non-participant subsamples. As seen in Figure 3, UOCAM had greater proportions of farmers who worked land in the categories below 10 ha. and both FENACAFE and non-participant coffee growers worked more land in the larger size categories of above 10 ha., with the exception of the over 100 ha. category where non-participants dominate.

An important factor related to the ability of farmers to maximize the use of their land is water. Only 22% of the population studied had some form of irrigation for its crops.

FIGURE 1: Amount of Land Held Coffee Program

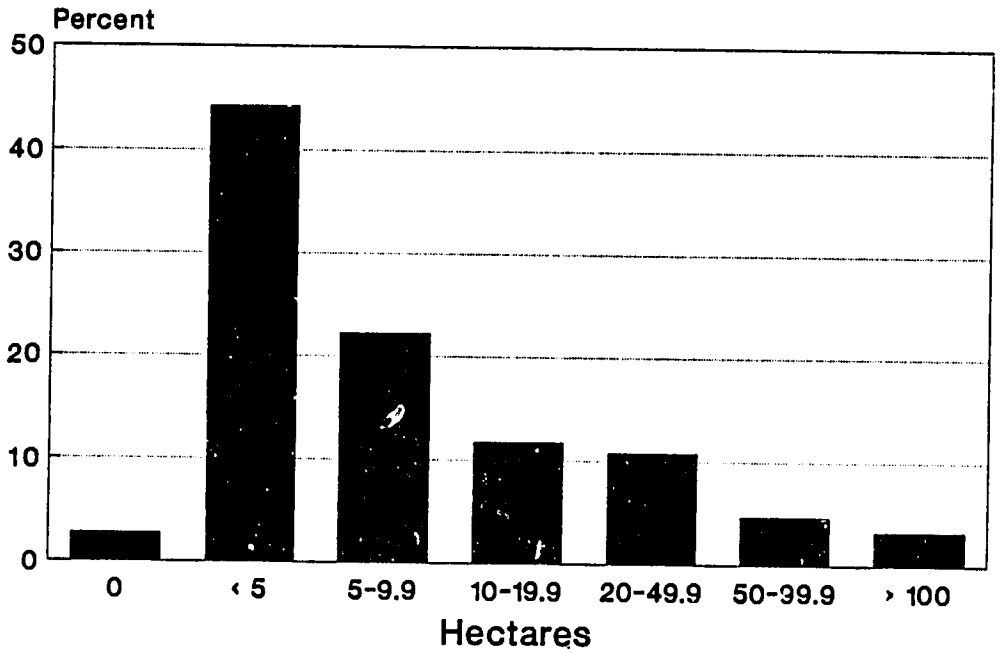


FIGURE 2: Land Planted Last Six Months Coffee Program

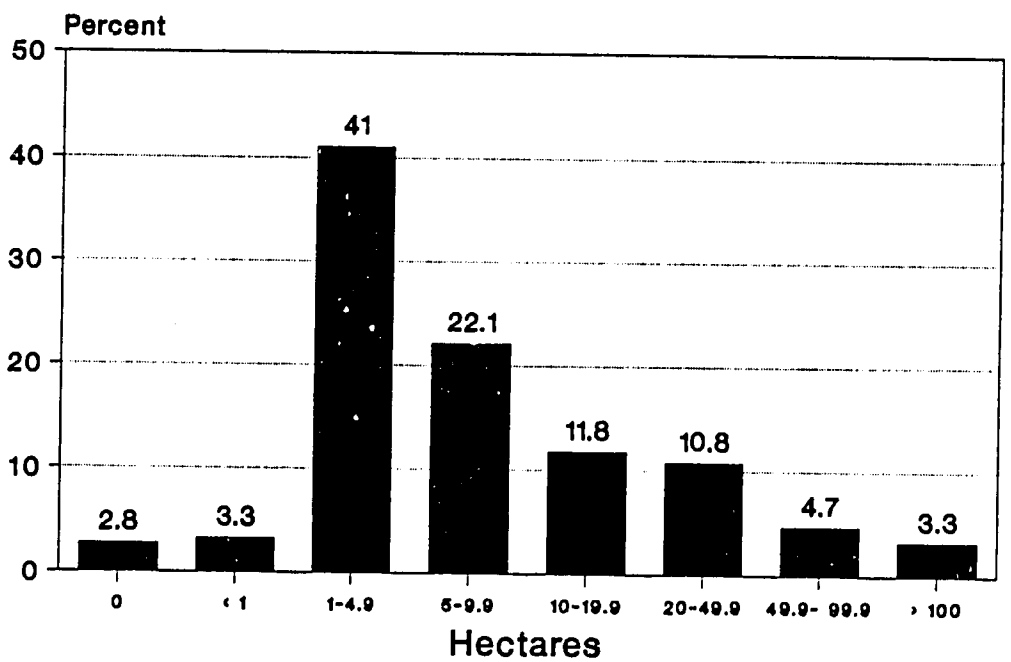


FIGURE 3: Amount of Land Worked Participants vs. Non-participants

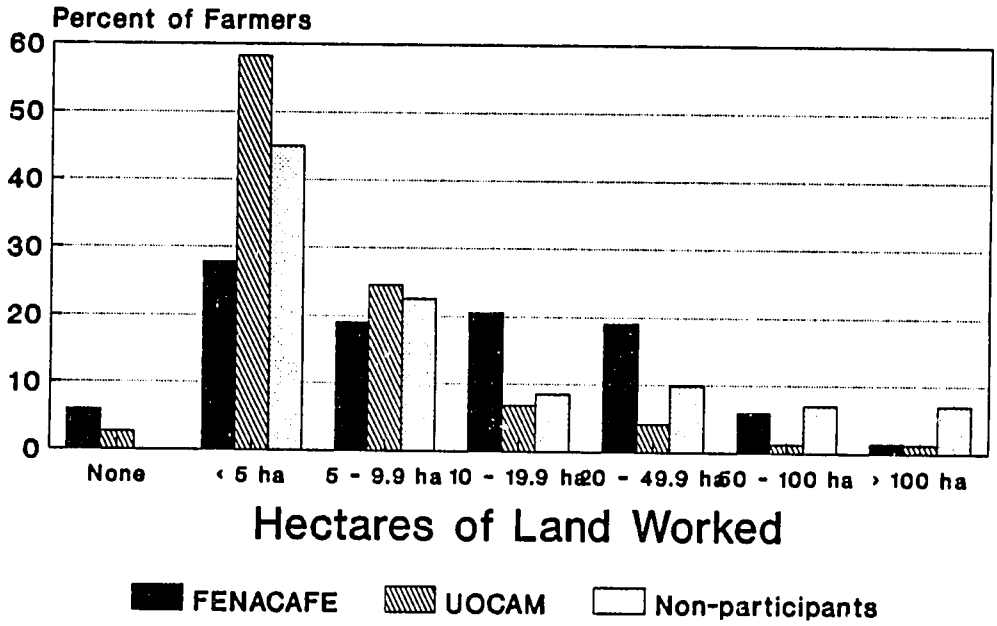
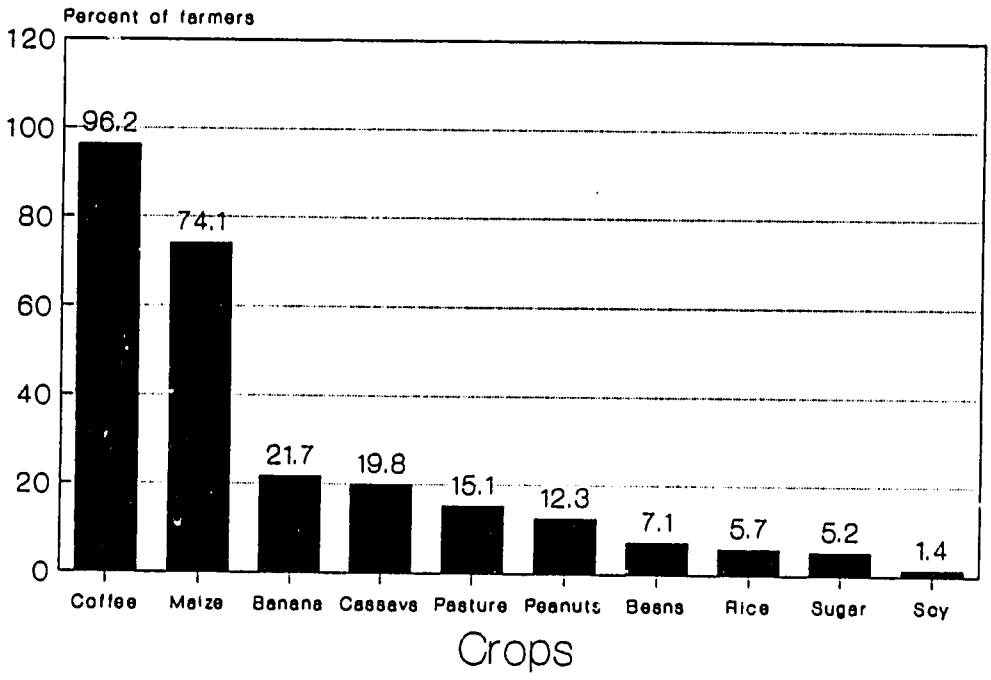


FIGURE 4: Principal Crops Coffee Program



C. PRINCIPAL CROPS

The farming system of the areas studied is of small and middle-sized producers that combine production for the market with subsistence farming. Consequently, as in other regions of the world, a variety of crops and small animals are found on the farms of these resource poor farmers.

The predominant crop is coffee (Figure 4) planted by 96% of the farmers, with a range of area planted that varies from a few trees to 55 ha. It is followed in importance by maize, which is cultivated by 74% of the farmers and covers a range of area planted from a few rows to 30 hectares. On a smaller scale, farmers also grow peanuts, cassava, castor beans, beans and rice as annual crops. Perennial crops include bananas and sugar cane.

1. Coffee production and sales

Of the total sample, only 8 (4%) have not planted coffee. About 42% have planted fewer than 2 hectares of coffee and 93% have from 0.5 to 10 hectares planted.

Coffee is produced for several different forms of processing. Almost 51% of the coffee growers report that they produce at least part of their crop in the simplest form, cherry coffee (cereza). In contrast, 27% also produce de-pulped coffee (bola) and 27% peeled coffee or pergamine (lavado). Note that these proportions are not exclusive. The important point is that a major part of the coffee produced is cereza and smaller proportions are produced as bola and lavado. The largest production is 750 quintales (1 quintal = 100lb) of cereza, 2,000 quintales of bola and 960 quintales of lavado.

With the exception of cherry, coffee sales vary directly with production. Thus, 48% of the coffee growers sell part or all of their coffee as cereza, 50% as bola and 49% as lavado. The quantities sold vary from 0.50 quintales to 300 quintales of cereza, 0.50 to 2,000 quintales of bola, and 0.20 to 960 quintales of lavado.

The value obtained by the selling of coffee varies in relation to the quantity and price at the moment of the transaction. Reported sales range from 4,175 to 38,400,000 sucres, with a median value of 289,000 sucres. Taking a broader view, it is noted that 80% reported earnings of less than 720,000 sucres in the last production cycle. Moreover, 80% of reported earnings were less than 720,000 sucres.

2. Maize production and sales

Based on the proportion of farmers that report it in their farms, maize is the second most frequently observed crop in the

areas studied. One hundred sixty-seven households or 74% planted between .03 and 30 hectares of maize; but the majority, 50%, grow from .35 to 2 hectares. The average area of maize planted is 1.28 ha, with a standard deviation of 3.02 hectares.

Thirty-one percent of the total interviewed do not produce maize; 63% produced less than 100 quintales and 6% produced from 102 to 1,150 quintales in the last cycle of production. The average production is 35.5 quintales and the standard deviation is 118.3.

Most of the producers consume their maize. Close to 56% of those interviewed do not sell maize. Of those that sell it, 19% sell up to 10 quintales, an additional 21% from 12 to 100 quintales, and only 4 in larger quantities. They sell an average of 27.14 quintales per farmer. The value obtained from the selling of maize fluctuates between 1,500 and 2,400,000 sucres; but half of those that sold maize (approximately 23%) obtained less than 36,000 sucres during the last cycle of production. The average value from the sale of maize is 66,195 sucres, with a standard deviation of 280,385.

D. LIVESTOCK PRODUCTION

The small and medium-sized producers of the coffee zones included in this study have several different animals on their farms (see Table 1). Among them were draft animals (e.g., horses, mules, and donkeys) and smaller animals and fowl for domestic consumption or sale. The most common are the laying hens and pigs with 75% and 58% of the respondents respectively reporting these. About 60% of the respondents had only 1 to 10 laying hens and 20% had from 10 to 30. In contrast, 48% of the sample had between 1 and 8 pigs, with an average of 2.4 per producer.

Table 1. Farm animals for total sample

Animal	# Owning	% Owning	Range
Fowl: laying	160	75.5	0 - 120
meat	74	34.9	0 - 200
Pigs	124	58.5	0 - 80
Cattle: dairy	22	10.4	0 - 70
beef	27	12.7	0 - 40
dual purpose	47	22.2	0 - 200
Horses	64	30.2	0 - 14
Mules	61	29.8	0 - 6
Donkeys	35	16.5	0 - 6
Goats	6	2.8	0 - 58
Ducks	5	2.4	0 - 15
Guinea pigs	5	2.4	0 - 20

Smaller proportions of producers have beef/dairy cattle (23%), horses (30%) and mules (30%). Less than 10% have dairy cattle, mules or goats.

It is interesting to note that while only 21% of those interviewed reported having no fowl, 46% reported that they did not consume it. This suggests that part of the farm population exchanges fowl for money and other goods. It is common for rural families in these areas to eat from 1 to 4 chickens monthly. Thus, more than 30% of those interviewed consumed between 6 and 24 chickens in the six months before the interview. Only a small number of pigs are eaten. Eighty three percent of those interviewed reported they did not eat their pigs. Of the rest, 15% had consumed between 1 and 3 of these animals in the last six months.

On the average, the value of the animals of each producer is 365,607 sucres. They consume animals at an average value of 29,931 and sell animals of an average of 69,682 sucres in a six month period. Non-participants in the sample possess and sell more animals than participants. The mean value of the animals owned for the first group is 475,260 sucres while for the second it is 310,391 sucres. Similarly, for the sale of animals the non-participants reported a mean value of 123,763 sucres and the participants 42,450 sucres.

E. YIELDS

The average coffee yields for the sample population, 15.5 quintales/ha, were higher than the estimated national average of 7 quintales/ha. Maize yields average 25.3 quintales/ha. for these subgroups. Yields of other crops are not included in the report due to the small size of the sample, usually less than 18 respondents.

F. UTILIZATION OF LABOR IN COFFEE PRODUCTION

Two-thirds of the coffee growing farms studied used domestic labor to grow coffee, from one to 356 person-days of labor during the last production cycle. For those that use under 100 days of labor, 40% report using family labor; while as much as 17% indicate the use of 1 to 10 days of hired labor, and 10% indicate more than 100 day-laborers during the last cycle. The utilization of male labor (in 60% of those interviewed) was a little more common than female labor (49%).

With regard to hired labor, 63 or 33% of those interviewed indicated they did not use it in the production of coffee. Of the 129 that resort to hired labor for the growing of coffee, the majority (92) utilize between 52 and 400 days during the annual production cycle and the rest utilize fewer than 50 (23) and from 470 to 1,200 (14) person-days of hired labor.

As in the case of household labor, the hired laborers are preferably male; thus, about 63% of coffee growers interviewed had hired men and 41% had hired women. Adding all of the laborers, domestic as well as hired, it is found that 31% of all of the coffee growers utilize fewer than 48 person days of labor during the year, that is to say, less than one per week on average. On the other hand, 64% utilize from 48 to 480 laborers, that is one to 10 laborers per week and 5% utilize more than 410 laborers a year.

From the information compiled, it is not easy to distinguish the quantity of laborers dedicated to other crops and to the care of animals. It is clear that a large part of the resource poor farmers' time is dedicated to the farming system and that they utilize as much domestic labor as hired laborers. For instance, in the specific case of maize cultivation, besides the use of domestic labor, 47% of the farmers also report the use of hired laborers in numbers that fluctuate from 3 to 900 a year, but the greater part (36%) use from 3 to 60 laborers in a year.

G. PRINCIPAL PROBLEMS OF PRODUCTION IN GENERAL

Asked about what type of problems are the most important for agricultural production, 50% report physical problems (climate, soils, etc) as the main ones, 40% biological problems (pests, diseases) and 30% economic problems (market, prices, transportation, etc).

1. Pests and Diseases

Among the problems of biological origin, the pests and diseases listed in Table 2 stand out, particularly Quemazón that affects 45% of the producers and, in descending order of importance, Gusano Cogollero, Mal de Hilacha, Gusano, Minador, Roya and Mancha de Hierro. Other pests and diseases are also mentioned but the proportion of those reporting them is less than 10%.

Table 2. Main pests and diseases affecting crops in coffee growing areas, by number of farmers reporting, 1988

Pest or disease	Producers reporting #	%
Quemazón	87	45.3
Gusano Cogollero	55	28.3
Mal de Hilacha	54	28.1
Gusano	38	19.8
Minador	27	14.1
Roya	23	12.0
Mancha de Hierro	23	12.0

2. Weeds

Among the most common weeds are Paja, Bejuco and Escoba, reported by over 30% of the coffee growers (Table 3). These are followed by Jorra, Hoja Ancha and Perrito. Other weeds were mentioned by fewer than 10% of the producers.

Table 3. Main weeds found in the crops of coffee producing areas, by number of producers reporting them, 1988

Weed	Producers reporting #	%
Paja	59	30.7
Bejuco	58	30.2
Escoba	58	30.2
Jorra	55	28.6
Hoja Ancha	38	19.8
Perrito	21	10.9

H. CHEMICAL INPUTS

In the coffee-based farming system, a diversity of chemical inputs are used. The costs of these inputs, like those for agricultural implements and labor, are costs that should be considered to determine the net return of production. In the case of the coffee growers included in this study, 52% indicated they did not use any chemical inputs, 39% spent from 40 to 10,000 sucres and 10% from 10,000 to 908,000 sucres during the last six months.

I. IMPLEMENTS OF PRODUCTION

As might be expected, agricultural tools and implements are used in production. However, 11 or 6% of the producers interviewed did not report any of them. Thirty-seven percent indicated that they had made a very small investment in implements, with a value less than 10,000 sucres; 46% had implements worth between 10,000 and 100,000 sucres and the remaining 11% had implements worth more than 100,000 sucres.

J. INCOME

All of the people interviewed had income from the agricultural production of their land; the average is 983,042 sucres, but the results range from a minimum of 26,500 to a maximum of 38,400,000 sucres. Grouping the sample in categories of earnings, the data shows that 10% of the coffee growers made 120,000 sucres or less in the last six months, 40% made from 120,000 to 341,000, an the remaining 50% made incomes over 341,000 sucres. The most exceptional case is one coffee grower who reported an income of 38,400,000 sucres in the last six months.

The main source of income is coffee production, with a sample mean of 595,145 sucres during the twelve month period prior to the interview (Figure 5). It is followed in importance by other crops (maize, bananas, fruits), with a mean income of 221,106 sucres and by animals and other animal products which provide a mean income of 109,335 sucres. Other sources of income individually do not represent more than a small proportion of the total. Thus, the mean income from daily wages\salary and retailer\merchant is only 28,390 and 16,922 sucres, respectively.

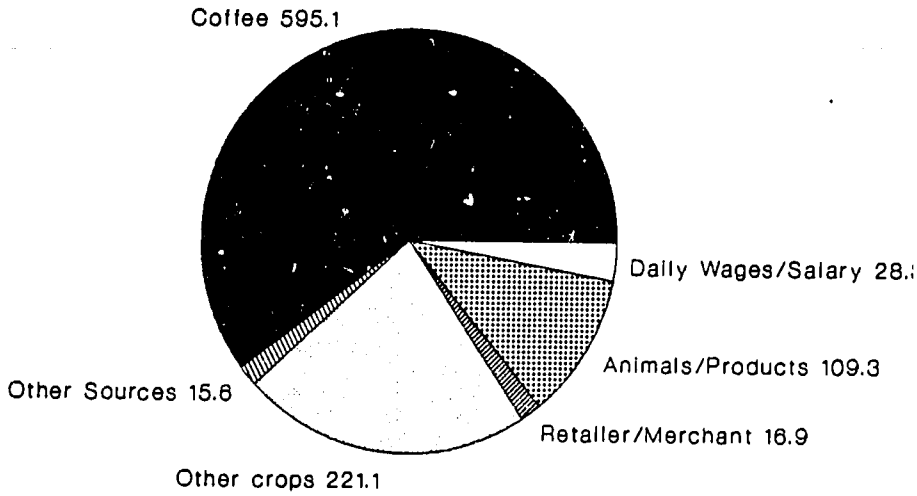
A comparison of the subsamples of participants and non-participants shows a substantial difference in the mean income derived from coffee production (Figure 6). While the participant group had a mean value of 698,057 sucres, the non-participant group had a mean of only 390,770 sucres. In contrast, income derived from the sale of other crops as well as from animals and animal products (meat, milk, etc.) was higher among non-participants than among participants.

The difference is particularly marked in the the last case, where income derived from animals and of animal products was much higher for the non-participant group (mean of 192,683 sucres) than for the participant one (mean of 67,224 sucres).

K. MARKETING

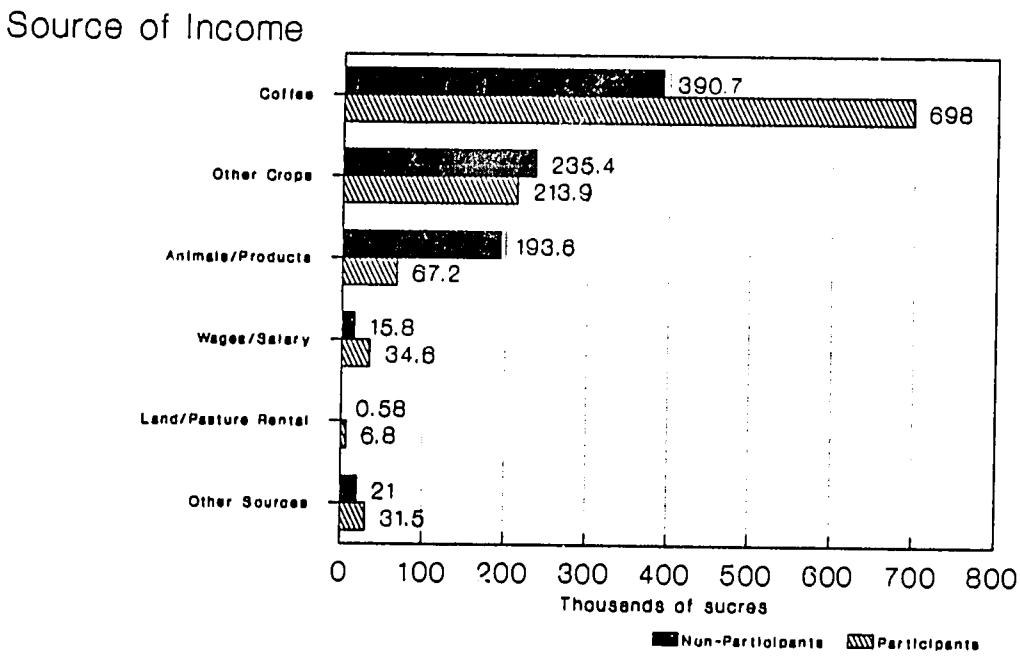
In all these areas, crops are marketed close to the farm. In fact, 98 producers (51%) reported they sold their crops to merchants from the same area, while 31 (16.1%) had sold them to distant merchants. The rest of the producers sold to consumers already in the area or to far away markets.

FIGURE 5: Main Income Sources Coffee Program



Thousands of sucres

FIGURE 6: Main Income Sources Participants and Non-Participants



The principal problems in the marketing of agricultural products, especially in the sale of coffee, are the variability of prices, according to 143 or 74% of those interviewed (see Table 5). In order of importance, other problems faced by farmers include the following: the intermediaries take a large part of the profit, inadequate transportation, low quality of their products, lack of knowledge of the market, and small demand.

Table 5. Marketing problems, by number of producers reporting, 1988

Problem	Producers reporting #	%
Prices	143	74.5
Intermediaries	88	45.8
Transport	67	34.9
Quality of product	44	22.9
Lack of marketing knowledge	25	13.0
Insufficient demand	21	10.9

L. CREDIT

When asked if they had ever had problems in obtaining credit for agricultural production, 116 or 60% of those interviewed responded affirmatively. The available sources of credit are presented in Table 6, in which it can be seen that the principal sources of credit are from UOCAM, from a merchant, from the National Agricultural Development Bank (BNF), from informal lenders (chulqueros), or a coffee cooperative associated with FENACAFE.

Table 6. Credit availability, by source, according to producers' opinions, 1988

Source	Producers reporting #	%
UOCAM	51	26.6
Merchant	40	20.8
BNF	30	15.6
Informal lender	10	5.2
Coffee cooperative	10	5.2

UOCAM lends only small amounts, generally lower than 10,000 sucres, so its importance is very relative. Other sources of credit are able to lend much higher amounts, but the merchants and chulqueros are well known for their high interest rates, that can range from 50 to 200%. On the other hand, the best source of credit in terms of interest rates, risk, etc. is BNF, accounting for 27% of the producers. In order of preference the best lenders are as follows: UOCAM 24%, a merchant 10%, the chulquero 8% and the coffee cooperative 4%.

M. TECHNICAL ASSISTANCE

Asked if they had received a visit from an agricultural technician, 41% of those interviewed gave an affirmative answer; 11% said that the technician was from UOCAM, 9% from the National Coffee Program (PNC) and fewer than 10% identified technicians from other institutions.

Agriculture was the most common topic of extension. The prefered institutions, in terms of the proportion of favorable responses were UOCAM (28%), a Coffee Cooperative (16%), PNC (19%), FENACAFE (13%), and the Jipijapa Rural Development Project (DRI) (2.1%). If one considers that the majority of cooperatives belong to FENACAFE, it is possible to combine their proportions and arrive at a figure of about 29% of agricultural training having been given by this organization.

N. KNOWLEDGE OF DEVELOPMENT INSTITUTIONS

As one can see in Table 7, the rural people in coffee producing areas have a greater knowledge of the National Agricultural Development Bank (BNF) than of any other development institution. The Agrarian Reform Institute (IERAC), PNC, and Ministry of Agriculture (MAG) follow in descending order. The others are known by fewer than 15% of the producers. There is considerable consistency in the understanding of the institutions and their main function, with the exception of PNC, UOCAM and DRI. This latter case must be due to the fact that the peasant organization UOCAM carries out varied functions in the field of community development while the Jipijapa DRI is a public institution of regional development with rather broad functions. But it is surprising that many can not clearly identify the function of National Coffee Program (PNC), which is predominantly of technical assistance.

Table 7. Identification of development institutions and their functions, 1988

Institution	Identification	Function known
BNF	63.2	59.8
IERAC	42.0	41.5
PNC	34.9	22.6
MAG	33.0	29.2
CRM	16.5	14.2
UOCAM	12.0	3.1
INIAP	16.0	14.6
DRI	8.0	1.6
JRH	2.4	-

O. TECHNOLOGY OF COFFEE PRODUCTION

1. Characteristics of the Crop

The variety of coffee that is predominantly found in the areas studied is Typica, with 183 producers or 86% (Figure 7) planting it on their farms. A second variety, Caturra, follows in importance with 62 producers or 29%.

Of the various coffee fields that the people interviewed generally have planted, the average age of the first field is 17 years and the others are between 16 and 17 years. Though the size of these fields of coffee in some cases reach up to a maximum of 35 hectares, 70% of them are smaller than 3 hectares.

With respect to the different systems of intercropping with coffee, Table 8 shows a large variety of arrangements. The most common practices are to plant only coffee, or to interplant it with citrus, with other trees, or with bananas.

Figure 7: Distribution of Coffee Varieties - Coffee Program

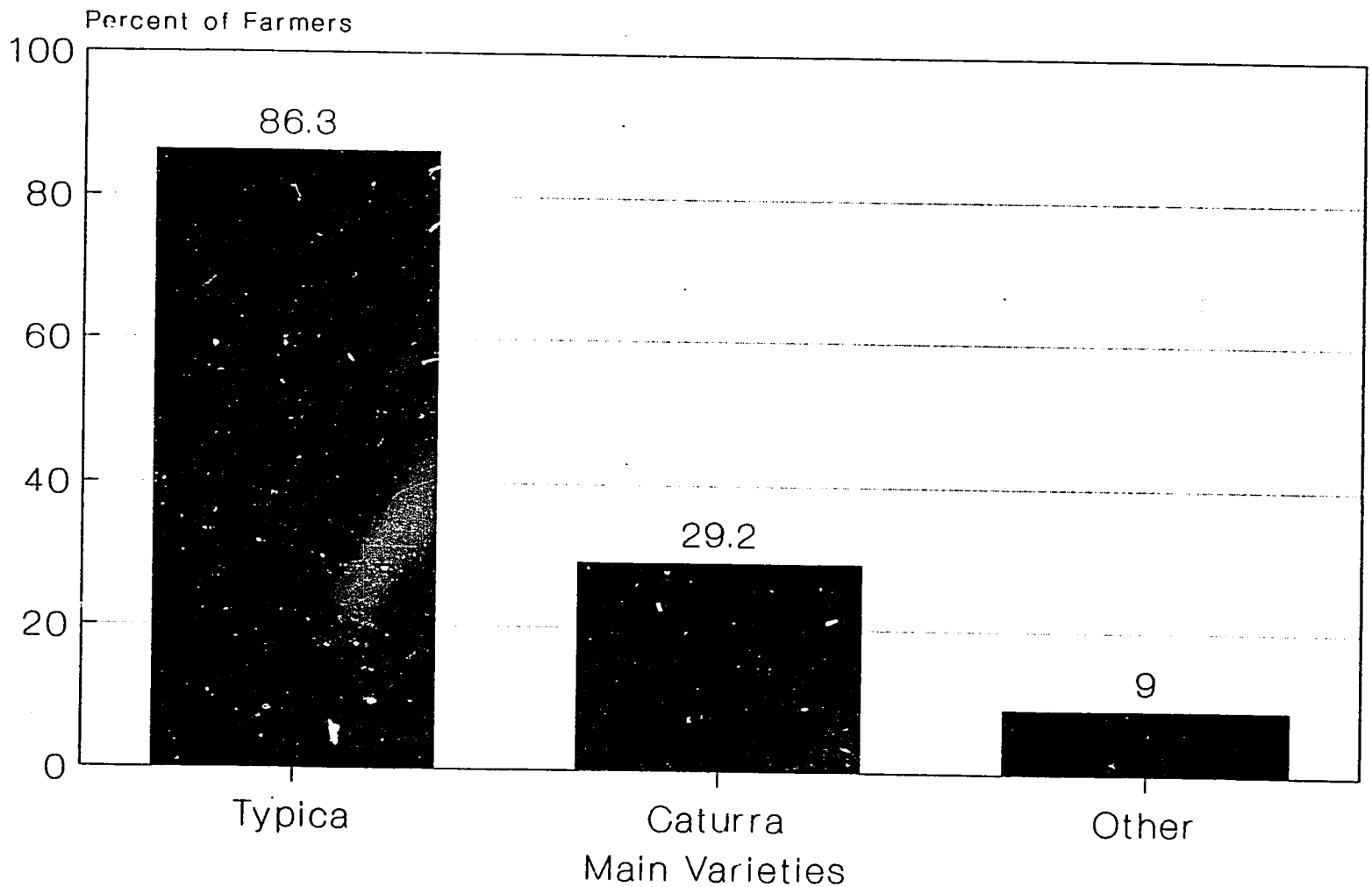


Table 8. Other crops present in the coffee plantations

Crop	#	%
Coffee only	150	70.8
Coffee + cacao	8	3.8
Coffee + plantain	18	8.5
Coffee + cacao + plantain	8	3.8
Coffee + other crops	44	20.8
Bananas + coffee	98	46.2
Plantain + coffee	54	25.5
Citrus + coffee	161	75.9
Trees + coffee	108	50.9
Cacao + coffee	21	9.9
Other	60	28.3

2. Weeds and Forms of Control

The main types of weeds in coffee cultivation, as is shown in Table 9, are Paja, Bejuco and Forra, which were reported by over 30% of the coffee growers. Weed control is almost exclusively manual, as 94% of those interviewed report. The tool preferred is the machete. Upon being questioned about the reasons for not using herbicides, 66 people (31%) mention lack of knowledge, 32 (15%) lack money, because it is not a custom (12%), and 4% believe that the chemicals damage the ground.

Table 9. Main weeds, pests and diseases in the coffee plantations

Weed	#	%
Soguilla	31	14.6
Achichilla	21	9.9
Hoja ancha	50	23.6
Bejuco	85	40.1
Paja	85	40.1
Escoba	57	26.9
Verdolaga	10	4.7
Forra	73	34.4
Grama	46	21.7
Hierba	18	8.5
Hortiguilla	24	11.3
Perrito	18	8.5
Vetilla	15	7.1
Pest		
Gusano blanco	29	13.7
Hormigas	33	15.6
Minador de la hoja	56	26.4
Disease		
Quemazón	91	42.9
Cercóspora	30	14.2
Ojo de gallo	47	22.2
Mal de hilacha	82	38.7
Mancha de hierro	42	19.8

3. Pests and Diseases

Though the cultivation of coffee in the areas studied is affected by many pests and diseases as is also shown in Table 9, the more well known pests of Broca and Roya are not mentioned. The plague recognized by the largest number of respondents was the Minador de la Hoja, reported by 56 coffee growers. With regard to the diseases, Quemazón was mentioned by 91 coffee growers, Mal de Hilacha by 82, and Ojo de Gallo by 47.

As is the case with weeds, very few people (9%) control pests and diseases. Of those that do not use any form of control, the main reason given is that they have insufficient knowledge of adequate measures.

4. Harvest and Initial Processing

The predominant method of harvesting coffee is what is called "sobado," by means of which all of the coffee beans of one cluster are loosened and pulled, with a resulting mixture of mature and immature beans. Two thirds of the coffee growers interviewed reported using this method. On the other hand, other producers harvest coffee by means of the method of "pepiteo" which consists of selecting from one cluster only the mature (yellow or red) beans, leaving the immature green ones on the plant. Forty percent of those interviewed apply this method.

After harvesting the coffee beans it can be sold in "cereza" (cherry form) or without any processing, in "bola" or depulped, and "lavado" or "pilado", peeled or pergamine coffee. These forms of sale are the practice of the majority of the coffee growers. Thus, the highest number (74%) sell it lavado, but 67% also sell it as bola, and 55% in cereza.

It is common to find depulping done at home on the farms of the sample studied. This is reported in 130 of the cases. On the other hand, 68 also had fermentation basins, and 38 drying-sheds for the drying of the grain.

Q. PREDICTORS OF COFFEE YIELDS AND FARMERS' INCOME

Correlation analysis of the data indicates that there are no good predictors of coffee yields in the study sample. However, there are several predictors of total income, as shown in Table 10. The best correlates of total income in the sample are the amount of land worked, area in crops and area in pastures. Weaker but still statistically significant variables are coffee production, maize production, and number of parcels worked by the farmers.

Table 10. Predictors of total income

Variable	r
Area in crops	.84*
Area in pastures	.79*
Amount in land worked	.79*
Coffee production	.39*
Maize production	.25*
Number of parcels	.20*

* Statistically significant at .05 or better

R. SUMMARY AND CONCLUSIONS

1. The formal survey carried out by FUNDAGRO and CANA for the baseline studies of the REE Project was done on a sample of participants in the Coffee Program, belonging both to UOCAM and FENACAFE, with a control group of non-participants. The largest proportion of people interviewed were from the South of Manabi, but interviews were conducted in most of the cooperatives which receive technical assistance from FENACAFE.

2. The socieconomic data shows that the family heads in the study areas are of middle age, with a mean of 53 years of age. Formal instruction in the majority of cases ranges from third to sixth grade of primary education. Agriculture is the primary occupation.

3. The size of holdings differs substantially among households in the sample, with a mean of 15 ha per farmer. In addition to legal possession of the land, there are other tenure arrangements in the region including untitled possession, rental and sharecropping. In fact, 44% of the farmers do not own the land they work.

4. Farmers usually hold more than one plot; 83% of the sample had between 1 and 5 plots of land under cultivation, with an average planted area of 7.5 ha.

5. The production systems of the areas surveyed are characterized by their complex mix of crops and animals, used both for home consumption and the market. Coffee is the main crop in the production systems of the study areas, followed by maize, bananas, and cassava. Only 4% of the individuals contacted had not planted coffee, and only 6% had not planted maize.

6. The arabica typica variety predominates (86%), followed by the arabica caturra (29%, which is usually planted in addition to typica and is expanding gradually). Coffee plantationa are old, with a mean age of 27 years for the first plot and 16 years for the rest of plots. As a lone crop on some plots, coffee is grown by 71% of the farmers. Intercropping coffee with bananas, plantain, citrus and other crops is very common; most farmers intercrop coffee on at least some of their plots.

7. Coffee is produced and sold in three different forms: "cereza" (cherry), "bola" (depulped), and "lavado" (pergamine). Two thirds of the sample reported the "sobado" method of harvesting, by which all the beans in a cluster, either green or mature, are picked. 8. Maize, in contrast to coffee, is grown not only for the market but also for home consumption. Thus 56% of the farmers who produce maize do not send it to the market.

8. Animal production is both for domestic consumption and for sale. The the most important animals in the system are chicken, pigs, and beef cattle.

9. The main problems of agricultural production are physical: bad weather, lack of rains, poor soils. Biological problems are next in importance, particularly those that affect the coffee crop: diseases such as Quemazón, Mal de Hilachas, Gusano Cogollero, and weeds such as Paja, Bejuco and Escoba. Yet, very few coffee growers control weeds, pest and diseases. Apparently this is due to insufficient knowledge about available control measures.

10. Farmers' income comes principally from agricultural production, especially from the sale of coffee and maize. The average income in 1987 was 983,042 sucres. Participants in the FUNDAGRO sponsored Coffee Program had higher incomes from coffee production than non-participants. The reverse is true for income derived from other crops and from the sale of animals and other animal products: non-participants show higher income than participants.

11. The most convenient source of credit, in terms of payment conditions and interests rates is the National Agricultural Development Bank (BNF), but other sources, such as coffee merchants and informal lenders, are more readily available, though they charge extremely high interest rates.

12. Coffee production is predominantly a family activity. About two thirds of the farms sampled used family labor to grow this crop. In both family and hired labor there is a high participation of females. Thus, in Manabi it was found that of the 60% who reported family laborers, females were employed almost as frequently than males; and of the 63% who reported hired laborers, about two-fifths had employed women.

13. Although computed coffee yields are higher than the national average, it is evident that in all the study area the level of technology of coffee production is extremely low. The practices outlined here are confirmed by the opinions of producers and technicians familiar with the area, who observe that it is common to plant the coffee plants, leave them to grow on their own and return to them only at harvest time. Since the majority of coffee growers in the sample are low resource farmers, one could justify their poor management practices on the basis of lack of money, especially when considering practices which require high cash expenditures such as chemical control of pests and the use of additional manual labor for harvesting by "pepiteo." However, one is disconcerted when learning that the same is true even in times of good prices for coffee, when they receive a larger profit profit from this activity. They apparently do not invest their resources to improve cultivation and believe that, somehow, their coffee plantation will keep producing indefinitely. Thus, the poor cultivation practices and poor initial processing of the coffee results in low quality and reduced prices in the market.

IV. FOOD CONSUMPTION AND NUTRITIONAL STATUS

A. OBJECTIVES

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 each of the programs as baseline data for 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.

B. METHODS

The preliminary surveys focused primarily on food consumption indicators for the communities surveys. The baseline surveys were conducted using a combination of interview techniques and anthropometrics to estimate nutritional status. In both surveys 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, in the baseline surveys, 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 schedules 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) it has been found that this is 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 <u>not</u> 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.

For the baseline surveys 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 on a sliding head board. Mid-arm circumferences were collected using non-stretchable, insertable arm tapes.

Heights and weights for the children of all three samples 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 standard deviations below their appropriate US medians (i.e. $Z < -2.0$) are deemed to be at nutritional risk (Frisancho, 1986).

C. PATTERNS OF FOOD CONSUMPTION

The patterns of food consumption in the survey areas typify those of Ecuadorean coastal cuisine with a high reliance on starchy staples and purchased foods. The range of preferences and possibilities is large, although rice, sugar, bananas, plantains, corn and cassava form the caloric mainstays of the diet. Beef, cheese, chicken, eggs, milk, and fish are major sources of protein as well as energy. This section provides a qualitative and quantitative assessment of food consumption in the zones, focussing on issues of preference and availability in the food system.

A typical breakfast for these rural cultivators includes coffee, ground and roasted from the farm's own production. The morning meal is generally a seco (dry rice plate) as opposed to a soup or porridge which is typical of suppers or the noon meal. Rice, usually served with fried meat, fish or eggs is complemented with roasted banana or plantain. The meat or fish may be seasoned with onions and green pepper and the coffee is most often sweetened with sugar.

The noon meal or almuerzo also includes the basic staples; rice, banana, and plantain, and generally centers on a caldo or clear broth. This mid-day soup is based on purchased noodles, potatoes or cassava (yuca) the latter which is about equally likely to be produced by the household or purchased in both areas. The soup may also contain beef, chicken or fish, some vegetables, and is seasoned with salt, pepper, green pepper and onions. If the meal includes meat, yuca, and plantains or banana, it is often referred to as a sancocho. Substituting for the caldo is menestra, a porridge containing beans, cabbage and other vegetables without meat and less frequently, a dry meal. A limeade or juice is frequently taken with lunch rather than a hot drink.

Supper or the merienda is often substantial and on occasions elaborate, although it is generally considered to be a lighter meal than that served at mid-day. It can consist of rice with meat, fish, or chicken and roasted banana or plantain. More elaborate dishes such as tripe with peanut sauce or something as simple as a vegetable soup with an omelet can form the center of the evening meal. A hot beverage is most often taken with the evening meal, either coffee or agüita (herbal tea).

1. Esmeraldas/ Pichincha

Differences in regional cuisines are related to differences in the cropping system as well as the market availability of certain foods, points that are elaborated upon below. At this point, an idea of some of the dietary differences between the two areas can be seen in Table 11, which shows the percentage of households reporting usage of key foods during the survey period.

The figures cited here indicate a difference in the relative importance of plantain and banana, both of which serve as a source of shade for coffee plants as well as products in both areas. In the northern, lower elevation areas of Santo Domingo and Quininde, plaintains are an integral part of the cropping system and of great nutritional significance with three quarters of the households surveyed reporting consumption.

Table 11: Percentage of Households using Key Foods in Preliminary Survey Zones.

Food	Santo Domingo - Quinindé (%)	El Oro (%)
Rice	100	100
Corn	26	64
Noodles	74	90
Sugar	95	100
Banana	68	88
Plantain	75	57
Peanuts	21	73
Beans	90	75
Potatoes	100	98
Casssava	58	83
Beef	94	100
Chicken	94	81
Pork	24	40
Fresh Fish	89	73
Dried Fish	6	50
Milk	72	40
Cheese	84	93
Eggs	94	90

In El Oro, plantains are somewhat less important with a little over one-half of the households reporting consumption. As Table 12 indicates, the majority of plantains are purchased in the higher elevation survey areas of the southern province while the bulk of plantains in Quinindé and Santo Domingo come from farm production.

Conversely, bananas are cultivated with greater frequency by farmers in the El Oro sub-sample, a fact which is reflected in their importance to the diet. Nearly 90% of the households in El Oro consumed bananas during the week of the survey while this figure was slightly under 70% for the other region. Although bananas are primarily supplied through farm production in both areas, the energy contribution differs significantly as can be seen in Table 13. For the small number of households where women responded with a quantitative estimate on the weekly market basket

in Santo Domingo - Quinindé, the mean caloric contribution of bananas came to about 1.5% of weekly totals. For El Oro, this figure is around 4%, reflecting the relatively greater significance of the food for those households consuming it and for the region in general.

Another difference appearing in these data are the relative importance of potatoes and cassava in the diet of the two areas. While consumption of the highland grown tubers was 100% for households in both areas, families in the Santo Domingo-Quininde sub-sample relied more heavily on potatoes as an energy source ($p < .01$). On the other hand, cassava was much less frequently consumed in the northern zone than in the south (58% vs. 83% in our survey) while its importance as an energy source was slightly greater in the northern coastal provinces than in El Oro for those households reporting a quantity for the usage of the tropical root crop.

Table 12: Sources of Key Foods in Preliminary Survey Zones

Food	Santo Domingo Quinindé (%)		El Oro (%)	
	Produced	Purchased		Produced
Purchased				
Rice	21	79	9	91
Corn	50	50	33	67
Noodles	0	100	0	100
Sugar	0	100	0	100
(raspadura)	0	100	16	84
Banana	89	11	71	29
Plantain	92	8	30	70
Peanuts	50	50	40	60
Beans	9	91	13	87
Potatoes	0	100	0	100
Cassava	56	44	52	48
Beef	0	100	0	100
Chicken	91	9	50	50
Pork	25	75		
Fresh Fish	0	100	11	89
Dried Fish	0	100	0	100
Milk	80	20	46	54
Cheese	42	58	15	85
Eggs	79	21	87	13

Based on responses of those households providing source information. Percentages may not reflect the importance of the food to either the farming or food system.

Table 13: Energy Contribution of Key Foods in Preliminary Survey Zones.

Food	Santo Domingo-Quininde		El Oro	
	%	(N)	%	(N)
Grains	38.8	(17)	44.9	(34)
Rice	29.5	(17)	26.7	(29)
Corn	7.1	(2)	8.0	(16)
Noodles	3.0	(12)	3.2	(31)
Sugar	14.1	(17)	12.9	(33)
Banana/Plantain	7.1	(14)	9.8	(29)
Banana	1.5	(5)	4.0	(26)**
Plantain	7.1	(13)	6.6	(21)
Legumes	6.5	(18)	7.7	(26)
Peanuts	1.9	(2)	4.3	(19)**
Beans	4.8	(17)	4.5	(23)
Tubers	4.3	(15)	4.8	(33)
Potatoes	2.1	(13)	1.3	(34)**
Cassava	6.7	(5)	4.1	(24)
Meat & Fish	4.0	(18)	4.4	(32)
Meat	2.9	(16)	3.2	(33)
Beef	1.9	(14)	1.7	(33)
Chicken	1.3	(14)	1.4	(27)
Pork	.7	(3)	.8	(13)
Fish	1.4	(17)	1.6	(25)
Fresh	.6	(12)	.4	(14)
Dried	0	(0)	1.7	(13)***
Dairy	3.5	(16)	3.7	(24)
Milk	2.9	(10)	2.6	(10)
Cheese	2.2	(13)	2.1	(28)
Eggs	1.1	(13)	1.3	(31)

Based on 5% trimmed samples showing mean percentages of caloric contribution of food to total household calories for those households responding with a weekly total.

** $p < .01$

*** $p < .001$

Among the legumes, peanuts are more regularly found on the tables of El Oro households, although the extent of this difference may in part be related to the times of year during which the surveys were conducted. Nevertheless, peanuts are more common in the southern farming system and their energy contribution to households in that zone is over twice that for those responding with consumption amounts in Santo Domingo -Quinindé ($p < .01$). Bean consumption appears with a slightly higher frequency in the northern provinces, although in both areas this largely purchased food provides a roughly comparable caloric contribution to households.

Fish is an important source of dietary protein, largely puchased in both areas. While none of the households consumed fish caught by family members in the Santo Domingo - Quinindé region during the time of the survey, one respondent suggested that river fishing is an important source of this food in the area. Although the importance of fishing as a source of food may be understated for the northern region in these data, fresh fish as an energy source is roughly comparable in both areas. A clear difference in the use of dried fish in the two regions is evident, however. The dried product was used by about one-half of the El Oro respondents and its caloric contribution to the diet is substantial.

Food preferences confirm the essential dietary contribution of rice and meat, particularly beef, while at the same time indicating the range of variability in and the idiosyncratic nature of what households like to eat. For the sample as a whole and for both areas, rice and carne (meat in general, most often referring to res or beef) are the overwhelming favorites. Both fish and chicken are important preferences in the Santo Domingo-Quininde sample while El Oro women are more likely to mention eggs, cheese and beans as family favorites. Corn, both in the form of hominy and as corn-on-the-cob, was mentioned as the first choice preference of two households in the Santo Domingo-Quininde sample while the general category of grains which includes corn are third choice favorites for about ten percent of El Oro households.

Among those foods having a low frequency on the list of preferences are banana, plantain and potatoes, all of which make sizeable caloric contributions to the diet. Potatoes were mentioned as a third choice preference only once by the northern coastal women and as a second and third choice only by two El Oro women. Despite their dietary importance, banana and plantain appear to be less highly esteemed than given components of the food system. Soups containing them were mentioned by only two women in El Oro with bananas being mentioned as a primary or secondary preference on only three occasions across the sample.

Other preferred items reflect favorite dishes including noodle soup, chicken soup, or vegetable dishes such as peas and beans. Bread, crackers and even sardines were mentioned along with the preference category of two El Oro women -- whatever is in the

house. In general, stated food preferences reflect the overwhelming dietary importance of rice and a taste for protein "packages" such as meat, cheese and eggs.

In general, dietary diversity as measured by a count of different foods in the market basket is greater in El Oro than in the northern provinces. Although the measure of diversity proves to be significant at the .05 level, this result should be viewed with some caution since the number of items included in the El Oro survey is slightly larger. Thus the extent of the difference may be an artifact of the survey instrument itself.

An important aspect of dietary diversity in both regions is the variety of fruits, many of which are raised on the farms of these coffee producers. Citrus fruits such as oranges, grapefruits and limes are among the most commonly grown along with mangos and guava. The variety of fruits raised allows for some production throughout the year, although one of the women interviewed in El Oro noted that winter food shortages were related to a shortage of fruit on the farm.

In terms of average overall dietary adequacy as measured by the ratio of household calories to requirements, the two regions surveyed do not differ significantly. At the same time, the reliance on purchased foods in both zones is is very high. This can be seen in Table 12. Further, the Pearson correlation coefficient measuring the association between the household calorie ratio and the weekly food budget is a relatively strong .41 ($p < .01$; $N=50$) for the sample as a whole.

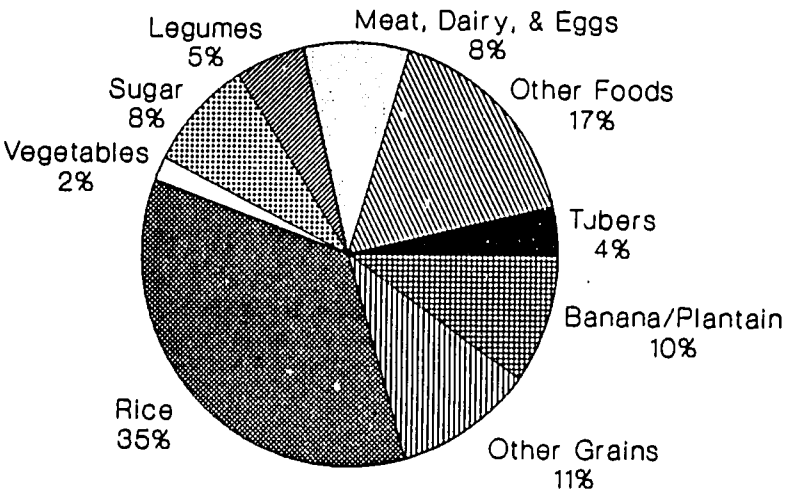
On the average the diet of the areas surveyed in the coffee baseline is heavily dependent on grains, banana and plantain, and a variety of prepared foods (Figure 8). About 46% of the diet comes from grain products, with over 35% of the total energy accounted for by rice. Banana and plantain account for nearly 10% of the calories. Grains, banana and plantain taken together acount for about 56% of the calories and constitute the primary starchy staples in the diet. Other foods, particularly grain products such as noodles and flour, along with fats and oils comprise 17% of the dietary energy. The calories from sugar amount to 8%. Meat, dairy products and eggs likewise account for over 8% of the diet and provide a significant source of protein for these coffee producers. Legumes, especially beans, provide 5% of the dietary energy along with another 2% from other vegetables.

An overwhelming portion of the energy intake of sample families comes from purchased food (Figure 9). Households derive only about 16% of their total energy from farm production. Purchased foodstuffs on the other hand account for nearly 84% of total.

1. Household Characteristics

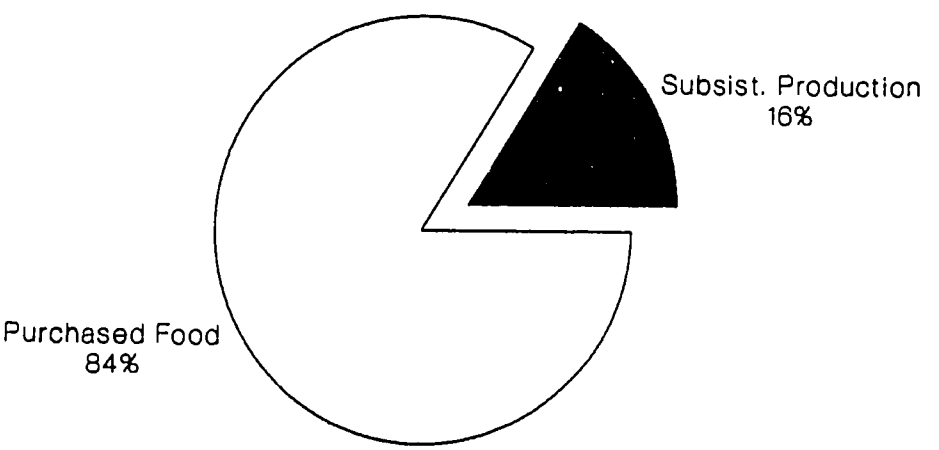
Families sampled in the coffee program baseline exhibit distinctive demographic characteristics (Table 14). There are no significant differences between participants and non-participants in age of household heads, family size and other family indicators. However, non-participating families report fewer animals than participating households (Table 14).

FIGURE 8: Proportion of Diet From Key Foods - Coffee



Mean percent household calories from each source

FIGURE 9: Proportion of Diet From Subsistence Production - Coffee



Mean percent household calories from each source

Table 14: General Household Characteristics, Coffee Sample: Participants vs. Non-Participants

	Participants			Non-Participants		
Measure	n	mean	SD	n	mean	SD
Age	85	47.9	13.3	48	44.4	16.4
Age (Spouse)	76	51.3	16.7	43	47.8	14.4
Education	88	7.8	7.0	49	9.2	6.6
Family Size	90	6.1	2.8	49	6.9	2.9
HH Items[1]	90	1.8	1.6	49	2.0	1.7
Food exp/wk	90	6957	3868	49	7427	4455
Chickens	90	8.1	11.9	49	6.6	4.7
Pigs*	90	1.4	2.0	49	0.9	1.3
Guinea Pigs	90	0.3	1.5	49	0.1	0.3
Cows*	90	2.3	9.0	49	0.2	0.8
Eggs/wk	90	12.0	14.8	49	12.0	12.7
Milk/day	90	0.7	3.7	49	0.02	0.1
Cheeses/wk	90	0.1	0.4	49	0.02	0.1

[1]Number of common household items (e.g., radio, bicycle, oven) owned by family. Maximum number is 10.

* $p < 0.05$

Table 15: General Household Characteristics, Coffee Sample: UOCAM vs. FENACAFE

	UOCAM			FENACAFE		
Measure	n	mean	SD	n	mean	SD
Age	99	45.4	14.1	39	50.4	15.4
Age (Spouse)	89	49.6	15.7	34	51.0	16.0
Education	102	8.2	6.8	40	9.3	7.5
Family Size	104	6.2	2.6	40	6.8	3.6
HH Items[1]	104	1.7	1.3	40	2.5	2.6
Food exp/wk**	104	6670	3105	40	8802	6247
Chickens	104	7.2	10.2	40	8.4	9.1
Pigs	104	1.1	1.6	40	1.5	2.1
Guinea Pigs	104	0.1	0.6	40	0.5	2.0
Cows	104	1.1	3.3	40	2.5	12.6
Eggs/wk**	104	13.5	15.2	40	7.2	8.11
Milk/day	104	0.5	3.4	40	0.3	1.0
Cheeses/wk	104	0.06	0.4	40	0.08	0.4

[1] Number of common household items (e.g., radio, bicycle, oven) owned by family. Maximum number is 10.
**$p < 0.01$

2. Nutritional Status

Anthropometric méasures indicate that children in the coffee sample are undernourished (Table 16). The average Z-score for height is -1.96, with over 40% of the children falling below Z = -2.0. Mean weight for age is also evident of this trend with a figure 1.39 SD below NCHS standards.

Within the sample, children of the UOCAM families appeared worse off than those of the FENACAFE sample (Table 17). For all four anthropometric measures, children of the UOCAM group were lower than those of the FENACAFE group. Children of non-participating families also appear to be at greater nutritional risk (Table 18). Differences were statistically significant for weight for age, and also very large for height and weight for height.

As for gender differences in nutritional status, no clear pattern is evident (Table 19). Height and weight for age are both greater in boys, while weight/height and arm circumference measures are higher in girls. The fact that girls have significantly higher arm circumferences scores than boys is probably reflective of reduced levels of sexual dimorphism in muscularity in this population. As has been demonstrated in many developing countries, chronic undernutrition results in reduced muscularity among males (Stini 1972); hence in terms of arm circumference, females tend to be closer to NCHS medians than males.

Table 16: Anthropometric[1] Characteristics: Coffee Sample

Measure	n	Mean	SD
ZHT	106	-1.93	1.53
ZWT	115	-1.37	1.28
ZWTHT	108	-0.13	1.06
ZARM	115	-0.67	1.14

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).

Comparing anthropometric measures from the coffee sample with other projects, weight for height was slightly better than in the dairy sample, whereas mid-arm circumference was worse, averaging 0.67 SD below the US Median. However, when the data are disaggregated by age (Figure 10 & 11), it is evident that the highland children appear to start out with low birthweights and recover somewhat as they get older. Toddlers in the coffee sample, on the other hand, rapidly decline in both weight for age and height for age. It is probable that young coastal children suffer more intestinal parasites and infection than those in the highlands. Additionally, early weaning age and poor quality (i.e., low protein) weaning foods may also contribute to this decline. Average age for complete weaning is 11.6 ± 4.2 months, which is significantly shorter than the average weaning age of 18.4 ± 6.1 months for the dairy sample. ($t = 10.4$; $p<.0001$). Finally, it is also of note that households in the sample as a whole are less able to meet their energy requirements than households in the dairy sample (108% of household requirement as compared with 125%; $p<.05$).

Table 17: Anthropometric Characteristics, Coffee Sample: UOCAM vs. FENACAFE

	UOCAM			FENACAFE		
Measure	n	mean	SD	n	mean	SD
ZHT	74	-2.02	1.61	32	-1.87	1.39
ZWT	83	-1.48	1.28	32	-1.08	1.25
ZWTHT	76	-0.24	1.09	32	+0.13	0.96
ZARM	83	-0.76	1.08	32	-0.45	1.26

Table 18: Anthropometric Characteristics, Coffee Sample: Participants vs. Non-Participants

	Participants			Non-Participants		
Measure	n	mean	SD	n	mean	SD
ZHT	85	-1.86	1.54	21	-2.44	1.42
ZWT*	94	-1.25	1.28	21	-1.89	1.17
ZWTHT	87	-0.05	1.06	21	-0.48	1.04
ZARM	94	-0.65	1.15	21	-0.78	1.10

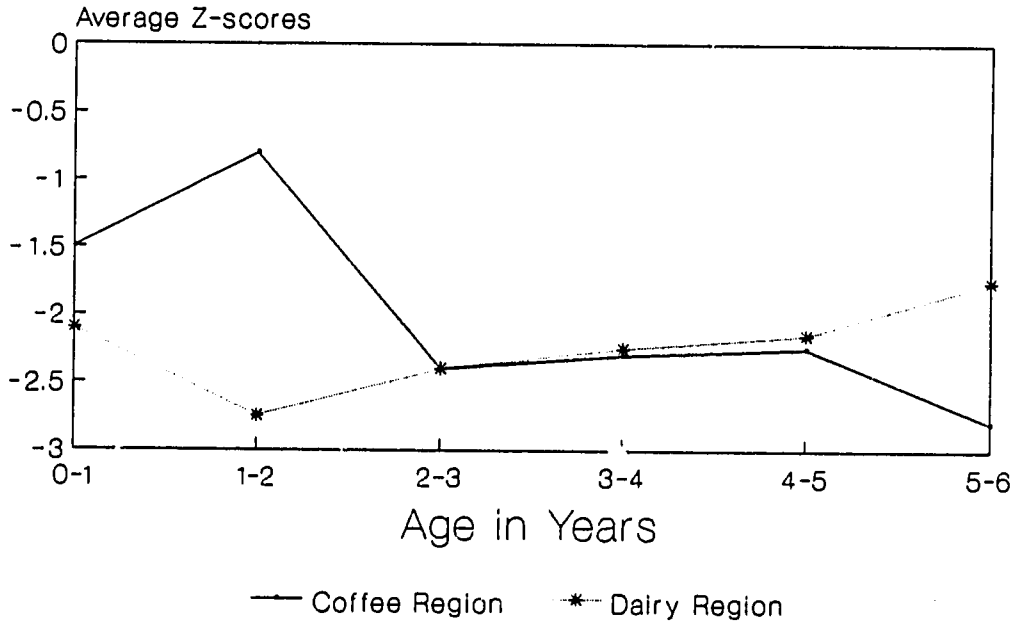
*$p < 0.05$

Table 19: Anthropometric Characteristics, Coffee Sample: Males vs. Females

	Males			Females		
Measure	n	mean	SD	n	mean	S D
ZHT	53	-1.78	1.61	53	-2.16	1.43
ZWT	57	-1.29	1.43	58	-1.45	1.12
ZWTHT	54	-0.27	1.18	54	+0.01	0.93
ZARM*	56	-0.91	1.07	59	-0.45	1.17*

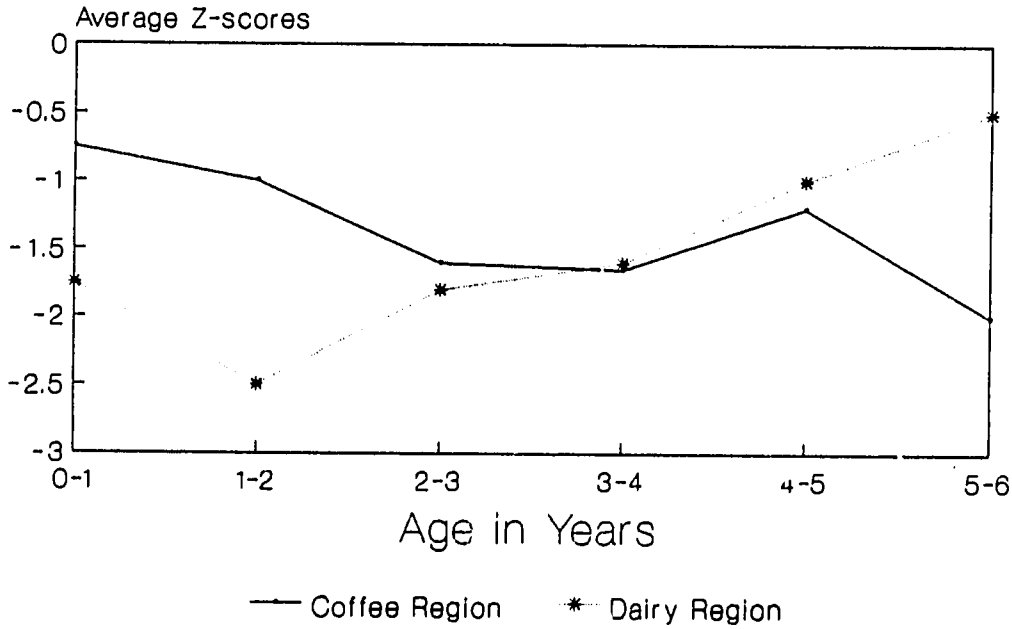
* $p < 0.05$

FIGURE 10: Height/Age Disaggregated by Age - Dairy and Coffee Regions



Z-scores based on NCHS standards.

FIGURE 11: Weight/Age Disaggregated by Age - Dairy and Coffee Regions



Z-scores based on NCHS standards

3. Production / Consumption Linkages

In linking the nutritional system with the farming system, it is useful to look at some of the variability in regional diets. As an aid in clarifying the patterns of consumption and targetting those at nutritional risk, we have employed cluster analysis. This procedure allows us to define four different groups in the coffee sample based on the adequacy and composition of household diets.

The bar graph (Figure 12) shows group means for percentages of total household energy derived from three food source categories and the group means for the calorie ratio. Immediately evident are the low averages for energy in groups one and three, standing at 76% and 94% of requirements respectively. Also of note is the high reliance on fruit calories in group three, primarily bananas along with smaller amounts of plantain.

Those households at greatest nutritional risk based low consumption of dietary energy are for the most part located in two villages of the UOCAM area, Aguapato and San Pablo. This confirms the observations noted above regarding the resource poverty and poor diet of the UOCAM area farmers.

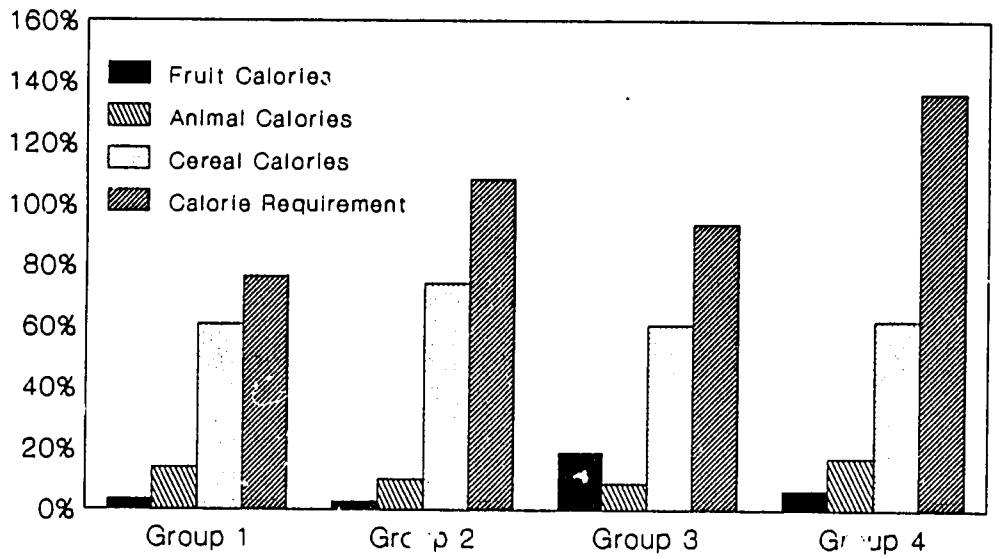
The marginally adequate group, highly reliant on banana and plantain, is found in the higher and wetter areas of the FENACAFE target area. For this latter group of low income households, the farming system rather than the market provides an important source of dietary energy that appears to be substituted for rice (cf. Timmer et al). This can be seen in Table 20 which shows each of the groups defined in the analysis and the percentage of households consuming banana from market or farm during the week prior to the baseline survey. This linkage between consumption and production based on crop diversity allows for the substitution of rice which may be harder to obtain due to cash shortage or problems of price and availability. The figures for mean weekly per capita kilocalories from rice and bananas demonstrate a lower actual per capita consumption of rice for the high fruit group corresponding with a high intake of fruit energy (Figures 13 and 14).

Table 20. Percentage of Households Consuming Banana by Group and Source.

	Farm Production	Purchased	Not Consumed	N
Poorly Nourished	12	25	63	16
High Cereal	13	17	70	23
High Fruit	80	7	13	15
Well Nourished	9	36	55	11

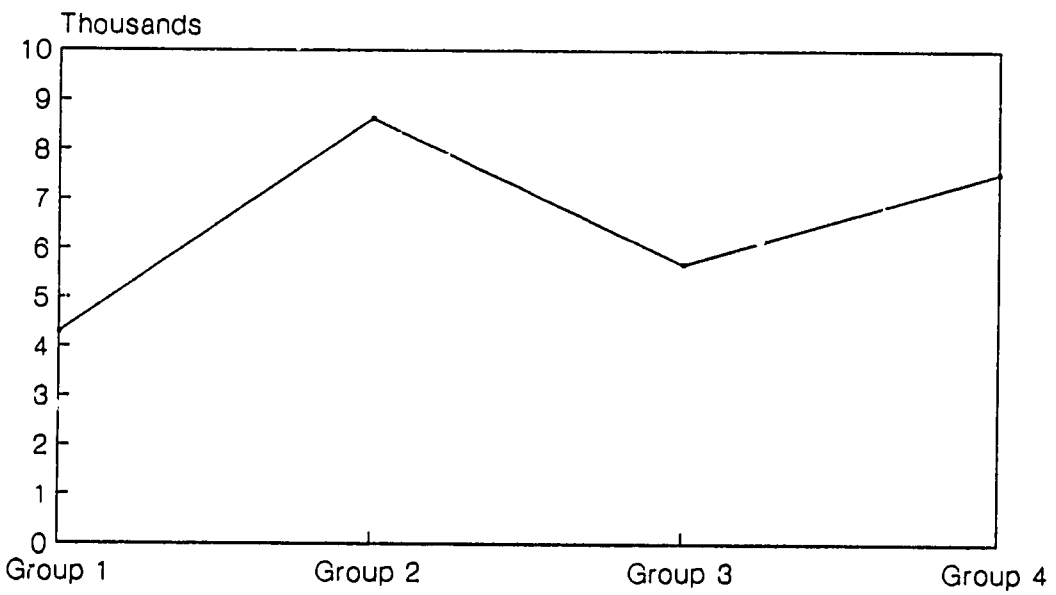
Seasonality, not only of production, but also of income and market price may be playing a role in what appears to be staple substitution among these resource-poor farmers. The amount spent on purchased food and the estimated amount usually spent on food is revealing in this regard. The poorly nourished, high cereal and well nourished groups all estimate greater expenditures in sucres per person than average during the last week. The high fruit group on the other hand estimates that its expenditures have dropped. Based on ethnographic evidence obtained during the preliminary research, individuals report that cash reserves often taper-off during beginning in December (when these data were collected) and remain small until the harvest. Women also report difficulty in getting to market and reduced access during the rainy months, particularly from January to April.

FIGURE 12: Household Clusters Energy - Sources and Adequacy Coffee Program Region



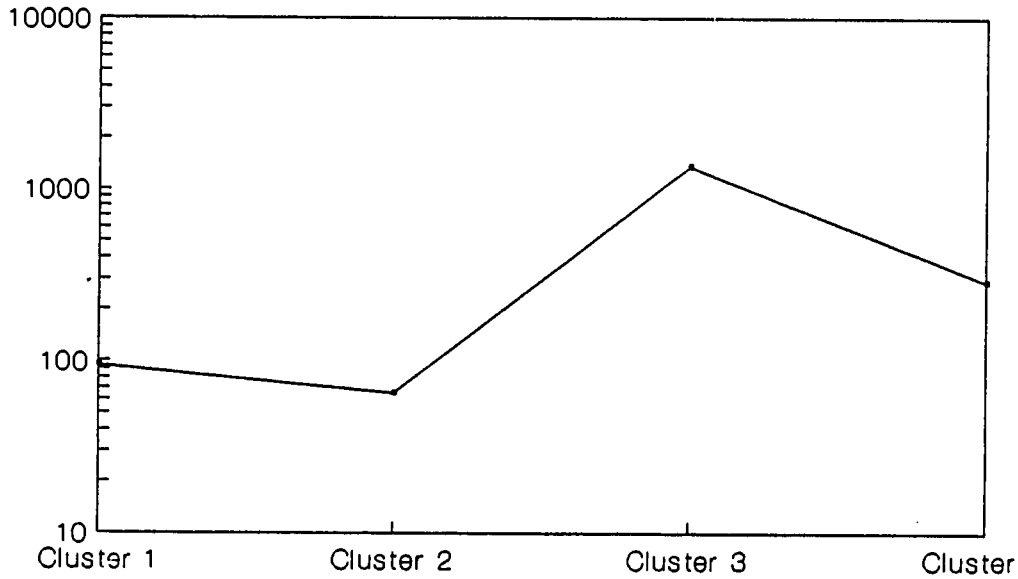
Within Cluster Mean Percentage from Food and Percentage of Derived FAO Standard

FIGURE 13: Weekly Per Capita Household Energy From Rice Coffee Program Region



Within Cluster Means in KCAL

FIGURE 14: Weekly Per Capita Household Energy from Banana Coffee Program Region



Within Cluster Means in KCAL

V. RECOMMENDATIONS

1. In general, differences between participants and non-participants in these projects are sufficiently small such that the samples should serve as reliable baselines.

2. The possibility of having a positive impact on the coffee growing areas studied is evident from this short analysis. Agronomic research is necessary to generate and validate appropriate technologies. In addition, much work needs to be done at the educational level. Training the producers will create conditions for the bettering of the coffee based farming system, with the consequent elevation of their earnings and also, hopefully, their quality of life.

3. Extension efforts should be directed also to maize production which is the second most important crop in the system, and is both a cash and food crop, especially in light of the low percentage consumption in this region.

4. The renovation of coffee plantations is necessary. Although a change of variety from typica to caturra seems advisable at the moment due to international market preferences. What is urgently needed is to teach coffee growers about improved crop management and coffee processing practices. As a consequence, extension efforts would promote a greater use of local labor in the production and processing of coffee. The coffee produced would also be of higher quality and command a better price in the market.

5. The families involved in the UOCAM project have fewer and poorer resources, as well as diets, indicating greater nutritional risk than those households in the FENACAFE project. Targeting to this population may have a greater overall impact.

6. The growth indicators for small children, particularly for toddlers, as well as the disaggregated data on consumption are highly suggestive of chronic seasonal malnutrition for those with inadequate resources. The limiting factor is dietary energy which might be made more readily available to the poorest of the poor through targeted food subsidies.

7. Such efforts should be coupled with efforts to assure potable water supplies, health care, and education which remain important components of rural development. Nutritionists and health professionals serving their año rural should be encouraged to work in the area.

8. While the population is highly reliant on purchased foods, farm production provides an essential source of dietary energy for households at nutritional risk. Extension efforts which might focus on coffee, need to give attention to crop diversity particularly for resource poor farmers in the FENACAFE target area. Promoting crop diversity might help provide a buffer against seasonal variabilities in resources, income and market access as well as the fluctuations in the market in the project commodity.