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A PROPOSAL TO CONDUCT COMMUNITY EXPERIMENTS IN THE REDUCTION OF MALNOURISHMENT IN COLOMBIA

A N N U A L R E P O R T

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

FUNDACION PARA LA EDUCACION SUPERIOR

COMMUNITY SYSTEMS FOUNDATION

Project No. 931-17-560-568

Contract No. AID/ta-C-1121

June 30, 1974 - June 30, 1975

CALI - COLOMBIA

A N N U A L R E P O R T

I WHAT WE PLANNED TO DO

The purpose of this project is two-fold. On the one hand, we are developing and testing a procedure for diagnosing the causes of malnutrition in small communities in order to identify treatments which will reduce malnutrition in those communities. On the other hand, we are developing and testing methods for assessing the learning capacity of a community in order to design interventions which will increase that capacity.

Our concern with malnutrition has led us directly to a concern with community learning. The implementation of treatments to reduce malnutrition depends upon community acceptance of those treatments and adjustment to the changes they require; even in the case where outside intervenors are present, implementation will require community learning for acceptance and adaptation. We believe participation in the diagnostic procedure will increase the likelihood of community acceptance of its results; but this participation, generally more honored in word than in deed, requires learning. The widespread replication of the diagnostic procedure might be prohibitively expensive unless it is possible for communities to learn to apply it with

relatively small amounts of outside help. Finally, the learning required to set and solve problems of malnutrition is broadly applicable, we believe, to the full range of community development problems.

Hence, we aim at two interrelated results: a teachable methodology for diagnosing the causes of malnutrition in rural area communities, and a teachable methodology for improving learning capability. The first requires detecting and filling what we have called the "nutrient gap"; the second requires detecting and filling an equally important "community learning gap"

Both kinds of results have more than one use. The diagnostic methodology may be applied directly by community leaders or by the local arm of national community service programs (such as agricultural extension, health delivery, family planning, maternal and child health care, as well as nutrition programs) But national nutrition planners should also find it useful, since a diagnosis in a sample of communities can be used to estimate causes of malnutrition on a national scale, as well as the potential effectiveness of proposed national programs. Our approach to community learning is applied directly to implement diagnostic procedures and the resulting treatments. But it should also be useful to planners who wish to engage

community participation in work on many different kinds of development problems.

A. THE DIAGNOSTIC PROCEDURE

Like most good diagnostic procedures, ours is based on a theory of the underlying causes of the problem -a theory we call the "nutrient flow theory". The nutrient flow theory is based on the concept that the level of malnutrition in the community, household or individual is related to the difference between nutrient requirement and nutrient availability (a difference we call the "nutrient gap").

1. Nutrient availability is determined by the complex process by which food is produced, distributed and consumed. Nutrient flow theory describes the losses which occur at various stages of the process, for example losses during harvest, storage, transport, processing, unequal allocation among families and non-optimal allocation within families, seasonality, and preparation.

2. Nutrient requirements* are determined by several individual characteristics such as weight, age,

*The requirements used were those established by the FAO/WHO Joint Committee on Nutrition.

activity and sex; but also important from the viewpoint of potential treatments, is the ability of the individual to absorb nutrients, which is adversely affected by a complex of diseases and disease-causing factors.

For any particular community, the size of the nutrient gaps at the individual, household and community level, the kinds of nutrient losses, and the kinds of disease-causing factors lead to predictions about which treatments are likely to produce the greatest reduction in malnutrition in the community, and at what cost.

B. THE APPROACH TO COMMUNITY LEARNING

There is, so far as we know, no satisfactory theory of community learning. Hence, we recognize the need to invent our own and to subject our progressive formulations of it to experiment.

We begin with the concept of a <u>learning process</u> which has three components: a certain way of looking at objects of inquiry so as to perceive their mutual interaction (a system view); a method of problem-setting and solving which is, in the broad sense, scientific; and certain behavioral norms essential to

acting on a systems view of the world and to the application of a scientific method. The embedding of these components of the learning process in the problem-solving institutions of a community is what we mean by effective community learning capability. The difference between effective learning capability and existing learning capability is what we mean by the "learning gap". We recognize the need to characterize this gap more precisely, perhaps eventually to quantify it, and we plan in the course of the project to address ourselves to this task.

To illustrate in the context of malnutrition, a systems view would include the idea that while disease is a consequence of malnutrition, it is also a condition of malnutrition; for disease can increase the requirements for nutrients and thereby increase the nutrient gap. The scientific method applied to a problem of malnourishment would consist of the following steps:

1. Formulate, on the basis of current knowledge, a theory of the problem and of its possible solution. (For example, a theory which proposes that among the various interactive factors associated with a high rate of malnourishment, the most sensitive is the use of soya for animal feed rather than for direct consumption).

2. Design an experiment to test the theory.
3. Based on the theory, predict the results of the experiment.
4. Perform the experiment and measure the results.
5. Compare the predicted results to the measured results and modify the theory accordingly.

Norms for inquiry would include, for example:

-- A disposition to be skeptical about assertions of fact, even when they are uttered by authorities such as teachers.
-- A readiness to subject beliefs to public testing, rather than simply to counter one belief with another
-- A willingness to convert ideas to action quickly.

It is the application of such a learning process to the problem of malnourishment which has given rise to our procedure for diagnosis and treatment; but we believe that by mastering the diagnostic procedure, members of a community can also begin to grasp the learning process which underlies it.

Community learning capability does not equal the learning capability of a few individuals, even if they are community leaders. It is also a function of the institutions for setting and solving problems which

exist in the community and of the norm for inquiry characteristic of the community. Hence, the need to understand existing institutions and norms, and to experiment with means of transforming them.

In two of the communities chosen for this project, we have adopted two quite different strategies for enhancing community learning capacity. In one (Villa Rica), we are ourselves in the process of applying the diagnostic procedure and inferring appropriate treatments. Community learning will focus on acceptance and implementation of results. In another (Buenos Aires), we have begun by teaching young members of the community to discover the diagnostic procedure (and its underlying assumptions) for themselves and then, to apply it to their own community settings.

C. THE OVERALL PLAN FOR THE STUDY.

The plan for the entire study was to proceed roughly as follows:

1. The proposed diagnostic procedure was developed prior to this contract, in conjuction with projects undertaken in the village of Candelaria, Colombia, over the past decade.

2. Five small Colombian communities were to be selected for study and intervention. To be selected a community should:

   a. Show high prevalence of malnutrition.
   b. Be ecologically different.
   c. Be culturally different.

3. Proceeding one community at a time, the diagnostic procedure was to be performed in each community.

   The process consisted of:

   a. A way to approach the community.
   b. What data to collect and how to collect, it including data on the extent of malnourishment, the size of the nutrient gaps, the kinds of nutrient losses and the kinds of disease-causing factors.
   c. A logic for analyzing the data which would lead to recommended treatments, and a prediction of how much the recommended treatment would reduce the nutrient gaps and the level of malnutrition in the community, as well as a prediction of the cost of the treatment and its feasibility.

4. At the same time, in each community, an approach was to be selected for the building of community learning capability with respect to problems of malnourishment. Information was to be gathered about

problem-solving institutions in the community: individual families, formal institutions such as a community council and informal networks of community members which function in the setting and solving of community problems. Cultural features were to be observed which looked as though they might influence community learning capacity.

An important issue is the relationship among the manner in which the diagnosis is performed, the approach taken to enhancing community learning capacity, and the success of the resultant treatment for malnourishment. We assume that some kinds of treatment can succeed without a great deal of community involvement in diagnosis, whereas other kinds of treatment depend for their feasibility on community learning to understand the results of diagnosis or even to carry out the diagnosis themselves.

5. Once the diagnosis is complete, the project faces the difficult problem of intervening in the communities so as to cause recommended treatments to be implemented. Unlike the diagnostic procedure, which we believe is generalizable to all communities, we do not know of an intervention procedure which is universally applicable; so the intervention may have to be custom-designed for each community.

Moreover, in this study there are additional constraints on intervention: in Candelaria, the interventions have already occurred and the problem is more one of making sense of the available data: in situations where implementation costs are minimal, the treatment recommended could be undertaken with resources of the present contract; but where implementation costs are high and beyond the funds available in the present contract, the results of the diagnosis will be used to seek additional resources for implementation.

when

6. Following implementation, the size of the nutrient gaps and the level of malnutrition will be measured over time, in order to learn to extent to which the diagnostic procedure predicted correctly.

who Top-down?

7. At the end of the study, an overall evaluation will attempt to draw conclusions with respect to:

   a. The validity of the hypothesis that the diagnostic procedure recommends treatments which, when implemented and evaluated, lead to significant reduction in the measured malnutrition rate in the community.

   b. The accuracy of the diagnostic procedure in predicting the results of treatments.

   c. Practical methods for applying the diagnostic procedure and its cost.

d. The validity of the hypothesis that it is possible to increase community learning capacity with respect to problems of malnourishment and a comparative assessment of the costs and benefits of the two different approaches to community learning adopted in this project.

assumes these approaches would be broadly generalizable + transferable

However, the present contract provides only for the development and application of the diagnostic procedure, and does not provide for implementation and evaluation of treatments. In other words, this contract does not provide for a testing of the value of the diagnostic procedure. The work under this contract should produce the following:

1. A detailed description of the general diagnostic procedure, which includes the methods of measurement, methods of checking the precision of the measurements, the nutrient flow model, methods of analysis and estimated costs of the various stages of the diagnostic procedure.

2. A description of the application of the diagnostic procedure in five Colombian communities (five case studies).

3. Procedures for training personnel to carry out the diagnostic procedure, including measurements and analysis.

4. The recommended treatments for the Colombian communities, their estimated benefits and costs, and proposed methods for funding their implementation.

5. A detailed description of the approach taken to enhance community learning capacity in one community; training procedures for personnel to carry out this approach in other communities.

6. Recommendations for further experiments in community learning, to be carried out in connection with the implementation of diagnostic procedures and treatments in other communities.

Although the nutrition and community learning dimensions of this project are tightly interconnected in practice, we have chosen in the remainder of this report to devote one section to the diagnostic procedure for malnourishment and another to community learning.

This is for clarity in presentation; but it is feasible because our emphasis to date has been, in one community (Villa Rica), on a diagnostic procedure carried out by project staff and, in a second (Buenos Aires), on teaching community members to discover and carry out this procedure themselves.

OUTLINE OF REPORT

I WHAT WE PLANNED TO DO

A. Diagnostic Procedure
B. Approach to Community Learning
C. Overall Plan for Study

II WHAT WE DID THE FIRST YEAR

A. Scenes from the Project.
B. Site Selection.
C. Field Implementation
D. Preliminary Analysis - Villa Rica
E. Approach to Community Learning.
   1. Buenos Aires
   2. Conceptual Framework for Community Learning
   3. Decompose the task of enhancing Community Learning Capability
   4. Description of the Procedures undertaken to date.

III APPENDIXES

A. Logic of Data Analysis
B. Graph of Individual Nutrient Gaps
C. Nutrient Requirements
D. Gap Calculations
E. Food Purchasing
F. Surveys
G. Visitors and Meetings.

II WHAT WE DID DURING THE FIRST YEAR

A. SCENES FROM THE PROJECT.

1. Conversation on a bus

Ramiro Muñoz, engineering student, member of the project team and Colombian, took a bus back to Cali after a tiring day of walking and interviewing farm families near the village of Villa Rica. His conversation with the elderly woman next to him began spontaneously. They talked of the high tariffs on the bus, the high price of food and generally the high cost of living.
But the woman thought she had found a solution -she had purchased five chickens and was raising them to eat. Thus, she could always put food on the table.

Ramiro, wondered, "How do you feed them?"
"With corn".
"Do they eat much?"
"Not so much", she said. "About a kilo a day".
"For each chicken?"
"No, for all five", she said.
"Corn is expensive now. I saw in the store in Villa Rica today that it cost six pesos per kilo".

"Yes, it has gone up. And so have chickens. Full-grown, they cost 70 pesos in the market". Ramiro thought for a while. "I wonder," he finally said, "if the corn you feed your chickens costs more than 70 pesos". Then the woman thought for a while. "If it does, I should buy full-grown chickens and not the corn to feed the chickens". So Ramiro asked, "How long do you keep the chickens before you eat them?" "It depends. I ate one after three months, but it was a little small".

"I think I see", he said. "Each day you pay $1.20 pesos for the corn to feed each chicken. After 90 days, you can eat them. So you pay $108 pesos in corn for each chicken".

The old woman paused and said, "You are a nice young man. I think you are right. I have been losing money. Corn is too expensive to feed chickens".

Later, as he thought about his conversation with the woman, Ramiro concluded that it contained many of the important concepts of the Community Nutrition Project:

a. He and the woman had engaged in a <u>dialogue</u>, not a monologue or lecture. It was a free exchange.
b. A goal had emerged-saving money- which both parties understood and which served to focus their discussion.

The woman clearly preferred saving money to raising chickens, communicated this and the dialogue focused on this goal.

c. He had undertaken an **analysis** - a simple computation really - which helped relate actions to the goal.

d. It appeared that the woman was going to take an action based on the results of the analysis.

Ramiro wondered about the knowledge he had acquired which enabled him to carry out the analysis, but which the woman apparently did not have. Was it pure technique, addition and multiplication? Or did it rest on a theory, just as the diagnostic methodology of the project rested on the nutrient flow theory?

2. A Breakfast in Villa Rica

"One of the scales is wrong!

"What! How can that be?"

"I do not know".

"Which one?"

"How do I know. They are just different. One says 10 ounces and the other says 6 ounces".

"But all of our measurements are wrong then".

Fanny Victoria usually enjoyed her work. She was good at it. As the full-time nutritionist on the project, she was responsible for all the measurements of malnourishment and food intake. She knew she provided the anchor for the rest of the project. It was an important job; she did it well; it gave her satisfaction to do so.

But this morning was different. Here, in a crowed kitchen in the muddy village of Villa Rica at 6 in the morning, the project seemed to be falling apart before her eyes.

Since there were two scales, she and Susan had split up and collected data on two families at once. This meant half as many sleepy car rides at 5 in the morning to get to Villa Rica in time for breakfast. But this morning, the family whose breakfast she was supposed to weigh was not at home, so she had trudged with scale and clipboard in hand to the little house where Susan was busy weighing the family breakfast. The mother was dishing up the breakfast -it looked

like a rice mush left over from the night before-onto each plate, handed it to Susan who scooped it onto the scale, recorded the weight and returned it to the plate. Meanwhile, the mother waited patiently and then took the plate and gave it to one of 4 or 5 children who were not waiting so patiently. The child would gulp down the food and continue the boisterous play on the dirt floor. Fanny noticed some of the children were drinking weak coffee, possibly with some sugar in it. The father did not seem to be around.

Standing there, observing, it had occurred to Fanny to check Susan's weighings. She had place her scale next to Susan's and Susan had weighed the last scoop of gray mush on each scale. That was when she had learned a whole month of data was wrong.

As things turned out, the problem was not a serious one. The scale was fixed, and the erroneous weighings were always wrong by the same amount. Fanny and Susan had breakfast with the family.

3. Excerpts from a student workbook

Children from the remote hillside farms located in the mountainous regions well to the South of Cali come to the residential training school in the small village of Buenos Aires to learn better methods of farming and homemaking. For several months now, staff of the community Nutrition Proyect have been working with the students for half a day a week, teaching them about malnutrition and problem-solving.

The following are excerpts translated and abstracted from the workbook of Aida Ofir Viáfra, one of the students at the school (the complete text, along with the comments of other students, is given later).

"During our stay at the school we have done some experiments for the purpose of finding out for ourselves what good nourishment really is. For these experiments some white rats, special for experiments, are used. Nine, 50 day-old white rats were brought. They were divided into groups of three rats per cage.

Group # 1 - fed plátano and yuca only

Group # 2 - fed a laboratory food for rats

Group # 3 - fed a variety of foods, like those we eat at the school.

It was observed that Group # 1 began to lose weight rapidly. Plátano and yuca are not sufficient foods for the rats to grow normally. Group # 2 develops very well. Group # 3 eat in a way that we enjoy. These also increased in weight rapidly and are quite happy contrary to what happened with Group # 1.

Then the foods were changed -those that ate the laboratory food were given plátano and yuca and visa versa. The rats who were switched to the food we eat began to increase their weight little by little.

I became completely convinced that plátano and yuca are not as good foods as I considered them. They do not contain all the elements necessary for growing and developing normally... I, Aida, see nothing funny, thanks to this experiment since it makes us realize what good nourishment is and of what it consists".

In the class we received some instruction on measuring and weighing children under 5 years old and, as with the rats, the age and size of the children tells us, more or less, if they are malnourished or not... Before going to our houses to weigh our younger brothers and sisters, we practiced on children in the homes near the school with some girls who taught to weigh children.

Then we went to our homes to weight the younger children. We weighed many children and brought back a great quantity of data that shows the bad malnourishment state".

"This system of teaching appears to be good to me. I like this kind because it is practical. Because, what one does is difficult to forget. It is easier to forget when something is only said".

"I have learned that one must analyze his own problems and then look for the solution to devise his own way of overcoming and not to expect others to do it for us".

"I am still waiting since this course began to learn how we are going to fight the malnourishment that affects so much our country".

4. <u>How big is my soya field</u>.

Ramiro Muñoz spent most of his time working with small farmers near Villa Rica, measuring crop yields and land areas and searching out marketing channels. Although he was not able to spend much time in Buenos Aires, he was impressed with the experimental method of teaching that other staff of the community nutrition project were undertaking there. He decided to try it for himself in Villa Rica.

Mono worked on his parent's farm near Villa Rica. Bright, energetic, possibly in his early twenties, knowledgeable of local farming, Ramiro decided that Mono was just the right person to become his assistant on the project. Ramiro began by teaching Mono how to measure the land area of a nearby farm, using in his teaching the principles of the experimental method as he understood them.

"1.2 plazas", answered Ramiro, proud of his work.
"What! No! " said the farmer. "It cannot be".
"But, why not?" asked Ramiro. "We measured it ourselves," and Mono nodded in agreement.
"Last spring I paid to have that field ploughed. It cost me one thousand pesos for each plaza. The man

with the plough said it contained two plazas. He charged me two thousand pesos. He cheated me. I never thought to measure my land. But he won't cheat me again".

Both Ramiro and Mono were impressed. They had not realize before now the value of their efforts. Mono was quick. He said to Ramiro, "After I learn to measure the farms by myself I am going into business. I can sell measurements to the farmers and make money for the man and for me".

Ramiro decided the experimental method worked pretty well, but the project might lose an assistant. Ramiro decided he had better teach "Mono" how to measure malnutrition rates.

B. SITE SELECTION

1. General Setting

According to what was previously set as criteria to be met by the communities in order to be selected for study and intervention (Page I-8), they should:

a. Show a high prevalence of malnutrition

b. Be ecologically different.

c. Be culturally different.

Villa Rica and Buenos Aires were selected. Both villages are located in the Department of Cauca (Map # 2). The Department lies in the southwestern part of Colombia (75°-78°W and 1°N - 3°N). It has an area of 60,870 km^2 and a population of approximately 3 million (1973)

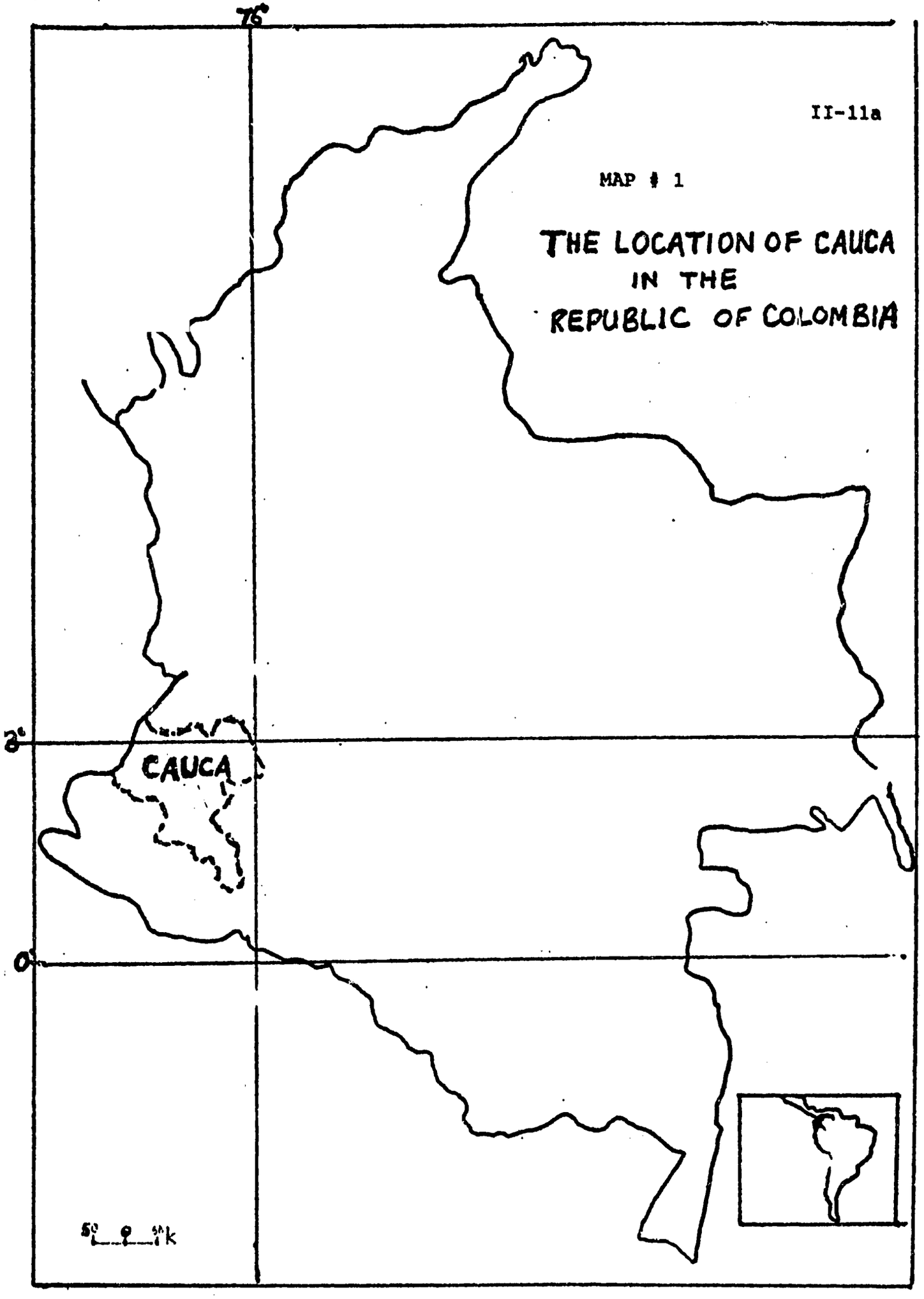
There are 36 municipios (administrative subdivisions of the Department). Popayán is the Capital and the largest administrative center.

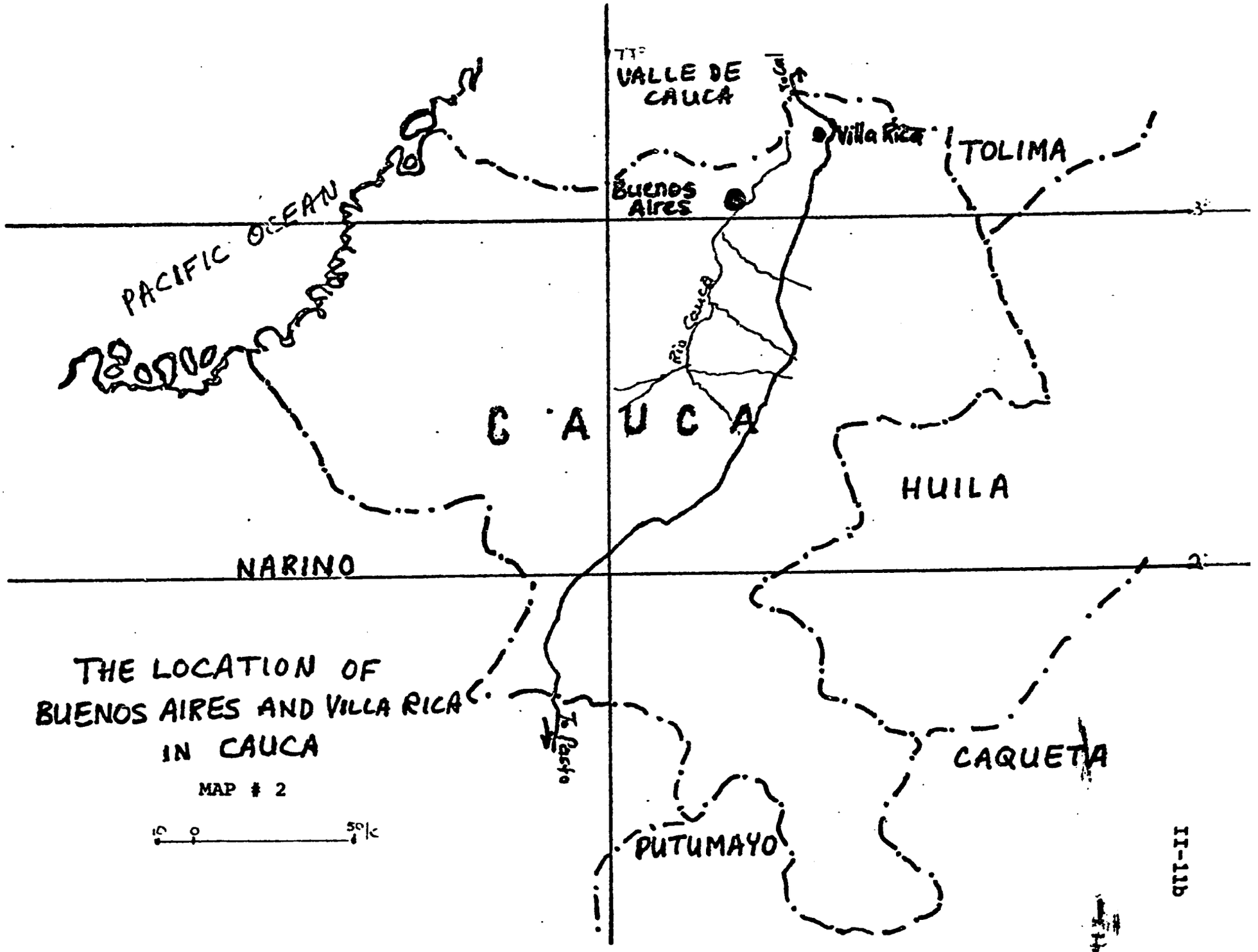
2. Physical Characteristics of the Department of Cauca

Three principal physical divisions can be recognized.

MAP # 1

THE LOCATION OF CAUCA
IN THE
REPUBLIC OF COLOMBIA





THE LOCATION OF BUENOS AIRES AND VILLA RICA IN CAUCA

MAP # 2

These are:

a. The Pacific coastal plain on the west (0-1,000 m.)

b. The Cauca-Patia Central Basin (1,000-2,000 m.)

c. The Eastern uplands (over 3,000 m.)

The Western Cordillera (over 4,760 m.) forms an important divide between (a) and (b) while the Central Cordillera and the Easter Cordillera (uplands) (c) contain the Cauca-Patia Central Basin (b) (4,750 m) These Cordilleras form part of the Andes system. They are scarred by steep-sided, narrow, V-shaped valleys, the result of heavy rainfall and erosion. Their general alignment is SWW-NNE.

The entire Department is drained by:

a. Short-flowing rivers on the Pacific Coastal plain.

b. The Cauca-Patia drainage system on the Central basin.

c. The headwaters of the Amazon river towards the Eastern Cordillera.

3. <u>Climate and Vegetation</u>

The climate is characteristically warm (13°C-24°C), on account of Cauca's location within the tropics.

However, variations in temperature can be found in some places. This is due mainly to altitude. There are two principal seasons: wet and dry. The vegetation is humid, tropical, evergreen forest. Some trees, however, show deciduous characteristics during certain parts of the year.

4. Principal Economic Activities

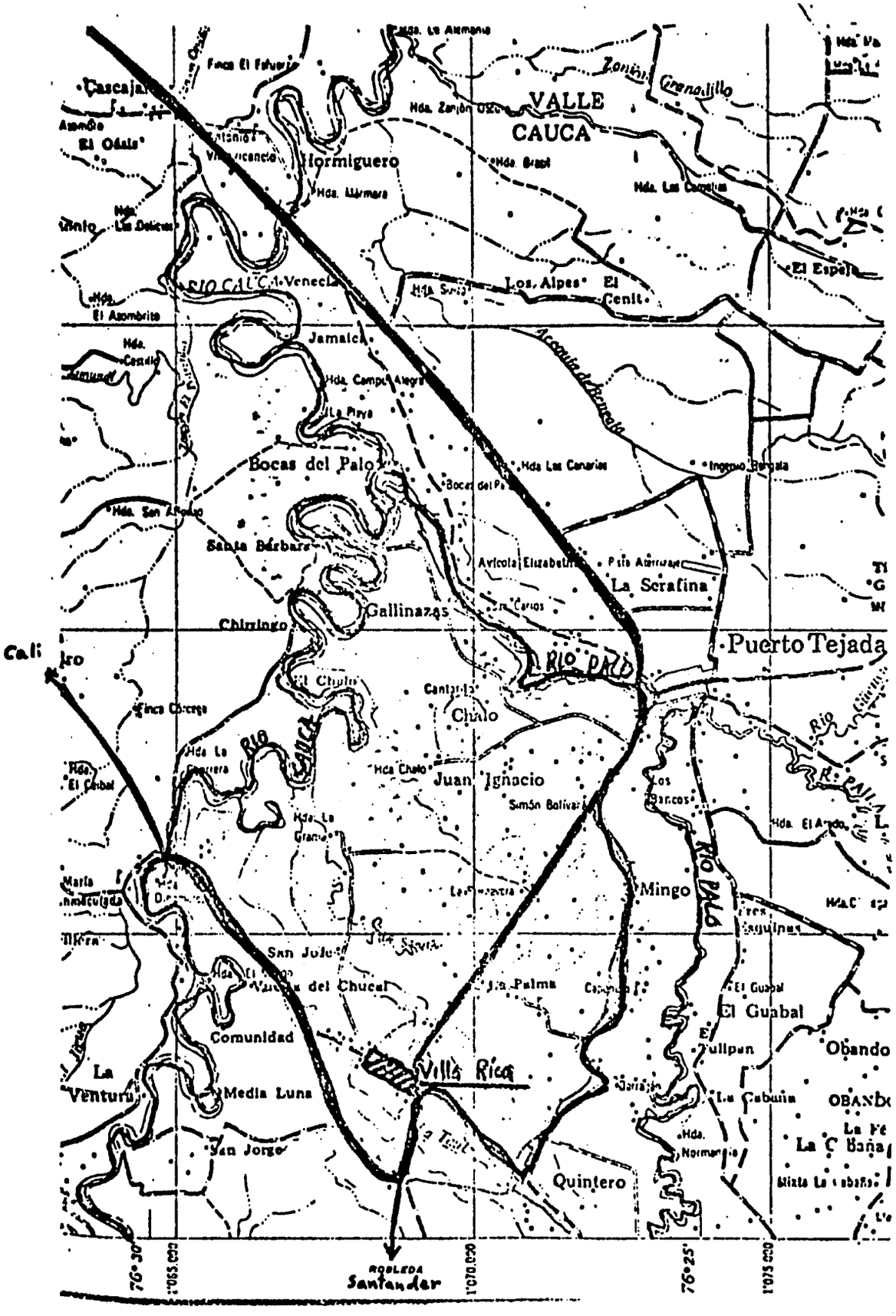
Agriculture is by far the dominant economic activity. Subsistence agriculture, intensive gardening and fishing are practiced along the Pacifid coastal plain. Elsewhere, the land is given to permanent cultivation. Major crops include: sugar cane, cocoa, coffee, maize, plantain, rice, cotton, tobacco, cassava and potatoes. Sheep, cattle, pigs and horses are also reared.

5. Rationale for the Community Selection

Villa Rica, the area in which the diagnostic methodology is at the most advanced stage of application, was selected for the following reasons:

1. The University del Valle project, CIMDER (a Spanish Acronym for Multidisciplinary Center for Research in Rural Development), had completed a census of the area, an anthropological study of

MAP # 3 THE URBAN AND RURAL VILLA RICA EXPERIMENTAL AREA



the area, and had collected some data which indicated a high rate of malnourishment in the area.

2. Further measurements of the malnourishment rate in the 0-6 age group confirmed that the rate in both the "pueblo" and the surrounding rural area was above 60%.

a. Characteristic and Geographic Description of the Villa Rica Area.

It is localted in the Valley of the Cauca River which flows between the Western and Central Cordilleras.

It is a rural area with a population of approximately 10,000. Nearly 90% of the inhabitants are engaged in agriculture. Major crops cultivated include: sugar cane, coffee, cocoa, soya, plantain, maize and beans. Nearly 95% of the cultivated crops are sold.

In this report, Villa Rica is defined to include the area which lies:

(1) To the east of Rio Palo

(2) To the west of the Rio Cauca

(3) Its southern boundary is formed approximately

by the first-class road that connects Cali to Santander (Map # 3).

More specifically, Villa Rica is bounded by the 76°25'W and 76°30'W longitudes and by latitudes 3°10-N and 3°14'N, respectively. This study area lies within the municipio of Santander.

Buenos Aires (Cauca), the second area, was selected as a site to apply the diagnostic methodology in December, 1974. The reasons for its selection were as follows:

1. A brief survey of malnourishment indicated that it would be greater than 50% for the 0-6 year old children.
2. The area is different than the Villa Rica area. It is not a valley area but is in the hills and includes some higher mountainous regions. The inhabitants are much more dispersed in the region -life styles are different than Villa Rica.
3. Also, as in the selection of Villa Rica, the Buenos Aires region does not represent a unique life style or culture but is typical of a large number of inhabitants of Colombia.
4. The project was invited to participate in the area by local leaders of the community.

a. Characteristic and Geographic Description of the Buenos Aires Area.

The Buenos Aires region represents dispersed rural area living. Some families of the region live in areas in which no government services have been made available. Some inhabitants live is far as a 3-day walk (no other form of transport is available) from the county seat.

Buenos Aires is located approximately between the 76°34'W and 3°N parallels. With an estimated population of 35,000, it is easily the largest settlement in the municipio of Buenos Aires. It covers a total area of 1,124 km.^{2}. This rural mountain village has a population composed largely of mixed races (principally, Indians and Negroes). Historically, Buenos Aires was declared a municipio in 1850).

Although the experiment in community learning is taking place in the village of Buenos Aires, the student-participants are drawn from the entire municipio. These are also students of Hogares Juveniles Campesinos in Buenos Aires.

Like Villa Rica, the municipio is noted for its agricultural activities. This comprises both subsistence and cash cropping. Coffee, yuca, plantain, maize and fruits are cultivated. Forestry and mining (gold and coal) contribute marginably to the total economic activities.

Candelaria, was selected as a site for the project prior to its initiation. During the first year, no field measurements were made in Candelaria. All of the project effort in Candelaria has been devoted to the analysis of previously collected data -data that have been collected over the last 8 to 10 years on malnourishment in the community. Our analysis of the Candelaria data is expected to further support (or deny) the relations of community factors in the nutrient flow model, upon which the diagnostic methodology is based. Also to be analyzed from the Candelaria data is effected of specific interventions that have been conducted there over the past 8-10 years.

C. FIELD IMPLEMENTATION OF DIAGNOSTIC METHODOLOGY- VILLA RICA

1. Definitions

a. Study Area. The study area is roughly a 30 square kilometer area which includes the village of Villa Rica, located near its southern extremity and extends northward toward the marketing center of Puerto Tejada. The study area contains approximately 8,000 people in 1,200 households, with roughly half in the nuclear village of Villa Rica. It coincides with the pilot area being studied by the CIMDER project (see section B of this chapter), which is one of the principal justifications for its definition.

b. Sample Area. Seventeen small, non-contiguous geographical zones were identified as representative of the study area. Each zone contains 20 to 30 households. Twelve zones are in Villa Rica (we call them "urban segments") and five zones are in the rural area (we call them "rural segments").

Most of the data collected were obtained from households located within the seventeen urban and rural segments, although not all of the surveys collected data from all of the segments. For

example, most of the surveys collected data in only six of the urban segments; only the malnutrition survey used all twelve urban segments.

SUMMARY OF SEGMENTS (Sample Area)

Description of Segments	No. of house-holds.	No. of people	Family with Child.	No. of Child. 0-6
Six Urban (a)	163	472	76	140
Six Urban (b)	124	543	59	130
Five Rural	134	465	78	143

c. Household. A household is defined to include all those persons currently living together who are part of the same family or attached more or less permanently to the family. Thus, an overnight or one-week guest would not be considered part of the household, while a three-month resident would be. Two nuclear families living under the same roof would be considered two households.

d. List of Foods. Initially, a list of 62 different foods likely to be consumed within the study area was prepared. During the study, eight more were identified, making a total of 70 different foods.

A standard value for the nutrient content of each of the 70 food is obtained in order to complete the analysis. Note that this list of foods differs from the list of crops produced. This is because some foods are made of several crops, and some crops go into several foods.
(See Appendix E for a more detailed description of the list of foods and their nutrient content).

2. Sample Area Census.

The first task of data collection, prior to the taking of surveys, is to complete a census of the sample area. Maps had been created which located each household and the names of the residents. These maps for the seventeen segments in our study sample formed the basis for the subsequent surveys.

3. Malnutrition Survey.

Measurements were taken on 412 children aged 0-72 months. This represented all children in this age group residing in the 17 segments as identified in the Sample Area Census. Measurements were taken of weight, height and arm and head circumference. In addition, sex and age were recorded. No families in

in the sample area refused to participate. Measurements were taken in the homes. There were numerous instances where families outside the sample area brought their children to a home in the sample area to be weighed. This was always done, but not included as part of the malnutrition survey.

4. Household Survey.

a. Purchasing. A total of 151 households in the sample area were interviewed about their food purchasing practices. An attempt was made to interview all 134 households in the five rural segments and all 163 households in the first six urban segments, but for various reasons, we succeeded in interviewing only 87 households in the rural segments and 64 in the first six urban segments. Some of the families were never at home, in spite of repeated attempts, while others did not want to participate. No attempt was made to interview households in the second six urban segments.

It was our goal to visit each household three times, at each visit, inquiring about the food purchased during the previous weeks, but of course many households were only interviewed once or twice.

In total, 151 interviews were held, usually by a trained nutritionist with the mother. Using the list of 70 foods as a guide, we obtained the following information: which of the 70 foods was purchased during the previous week, where each item was purchased (city, store), how much was purchased, and what was the price.

b. Twenty-four hour recall. This survey included exactly the same 151 households interviewed in the purchasing survey above, and was carried out at the same time as the purchasing survey. Thus, as with the purchasing survey, some households were interviewed once, some twice, and others three times.

The interviewer (generally the same trained nutritionist) asked the person being interviewed (generally the mother) to recall what food had been prepared and eaten during the previous day. Using the list of 70 foods as a guideline, the amount of each kind prepared at each meal was obtained. The number of persons present at each meal was recorded. The assumption was made that the amount of food prepared equaled the amount eaten, and we never observed anything that would contradict this.

c. Food weighing survey. A subset of 55 households of the 151 included in the purchasing and 24-hour recall surveys participated in the food weighing survey. Just as in the purchasing and 24-hour recall surveys, we attempted to survey each participating household three times, but families were generally more reluctant to participate in food weighing than in the purchasing and 24-hour recall surveys, so that a total of only 250 (approximately) meals were weighed. An attempt was made to weigh one breakfast, one lunch and one dinner for each family and, in general, to obtain roughly the same number of measurements for each of the three meals for the entire sample.

The number of grams of each type of food served to each member of the household was obtained. The food was dished up from the stove by the mother, separated and weighed by the team member and then returned to the plate by the team member prior to its consumption. If no food was served at a particular mealtime, this was recorded.

d. Scheduling the visits. The first contact with a household is made by the team social worker, who explains the project and requests the opportunity to visit them three times. During this initial

visit, the three surveys (purchasing, 24-hour recall and food weighing) are explained. If the family agrees to participate, the first visit is scheduled. After each visit by the survey team (to perform the purchasing, 24-hour recall, and food weighing surveys), the team social worker returns to the household to determine if they are willing to continue and, if so, schedules the next visit of the survey team. (In some cases, the family was willing to continue with the purchasing and 24-hour recall survey, but not the food weighing survey).

5. Production Survey.

a. Farm survey. A total of 125 of the 135 households in the five rural segments were interviewed about their crop production. The initial contact with these households had been made by the team social worker as part of the household survey. However, the social worker usually talked with the mother, whereas a male adult was interviewed in the farm survey. During the first few interviews, a set of thirteen crops and crop mixes were identified: coffee, cocoa, plantain, maize, beans, soy, sugar cane, cattle, coffee-cocoa, coffee-plantain, cocoa-plantain, coffee-cocoa-plantain, and maize-beans.

No others were identified during the course of the survey.

At each interview, we asked the amount of land planted in each crop and crop mix, how much of the harvest of each crop is sold and how much saved for home consumption. Very little crop land was found to be uncultivated, and so this was not included.

b. Yield survey. In order to estimate the yields of various crops per unit of land area cultivated ("plaza"), a sample of 25 rural households were surveyed. In about half of the cases, a recent harvest was available so that the yield of each crop could actually be measured (a standard measure for plantain proved to be elusive however). In the other half , the farmers were asked directly what their total harvest was for each crop and for crop mix. In addition, the land area devoted to each crop and crop mix was measured by a simple method. Finally, an independent estimate of yields for each crop and crop mix in the general region was obtained from the Colombian Agricultural Institute (Instituto Colombiano Agropecuario).

6. "Tienda" Survey.

At the beginning of the study, 41 food stores ("tiendas") were identified in the entire study area. Three were large tiendas located in Villa Rica which sold to other smaller tiendas (wholesale) as well as directly to consumers (retail). Thirty-two other small tiendas, usually in the front room of a household, were located in Villa Rica which sold some food. Six small tiendas were located in the rural areas, but these sold little or no food.

Each of the tiendas in Villa Rica was visited three times. The rural tiendas were not included in the survey. During the second visit, one tienda had gone out of business but two new ones were identified and interviewed, for a total of 36 in Villa Rica. During the third visit, another new tienda was identified and visited, for a total of 37 in Villa Rica. The interviews were held several weeks apart.

Using the visible inventory and the list of 70 foods as guides, the interviewer obtained the following data for each type of food sold by the tienda: the date on which it was last purchased, the quantity of that purchase, the price paid and the city and person (or tienda) from which it was purchased.

In the case of the three large tiendas, the amount of each food sold to tiendas located outside of the study area was also obtained.

7. Diarrhea Disease Survey.

This survey included 64 households located in the first six urban segments only. No rural households were included. Mothers with children were interviewed They were asked if any of their children, aged 0-72 months, had diarrhea in the past month, how many times, how many days had it lasted, and what was the stool frequency.

8. Water Survey.

This survey is just beginning. It includes the 64 households which participated in the diarrhea survey. Samples of the drinking water are obtained and brought back to the laboratory to determine the potability. In addition, the source of the water is recorded.

D. PRELIMINARY ANALYSIS - VILLA RICA

The purpose of the analysis is to indicate priorities for types of nutrition interventions. The analysis and the diagnostic procedure are based upon the assumption that all possible nutrition interventions cannot be implemented because of lack of resources and, furthermore, that some nutrition interventions (or combinations of interventions) will be more effective in reducing the malnourishment rate than others. The steps leading to the most cost-effective nutrition interventions are:

1. To rank types of nutrition interventions in order of their potential contribution to a reduction in malnourishment rate (the general types of interventions to be considered are those which would produce change in food production, food marketing, food storage and preservation, food distribution among families, food distribution within families, health and environmental sanitation).
2. To design the specific nutrition interventions (or combinations) for those which are ranked highest by the analysis.
3. To estimate the costs of implementation of the designed interventions.

In this report, the first annual report of the project, the analysis is in step 1, -the ranking of the general types

of interventions. This ranking is not yet complete because the data collection is not complete, but the logic of the analysis is outlined.

1. Nutritional Status (children 0-6 years).

Maria is 18 months old. She lives in the rural area a few kilometers from the village of Villa Rica. We weighed Maria along with her two brothers. Maria was classified as being Grade II malnourished. Of the 51 children in her age group included in the Nutritional Status Survey, 18 were found to be well nourished, 13 were Grade I, 13 Grade II, 7 Grade III.

A summary of the nutritional status of children 0-6 years of age is presented in the following table:

TABLE I

Nutritional Status- Children 0-6 years

230 children - Villa Rica

	0 -1	1 -2	2-3	3 -4	4 -5	5-6
Normal	26	18	9	17	20	22
Grade I	6	13	11	10	7	78
Grade II	5	13	11	8	9	5
Grade III	1	7	2	1	1	1
Total Mal.	12	33	24	19	17	13
Total Chil.	38	51	33	36	37	35

Maria has been classified as malnourished (Grade II). Likewise, 50% of the other children in the 0-6 group in Villa Rica were also classified as malnourished. In order to determine how Maria's nutritional status would be affected by different types of nutrition interventions, we asked the question, "Is Maria consuming sufficient nutrients to meet her theoretical requirements* for nutrients according to her age, sex, activity, etc.?"

2. <u>The Nutrient Gap for Children 0-6</u>

We determined Maria's theoretical requirements to be:

27 grams of protein per day, and
1350 calories per day.

We then measured, by weighing each kind of food Maria ate, the grams of protein and the number of calories consumed during the course of a 3-meal day. Maria consumed:

21 grams of protein, and
1053 calories per day.

Maria had a deficit of 6 grams of protein per day and 297 calories per day. These deficits are called the absolute values of the protein and calorie gaps.

* FAO/ WHO Expert Commitee on Standard Requirements.

The nutrient deficits can also be represented as a percentage of requirements. To represent them in this way, Maria had a nutrient deficit (or gap) of 24% of her protein requirements and 22% of her calorie requirements.

Of course, Maria exists only as a statistic. Her nutrient gaps represent the average of 52 children in her age group (between 12 and 24 months) in the sample.

Clearly, Maria is worse off than the majority of the children in Villa Rica. About 1/4 of the children 0-6 years old in Villa Rica suffer Grade II malnourishment or worse (See Table I).

Maria is an example of the problem which needs to be solved in Villa Rica. From the individual gap data we can make the following statements about Maria:

a. To become well-nourished, Maria must increase her consumption of nutrients by at least 25% to 30%, and as a corollary.
b. Health care and a more sanitary environment alone will not result in a well-nourished Maria.

The average individual gaps for other community members are presented in Table II.

TABLE II

Individual Gaps

	Protein Gap (Deficit)	Calorie Gap (Deficit)
Children, pre-school	24%	22%
Children, school	34%	28%
Adults	13%	22%
Pregnant women	43%	42%
Lactacting women	22%	17%

Table II shows that there is no age category in Villa Rica from which Maria could obtain her required supplement of nutrients. But, even if there was an age category consuming a surplus of nutrients, most of the members of that category would be in a family different from Maria's family. It would probably be easiest to shift nutrients from other members of the family to Maria if her family's supply of nutrients exceeded its requirements. To get at this information, we have computed the family nutrient gaps for the families of Villa Rica.

3. Family Gap.

For 255 families of the 1,272 families in the Villa

Rica area, the following were determined:

a. The family requirements for protein and calories -by adding up the requirements for each individual in the family.

b. The family consumption of protein and calories -by the 24-hour recall survey which was checked by the family food purchase survey.

From the above data, the protein gap for the average family was calculated to be 27% and the average calorie gap was 15%. If Maria is a member of this average family, there is little hope to redistribute nutrients from the other members. But, the average family only exists in our computer. It could probably not be found in Villa Rica. So we have determined the percentage of families for which the family gap is negative:

> 10% of the families exceed their calorie requirements by 49% and their protein requirements by 23%

In terms of absolute values of calories and protein, 10% of the families (127 families) consume an excess of 3,000 calories per family per day and 89 grams of protein per family per day. If Maria belongs to one of these families, she can easily make up her deficit from other family members.

The question yet to be asked of the analysis: How many malnourished children are members of a family that has negative protein and caloric nutrient gaps?

The answer to the above question is expected to be that few or no malnourished children are members of these families. Whether this is so or not, we will be able to determine the potential effectiveness of an intervention designed to change the distribution of nutrients among family members.

It can be said with no further analysis that if the nutrients available to the 1,272 families in Villa Rica were distributed in a manner as to minimize the nutrient deficit for every family, each family would have a calorie deficit of at least 27% and a protein deficit of at least 15%. The percentages (15 and 27) are modified by the term "at least", because when these same gaps were computed by a different method at the community level, the average family gaps were 31% deficit for calories and 33% for protein.

4 <u>The Community Gap - Villa Rica</u>.

The community gap is constructed my measuring the production of nutrients in the area and from the

production (protein and calories) subtract the exportation of nutrients and add the importation of nutrients.

Comparing these quantities of nutrients to the community requirements (average required per family x 1,272 families) produced the result that the community of Villa Rica has a deficit of 33% of the required amount of protein and 31% of the required number of calories.

If these community gaps are correct, or even approximately correct, equal distribution of nutrients among members of a family or equal distribution of nutrients among the 1,272 families in the area would results in more individuals and more families with deficits in nutrients (of course, some of the deficits would be less serious than before).

The better course of action to change the malnourishment rate is develop an intervention that reduces the community gap at least to zero. The community gap will have to be reduced even below zero to compensate for nutrient losses in the community (losses to rodents, storage losses, etc.) and to compensate for maldistribution of nutrients among families and within families.

As diagnosis includes the analysis of maldistribution within and among families, as well as storage losses, alternative interventions of increasing nutrients at the community level or reducing losses at the family level can be compared for the relative cost - effectiveness in reducing the malnourishment rate.

To increase the availability of nutrients at the community level in Villa Rica, one has the general options of:

a. Increasing production of nutrients.
b. Increasing importation of nutrients, or
c. Decreasing exportation of nutrients.

Which of the above is indicated for Villa?

To answer this question, it is useful to compare for Villa Rica the requirement for nutrients to the production of nutrients, exportation of nutrients and the importation of nutrients.

TABLE III

Protein-Community Level

Average Family Requirements	=	297 grams/family/day
Average Production (per family)		1855 grams/family/day
Average Export (per family)	=	1848 grams/family/day
Average Import (per family)	=	189 grams/family/day

Then the Villa Rica community appears to produce 6 times more protein than the requirements of all of its families. But, 99% of the production of protein is exported and insufficient protein is imported to bring the availability up to requirements.

TABLE IV

Calories- Community Level

Average Family Requirements	=	14,450 cal/family/day
Average Production (per family)	=	61,600 cal/family/day
Average Export (per family)	=	60,900 cal/family/day
Average Import (per family)	=	9,000 cal/family/day

As with the protein, the caloric production is far greater than the requirements of the community, but most of the production is being exported and imports (purchased with the profits from the exports) are not sufficient to meet the nutrient requirements of the community.

5. A Performance Specification for an Intervention

To close the community gap to zero would require an increase of approximately 30% in both protein and calories. Such an increase is available from the exported nutrients. If this was to be considered

as a type of intervention, what fraction of the exports would have to be retained for community consumption?

The community protein gap (in grams per family per day) is approximately 100 grams. As the export of protein from the community is 1,840 grams per family per day, only 6% of the export needs to be retained in the community to close the community gap to zero.

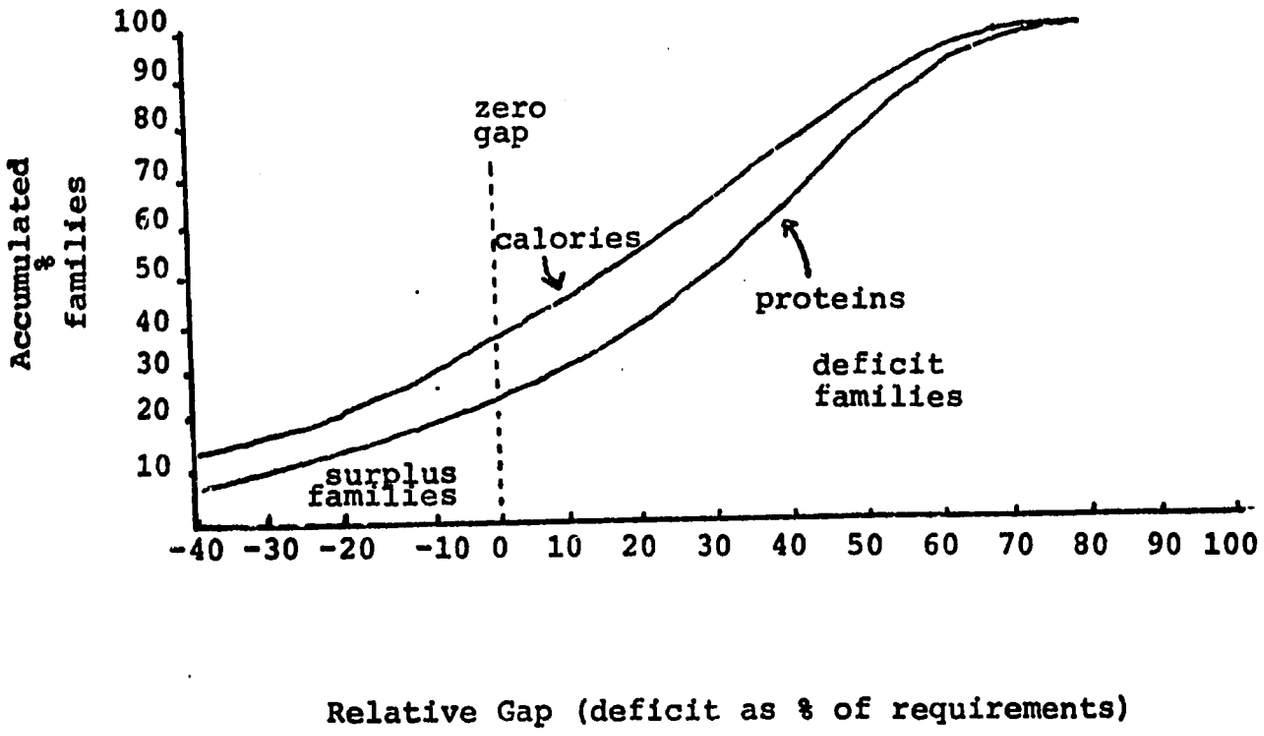
Regarding calories, the community gap is approximately 5,000 calories for each family in the community. As some 60,000 calories are exported (per family per day), approximately 8% of the exports would have to be retained within the community to close the community calorie gap to zero.

An intervention that would retain the above quantities of exports within the community, would close the community nutrients gaps to zero. But the calculation assumes that there are no losses of the retained nutrients and that the nutrients would be distributed among the families of the community in accordance with the value of each family's nutrient gap and also in accordance with the value of the deficit of each individual within the family.

In other words, the analysis must yield not only the average gap at the family and individual level but also the distributions of the gaps among the families and the individuals within a family. For example it is known for the Villa Rica community that 10% of the families are consuming 49% more protein than the family requirement and 10% of the families are consuming only 40% or less of their requirements for protein.

TABLE V

Distribution of Gaps Among Families



If an intervention were to be designed to increase the nutrients in the community by 30% (to close the community gaps to zero) and if these increases were distributed equally among the families of the community, 40% of the families in the community would still have protein and calorie deficits of over 20%, and this 40% is, no doubt, those families in which the greatest number and the most severe cares of malnourishment appear. (This can be checked with the existing data. However, the analysis is still not complete).

The conclusion is that an intervention designed to close the community gap in Villa Rica will probably require an associated intervention which will attempt to redistribute the nutrients among the families. An alternative is, of course, to force the community gap negative by, say, 50%. That is, to create a surplus of nutrients in the community amounting to 50% greater than the community's requirements. Even this intervention would still leave 10% of the families with a deficit of nutrients -according to the current distribution among families.

Another consideration in the selection of the interventions for Villa Rica is the requirements for nutrients. Those values used for the individuals are

for "healthy people". These requirements for nutrients will increase if disease rates are high. The "real" requirements for nutrients for the people of Villa Rica are not known at this time. On the basis of the health status and diarrhea surveys we will be able to make estimates of the increase in requirements above the theoretical requirements used in the analysis so far.

In summary, the intervention or combination of interventions which would reduce the malnourishment rate in Villa Rica from 50% to a near zero level would have to have to be capable of the following:

a. Reduce the community gap to at least zero.
b. Reduce the family gaps to at least zero.
c. Reduce the gaps of all individuals to at least zero.
d. Reduce the real requirements to the theoretical requirements, or provide an equivalent surplus of nutrients in each of the gaps in a, b, and c above.
e. Increase the surplus of nutrients still further in the gaps of a, b, c, and d above to compensate for any increase in nutrient losses associated with the interventions.

f. Provide the additional nutrients in a concentration sufficient for the younger children who are able to eat their "real" requirements.

g. Provide the additional nutrients at a cost which is consistant with the current cost of nutrients for families in Villa Rica, and

h. Ensure that the intervention costs have a value which is within the resources available to Colombia for expenditures on nutrition.

6. Is Soya a Potential Intervention for Villa Rica ?

The answer is yes. An analysis yielded the following about a soya intervention:

a. A total of 70% of the farmers produce soya.

b. A total of 60% of the protein exported from Villa Rica is soy-beans.

c. At the present time soya is not consumed in Villa Rica. It accounts for less than 1% of the nutrients consumed.

d. The community protein gap could be closed to zero by withholding for local consumption only 7% of the soya now being exported.

e. To close the family protein gap, each family would have to consume 300 grams of soya per day (2/3 of a pound)

f. The community calorie gap would be difficult to close completely with a soya intervention.
   (1) A total of 28% of the soya now exported would have to be withheld for local consumption.
   (2) Each family would have to about 2.5 pounds of soya a day.

It may be reasonable to expect to increase the consumption of the families of Villa Rica by 300 grams of soya per day. If so, the protein gap would be closed 100% and the calorie gap about 25%.

An intervention of this type would have to be accompanied by other interventions:

a. Another source of calories - perhaps oil, which is an efficient way for families to increase their input of calories.
b. A nutritional education program to instruct the families how to prepare soya for each of the age groups within the family.
c. A local marketing intervention to make soya available to the urban population of Villa Rica.
d. Perhaps, a method of storing soya for the rural population of Villa Rica.

The purpose of the diagnostic methodology is to provide basic information for the design of interventions which will reduce the malnourishment rate to a specific level.

Interventions will be designed for Villa Rica as part of this project.

Estimates of the costs of alternative interventions (each designed to reduce the malnourishment rate to the specified level) will be made. It is expected that a follow-on project will fund the implementation of the interventions so designed and selected.

E. THE APPROACH TO COMMUNITY LEARNING.

The problem of enhancing community learning capability has been the principal focus of project attention in the region of Buenos Aires.

1. Buenos Aires

The Municipio (equivalent to a county) of Buenos Aires is typical of the many remote rural areas in Colombia. It includes the rolling hills on either side of the Cauca River and the high mountainous regions of the Western Cordillera. A large portion of the municipio's 35,000 population lives in remote and isolated veredas (rural communities).

It is from this highly dispersed population that the Hogares Juveniles Campesinos in Buenos Aires draws its students. Of those 35 which are presently enrolled in the program all live between one hour and eight hours by foot or horseback from the town. Beginning in September, five students will be included from a community which can only be reached by a three-day walk across the mountains. In this respect the students of the Buenos Aires Hogar represent a considerable population which is removed from the mainstream of Colombian life. Nevertheless, a

considerable segment of Colombia's population lives in remote areas similar to the rural communities of Buenos Aires.

During the past six months the project has been working closely with the Hogares Juveniles Campesinos in Buenos Aires. The Hogares Juveniles Campesinos is a national program which attempts to provide rural children with an opportunity to continue their education beyond what is available in their rural communities. The program also provides practical training in areas which will improve the well-being of rural life. The first Hogar was begun in 1963 in the Department of Antioquia and there are now approximately 120 individual H.J.C.'s throughout the country.

The Hogares Juveniles Campesinos in Buenos Aires began working with its first group of students in September of last year but did not move into their facility until March of this year. The facility presently consists of dorms with space for up to 96 students, a kitchen and a dining room/meeeting area, on 17 plazas of land for agricultural instruction and experimentation. The building facilities are expected to be expanded over the next four years to the point where it can accommodate up to 240 students. The

Hogar is located on the edge of the town of Buenos Aires and is about a five-minute walk to the schools which the students attend.

The situation of the Hogar Juvenil Campesino in Buenos Aires seemed to present a good opportunity to carry out our nutrition study using a different approach. Given our objective of developing a methodology that can be easily and cheaply extended to many other communities throughout Colombia, we recognized that our methodology must not depend too heavily on a staff of highly skilled professionals. If the Hogar students could be trained to perform the diagnostic procedure, there would be evidence that the procedure could be reproduced on a larger scale without great expense and without excessive demand on scarse professional resources.

We decided to take the extra time needed to help the students understand the methodology. Rather than only teaching the students how to make the measurements, we would teach them the theory behind the measurements. Initially, we saw two reasons for this. First, if the students fully understand why they are taking the measurements, they will be more likely to take them seriously and to make fewer errors. Second, by teaching the procedures of measurement and analysis

along with nutrient flow theory, the students would learn not only about nutrition but about other areas - such as agricultural production, sanitation and health - which are included in our model.

Later, it occurred to us that in learning to understand and carry out these procedures, the students might also learn to become more effective at the fundamental learning process through which we ourselves had developed the diagnostic procedure. If they became more competent in this way and then returned to their communities, in accordance with the objectives of the Hogar movement, then they might also contribute to the learning capability of their communities.

The communities might then come to understand the results of the diagnostic procedure and participate in the design and implementation of interventions derived from it. Even more important, the community nutrition project might become, in Buenos Aires, a vehicle for the building of community learning capacity which could be applied to many other kinds of development problems.

For all of these reasons, we decided to reformulate the Buenos Aires project from a nutrition project,

which would draw on community participation for more effective implementation of its results, to a community learning project, which would use our diagnostic procedure for malnourishment, as a means to increase community learning capability.

This shift in perspective has had a significant impact on the design of the Buenos Aires project. Before describing our actual design and the experience we had so far in its application, however, we will turn to the conceptural framework we have developed for thinking about community learning experiments.

2. A Conceptual framework for Community Learning Experiments.

Because our concern is with the design of a particular community learning experiment, one which may be replicated in rural communities other than Buenos Aires, the problem of a conceptual framework may be reduced to four questions:

a. How to describe a "learning gap" in an operational way that permits at least rough measurement of its magnitude.

b. How to describe the different kinds of learning gaps that may exists in different communities in ways that will suggest suitably different strategies of intervention.

c. How to decompose the task of enhancing community learning capability into component tasks which can be considered separately and then reassembled into a coherent picture of the overall task.

d. For each of these component tasks, and for the overall task, to formulate:

- Measurable objectives, or outputs.
- Designs for optional strategies for achieving these outputs, and principles useful in carrying out these designs.
- Criteria for assessing comparative achievement of objectives, and costs of their achievement, within and across communities.

We will address these questions in a limited way, thinking only of the Buenos Aires project and of similar rural communities. We recognize that the answers to these questions may be very different in other social and cultural settings.

Moreover, we recognize the difficulty of these questions and the theoretical issues they raise

concerning theory of knowledge, theory of learning and teaching and theory of community structure, culture and change. However, we will limit our discussion to ideas that are likely to be useful in the relatively short term in the design and practice of community learning experiments.

Definition and description of "community learning gaps"

This is the difference between existing community learning capability and the capability for effective community learning, as we have defined that term.

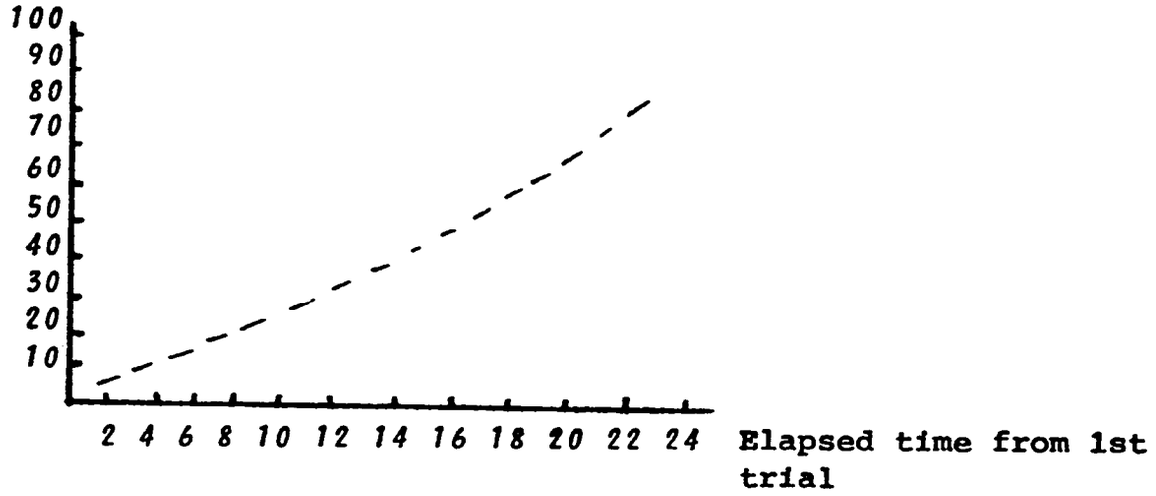
But in order to detect this difference, we must find ways to describe the "baseline" status of the community. This means identifying:

- The problem-solvers and decision-makers (individuals and institutions).
- What they identify as problems to be solved and decisions to be made.
- The quality of the problem-solving and decision-making process, in relation to the criteria we have proposed for an effective learning process.
- The rate at which solutions, once they are tried and found effective, spread throughout the community.

DESCRIPTION OF COMMUNITY LEARNING GAPS

	Problem-setting Competence	Problem-solving Competence	Norms for Inquiry	Frame for Inquiry
A. Individuals				
B. Institutions				

1. Description of learning process, comparing actual process to criteria for effective process for individuals and for institutions.



2. Diffusion curve, showing time from first trial of a solution (ex. consumption of soya) to its trial by percentage of families in community.

FIGURE 1

Problem-solvers and decision-makers.

We will want to observe those who set and solve problems important to community well-being and, given our focus on malnourishment, we will begin with those who make decisions relevant, in the broad sense defined by our nutrient flow model, to malnourishment.

This will include both individual community members and institutions.

We begin with two hypotheses. First, that individual problem solvers are best observed within the context of the problem-solving institutions in which they function. Second, that families are the most importar (though not the only) problem-solving institutions to be observed.

Many of the most important decisions related to malnourishment - whether to substitute one crop for another, for example - tend to be made at the level of the nuclear family. Looking inward, it will be important to observe the ways in which decisions are made within the family. For example:

- What are the differences in decision-making between male and female- headed hoseholds?

- Are the certain figures within the family (older females, to give one instance) who exercise great control on decisions?
- How does the family context constrain or facilitate the problem-solving behavior of individual members?

Looking outward, nuclear families in rural Colombian communities are often connected together in nets of extended families, sometimes headed by a living patriarch. Occasionally, as many as 30 or 40 nuclear families may be connected in this way.

It will be important to observe the ways in which these extended family nets enter into decision-making processes concerned with important problems related to malnourishment. To what extent, for example, do they influence the spread of attention to certain kinds of problems (potable water, for instance) and the diffusion of solutions to those problems?

In most communities, we expect to find other kinds of groups, formal and informal:

- Religious groups, involved in church activity and often led by the local priest.
- Political groups, organized around the activities of political parties.

- Sports teams.
- Communal marketing groups.
- Educational groups, those whose connection with each other derives from their having gone through a certain number of grades of school together.
- Neighborhood groups.
- Networks of farmers and workers that cluster around informal leaders or models of practice.

We will be interested in the kinds of problems and decisions, pertinent to malnourishment, with which these groups are concerned. A "baseline" or a measure of the current capability of these community groups to identify and deal with problems needs to be determined. The "baseline" must be more than a measure of the extent of problems or the number of problems mentioned by these groups, because by giving extensive publicity to problems, this number can be easily changed. The "baseline" needs to reflect both the identity of problems and the actions toward their solution. We will be attentive to the interactions among the community group with respect to the rate of identification of problems and decisions on action to be taken.

When proposed actions imply changes by individuals who live close to edge of survival, it is expected

(and has been observed) that the reactions of the individuals will be conservative. That is, to experiment with changes which could lead to non-survival is considered a poor policy.

In addition to the above community groups, there is also a structure of formal governmental organizations. In the village of Buenos Aires itself, there are:

- The acción comunal, consisting of some 12 members.
- The concejo municipal, consisting of some 10 members, and headed by the alcalde, a key figure in the community.
- The Junta pro-desarrollo, with some 15 members, which administers a small but significant budget for development.

There is a considerable overlap in membership among these three groups.

Each of the approximately 68 "veredas" in the "municipio" contains its own acción comunal, which functions relatively independently of the acción comunal in the village of Buenos Aires.

The concejo municipal and alcalde, in the village of Buenos Aires, correspond and interact with the asamblea departamental and the Governor of the Department of Cauca.

We would expect these governmental groups to be concerned with decisions involving such resources as water, sanitation, electricity, roads, and development funds.

The problems of diagnosis and intervention become the student's problems.

Where the goal is one of diagnosis malnourishment, the students learn to understand and carry out the diagnostic procedure. Where the goal is to reduce the community learning gap, the students learn to describe and diagnose that gap. As a consequence, each step in the intervention becomes a source of learning for students, and teachers are more nearly able to work with students as collaborators in the inquiry (rather than as transmitters of authoritative knowledge). Moreover, when students learn to teach the experimental method to others, they learn to teach in this way.

Evaluate the performance of component tasks, and of the overall enhancing of community learning capability.

The problem of evaluation can be divided usefully to three questions:

(1) How will we evaluate our success in reducing the community learning gap?

(2) How will we evaluate our succes in carrying out the component "transfers?"

(3) How will we evaluate the Buenos Aires experiment in comparison to Villa Rica?

As we have described above, students have been assembled at the Hogar in Buenos Aires from many small villages throughout the "municipio". The experiment starts with our effort to teach those students, in a simulation model described in the following section, to understand and to apply the diagnostic procedure for malnourishment.

Thereafter, the overall task can be conceived as a series of related "transfers" of learning. Each such transfer is an output of the experiment. For each, we must describe the content to be transferred, the design for transfer (the strategies and principles to be employed), and the methods of measurement and evaluation. Some of these transfers pertain to the students'own experience and performance; some, to the students' families and communities; and still others, to the future performance of the Hogar and to other Hogares. The transfers and their relationships are sketched out in Figure 2.

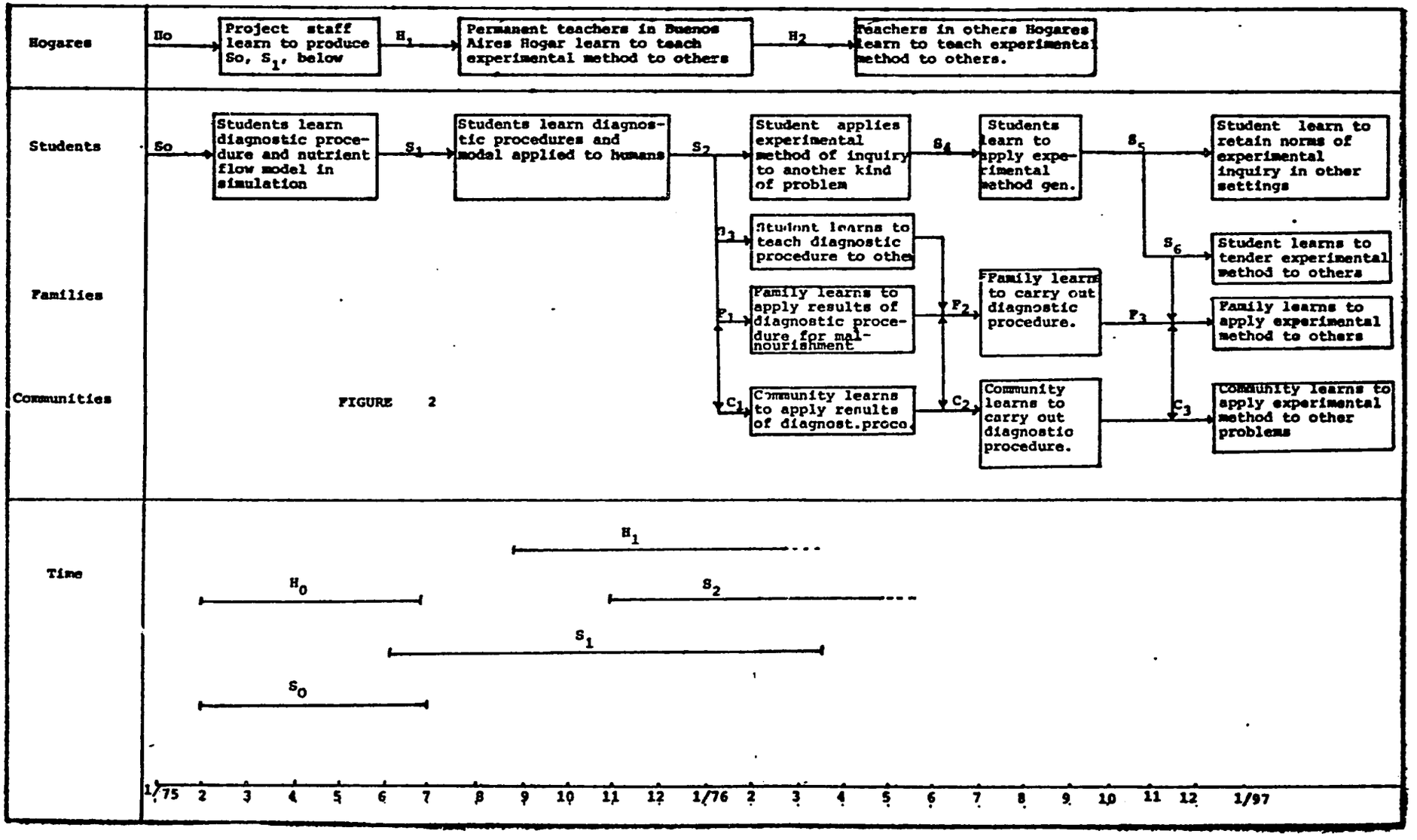

Hogares
Ho
Project staff learn to produce So, S1, below
H1
Permanent teachers in Buenos Aires Hogar learn to teach experimental method to others
H2
Teachers in others Hogares learn to teach experimental method to others.
Students
So
Students learn diagnostic procedure and nutrient flow model in simulation
S1
Students learn diagnostic procedures and modal applied to humans
S2
Student applies experimental method of inquiry to another kind of problem
S4
Students learn to apply experimental method gen.
S5
Student learn to retain norms of experimental inquiry in other settings
S6
Student learns to tender experimental method to others
Student learns to teach diagnostic procedure to other
Families
F1
Family learns to apply results of diagnostic procedure for malnourishment
F2
Family learns to carry out diagnostic procedure.
F3
Family learns to apply experimental method to others
Communities
C1
Community learns to apply results of diagnost.proce.
C2
Community learns to carry out diagnostic procedure.
C3
Community learns to apply experimental method to other problems
Time
H1
H0
S2
S1
S0
1/75 2 3 4 5 6 7 8 9 10 11 12 1/76 2 3 4 5 6 7 8 9 10 11 12 1/97

FIGURE 2

In this sketch, students, their families, their communities, and the Hogares themselved are the learning agents. Each transfer is indicated by a sign - for example, "S_1" for the first transfer of learning to be made by students.

The content of each transfer is described in the sketch. It may be at any one or more of the following levels:

(1) Outputs of the diagnostic procedure (for example, a change in the mix of crops grown).
(2) The diagnostic procedure itself.
(3) The learning process (that is, the system view, the experimental method and their related norms).
(4) Learning to teach the diagnostic procedure.
(5) Learning to teach the experimental method.

To take the student learning chain, the students learn initially (S_0) to apply the diagnostic procedure and learn the nutrient flow model, in simulation. Subsequently (S_1), the students learn the procedure and model as applied to human beings; in the first instance, to themselves and their families, and then to their communities. The other transfers are as follows:

S_2 - Students transfer the experimental method of inquiry to another kind of problem (for example, to the problem of soil erosion).

S_3 - Students learn to teach the diagnostic procedure for malnourishment to others.

S_4 - Students learn to apply the experimental method generally; that is, to a range of different kinds of problems.

S_5 - Students learn to apply the norm of experimental inquiry in other settings.

It is one thing to be able to carry out the experimental method, and to live out its norm for inquiry in a setting especially designed for that purpose - one in which these norms are being modeled and reinforced; it is quite another thing to do so in other settings where the students themselves must model and establish these norms. This is closely related, in our opinion, to

S_6 - Students learn to teach experimental method to others.

Family and community learning chains derive from the student learning chain, and interact closely with one another:

F_1 - Family learns to apply the results of the diagnostic procedure.

C_1 - Community learns to apply the results of the diagnostic procedure.

Students will apply the diagnostic procedure to their own families and communities and, on the basis of this analysis, will propose experimental interventions. Some of these will be applicable at the level of individual families (for example, changes in agricultural practices, changes in eating habits), and others will be applicable only at the community level (for example, agricultural changes that require cooperative efforts; large-scale changes in food storage methods).

F_2-C_2 Family and community learn to carry out the diagnostic procedure.

F_3-C_3 Family and community learn to apply experimental method to other problems.

Just as students themselves have learned to transfer to other problems the experimental method embedded in the diagnostic procedure, so they will work with their families and with community groups to help them make a similar transfer.

The learning chain for the Hogares consists of three basic steps. In the first (H_0), project staff learn to teach students the diagnostic procedure and its accompanying theory (the following section describes this process); in the second (H_1), permanent teachers at the Buenos Aires Hogar who have participated in the experiments learn to teach the diagnostic method and the experimental method which underlies it. Finally, in H_2, teachers in other Hogares learn to help their own students to carry out the learning chains demonstrated at Buenos Aires.

As far as timing is concerned, we are able to speak with reasonable certainty only about H_0 and S_0.

In the cycle which lasted, roughly, from February, 1975 to June 15, 1975, students learned the diagnostic procedure(but at the individual level,not at the community level)and to model in simulation. The project staff learned to help them do this (see the following section). We project a second cycle, from July 1, 1975 to January 1, 1976, in which students (S_1) will apply the procedure and model to their own families and communities and will begin to apply the experimental method to other problems; in this period as well, students will describe the present learning capability, of their own families and communities.

Beyond this point, we are presently unable to estimate the time requirements for the various transfers of learning.

Assuumptions and hypotheses.

Each of these component tasks requires its own strategy and design. We will be discussing some of these in the following sections; others remain to be developed. However, certain assumptions about strategy are built into the naming and ordering of component tasks. They are implicit in this way of decomposing the overall task of enhancing community learning capability.

(1) It will be effective to transfer learning from the students to their own families and then to their communities.

This is a basic premise of the Buenos Aires experiment; the experiment is designed, in large part, to test this premise.

(2) Learning chains are more effective if they proceed inductively.

Students first learn the diagnostic procedure and its related theory. They learn the experimental method at first only as it is contained implicity

in the diagnostic procedure; they learn to experiment with rats and nutrition before they learn the meaning of the word "Experiment". Later, they apply the method to another problem, and only then begin to make some features of the method explicit to themselves. Finally, they learn to apply the method to a broad range of problems. Families and communities learn in the same sequence.

The following matrix suggests the inquiry we will conduct into problem-solving and decision-making baselines. For each kind of institution, we will want to know:

- What kind of problems does it address?
- What roles does it play relative to those problems?

For each kind of problem, we will want to know:

- What institutions concern themselves with it?
- How do those institutions interact in relation to it?

It will be important to extend and refine such matrices for each community under study. Differences in the nature of community learning gaps may be defined, in part, by the contents of these matrices. In one community, for example, the role of individual families may be paramount -formal community

institutions may be weakly involved, if at all, in decisions related to malnourishment rate; in another community, informal networks of farmers may be important to decisions about agricultural production and there may be a number of problems (those related to water, electricity, or sanitation, for example) which are treated as cooperative ventures and decided upon in formal community councils.

In a rural village, the role of extended families may be of great importance; in a village whose members come from different urban and rural settings the role of extended families may be much less important.

What is observed? The main focus of observation will be the process by which problems are set and solved.

There are several factors, however, which make this difficult and a bias toward overestimating the learning gap.

Members of a community may tend not to treat as problems things that have been around so long that they have become routine features of community life. A gulley may be - simply a gulley, for example - not an example of erosion, even if people may be forgotten problems that were once defined and

effectively solved. The road that had crashed away and been repaired is no longer a "problem". But in this sense, there may be a tendency to de-select problems that have been more effectively engaged.

Hence, our baseline description of communiy learning capacity will depend in practice on:

(1) Responses to problems that are <u>currently identified as such by the community</u>.

(2) Community responses to proposed interventions and changes.

In the second category, the Buenos Aires project will afford opportunity for observing the processes involved in the setting up and the development of the Hogar itself, and the communities'responses to changes proposed as a result of the application of the diagnostic procedure for malnourishment.

For both categories, it should be possible to observe actual problem-setting and - solving processes in relation to the criteria for an effective learning process.

With respect to problem setting, for example, we can ask:

Is there explicit formulation of what has gone wrong?

- Is the diagnosis formulated in way that is testable?
- Are alternative diagnosis proposed?
- How are relationships perceived? For example, for any element of the nutrient flow model (agricultural production storage losses, sanitation), what connections are made to other elements of the system?

It will be important here not to confuse the quality of the problem-formulating process with the specific level of knowledge available to a community. To take one instance, members of a community may not know that nutrient requirements tend to increase with disease. The question is, rather, do people take account of the relationships they do understand? Is there a disposition to think in systems terms? And, does the problem-solving process work in such a way as to increase the number of important relationships received?

- Is there debate over the adequacy of problem-formulation?. If so, are reasons given, or is it a matter of pitting one belief against another?

With respect to problem-solving, we can ask:

- Are solutions derived from the thinking that has gone into problem-setting?

Are alternative solutions considered?

Is there a disposition to test solutions, as well as diagnosis? To measure results? To predict results before trying solutions? To make explicit the assumptions underlying solutions? In short, is the process an experimental one?

Are solutions and problem-formulations modified in response to test results?

With respect to norm for inquiry:

Is there skepticism toward received solutions, or passivity toward them?

Is there a willingness to test ideas, or a disposition to counter belief with belief?

Is there a disposition to make assumptions explicit, or to keep them tacit?

Is there a willingness to debate ideas and to find both insight and have fun in the process?

Is there persistence in the inquiry, or a disposition to give up when first results are disappointing?

Information of this kind may be gathered by recollection - for example, by asking a family to remember problems they have been concerned with over the last week, month, or 6-month period.

But a more reliable and detailed account will depend upon actual observation.

In the first instance, observations will be in the form of narrative accounts; the data will be qualitative and impressionistic. Nevertheless, we believe that such data will be useful in characterizing community learning capability, in diagnosing the nature of community learning gaps, and in comparing learning gaps across communities.

Qualitative information will be particularly useful in describing the "frame" of values and assumptions within which a community undertakes its problem-setting and solving; that is the way of looking at the world which constrains what may be considered as a "problem" or a "solution". There is reason to believe, for example, that many members of the communities we are studying operate in a "survival mode."

They feel, with much justification, that they live on the edge of survival. "Progress" is measured in terms of movement back from that edge. Any change in practice may be seen as dangerous because it carries <u>some</u> uncertainty as to consequences; it might just push them over the edge. Hence, there is

a disposition toward extreme conservatism, and minimum units. A family may buy a very small quantity of rice at one time because a large purchase carries with it such a large opportunity cost. A farmer may be willing to plant a small corner of his finca in soya, to see how it works out, but not to convert his entire finca to soya. No "solution" may be found acceptable if it violates these rules of operation in the survival mode. Within that mode, problem-setting and solving may be highly effective, and yet appear ineffective to an outsider who does not share the assumptions and values of that mode. Hence, the very great importance of being able to describe the "frame" within which problem-solving occurs.

The frame of survival mode may create a special difficulty for experimental changes. To take an example, a farmer may be willing to try out a new crop only in the least fertile part of his finca -thus insuring the experiment's failure. Design of an effective experiment may depend upon taking account of the survival mode - perhaps by insuring the farmer against the risk involved in the experiment.

At a later stage of the inquiry, it may be possible to rank order community institutions and entire communities, in terms of the various features of the problem-setting and solving process. (Given a sample of families, for example, which ones rank "high", "medium" and "low" with respect to the norms of experimental method?) Still later, it may be possible to quantify community learning gaps. At present, however, we are far from the point.

A final characteristic of community learning capacity concerns the rate at which ideas about problems-to-be-solved or problem-solutions come into good currency within the community. That is, the rate at which they become powerful for action. To a considerable extent, the learning effectiveness of a community depends upon its ability to find problems, to identify as problems things that were previously taken as normal; the problem of potable water is a case in point. Once the idea of the potability of water as a problem has been introduced into a community (once a single family has come to see it as a problem, for example), at what rate does it spread through the rest of the community? Similarly, with ideas about "solutions". Once a particular family has tried out the consumption of soya as a solution to

its own malnourishment problem, and has found that solution effective, how long does it take for 80% of the community to try out that solution?

These rate phenomena are not reducible to the problem-solving effectiveness of particular institutions within the community, but they are essential to the description of community learning capacity.

Figure 1 suggests how some of these features of community learning capacity fit together so as to enable us to describe community learning gaps and to make preliminary diagnosis of them. Description of the learning process displayed by individuals and then by institutions, both with respect to the criteria for effective learning processes, should give us qualitative descriptions of learning gaps for individuals and for institutions. We will select for observation individuals who function in institutions which we will also observe. We can then compare learning gaps for individuals and for the institutions in which they function.

Consider the following simple matrix:

Kinds of Institutions (examples)	Kinds of problems (examples)	What crops to plant?	How much of a crop to sell?	What to buy for consumption?	Actions to improve or repair or maintain transportation routes	Decisions about childrens' education	Action to improve water supply
Nuclear Families							
Extended Families							
Religious Groups							
Political Groups							
Informal leaders							
Other Informal groups							
Acción Comunal							
Consejo M/pal							
Other governmental groups							

PROBLEM SOLVING/INSTITUTIONAL MATRIX

	Low	High
Individual learning gap		
Institutional learning gap		

If the individual learning gaps are low, relative to the institutional gap, then the target for intervention may be the institutional problem-solving process, it may be less important to work on the problem-solving competence of individuals. If both learning gaps are high, then both kinds of interventions may be necessary. (If individual learning gaps are high and institutional learning gaps are low, then we may have a phenomenon worth reporting in the literature!)

Similarly, the relative steepness or shallowness of diffusion curves can have diagnostic significance. A relative shallow diffusion curve may suggest interventions aimed at improving the learning processes of existing institutions or at the creation of new institutions. Analysis of institutional learning gaps may help to suggest which of these interventions is most appropriate.

3. <u>Decompose the task of enhancing community learning capability</u>.

The Buenos Aires experiment represent a particular approach to the task of enhancing community learning capability. It is by no means the only approach that might be taken, but it carries with it a particular way of decomposing the overall task.

a. Evaluation of changes in community learning capacity will follow the pattern outlined in the previous section. The basic method will be observation of individual and institutional problem-solving processes. Students will collect baseline data about these processes, and will return to make soundings of them at intervals thereafter. The first of those should occur when families, community councils and others have carried out the diagnostic procedure for malnourishment and are in the process of considering interventions.

b. Evaluations of component transfer must be considered, each in its own right. For example, C_1 (community learns to apply results of diagnostic procedure) will be evaluated in terms of the effectiveness of the intervention on community malnourishment rate.

S_1 (student learns diagnostic procedures and model applied to humans) will be evaluated in terms of the accuracy, reliability and internal consistency of the data developed through the use of the procedu H_0 will be evaluated in terms of the effectiveness with which students learn the diagnostic procedure and model in simulation. This, (S_0) in turn, will be evaluated qualitatively in terms of narrative accounts of student performance, as in the following section.

c. The Buenos Aires experiment can be compared with Villa Rica along several dimensions:

- Effectiveness of interventions on community malnourishment rate.
- Effect of the diagnostic interventions process on community learning capacity (which requires developing baseline data for Villa Rica comparable to those for Buenos Aires).
- Cost of the experiment.
- Stability of the solution: That is, stability of processes by which the community will have reduced its malnourishment rate.
- Adapatability: the ability of the community.
- To modify its diagnosis of the malnourishment problem and to design new interventions, when circumstances change.

4. Description of the procedures undertaken to date.

The project in Buenos Aires has been in preparation for over eight months and project staff have been working regularly with Hogares Juveniles Campesinos students since mid-February, 1975.

In this section, we will describe the work in Buenos Aires to date, beginning with the first contacts. Occasionally, we will include excerpts from discussions as they actually took place, and we will interrupt the narrative from time to time to comment on strategies and principles employed by project staff.

a. First steps. In January, 1974, Doctor Oscar Bolaños who was engaged in planning a new Hogar to be established in Buenos Aires, heard Dean Wilson give a talk on problem-solving methods, using nutrition as an example. In his talk, Dean pointed out the losses involved in using maize or soya to feed animals, rather than for direct human consumption. Afterward, Oscar approached Dean:
"We've been thinking of teaching students at the Hogar to raise animals, but you say that's a bad idea. How would you like to help us design the nutrition curriculum?"

Two months later, Dean went out to Buenos Aires with Oscar to meet several of the leading citizens concerned with the Hogar - the priest and the alcalde, among others. There were several other trips of this kind where a mutual sizing up occurred, and where the first discussions of curriculum took place.

At the same time, a doctoral student from the University of Michigan, known to Dean, went with him to Buenos Aires and, as a result, decided to make the Hogares the subject of her doctoral thesis.

By Fall, 1974, the Hogar was ready to open. Dean and other project staff began to think seriously about what would be done at the Hogar. They were intrigued with the idea that the diagnostic procedure should be done by students at the Hogar and hence by members of the community themselves. Project staff would provide instruction for the students and direct the overall investigation.

By January, it had been decided that project staff would meet with the students every Wednesday afternoon, when they were free from their regular schooling. The question was, what would happen

on the first day?

b. The first experiment. In the project office, there was a colony of rats, fed on different diets. The rat cages were arranged in the form of a matrix, so that it was possible, reading from the upper left to the lower right-hand corner, to see dramatic differences in the size and behavior of rats as function of diet. The display never failed to interest visitors; it was a way of seeing at a glance what would otherwise take many words to explain.

It was decided to do something similar at Buenos Aires. On the first Wednesday, the staff brought out a bunchof rats and told the students, "We'd like you to keep these rats, and of course it will be necessary to feed them. What do you suggest?"

The students entered into a lively discussion of the problem.

(Long before, the project staff had visited the students in other settings. They had talked and played with the students so that, on the first day, the students tended to see them as "people they knew" rather then as "teachers").

The students disagreed about the best diet for the rats. There were three main proposals:

(1) Yuca and plátano (two popular foods containing no protein);

(2) The same foods the students were eating in the Hogar; and

(3) A standard laboratory diet for rats. The project staff suggested, "Let's divide the rats into three groups (of three rats each) and feed each a different diet. Then we can see if they look any different"

The students ran the experiment. They were responsible for feeding and caring for the rats and for weighing them once a week. Their enthusiasm for the experiment was very great, exceeding the expectations of the project staff themselves.

The first results, after one week, were astonishing to the students. The groups on the Hogar diet and on the laboratory diet had gained weight considerably, while the groups on the yuca and plátano diet had actually lost weight. After four weeks of this,students became concerned that "these rats weregoing to die", and a general

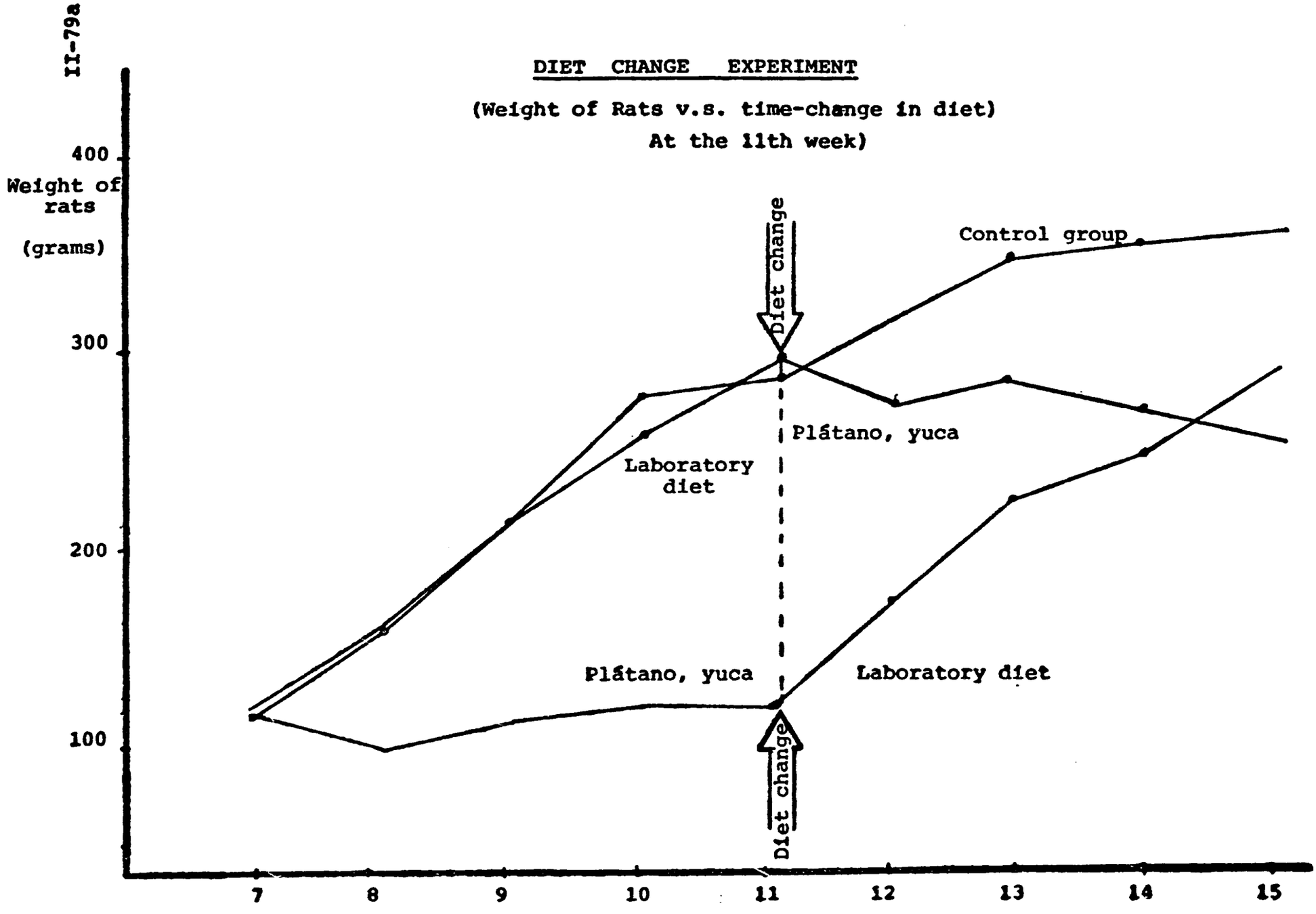

DIET CHANGE EXPERIMENT
(Weight of Rats v.s. time-change in diet)
At the 11th week)
Weight of rats
(grams)
400
300
200
100
Control group
Diet change
Plátano, yuca
Laboratory diet
Plátano, yuca
Laboratory diet
Diet change
7
8
9
10
11
12
13
14
15

FIGURE No. 3

discussion took place.

It was decided to switch the rats' diet and then to observe the results (shown in Figure 3). The curves actually crossed.

Let us pause for a moment to notice some of the principles at work in these early weeks of the project:

(1) There had been a slow and careful preparation of contacts with both students and community leaders; by the time work at the Hogar began, the project staff had been tested and found acceptable. They were a known quantity.

(2) The choice of the Hogar as a site for the experiment was a result of careful opportunism; the project staff took advantage of events which were unanticipated in the specific area (there had been no earlier thought of Buenos Aires as a site); but events of this kind were generally predictable as consequences of contacts, talks and discussions.

(3) The use of the rats was a <u>simulation model</u> for human nutrition; one that was concrete and dramatic, and designed to capture the students' attention.

(4) The method of teaching was the <u>method of discovery</u>. Students were "taught" the relationship between diet and age-weight ratio by discovering it for themselves through experiment. Similarly, they were led to experience the principles of experimental method and of problem-solving before any explicit mention was made of these principles.

(5) The students were given <u>maximum control over events</u> and therefore over their own learning. The experiments was designed to test conflicting theories they had proposed. The students decided which experiments to run. They ran the experiment. When they became aware of a problem, a new experiment was designed by the students in response to it.

In order to give students control over their own learning, the staff had to be willing to make the curriculum follow the actual flow of events and the actual content of student responses. Given the staff's general idea of what it wished to teach, the specific design for teaching was made to depend on student initiatives.

* * *

c. Mapping. The staff knew that in order to apply the diagnostic procedures for malnourishment, they would eventually need a census of the region and for this, a map which showed the location of the students' own veredas. It turned out that there was no such map. Then the staff asked the students,

"Could you write down a set of instructions so that we could find our way to your house?"

The instruction came back in forms like, "Go to Timba. Head off into the mountains. After an hour or so, yell my name and someone will know me! " When a map of the region was finally produced, and the students were asked to place their villages on it, they could not do so. The task appeared to make demands which exceeded the students' representations of the space in which they lived. Perhaps experience of the ups and downs, the twists and turns, of the mountain paths was not conducive to thinking in term of coordinate maps.

It was decided not to teach the students how to make maps in the usual ways. Instead, there are plans to learn more about how the students represent their space and locations to themselves

(the use they make of landmarks, for example) , and to help the students make their own kinds of maps. As one step in this direction, aerial photographs of the Buenos Aires region are being collected. These may help the students to discover, on their own, the idea of a coordinate mapping system. And students will be asked to write and draw for each other instructions for going to one another's houses.

d. The transfer to human beings. In the midst of the first experiment, the students were shown pictures of a group of children, all aged 7 or 8. They were asked, "What do you see?"

The students noticed that some were small and some were big. But they noticed other things as well. "The little ones look sad," they said. "They do not have any muscles".

Staff did not use the word "malnourishment", nor did they ask what the children in the picture might be eating. They hoped to elicit such responses spontaneously, as a test of the transfer of learning (from rats to people) that might already have taken place. But no such responses were forthcoming.

At this point, Dr. Bolaños broke the group of students into three smaller groups, rank-ordered in terms of staff judgements of "fast", "medium" and "slow" learners. Surprisingly, all three groups held lively discussions. There was little observable difference among the gruops.

Apparently, the "slow learners", left to themselves, had more opportunity for participation. And in this group, too, there were several who were more vocal; presumably, they thought of themselves as the "fastest among the slow".

In these groups, students also noticed the fact that the smaller children in the picture had lighter hair color than the others. Dr. Bolaños spent 15 or 20 minutes on this subject of hair color (a common sign of malnourishment).

We can observe some other principles at work in these examples:

1. There are two additional features of the method of discovery:
   - It is assumed that students may learn from any given interaction, not only a particular

substantive lesson (how to make a map, for example) but something about the interaction of teacher, student and substantive knowledge. If the staff had told the students how to make a coordinate map, the students might have learned not only the technique of coordinate mapping but that the way to learn such things is by having someone in authority tell you. And they might have believed that the method they were taught was the "right one" making it irrelevant (or improper) to invent methods of their own.

Allowing the students first to write down "instructions for getting to my house" gave the staff a picture of the students' ways of looking at the world and of their initial mapping skills. It was important to discover where the students were, in relation to this particular competence, before beginning to "teach" them.

2. The project staff were experimental with respect to their own teaching and their views of student performance. They attempted to test whether the students had already made transfers of learning

from rats to humans, and by breaking the larger group up into smaller ones (based on presumed learning speed), they learned something about the effects of the larger group on students they suspected were slower learners.

* * *

e. The visits home. Some of the students, those who live near enough to the Hogar to make the trip, made visits home once a month. After the first few weeks, these students were asked to bring back information about the members of their households, including name, sex and age relationship; and they were asked to weigh their brothers and sisters. Upon their return, the data was plotted on a "scatter graph".

Staff have independently analyzed these data, and have found a number of examples of Grades 1, 2 and 3 malnourishment.

But the students themselves had few comments to make about the data. They did not yet have concepts sufficient for such analysis. They did not have the concept of standards such as the Gómez age/weight scale, for example, although it is hopped they will later come to this idea for themselves.

It was clear, also, that the students had not yet learned two essential skills:

- To put data in good form for comment; that is, to organize data so that they can be examined from a number of different points of view suggestive for analysis.
- To make explicit, in advance of an experiment, some interesting statements which might be shown to be true; and then to compare those statements with what was actually found.

Once the age-weight data were plotted, the students were told they could now tell the relative nutrition status among their brothers and sisters. But they could not tell the absolute level of nourishment.

They were asked what the next step should be.

The answer was that they should find out what their families were eating (a pleasant surprise, since consumption measurements were the next step in the diagnostic procedure for malnourishment). When the students were asked how to do this, they first said,

"Go ask our mothers" and then,

"Go weigh the food".

They quickly identified the two principal methods used in the diagnostic procedure.

During their visits home, the students were also asked what "problems" were found at home. But the results of this effort were disappointing. In retrospect, staff believe the students may have been trying to puzzle out what the staff meant by "problem". For one reason or another, real problems tended not to be articulated.

Perhaps the students tended not to treat as "problems" things that were routinely observable in their own sorroundings.

f. The second experiment. In the first experiment, the students had three groups of rats. But now they wanted a more complex experiment. They disagreed over what was a good diet and what was a bad diet. In order to answer this question, there had to be a wider set of variations. Hence, in the second experiment, there were five groups of rats consisting of two rats each.

One group was given yuca, plátano and panela; one group, rice; one, beans; one, corn; and one, a rice-corn-bean mixture. Each group had unlimited food

available. Each week, the quantity of food consumed by each group was weighed and recorded, and the weights of the rats were also recorded from week to week.

The second group of rats was younger at the start of the experiment than the first group had been. The ability to digest certain foods is dependent on weight, and these rats grew more slowly. But by the second week, consumption by some groups actually began to fall. The students felt that something had gone wrong, although they did not know what. At first, they thought the problem might be environment, and they changed the rats' location to a dryer, lighter spot. But in the following weeks, the weights leveled off and hair loss began to appear.

g. Vitamins. In the fourth week of the experiment, the rats were brought into the classroom. Dr. Bolaños asked the students, two at a time, to weigh them and record the results; then to weigh the food consumed since the last weighing. He wrote on the blackboard:

	Food	Amount consumed since last weighing	Weight of last week	Weight this week
Group I	Frijol Maiz Arroz	90 grs.	100	110
Group II	Maiz	80 grs.	100	90
Group III	Frijol	85 grs.	100	90
Group IV	Arroz	70 grs.	80	85
Group V	Yuca Plátano Panela	40 grs.	70	50

In addition, two of the rats in Group IV, those fed on rice alone, were losing their hair.

The students were puzzled at these results, so different from the previous experiment. Dr. Bolaños asked,

"How can we account for the results in Group IV?"

One boy suggested, "The rice does not contain enough nutrients; but it would be better if it were cooked."

How did he know this?

"If the rice were cooked, it would be mixed up with other vegetables". There was general laughter and Dr. Bolaños returned to his question -the same boy suggested,

"The rice does not contain enough vitamins".

This answer received general agreement. But no-one was quite sure what vitamins were. One girl called them "sustancias". But what "sustancias"? Oscar delivered a short lecture on vitamins, naming each, and asked "What foods contain vitamins?" Many candidates were brought forward. Oscar asked, "What experiment could we perform to test whether this theory is correct?"

At first, a student offered yet another theory: "Perhaps the rats in Group V have not been getting enough protein". But Dr. Bolaños persisted in his question.

Marina, who had been quiet up to this point, offered this suggestion:

"We could feed the rats a substance which contains vitamins along with the rice; then we could observe the changes in their weight and hair". But what vitamins? "All of them", said Marina, "since we are not sure which ones would make the difference.".

Is there a "sustancia" that contains all the vitamins? A long discussion culminated in Dr. Bolaños's suggestion that formulas are prepared for humans and for animals, precisely for this purpose. At this point, Dean Wilson said, "Let's drive into town to get some! " He asked one of the smaller boys to go with him. The boy was worried about telling the storekeeper the vitamins were for rats: "He might get angry- perhaps we should say they are for some other animal?" As they drove off, the class broke into laughter.

The boy left the room shyly, but a little later he re-entered proudly with the vitamins. Everyone crowded around the rats. But there was yet another problem. The vitamins were intended for cows. "How shall we figure out the dosage suitable for rats?" Someone asked, "How many rats equal a cow?" The students knew the weight of an average rat and could agree on an estimate of the weight of a cow. Two groups worked independently to calculate the dosage. There was some discussion about how accurate it was worth trying to be, and they agreed that it is better to err in the direction of excess. They approximated the dosage, and added the vitamins to the rats' water. There was nothing to do now but wait.

A week later, the class convened and the rats were weighed again, this time with the following results:

	Weight change	Appetite.	Hair
Group I	+ 20	130 grs.	No hair loss
Group II	+ 20	116 grs.	No hair loss
Group III	+ 10	120 grs.	No hair loss
Group IV	+ 20	185 grs.	Hair loss
Group V	0	150 grs.	Hair loss

Dr. Bolaños asked, "For each group, what has happened to appetite (as measured by food consumed?) To hair? to weight?"

This time, a group of students' fathers were in the room, some six of them -gaunt, dignified men - and they watched attentively as the results were tallied.

A student observed, "They've all gotten good appetites. But the rats on panela, yuca and plátano have not gain weight! "

Among the project staff, some had been worried that the use of vitamins could be misleading; for the students were already disposed to believe in the magic power of vitamins.

But here they were noting that although vitamins seemed to improve appetite and reduce loss of hair, the rats on panela, yuca and plátano still lost weight.

Now there were a number of questions:

"People in China eat rice all the time and they do not lose their hair. How come?"

"Let's look at these results compared with the results of the first experiment. How are they different?"

"It's all very well to experiment with rats, but we do not keep rats in the veredas. What about rabbits?" The students at the Hogar were keeping rabbits to sell. "Could we experiment with rabbits and see what kind of diet is best for them?" Dr. Bolaños explained that they could experiment with any animals - rabbits, horses, cows, even men; but with the rats, it was possible to see the results more quickly.

* * *

In the last few examples, we can observe again principles which had also been at work earlier: the method of discovery, for example, and the role of student-controlled experiment. But there

are also some additional elements:

1. Debate is encouraged, but students are urged to formulate propositions that are testable. Argument is to be resolved, wherever possible, by experiment.
2. Where possible, action should follow quickly on ideas for solutions.
3. There is the beginning of sensitivity analysis (the relative importance of accuracy in estimation), and the first appearance of the method of approximation.

h. Student Responses. (Translated from the student workbook). Students range from 12 to 17 years -the first student report is complete, the others are excerpts from the students' reports.

AIDA OFIR VIAFARA. During our stay in the Hogar we have made some experiments with the purpose of informing us of what is really good nourishment. For these experiments some white rats, special for experiments, are used. Nine little, 50-day old, white rats were brought and divided into groups of three rats per cage.

Group # 1 - fed plátano and yuca only
Group # 2 - fed a laboratory food for rats.
Group # 3 - fed a variety of foods - such as we eat at the school.

It was observed that Group # 1 had more weight than the other groups (121 grams) but began to lose weight rapidly. Plátano and yuca are not sufficient foods for the rats to grow normally.
Group # 2 - develops very well, since the laboratory food is a balanced diet.
Group # 3 - they eat in a way that we enjoy. These also increased in weight rapidly and are quite happy -contrary to what happened with Group # 1.

The second rat experiment had five group of rats -some ate yuca, plátano and panela (brown sugar), others only corn, others only beans, others only rice, and another group a mixture of beans, others only rice, and another group a mixture of beans, corn and rice.
I, Aida, see nothing funny, since thanks to this experiment it makes us realize what good nourishment is and of what it consists.
I have learned to recognize the qualities or characteristics of a poorly nourished child; they (the other students) went to their homes to weigh

the younger children up to 6 years to analyze more in depth if they are malnourished. Before going to our houses to weigh our younger brothers and sisters, we practiced on children in the homes near the Hogar with some girls who taught us how to weigh children.

This system of teaching appears to be good to me. I like this kinds because it is practical. Because, what one does is difficult to forget. It is easier to forget when something is only said. I am still waiting since this course began to learn how we are going to fight the malnourishment that affects our country so much. I have learned that one must analyze his own problems and then look for the solution - to devise his own way of overcoming and not to expect others to do it for us.

I am convinced that plátano and yuca are not as good foods as I considered them. They do not contain all the elements necessary for growing and developing normally.

Then the foods were changed - those that ate the laboratory food were given plátano and yuca and vice-versa.

I became completely convinced about plátano and yuca. I came to the conclusion that a good diet is a varied diet and it can cost less.
The rats who had been eating laboratory food, and were switched to plátano and yuca, began to lose weight and those who had been eating plátano and yuca, when switched to the food we eat, began to increase their weight little by little.

In the class we received some instructions on measuring and weighing children under 5 years old and as with the rats, the age and size of the children tells us, more or less, if they are malnourished or not.
We weighed many children and brought back a great quantity of data that shows the bad malnourishment state. The aim of these experiments and activities is to fight the malnourishment that is affecting us.

DANIEL MINA. This experiment (the second rat experiment) is similar to the other, but we are also weighing the food that the rats eat each week. This was done in order to see if the increase in weight has something to do with the quantity of food. We have seen during the past 2 weeks that rats can eat a lot of food and still not gain

weight. That is to say, that one can eat well but there are other factors that prevent a weight increase, such as a high temperature, sickness, etc.

If you wanted to know whether plátano and yuca were good foods or not, the result is negative.

NORA AGRONO DIAZ. That now some of these little rats are losing hair, that is to say, those eating rice and those eating plátano and yuca. And those eating beans seem to be increasing in weight and are not so malnourished that they lie down all the time. I believe that those who are finally going to win are those that eat beans.

MARDEN BALANTA. (Note: the students at this stage are not familiar with the Gómez charts or the Morley charts as a representation of malnourishment status). Marden says that the graph of the rats' weight each week contains a certain imaginary line that has a certain similarity to a level - if the weight of a rat or a person goes over this level, he is in a good nutrition state or if the ages go up and the weight does not reach this line, he is in malnourished condition. With the children less than 6 years old, as with the rats, we also weigh

them and according to the weight and the age, we account for the nutrient state.

NINIA SOLIS. From the experiments with the rats and the weighing of our brothers and sisters it is concluded that in our homes there are malnourished children because they have not been well nourished since young and now I know from the experiment that a child well nourished from birth is going to grow and gain weight, that which we look for in the second experiment is how much food the rats consume in a week and why do they consume this quantity and not grow or gain weight. For example, I eat a quantity of food and if it does not have nutrient value, I am not going to gain weight.

The experiment will not leave me because I learned how one must feed a child from a very young age - rice alone is not a good food, beans, corn and rice are better, plátano and yuca are very poor foods.

JOSE CASIÑO. We weigh our young brothers and sisters to see which of them are malnourished. Because if they eat only plátano and yuca they will be malnourished. In order to obtain a good

diet, our brothers and sisters must eat a varied diet and not eat every day just one food. Because the rats that ate beans did not weigh the same as those that ate rice. That is to say, beans have more protein than rice. Our brothers and sisters must also eat protein so they will grow and not die of malnourishment - that is the major cause of sickness in Colombia because of the malnourishment.

JOSE DIAZ. With the rat experiments we are concerned with what is a good diet. If we want to know if a person is malnourished we must know his weight, age and his height. It is also essential to know what foods he eats - that is to say, not only eat plátano and yuca nor rice alone. A good diet is based on eating meat, eggs, beans, corn, water and vegetables.

MARINA RIVERA. The objective of the experiment was to know what kind of a diet is a good diet and to vary the diets and to see what happens. Then we weighed our brothers and sisters under 6 years and found that many of them were malnourished. In the second experiment we also measured the quantity of food eaten to find the difference between quantity and quality of food eaten.

I understand very well the experiments through means of rats - it is so that we can learn to improve our own ways - putting it up to us to take care of and feed ourselves adequately. I have learned much that I did not know and if I did know some of it, it was not as clear and precise. I won't say more about the experiment because they have not finished yet. It is that some of the rats are very sick. It seems that if they continue in this way they will die even if they eat more. We must think about what will happen and then wait and see what happens.

JESSER CARABALI. We did experiments with rats. We are discussing what nutrients and vitamins are in beans, rice, yuca, plátano and panela. Also, I learned to locate my house on a map.
It was observed that some children were older but had lost weight. This happens from when we are very young and are not eating the right nutrients and vitamins to have anormal growth and a normal mental development. As happened with some of the rats that had a good diet and gained weight because they had protein, vitamins and calories. On the other hand, those that had a diet that was not sufficient to gain weight and growth, decreased their weight.

The same can happen to us the christians.

IWERVAL CERON. We went to our house to weigh our brothers and sisters less than 6 years old. This was with the purpose of knowing if they are malnourished or not and, if they are malnourished, to learn what food they are consuming and to change the food.

IMER CARABALI. In the graph of the weights and ages of the children some are well-nourished and some malnourished because some points are high and some are low.

In the graph of the rats some points are high and some are low also.

In the second rat experiment with 10 rats eating different foods, it is shown that some rats eat well but nevertheless do not gain weight. This has also been done with small children.

Some of the rats are losing hair because they do not have enough protein in their food and they are sick.

III APPENDIXES

A. LOGIC OF DATA ANALYSIS

B. GRAPH OF INDIVIDUAL NUTRIENT GAPS

C. NUTRIENT REQUIREMENTS

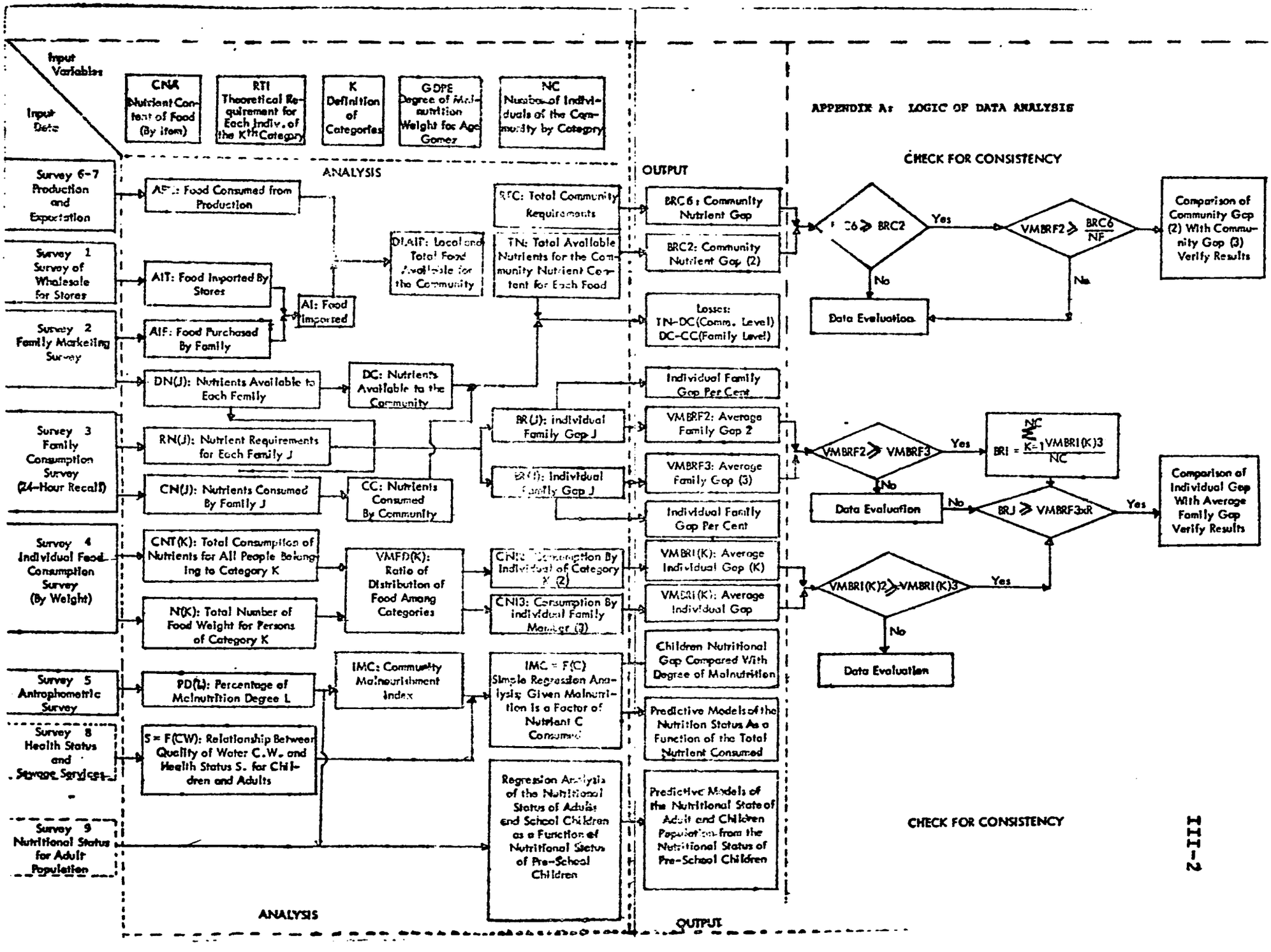
D. GAP CALCULATIONS

E. FOOD PURCHASING

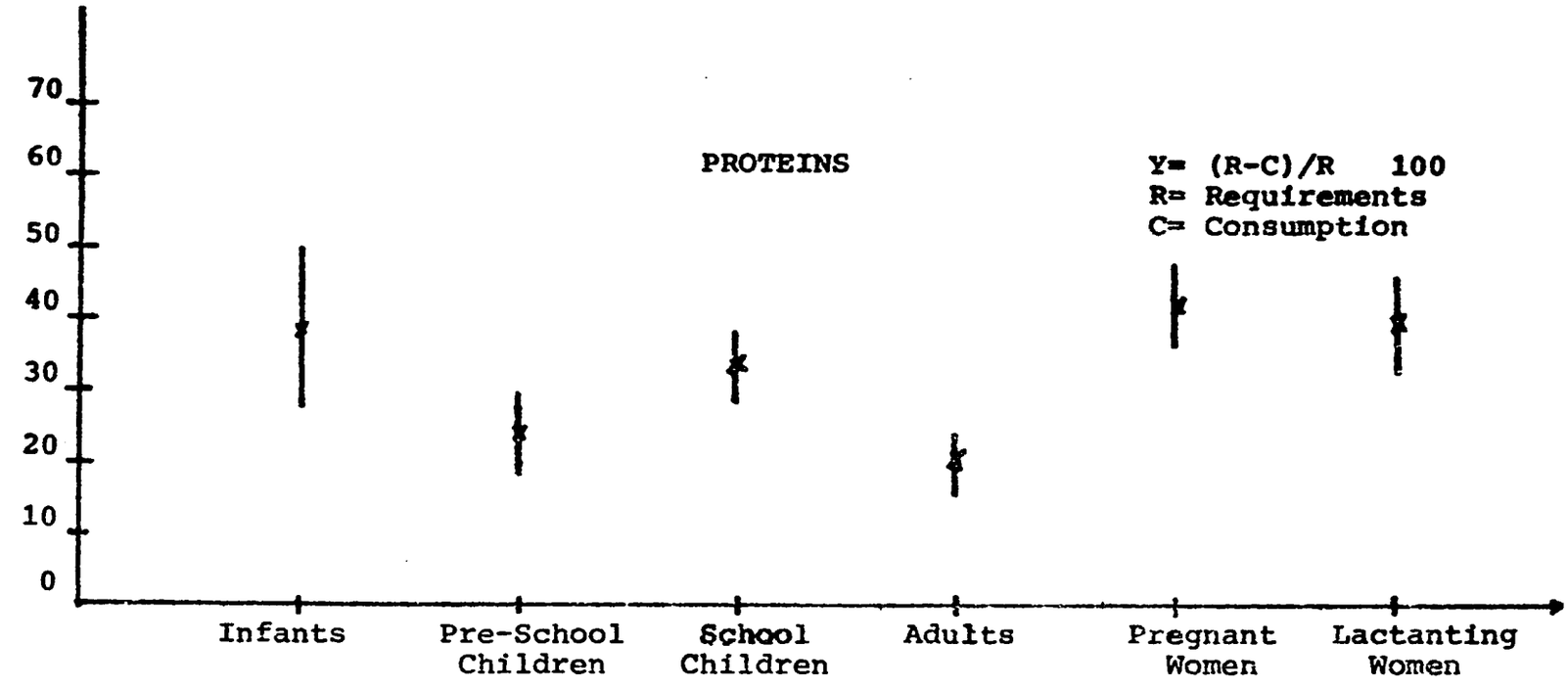
F. SURVEYS

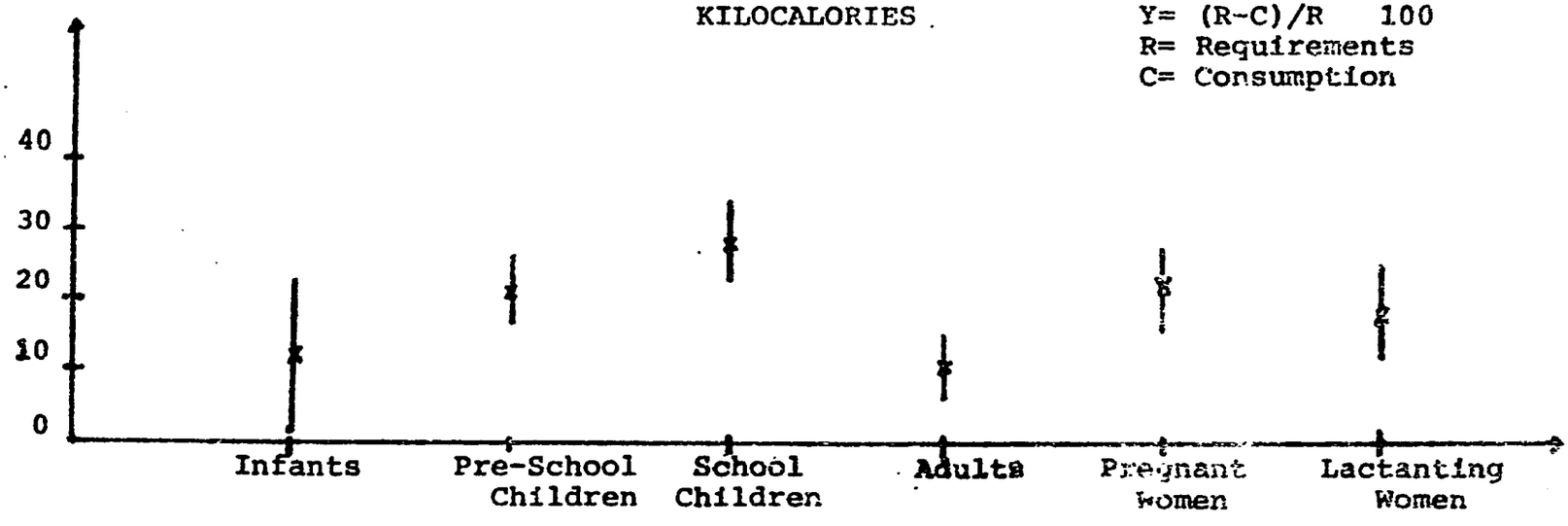
G. VISITORS AND MEETINGS

APPENDIX A: LOGIC OF DATA ANALYSIS



APPENDIX B: PERCENTAGE INDIVIDUAL GAP





APPENDIX C : REQUIREMENTS

Category	Age in months	Sex	Protein p* req. day	Calorie p* req. day	Aggregated Categories
1	11	1	23	820	INFANTS
2	11	2	23	820	
3	12	1	27	1130	
4	12	2	27	1[illegible]80	
5	24	1	27	1350	
6	24	2	27	13[illegible]	
7	36	1	27	1520	PRE SCHOOL CHILDREN
8	36	2	27	1560	
9	48	1	34	1670	
10	48	2	34	1720	
11	60	1	24	1790	
12	6[illegible]	2	34	1870	
13	72	1	34	1900	
14	72	2	34	2010	
15	7	1	41	2015	SCHOOL CHILDREN
16	7	2	41	2140	
17	8	1	41	2110	
18	8	2	41	2260	
19	9	1	41	2210	
20	9	2	41	2380	
21	10	1	48	2300	
22	10	2	50	2500	
23	11	1	48	2350	
24	11	2	50	2600	
25	12	1	48	2400	
26	12	2	50	2700	
27	13	1	52	2450	
28	13	2	62	2800	
29	14	1	52	2500;	
30	14	2	62	2900	
K 31	W. Adult	1	48	2200	
K 32	M. Adult	2	62	3300	
K 33	Pregnant	1	63	2500	
K 34	Lactating	2	76	2750	

*These values are taken from "Requerimientos y Calorías" FAO/1973

D. GAP CALCULATING

In this Appendix, the main relations used in the calculation of the community, family and individual gaps are given . All these gaps are relative to proteins and calories (we call them nutrients) and refer to the daily consumption availability or requirement at community family and individual level.

The community gap (CG) is calculated in the following way:

CG= COMMUNITY REQUIRED NUTRIENTS (CR) - COMMUNITY AVAILABLE NUTRIENTS (CA).

CR is calculated as the sum of all 34 categories (Appendix C) of the product of the nutritional requirements R(K) for a person of category K, the number of people N(K) of the community belonging to the category K

$$CR = \sum_{K=1}^{34} N(K)\ R(K)$$

CA is calculated as:

CA = P+IF+IT+E

where

P =Agricultural production of nutrients in the community's area.

IF=Nutrients imported by families in their shopping activity outside the community.

IT=Nutrients imported by "tiendas"* from outside the community.

E =Nutrients produced by the agricultural sector of the community but exported outside.

The average family gap, $\overline{FG}$, is calculated as:

$\overline{FG}$ = FAMILY AVERAGE REQUIRED NUTRIENTS ($\overline{FR}$) - FAMILY AVERAGE AVAILABLE NUTRIENTS ($\overline{FA}$).

$\overline{FR}$ is calculated as the sum of the nutrient requirements for each family, divided by the total number of families. The nutrient requirement FR(J) for a family J is given by the sum of the requirements R(K) for each person of the family, according to the category K which it belongs to. NF is the number of families in the community.

$$\overline{FR} = \frac{1}{NF} \sum_{J=1}^{NF} FR(J)$$

$\overline{FA}$ is calculated as the sum of all the nutrients FA(J) available to a family J at a given time, and divided by the number of families in the community.

* "Tienda" is the name for a small shop where food, drinks and some other household items are sold to families or other "tiendas".

$$\overline{FA} = \sum_{J=1}^{NF} FA(J)$$

Therefore, we have for the mean value of the family gap $\overline{FG}$

$$\overline{FG} = \overline{FR} - \overline{FA} = \frac{1}{NF} \sum_{J=1}^{NF} RF(J) - FA(J)$$

Another way of calculating the same gap is to compare $\overline{FR}$ with the average consumption of nutrients for part of a family of the community. The actual consumption is measured by the 24-hour recall survey. All the previous calculations are still valid, but now the available nutrients are substituted by the consumed nutrients.

The relation:

$CG^* = NF \times \overline{FG}$

represents an alternative way of calculating the community gap as the sum of all the family's gaps.

The gap $\overline{IG}$ (K) for an individual of category K is calculated in two ways.

First method:

$\overline{IG}$ = REQUIRED NUTRIENTS R(K) FOR AN INDIVIDUAL OF CATEGORY K - AVERAGE AVAILABLE NUTRIENTS $\overline{IA}$ (K) FOR AN INDIVIDUAL OF CATEGORY K.

R(K) is clearly derived from Appendix C table for each category. $\overline{IA}$ (K) is calculated by the following steps:

1. Sum up all the nutrients consumed by each person of category K (from survey number 4: See Appendix A). Let us call it IC(k)
2. Calculate the total nutrients TIC consumed by the sample population:

$$TIC = \sum_{K=1}^{34} IC(k)$$

3. Calculate the fraction of nutrients eaten on an average in the family by a person of category K:

$$PC(K) = \frac{IC(K)}{TIC \times N(K)}$$

N(K) is the number of people of the whole population in the community belonging to category K.

4. Multiply PC(K) by the total nutrients available at community level and defined as:

$$\text{TOTAL NUTRIENTS} = \sum_{J=1}^{NF} A(J)$$

A(J), J, NF have the same meaning as before. We get for $\overline{IA}$ (K):

$$\overline{IA}\ (K) = PC\ (K) \times \sum_{J=1}^{NF} A(J) = \frac{IC(K)}{TIC \times NK} \sum_{J=1}^{NF} A(J)$$

Therefore, we have for the mean value of the gap of an individual of category K:

$$\overline{IG}\ (K) = R(K) - \frac{IC(K)}{TIC \times N(K)} \sum_{J=1}^{NF} A(J)$$

The second method of calculating the same gap is quite straightforward:

$$IG^*\ (K) = R(K) - \frac{IC\ (K)}{N^*\ (K)}$$

and refers to the difference between the nutrient requirements and consumption of an individual of category K. In this case, N*(K) is the number of persons of the sample population belonging to the category K. The mean value of the individual gap for a person of the community is given by:

$$\overline{IG} = \frac{\sum_{K=1}^{34} N(K) \times \overline{IG}\ (K)}{\sum_{K=1}^{34} N(K)}$$

or

$$\overline{IG} = \frac{\sum_{K=1}^{34} N(K) \times \overline{IG^*}\ (K)}{\sum_{K=1}^{34} N(K)}$$

E. FOOD PURCHASING

In this Appendix, some trends in food purchasing of families and tiendas* of the community are presented. Tables 1 to 6 show some results relative to the analysis of the diet in the urban and rural areas. For each commodity the percentage contribution to the diet in terms of proteins, calories and expenditures is presented. Commodities not listed have no significant contribution. For the rural sector, almost 46% of the total food budget is spent for rice, plantain, fat, potatoes, sugar and coffee, which are quite poor in protein. Despite the fact that plantain contains about 1% protein, it supplies more than 12% of the total protein in the community diet. Even for the urban sector, plantain is a staple source of protein and calories, but its consumption tends to decrease while meat consumption increases.

Cheap sources of protein are quite absent: onion supplies more protein than soybean in both diets! Rice, meat and plantain are the basic ingredients of the community diet: they represent approximately** 40% of the food budget and

* Tienda is the name for a small shop where food, drinks and some other household items are sold to families or to other tiendas.

** As a matter of fact this percentage can be overestimated as in the target community some commodities like plantain, bean, banana, etc. are received as a gift rather than purchased.

supply between 58% and 64% of the total protein and between 46% and 54% of the total calories.

Coffee represents between 4.5% and 6% of the total expenditure but does not show any significant protein-calories contribution.

Of course, some other considerations should be included in this kind of analysis to avoid simplified conclusions, but these results show once more that malnutrition or undernutrition is due not only to low income, but sometimes also to ignorance about nutrition.

Special emphasis was given to the analysis of "tienda" surveys in order to understand the process of the food market, the change in price along its channels of flow, the kind of commodities traded off, the % imported for each commodity, etc.

The total nutrients imported monthly by the whole sector oscillate between 1.2×10^6 grams of protein and 70×10^6 and 80×10^6 calories: this amount of nutrients represents about 25% of all the nutrients available monthly at the community level.

Rice represents almost 50% of total protein imported by tiendas, approximately 35% of the calories imported and

and approximately 25% of all the expenditure for food importation. It is followed, as staple sources of imported proteins, by bread, meat and corn, oscillating between 10% and 20% and sugar, margarine, oil as important sources of calories.

Highly perishable commodities like meat, fruits, vegetables and fresh milk are imported only in small quantities by tiendas which have no cooling facilities, so that families prefer to buy some of them outside the community. The only exception is represented by bread and eggs, which are produced locally and distributed to other tiendas or sold directly to the consumers. The lack of fresh milk production in the community is substituted by powdered milk, which is sold by tiendas. The outside market places, where the tiendas buy their food, are essentially the same as for families. Table 7 gives the source of the 10 most consumed commodities imported by tiendas and relative mean price paid per pound (1 pound = 500 grams). Table 8 gives the same information for the shopping activity of the families. Comparing the cost declared by tiendas' owners for each commodity with the price that the families assert to pay for the same commodities in Villa Rica's tiendas, we should have an estimate of the change in price through the flow channel:

outside market ⟶ community tiendas ⟶ community families

However, the results look quite strange, at least for some foods like meat, beans and bread. For example, families claim to pay approximately Col. $1.20 per egg in Cali and tiendas Col.$1.40! At least in this case, we know that data coming from families are more precise than the other ones. This is probably true for the other prices too, because of the fear on the part of tiendas' owners that the data could be used for administrative rather than social investigation purposes.

We divided all the tiendas into three groups according to their volume of transactions per month: small tiendas - volume less than Col.$ 5,000; medium-sized tiendas - volume greater than Col.$5,000 but less than Col.$20,000; and large tiendas - volume greater than Col.$20,000. A total of 15 tiendas fell in the first category, 21 in the second and 2 in the third.

Small tiendas have average expenditures (per month and per tienda) of Col.$ 3,300 (106 U.S. dollars) and between 60 and 80% of this amount is paid in cash. They sell directly to the consumer and between 55 and 65/ of the volume of food sold daily is imported from outside. Among the imported commodities are: soft-drinks, meat, vegetables, bread, potatoes, cassava, plantain, salt, etc. With respect to the other types of tiendas, they tend to sell mainly commodities which are quite perishable or

consumed daily by families like those listed before as well as fresh milk, eggs, sugar, etc. Medium-sized tiendas have average expenditures per tienda and per month of Col.$ 7,500 and between 45 and 65% of total expenditures is paid in cash (the variation is related to a particular month). They also sell directly to the consumers with the exception of some tiendas which produce eggs or bread and sell to the other tiendas as well as to the consumers, They sell the broadest variety of commodities and import between 65 and 72% of all the food sold daily. They import mainly soft-drinks, corn potatoes, oil, canned fish, wheat flour, and many other kinds of food but in small percentages. Almost everything is sold in these tiendas and, with respect to small and large tiendas, they tend to specialize in the sale to the consumer of grains, legumes, oil, margarine, eggs, canned fish, soft drinks, coffee, chocolate, brown sugar, sugar, potatoes, etc.

Large tiendas have average expenditures of Col.$80,000 per month and per tienda (U.S.$2,500) and import almost 100% fo their stock, with the exception of eggs and bread which are partially bought in Villa Rica. They tend to trade with food which can be bought and stocked in the warehouse such as canned foods, coffee, oil, spaghetti, grain, and rice. The two large tiendas import more

than 50% of all rice imported monthly by the whole sector. Corn and wheat flour represent the other big sources of trade for them.

Of these commodities, part is sold to small or medium tiendas and part to the consumers. For example, in the month of April 1975, rice, corn and sugar were sold as follows (values in pounds):

COMMODITY	TO SMALL TIENDAS	TO MEDIUM TIENDAS	TO CONSUMERS
Rice	400	4,000	7,300
Corn	50	800	900
Sugar	300	3,200	100

but these values are not constant through time.

The percentage of cash expenditure quite high (between 70 and 90%) perhaps because they tend to buy outside the community where there are fewer credit facilities.

How does the price of goods change when they pass through two different tiendas before reaching the consumer?
As a matter of fact, the longest market chain is when the large tiendas sell to medium or small tiendas and they, in turn, sell to consumers or when two medium tiendas sell

locally produced eggs or bread to large or small tiendas and they, in turn, sell to consumers. The change in cost at these two levels and before reaching the consumer are given in the following table for 9 products.

FOOD	APPR.VOLUME OF TRANSACTIONS. POUNDS PER MONTH	LARGE OR SMALL TIENDA. PAY PER POUND	SMALL OR MEDIUM BUY FROM LARGE MEDIUM AND PAY PER POUND
Eggs	2,000	14	14
Beans	200	11.6	12.6
Synt.Food	300	3.8	5
Rice	15,000	3.7	3.8
Oats	10	10	14
Corn	4,500	2.6	2.8
Spaghetti	600	7.9	8.6
Sugar	5,800	2.7	2.7
Fat	1,100	11.5	11.6

Though the data on prices for survey # 1 are in the process of revision due to errors in the sources and instrument, this first analysis can give us a rough estimate of the change in price of food along its steps of flow. From this last table we can see, for example, that the more consumed or sold of a commodity the less it changes in price, so that the product: quantity sold x earning per pound tends to be constant for the various commodities.

URBAN SECTOR

TABLE 1

FREQUENCY	FOOD	PERCENTAGE IN PROTEINS OF THE TOTAL DIET DERIVED FROM THE FOODS LISTED
197	MEAT	30.292
205	RICE	25.336
202	PLANTAIN	8.286
85	BEANS	5.276
202	POTATOES	5.243
56	CORN	4.870
58	WHEAT FLUOR	3.138
104	PASTA	1.911
51	LENTILS	1.938
27	FISH	1.817
28	VEGETABLE MIXTURE	1.703
72	EGGS	1.554
16	POWDERED MILK	1.219
33	CORN FLUOR	1.102
32	MILK	0.916
18	CHEESE	0.712
30	OATMEAL	0.598
165	ONION	0.500
2	SOYBEAN	0.411
114	BROWN SUGAR	0.348
146	YUCA (CASSAVA)	0.323
116	TOMATOES	0.241
14	ORANGES	0.179
29	CHOCOLATE	0.170
3	CHICK-PEAS	0.166
80	BEETS	0.166
5	DRY PEAS	0.165
33	CABBAGE	0.153

11	BREAD	0.147
151	COFFEE	0.139
35	ULLUCOS	0.126
1	CHICKEN	0.125
75	CARROTS	0.105
2	VISCERAS	0.105

TOTAL QUANTITY OF PROTEINS = 413386E+05

URBAN SECTOR

TABLE 2

FREQUENCY	FOOD	PERCENTAGE IN KILOCALORIES OF THE TOTAL DIET, DERIVED FROM THE FOODS LISTED.
205	RICE	21.451
202	PLANTAIN	18.041
203	SUGAR	17.067
202	FAT	9.471
197	MEAT	6.914
202	POTATOES	4.621
114	BROWN SUGAR	3.997
129	OIL	3.490
56	CORN	3.450
85	BEANS	1.437
58	WHEAT FLUOR	1.414
104	PASTA	1.168
146	YUCA (CASSAVA)	1.084
151	COFFEE	0.985
33	CORN FLUOR	0.769
51	LENTILS	0.478
28	VEGETABLE MIXTURE	0.459
72	EGGS	0.364
29	CHOCOLATE	0.363
16	POWDERED MILK	0.362
30	OATMEAL	0.348
32	MILK	0.297
80	ARRACACHA	0.287
18	CHEESE	0.203
165	ONION	0.199

27	FISH	0.188
14	ORANGES	0.165
11	BREAD	0.101
75	CARROTS	0.100

TOTAL QUANTITY OF KILOCALORIES = 224669E+07

U R B A N S E C T O R

TABLE 3

FREQUENCY	FOOD	PERCENTAGE OF INCOME BUDGETED FOR FOOD SPENT ON EACH FOOD LISTED
197	MEAT	20.226
205	RICE	12.751
202	PLANTAIN	7.605
202	FAT	7.416
202	POTATOES	6.855
151	COFFEE	6.265
203	SUGAR	5.658
129	OIL	4.525
85	BEANS	3.270
114	BROWN SUGAR	2.631
72	EGGS	2.119
56	CORN	1.616
27	FISH	1.606
104	PASTA	1.526
146	YUCA (CASSAVA)	1.452
116	TOMATOES	1.372
58	WHEAT FLUOR	1.293
16	POWDERED MILK	1.280
165	ONION	1.229
51	LENTILS	1.055
29	CHOCOLATE	0.980
75	CARROTS	0.781
33	CORN FLUOR	0.713
32	MILK	0.660
18	CHEESE	0.573
30	OATMEAL	0.518
80	ARRACACHA	0.452

28	VEGETABLE MIXTURE	0.414
35	ULLUCOS	0.303
9	BANANA	0.276
5	SOUP BONES	0.259
48	BEETS	0.259
33	CABBAGE	0.239
53	SALT	0.230
14	ORANGES	0.202
1	CHICKEN	0.181
11	BREAD	0.159
2	VISCERAS	0.117
7	GREEN PEAS	0.114
15	STRING BEANS	0.102

TOTAL EXPENDITURES = 851240E+04

RURAL SECTOR

TABLE 4

FREQUENCY	FOOD	PERCENTAGE IN PROTEINS OF THE TOTAL DIET DERIVED FROM THE FOODS LISTED
162	MEAT	25.278
191	RICE	20.370
214	PLANTAIN	12.694
73	EGGS	10.895
55	BEANS	5.043
163	POTATOES	3.798
54	CORN	3.693
52	FISH	3.351
59	WHEAT FLUOR	2.658
111	PASTA	2.103
39	VEGETABLE MIXTURE	2.114
20	MILK	1.079
14	CHEESE	0.644
37	OATMEAL	0.621
13	POWDERED MILK	0.616
11	LENTILS	0.522
26	BREAD	0.521
145	ONION	0.432
3	SOYBEAN	0.423
12	CORN FLUOR	0.339
5	VISCERAS	0.324
64	ARRACACHA	0.292
3	CHICKEN	0.237
75	BROWN SUGAR	0.226
79	TOMATOES	0.185
2	DRY PEAS	0.170

29	TORTILLA	0.151
87	YUCA (CASSAVA)	0.141
73	CARROTS	0.136
15	CHOCOLATE	0.123
12	ORANGES	0.108

TOTAL QUANTITY OF PROTEINS = 401577E+05

R U R A L S E C T O R

TABLE 5

FREQUENCY	FOOD	PERCENTAGE IN KILOCALORIES OF THE TOTAL DIET, DERIVED FROM THE FOODS LISTED.
214	PLANTAIN	29.501
191	RICE	18.413
170	SUGAR	11.522
188	FAT	10.091
162	MEAT	6.159
163	POTATOES	3.573
54	CORN	2.792
75	BROWN SUGAR	2.773
73	EGGS	2.724
77	OIL	2.183
55	BEANS	1.466
111	PASTA	1.402
59	WHEAT FLUOR	1.279
159	COFFEE	0.715
39	VEGETABLE MIXTURE	0.608
64	ARRACACHA	0.539
87	YUCA (CASSAVA)	0.507
37	OATMEAL	0.385
26	BREAD	0.383
20	MILK	0.374
52	FISH	0.371
15	CHOCOLATE	0.281
2	CORN FLUOR	0.236
14	CHEESE	0.196
13	POWDERED MILK	0.195

145	ONION	0.183
73	CARROTS	0.137
11	LENTILS	0.137
29	TORTILLA	0.129
12	ORANGES	0.106

TOTAL QUANTITY OF KILOCALORIES = 204474E+07

R U R A L S E C T O R

TABLE 6

FREQUENCY	FOOD	PERCENTAGE OF INCOME BUDGETED FOR FOOD SPENT ON EACH FOOD LISTED
162	MEAT	19.280
191	RICE	11.415
214	PLANTAIN	9.954
188	FAT	8.269
163	POTATOES	6.874
170	SUGAR	5.364
159	COFFEE	4.462
52	FISH	3.815
55	BEANS	3.543
77	OIL	3.176
75	BROWN SUGAR	2.125
111	PASTA	2.089
73	EGGS	2.027
73	CARROTS	1.720
54	CORN	1.432
59	WHEAT FLUOR	1.289
145	ONION	1.201
79	TOMATOES	1.174
20	MILK	0.962
13	POWDERED MILK	0.877
15	CHOCOLATE	0.830
37	OATMEAL	0.678
42	SALT	0.674
14	CHEESE	0.671
87	YUCA (CASSAVA)	0.670
26	BREAD	0.650
39	VEGETABLE MIXTURE	0.607

64	ARRACACHA	0.448
3	CHICKEN	0.395
11	LENTILS	0.372
5	VISCERAS	0.349
7	SOUP BONES	0.265
24	ULLUCOS	0.265
12	CORN FLUOR	0.236
29	TORTILLA	0.233
7	BANANA	0.222
27	BEETS	0.191
12	ORANGES	0.141
7	BABY CEREAL	0.133
10	STRING BEANS	0.111
10	CABBAGE	0.105

TOTAL EXPENDITURES = 715075E+04

TABLE 7

WHERE "TIENDAS" BUY: PRICE PER POUND AND PERCENTAGE FROM EACH SOURCE

COMMODITY	PUERTO TEJADA		SANTANDER		CALI		CAVASA		BY TRUCK	
	%	Price	%	Price	%	Price	%	Price	%	Price
MEAT					100	14				
EGGS	28	14.1	32	14	2	14			37	14
BEANS	36	11.6			64	11.6				
RICE	48	3.8			37	3.8	14	3.4		
CORN	71	2.5			29	2.6				
SPAGHETTI	73	7.8	7	8.4	17	7.4	2	7.6		
POTATO	3	2.8			56	2.3	9	2.4	31	2.3
PLANTAIN					100	0.9				
FAT	56	12			28	11.4	15	11.6		
BREAD	59	10			10	10			30	10

TABLE 8

WHERE FAMILIES BUY: PRICE PER POUND AND PERCENTAGE FROM EACH SOURCE

COMMODITY	VILLA RICA		PUERTO TEJADA		SANTANDER		HOME MADE		CALI		OTHER SOURCES	
	%	Price	%	Price	%	Price	%	Price	%	Price	%	Price
MEAT	17.9	13.37	69.8	12.69	4.7	12.2			7.5	14.88		
EGGS	15.4	15	7.7	15.3	3.8	15	67.3		3.8	13	2	
BEANS	20.4	11.3	45.4	12.4	2.3	15	13.6				19	
RICE	24	4.06	66	4.0	3.	3.8			7	4.3		
CORN	18.6	3.15	69.7	2.96	6.7	2.8						
SPAGHETTI	12.6	7.87	82.5	7.36	3.2	8.0					2	
POTATO	20	2.7	71.2	2.8	3.4	3.2			5.2	2.58		
PLANTAIN	12.4	0.95	22.5	0.9	3.1	1.1	47.3		5.4	1.2	9.3	
FAT	18.8	14.09	72.1	13.0	4.1	14.7			4.9	13.83		
BREAD	66.6	10	16.6	10					16.6	10		

F. SURVEYS

1. Nutritional Status Survey

2. Family Level-Marketing Survey

3. 24 Hour Recall Survey

4. Food Weighing Survey

5. Community Level- Marketing Survey

6. Yields Survey- Determination of Nutrient Production

7. Agriculture Production

8. Diarrhea and Water Quality Surveys

1. NUTRITIONAL STATUS SURVEY

a. Objective.

The objective of this survey is to determine the nutritional status of children under 6 years of age utilizing different anthropometric measurements.

b. Initial Design

The survey was designed to measure the weight, height, arm perimeter, craneal circumference and age of children under 6 years of age.

A team composed of supervised nurses' auxiliares and health promotors would visit the homes of the families to be sampled.

The following information was obtained on each family:

(1) Identification of the family

(2) Names of children under 6 years of age

(3) Age of children under 6 years of age (months); an attempt was made to verify this data to the maximum by referring to documents such as birth and baptismal certificates, etc.

(4) Sex

(5) Weight in grams of each child under 6 years of age. A 100 gram approximation Detecto baby scale was used for those children weighing less than 15 kilos and a 250 gram approximation Detecto scale was utilized for children weighing more than 15 kilos.

The children were weighed without shoes and a minimum of clothing.

(6) Height in centimeters using a wooden scale with adjustable head and metric measuring tape with 0.15 centimeter approximation.

(7) Craneal measurements were taken with a non - elastic, metric measuring tape (0.25 centimeter approximation).

(8) Arm perimeter: the right arm (1/3) was measured with a non-elastic, metric measuring tape (0.25 centimeter approximation).

c. Execution

(1) Community approach.

The nature of the survey was explained to the community's health personnel (doctors, nurses and health promotors) in order to ensure extensive participation.

The health promotor was encouraged to accompany the health team during each home visit.

Project members were on hand to explain the presence of the interviewer and nature of the survey to community members.

(2) Personnel.

Each team which visited a family was composed of a promotor (from the community) and a nurses' auxiliary. A supervisor was in the area at all times.

Since the auxiliary nurse personnel had experience regarding community weight and height surveys, their training consisted only of an explanation of the project, the importance of reliable measurements and causes of error.

It was planned for each group to visit 15 families per day.

d. Comments

Community response to the survey was satisfactory in the sense that there was no objection to the presence of the interviewers.

NUTRITIONAL STATUS SURVEY

SURVEY No. 3

ADDRESS:

NAME OF HEAD OF HOUSEHOLD

COMMUNITY	SURVEY	DATE M-Y	C SECTOR	C FAMILY		NUM CHILD
1	2	3 4 5	6 7 8	9 10 11	12 13	14 15

COMMUNITY	SURVEY	DATE M-Y	C SECTOR	C FAMILY		C INDIVID	AGE MONTHS	SEX	WEIGHT	HEIGHT	CIR ARM	CR HEAD	C INDIVID	AGE MONTHS		WEIGHT	HEIGHT	CIR ARM	CR HEAD
1	2	3 4 5	6 7 8	9 10 11	12 13	14 15	16 17	18	19 20 21	22 23 24	25 26 27	28 29 30	31 32	33 34	35	36 37 38	39 40 41	42 43 44	45 46
1	2	3 4 5	6 7 8	9 10 11	12 13	14 15	16 17	18	19 20 21	22 23 24	25 26 27	28 29 30	31 32	33 34	35	36 37 38	39 40 41	42 43 44	45 46
1	2	3 4 5	6 7 8	9 10 11	12 13	14 15	16 17	18	19 20 21	22 23 24	25 26 27	28 29 30	31 32	33 34	35	36 37 38	39 40 41	42 43 44	45 46
1	2	3 4 5	6 7 8	9 10 11	12 13	14 15	16 17	18	19 20 21	22 23 24	25 26 27	28 29 30	31 32	33 34	35	36 37 38	39 40 41	42 43 44	45 46

2 = Man
1 = Woman

Weight= Grams/10

C	M - A	SECT	F AH	CR	ADDRESS
1 2 3 4	5 6 7	8 9 10	11 12	13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60	

C	M - Y	SECT	F AH	CR	C I	NAME	AGE	S	PHYSIOLOGICAL STATUS	F
1 2 3 4	5 6 7	8 9 10	11 12	13 14	15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60					

2. FAMILY LEVEL - MARKETING SURVEY

a. Objectives

An attempt was made through this family- level marketing survey to acquire knowledge regarding the availability of food at the family level and some factors related to the marketing of food which could affect the magnitude of its availability.

b. Initial Design

The survey was initially designed to be carried out by a nutritionist who would interview preferably the mothers or person who did the marketing.

It was designed to be filled out completely in the field during the period in which the recall and food weighing surveys were completed.

The following questions were asked:

(1) Identification of the family.

(2) Date

(3) Marketing intervals (defined as the customary purchase of the majority of food)

(4) Place where the family usually did their marketing (refers to geographical area)

(5) Reason for family's preference to do their marketing in a certain place.

(6) An inquiry was made regarding the origin, quantity or availability and cost per unit of each food mentioned by the mother or person who did the marketing.

In order to compile a list of those foods available to the family, the interviewees were asked what articles were purchased the last time they bought groceries. They were also asked what foods, in addition to those purchased, were available in the home during the past week and their origin, Six classes of origins were established, Villa Rica and other markets, including Cali.

During this same visit, the interviewer also executed a recall survey regarding foods consumed by the family on the day before as well as what foods were consumed that same day and in this manner was able to correct any omission on the part of the person being interviewed.

c. <u>Execution</u>

(1) It was planned to carry out three surveys per family at intervals of at least one week.

(2) Of the selected sample, the visit to each family was chosen at random.

(3) Five visits per day were programmed.

(4) Initially the team was composed of one nutritionist.

(5) The families were visited previously by the nutritionist and an assistant dietician from the same community.

d. Problems Encountered for Execution

Upon considering the number of surveys and the time available, it was concluded that the number of interviews carried out daily was insufficient.

After studying the obstacles found for executing the survey, we concluded that:

(1) The interview prior to the survey should be carried out by the same person

(2) This person (the nutritionist) should also perform the food weighing which limits the number of visits to a maximum of five (one breakfast, two lunches, two dinners).

e. Final Survey Methodology

Community Approach . An initial diffusion compaign

regarding our aims at vaious levels was effected.

(1) Information was made available to community leaders through meetings of the Community Action Board and the Parent-Teachers Association.

(2) Identification of and information regarding non-formal leaders. It was possible to identify the following persons as informal leaders: a group of nuns who operated a loudspeaker, the members of the health team (nurses' auxiliaries and health promotors), and owners and managers of stores where community members gathered. Contacts were made with these informal leaders in a casual manner by different project members.

(3) An attempt was made for several project members to be seeen in the community most of the time.

(4) On various occasions some of the parents, chosen for interviewing were given a full explanation regarding the program content during informal meetings with project members.

During the development of the survey a social worker interviewed each family as many times as necessary in order that they:

(1) Comprehend the nature of the survey and the project as a whole.

(2) Accept the presence of the interviewers.

Personnel. In order to overcome the problems encountered for carrying our additional surveys, it was decided that:

(1) The preliminary interviews would be executed by the social worker and an assistant from the same community.

(2) The food weighing was assigned to assistant dieticians who were supervised by the nutritionist.

Time. A minimum of 9 surveys daily, 4 days a week, were programmed.

f. Comments

Upon executing the marketing survey together with the 24-hour recall survey and through direct observation of the foods consumed, it was possible to rectify most of the interviewee's omissions.

This survey caused less uneasiness among the families. For this reason, we are of the opinion that it should be carried out first. Since specific questions such as amount of money spent on a certain food are asked, it is believed that involuntary errors regarding quantification would be minimal.

g. Community Response

No rejection of the survey on the part of the community was observed.

SURVEY No.2 FAMILY CONSUMPTION _ MARKETING SURVEY

Name of Head of Household:

Family ☐☐☐ Sector ☐☐☐

Address State Town ☐

Date ☐☐☐

Frequency marketing done ☐

Where ☐ Why you prefered this site ☐

Food Purchased	Origin	Frequency	#D	Quantity	If package Unit/package	Cost/unit

FAMILY ☐☐☐ Kind of Food ☐

Preparation	Food	Quantity	No.	Physiologic. Status	Age	Sex
			PNC			
			PNCO			
			PC			

Kind of Food ☐

Preparation	Food	Quantity	No.	Physiologic. Status	Age	Sex
			PNC			
			PNCO			
			PC			

3. 24-HOUR RECALL SURVEY

a. Objectives

The objectives of this survey were:

(1) Determine the food intake of a family unit during the 24-hour period prior to the interview.

(2) Determine the family's eating habits.

(3) Determine, together with the food weighing survey, the food intake of each family member.

b. Initial Design

This survey was designed to be carried out in conjuction with the marketing survey and no substancial modifications were made during its execution.

c. Final Methodology

The same problems were encountered regarding availability of time on the part of the nutritionist to carry out the number of surveys required. However, these were solved in the same manner as described in the marketing survey.

Community Approach. As with the previously described marketing survey, the community was informed regarding the plans and purpose of this survey.

Personnel. The surveys were executed by a nutritionist.

The Surveys Includes the Following:

(1) Identification of the family

(2) Date

(3) Type of meal: breakfast, lunch, dinner, etc.

(4) Dishes prepared: beans, rice, "sancocho", etc.

(5) Ingredients (includes basic foods)

(6) Quantity measured (tablespoons, units, pounds, glasses, etc.)

(7) Quantity measured converted to grams

(8) Persons who did not partake (persons for whom food was prepared but for some reason did not consume it)

(9) Persons who consumed the food prepared.

(10) The persons described in 9 above were discriminated as follows:

(a) Children under 6 years of age - age, name, se.

(b) Children between 6 and 14 years of age

(c) Adults - sex and physical status (father, mother-pregnant-nursing)

Fammily Unit. Family unit was described as those persons who usually ate from the same pot.

d. Comments

(1) Upon carrying out this survey in conjunction with the marketing and food weighing surveys, it was possible to identify and correct some errors:

(a) If the person interviewed mentions some food which does not appear on the previous survey, they were informed and this probably involuntary omission is rectified.

(b) The food weighing survey gives us an idea of the size of the portions of different food. This information is of great assistance in evaluating the reliability of the data obtained in the 24-hour recall survey because types and amount of foods should be of the same magnitude.

(c) In most instances the interviewer is not able to quantify differences in food distribution within the family.

f. Community Response

Although the survey was not rejected by the community, it was observed that its execution caused uneasiness in some of the families.

SURVEY No. 3 DAILY FAMILY CONSUMPTION

24-HOUR RECALL

Name of Head of Household: Date: ☐☐☐

Family ☐☐☐ Sector ☐☐☐ Address

State: Place ☐

Kind of Food ☐

Preparation	Food	Quantity	No.	Physiologic. Status	Age	Sex
			PNC			
			PNCO			
			PC			

4. FOOD WEIGHING SURVEY

a. Objective

The objective of this survey was to determine food distribution within the family.

b. Initial Design

The survey was designed to be executed by a nutritionist and assistant dietician. However, a limitation existed regarding the number of surveys which could be carried out daily.

Upon analyzing the nature of the surveys and possibility of errors on the part of available personnel, it was concluded that the food weighing survey could be carried out by the nurses' aids because:

(1) The nutritionist interviewed the family prior to this survey

(2) There would be no estimation errors committed since all the data in the survey are directly verified and/or measured.

(3) A trained team member remained in the area for consultation.

During the first month of operation the food weighing survey was carried out only by the nutritionist.

c. Design and Execution

Community Approach. Information regarding this survey as well as the others was made available to the community.

Personnel. The personnel selected to execute the surveys consisted of three nurses' auxiliares with training and experience in public health. They were under the constant supervision of the nutricionist.

Training. Initial training was given in the dietetic laboratory and consisted basically of theory and practice sessions.

(1) The nature of the project was explained as well as the importance of quantifying the food consumed in order to establish its distribution within the family.

(2) The possibilities of committing weighing errors were explained and demonstrated.

(3) Practice demonstrations with different foods and food mixtures were carried out repeated until the intra and interpersonal variation coefficient was less than 5% for the weight of the same food.

(4) The training process lasted 24 hours (three working days).

It was planned to have each auxiliary team member carry out three surveys daily.
In some instances, it was possible for a team member to execute more than one survey during the same breakfast, lunch or dinner period.

The survey was prepared in the following manner:

(1) Identification of the family.

(2) Type of meal.

(3) The following data was collected regarding each family member: sex, age, physiological status (father, mother, pregnant mother, nursing mother, adult, infant, pre-school, student).

(4) The different prepared foods were weighed by portions just before they were consumed and the quantity served each person were recorded.

d. Problems Encountered

Due to the characteristics of this survey it was the one least acceptable because many mothers were hesitant to have their food weighed.

As with the recall survey, depending upon the mothers' belief as to how the data are to be utilized, she could change the quality and quantity of food.

We believe the allocations of portions within the family is a long standing routine which would not suffer any seriously changes due to the presence of the interviewers.

SURVEY No. 4 DISTRIBUTION OF FOOD WITHIN THE FAMILY UNIT - FOOD WEIGHING SURVEY

Name of Head of Household

Family ☐☐☐ Sector ☐☐☐ Address State:

Town ☐ Fecha ☐☐☐ Kind of food ☐ Number of Individuals ☐☐

Cod. Ind. / Sex / Age / F.S. / I — FOOD	P.C	P.C.	P.C.	P.C.	P.C.	P.C.	P.C.	P.C.	P.C.	P.C.	P.C.	P.C.	P.C.

5. COMMUNITY LEVEL- MARKETING SURVEY

a. Objective

The objective of this activity is to determine the quantity of food which passes through the Villa Rica marketing system. A second objective is to better understand the functioning of that marketing system in order to identify key factors which might indicate points at which to intervene in the system.

b. Initial Design

First a meeting was held with community leaders in order to identify wholesalers, retailers, small stores and stores operated in the homes where plantain and vegetables were sold.

A list was made of the stores in the Villa Rica urban area. Due to the fact that this is a small town, the identification and location of each store was completed quickly. In a larger town it would have been necessary to take a statistical sample.

A questionaire was designed to obtain the necessary information. Initial discussions were held individually with each of the tienda operators. The project and the purpose of the survey was explained and all of the tiendas agreed to cooperate

in the study. It was planned to carry out the survey covering a continuous period of time until a pattern was established.

c. Execution

The questionnaire was distributed to the storekeepers who participated in its construction and collaborated in the collection of data. An appointment was made previously and the information concerning purchases was taken from bills of sale or supplied from memory.

All the stores were visited during a period of 25 days. Upon leaving each store, the information regarding quantity of food purchased was recorded on the questionnaire. This process was repeated at all the stores in Villa Rica. Each operation was denominated "round". Three consecutives "rounds" (covering approximately 3 months) were carried out and data was obtained regarding food purchases during each one. This information is on record in the office files.

The prices and weights of all foods are included in the questionnaire. From this it was possible to establish the fluctuations in prices for this

period from the data collected on prices during the three "rounds".

The boundary conditions for this survey are not available because the beginning and end stock was not measured. It was assumed that the frequency and constancy of purchases would be such that a pattern would quickly emerge.
This turned out to be true only for the smaller tiendas. As a result the information from this survey can only provide an approximate estimate of the quantity of food which is distributed in the Villa Rica market system. It is important that further market surveys include a measurement of stock at the beginning and end of the survey.

Two persons from the project initiated the talks with storekeepers, explained the project and gathered information. Late on person continued this activity,

The work was initiated in January, 1975 and terminated with the coding in May, 1975

d) Comments

The survey was successful in obtaining an understanding af the Villa Rica marketing system and identifying

potential intervention points. Some storekeepers are now in fact organizing such a cooperative.

The quantity of food distributed through the Villa Rica marketing system was not accurately determined for reasons mentioned earlier. There exists the additional problem that the Villa Rica marketing system accounts for less than half of the food purchases in the study area. Over half of the food purchases are made by individuals in Puerto Tejada. The marketing system may need further study depending on the usefulness of information gathered in the Family Level Marketing Survey.

SURVEY No. 1

MARKETING IN VILLA RICA - URBAN AREA

Store Address _____

Owner _____

Administrator _____

Frequency of buying foods _____ Date _____

FOODS	Date of buying.	Quantity	Weight	Price	Place of Origin	System of Payment	Quantity exported to other town

6. YIELD SURVEY- DETERMINATION OF NUTRIENT PRODUCTION

The following steps were taken in order to estimate the production of food on a farm in Villa Rica:

a. Secure the equipment and personnel required to measure the farms:

(1) A compass with 0-360°graduation

(2) A decameter (30 meters)

(3) Three wooden rods 2 meters long and 5 centimeters in diameter, preferabley having a red color.

The measurements were taken by two persons having the following characteristics:

(1) A technician with sufficient technical training in mathematics and trigonometry.

(2) An assistant who needs no special training. In the case of Villa Rica a person was chosen from the community who was acquainted with the area under study and had a knowledge of agriculture.

The cost of taking this measurement was Col.$100 per farm, which correspond to salary for the two persons mentioned above. A maximum of 2 hours was required taking into consideration the irregularities of the terrain.

b. Procedure

Assuming that the terrain indicated in Figure No.1 is to be measured with a compass:

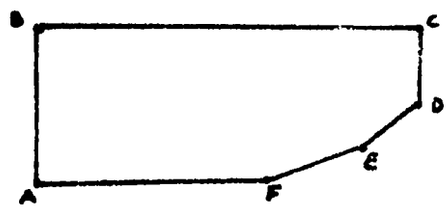


Figure No. 1

(1) The first step consists in placing one of the wooden rods on any initial vertex, for example point A where it will remain until the work is completed. The technician remains at point A while his assistant advances toward point B and places another rod at this point.

(2) These two persons proceed to measure the length of AB using the decameter. The person at point A takes a clockwise measurement with the compass of the angle formed by the boundary AB with the north as indicated by the compass.
The direction of the boundary is taken when, observing from point A, the two rods form a stright line.
A drawing of this boundary is made in a note-book as well as the respective angle and length measurements.

(3) The technician then advances toward point B and his assistant to point C with the third rod and the decameter; the rod is placed on point C. The same operation described in (2) above is repeated, taking in this case the measurements for boundary BC.

(4) The technician removes the rod placed on point B, advances toward point C, hand the road to his assistant, who places it on point D. The steps mentioned in (2) are taken and this operation is repeated section by section until arriving at the initial rod placed on point A.

At this point all the field work necessary for measuring the area is completed. If there are several parcels of land with different crops, the same steps indicated in (b) above are taken for each one.

Later, the owners of each parcel of land are questioned regarding the yield obtained in kilos or pounds of each crop or of crops soon to be harvested.

This information, together with the measurements taken, will serve to estimate the productivity.

c. The next step is a revision, which is carried out in the office, in order to verify that the angle and length of the boundaries are correct. On the basis of these measurements, coordinates for each established point of the land are obtained following a Cartesian system. The components of each axis are added up and the result should be approximately 0.

In the case of those farms measured in Villa Rica having a regular terrain and maximum extension of 0.7 hectares, the total sum of the components in 75% of the cases was less than 2.8 meters and in the remaining 25% less than 5 meters. For irregular terrain having a maximum extension of 2 hectares, in 70% of the cases the error in the sum was less than 7 meters and in 30% less than 15 meters. There was an estimated margin of error of not over 6%.

d. Calculation of the Area.

On graph paper, preferably milimetric, an initial point is indicated as the origin of the coordinates. A scale is established, for example 5 milimeters = 1 meter. Each established point of land is indicated by the coordinates. In this manner a model is drawn.

The area is then estimated by adding the number of units within the model, bearing in mind that 25 square milimeters= 1 square meter.

e. Once the area is estimated, the production of each crop is obtained by dividing the yield in kilos or pounds by the number of hectares of ground. A kilo/hectare measurement is obtained which can be converted to proteins and calories, resulting in the estimation of food/hectare.

7. AGRICULTURE PRODUCTION

To determine the community nutrient gap the production of nutrients is measured. The quantity of produced crops exported from the community, the quantity sold within the community and those used for home consumption are determined. The field procedure follows:

The first step is to locate the rural segments including 125 farms in the community. The boundries of each segment were located relative to the principal roads and the small access roads.

Initial Contacts. The first communication with the farmers was aided by the program CIMDER. CIMDER has non-formal education program in the Villa Rica area. Three farmers were found who offered to help us in locating the segments, showing the location of farms and small roads. Our work was presented as a part of a University project.

Participation of farm owners. This step was the most difficult and delicate. Farmer participation was absolutely essential. We visited farm by farm a total of 125 farms. Let us consider the following aspects.

a. We visited each owner-farmer to explain the objective of our work. In the course of the visits we established with them, little by little the terminology and words we both understood.

b. Initially, to each owner, we explained that the University was interested in determining types of agriculture programs which might reduce malnutrition or low weight of children. To do this, it is necessary to know the production of foods grown in the fields. For example; what crops are cultivated for production on the farms. Of these crops, what quantity is consumed in the home and what quantity is sold in the market, and what quantity of land is used for each crop?

They expressed doubts about our work. They asked if we wanted to impose more taxes on their land to change the traditional cultivations of their crops, or to publish in a review how poor they are.

Then it was explained that we were not there to harm them, but to help them to establish new alternations of work which could be done in the fields in order to increase the status of nutrition in the community. It was explained that in children under six years 7 of 10 in the "vereda" are under weight, then we

discussed with the farmers possible farm production programs to reduce malnutrition.
It was made clear to the farmers that such farm production programs could not be put into effect immediately. When this diagnostic study is completed, the results will be available to the community to use to seek government help for agriculture programs. We explained very carefully that the University, at the moment was interested in knowing the causes of the problems and then proposing the solutions to them.

The majority of the farmers agreed with our ideas. Each farm was located on the map we visited and we collected the following data:

a. Who owned the land?
b. How much land was used for each crop and what crops were grown on each farm? (detailed below Determination of Nutrient Production)
c. Where the crops were sold?
d. How much of each farmers production was eaten in the home?

At the same time, we made more contacts with community leaders, health promotos (a government field worker in health) teachers, others farmers all of who came from the rural area. We exchanged some idea with

them clarifying why we were there. They accepted us and were also willing and ready to help the community in any way they could.

Therefore, the every-day problems of the farmers were communicated to us. We learned about the yields of their crops, the losses and gains, their health and the health of their children, and their motivations to work.

8. DIARRHEA AND WATER QUALITY SURVEYS

The purpose behind these activities is to establish intermediate indicators which relate predictable reductions in the malnourishment rate to potential interventions in the environmental sanitation area. While it is generally held that improvement in environmental sanitation will lead to a reduction in malnourishment rates, it will be difficult to quantify this relationship without establishing and measuring these intermediate indicators.

The objective of the diarrhea survey was to determine the rate of diarrhea in children under six years old. Up to now this survey has been carried out in the original six sample segments in the Villa Rica urban area. A health promoter from the town would visit each family with children under six. On the first visit the promoter explained to the mother what was to be meant by diarrhea. Basically, the Hipocratic definition was used which describes diarrhea as "an abnormal frequency and liquidity of faecal discharge".

Once every two weeks the mother was visited and asked whether any of her pre-school (i.e. under six) children had had diarrhea in the previous two week period since the last visit.

When the response was affirmative = the mother was asked the number of days out of the period that the child had had diarrhea and also the average frequency of discharges per day. These interviews were carried out for six contiguous two week periods.

The data from this survey has not yet been coded nor stored in the computor. As a result only an agregated analysis has been performed which gives incidence of diarrhea by segment. (See table A). Later, with the help of the computor, it will be possible to look for a relationship between individual malnourished children and those children with a high incidence of diarrhea.

This method for establishing the incidence of diarrhea in preschoolers needs to be examined and evaluated for accurancy. Nevertheless the initial feeling is that this methodology has good potential for providing a valuable diarrhea indicator. A possible change in the method is that it is probably not necessary to perform the survey over a continuous period. If each family is visited once every two or three months and questioned about the preceding two weeks, the data will probably be equally useful. This change, in addition to being less costly, would also be less "bother" for the mother being surveyed.

The water quality is being tested using a Millipore portable analysis kit. The procedure that is used is the same as described in the Millipor Application Manueal (302). The test determines total coliform which can be a useful indicator of the possibility of contamination from human waste.

Most of the families in Villa Rica consume the water from their own aljibe* or that of a neighbor. Therefore it will be possible to associate an independent water quality value with each family. The idea is to establish relationships between a water quality indicator and a diarrhea indicator and between diarrhea indicator and the malnourishment indicator.

The preliminary results from analizing the water of sixteen families in one segment of Villa Rica indicates that the water quality problem may not be as serious as one would expect from observing the situation. However these results must be further varified since during the initial test it was necesarry to become familiar with the equipment and the procedure.

* "aljibe" is a shallow dug well usually without lateral support or protection from surface run-off.

In general the methodologies being developed to establish indicators for diarrhea and for water quality appear to be feasible and useful. The results to date would indicate that environmental sanitation may not be a serious problem in Villa Rica in term of its effect on the malnourishment problem. However these results are preliminary and incomplete and more work is needed before conclusions can be drawn with any confidence.

TABLE A

Average Percent of Days with Diarrhea for Children under Six Years Old

Segment	1	1.21%
Segment	8	1.01%
Segment	15	0.94%
Segment	22	0.88%
Segment	29	1.00%
Segment	36	0.34%

G. VISITORS AND MEETINGS

1. Visitors to the Nutrition Project

MAX RUTTMAN:	INNAL - Santiago de Chile, Chile
DAVID NELSON:	USAID - Quito, Ecuador
ERWIN HORSTEIN:	USAID - Washington
DAVID DENNMAN:	USAID - Bogotá, Colombia
ROSARIO SINTES:	NATIONAL PLANNING OFFICE, Colombia
GUILLERMO VARELA:	NATIONAL PLANNING OFFICE, Colombia
OLINTO RUEDA:	NATIONAL PLANNING OFFICE, Colombia
KATHY AUSTIN:	CONSULTANT - NATIONAL PLANNING OFFICE
ENRIQUE RODRIGUEZ	AND STAFF - NATIONAL PLANNING OFFICE
CHARLES FRANCIS:	CIAT - Colombia
DONALD SCHON:	MASS. INSTITUTE OF TECHNOLOGY, USA
JOHN NYSTWEN:	UNIVERSITY OF MICHIGAN, USA
IVAN BEGAN:	INCAP,- Guatemala, Guatemala
ALBERTO PRADILLA:	INCAP - Guatemala, Guatemala
MAGNO MUÑOZ:	NATIONAL NUTRITION PLANNING, Chile
CARLOS SCHLESINGER:	NATIONAL NUTRITION PLANNING, Chile
MBUMBA PHAKA:	NATIONAL NUTRITION OFFICE, Chile
AUDRY WIGHT:	UNIVERSITY JAVERIANA, Bogotá, Colombia

2. Meetings held to explain the project and discuss its progress.

Colombia National Planning Office (2 in Bogotá, 1 in Cali), with representatives of Colombia Institute Family Welfare, Minister of Health and Minister of Agriculture.

Colombia, Science Institute (Colciencias): Committee of Nutrition Research.

C.R.S. South American Representatives - Cali, Colombia

CARE South American Representatives - Bogotá, Colombia