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9. ABSTRACT

Malnutrition among poorer families in Nicaragua is evidently common, particularly in rural areas. The government is establishing a national food and nutrition program to deal with malnutrition. This report provides an analytic framework for selecting interventions in rural areas, and describes a program based on that analysis. The rural area includes three overlapping subpopulations at risk: small farmers, non-farmers, and farm laborers. The major characteristics of small-farm families which affect their nutritional status are dependent on home-grown food, combined with limited purchasing power, seasonality of production, their dispersion and isolation, and strong traditions. They will be benefited by interventions which increase and diversify their production, and protect stored food against loss. With small-farm families, children up to age six and pregnant and lactating women are the most at risk, and they will need some form of supplemental food to escape malnutrition. Protein-calorie malnutrition and Vitamin B-complex deficiency can probably be overcome by an increase in gross intake of the grain-pulse diet common to the area. However, weaning children may not be able to consume enough bulk to obtain the needed calories. Vitamin A deficiency can be overcome by fortification of sugar, and iodine deficiency by fortification of salt. A national program is preferable to a regional program. Nutritional interventions in rural areas should include salt and sugar fortification, community granaries, nutrition education programs in the primary schools and on national radio, and supplemental feeding of high-risk groups.

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NICARAGUA

A Strategy for Nutritional Interventions in the Small Farm Sector

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A STRATEGY FOR NUTRITIONAL INTERVENTIONS IN THE SMALL FARM SECTOR

Malnutrition in Nicaragua, as in other Central American countries, appears to be a widespread phenomenon among poorer families. Although no survey of the nutritional status of small farm families has been taken, the 1966 INCAP survey found that the nutritional status of residents of "rural" municipal capitals was poorer than that of residents of urban centers and extended this conclusion to the surrounding townships.

The Government of Nicaragua is in the process of establishing an intersectorial nutritional unit at the policy level to coordinate a national food and nutrition program to deal with malnutrition. A Technical Committee on Nutrition has been established to act as the executive secretariat of the policy unit, and to examine and recommend alternative interventions for the national program.

This report, submitted in compliance with Work Order No. 43 of Indefinite Quantity Contract AID/afr-C-1142, provides an analytic framework for selecting the interventions which would be most useful in dealing with malnutrition in rural areas, and describes a program based on that analysis. This report deals only with discrete activities which may be executed by various arms of the GON (specifically, the Ministries of Agriculture, Education and Public Health and the Comité Técnico de Nutrición) and which might be financed directly by a development loan. It does not deal with policies, e.g., income distribution, food export policy, etc., which may have a profound effect on the nutrition of lower income groups. These nutrition effects should be considered whenever policies affecting the equity of underprivileged elements of the population are adopted in light of the tradeoffs with other welfare considerations.

I. SUMMARY AND CONCLUSIONS

1. The rural area includes three somewhat overlapping subpopulations at nutritional risk: small farmers, non-farmers, and farm laborers. Each represents a particular set of conditions or characteristics which determines the probability of nutritional risk and suggests which interventions may be

most appropriate. In this study, I concentrated on the small farmer sub-population. Many members of the other subpopulations share the small family's isolation, dispersion, and traditional outlook, and some may also depend on home-grown food. All would be helped by mass fortification and mass communication programs.

2. The major characteristics of small farm families which affect their nutritional status are dependence on home-grown food combined with limited purchasing power; seasonality of production - and malnutrition; risk of crop failure; dispersion and isolation; and strong traditions. They will be benefited by interventions which increase and diversify their production; protect stored food against loss pending consumption or sale; provide security against crop failure or improvidence; or which improve the nutritional quality of the few foods they buy. They will not be helped by programs which require new purchases, access, an institutional structure, or rely on frequent contact on the printed word to provide information.

3. The entire farm family may be at nutritional risk. The best way to assure adequate nutrition is to assure that the farm's production is ample and diversified and that storage is adequate and secure. However, the poorer and least provident members of the subpopulation will occasionally be unable to satisfy their requirements. Within this latter group, children up to six years of age and pregnant and lactating women are the most at risk population (MARF), and this group will probably have to have some form of supplemental food if they are to escape malnutrition.

4. Protein-calorie malnutrition and Vitamin B-complex deficiency can probably be overcome by an increase in gross intake of the grain-pulse diet common to the area, except in weanling children who may not be able to consume enough bulk to obtain the needed calories. Vitamin A deficiency can be overcome most readily by fortification of sugar, and iodine deficiency by fortification of salt. Iron deficiency should probably be treated by reduction of endoparasitism and intestinal disease through improved personal hygiene focused on sanitary water, food preparation and waste disposal.

5. A national program is preferable to a regional program. The most desirable interventions (Vitamin A fortification of sugar, iodization of salt, radio messages on nutrition and health, health and nutrition education in primary schools) should be of national scope. The presence in Region V of unique and well-financed organizations (INVIERNO and PLANSAR) provide a good institutional base, but one which is difficult to replicate in the near term. The weak institutional infrastructure of other regions provides a more typical setting for testing interventions.

6. A recommendable program for nutrition interventions in rural areas should include: (1) Regulatory interventions such as fortification of salt and sugar; (2) food availability interventions (crib drying and storage, farmstead animals and patio crops, community granaries); (3) information program (health and nutrition in the primary schools and on national radio, with a nutritional information and adaptation service to provide quality control and assistance); and (4) supplemental feeding of high risk groups.

II. RURAL TARGET GROUPS

A. MAJOR SUBPOPULATIONS IN RURAL AREAS

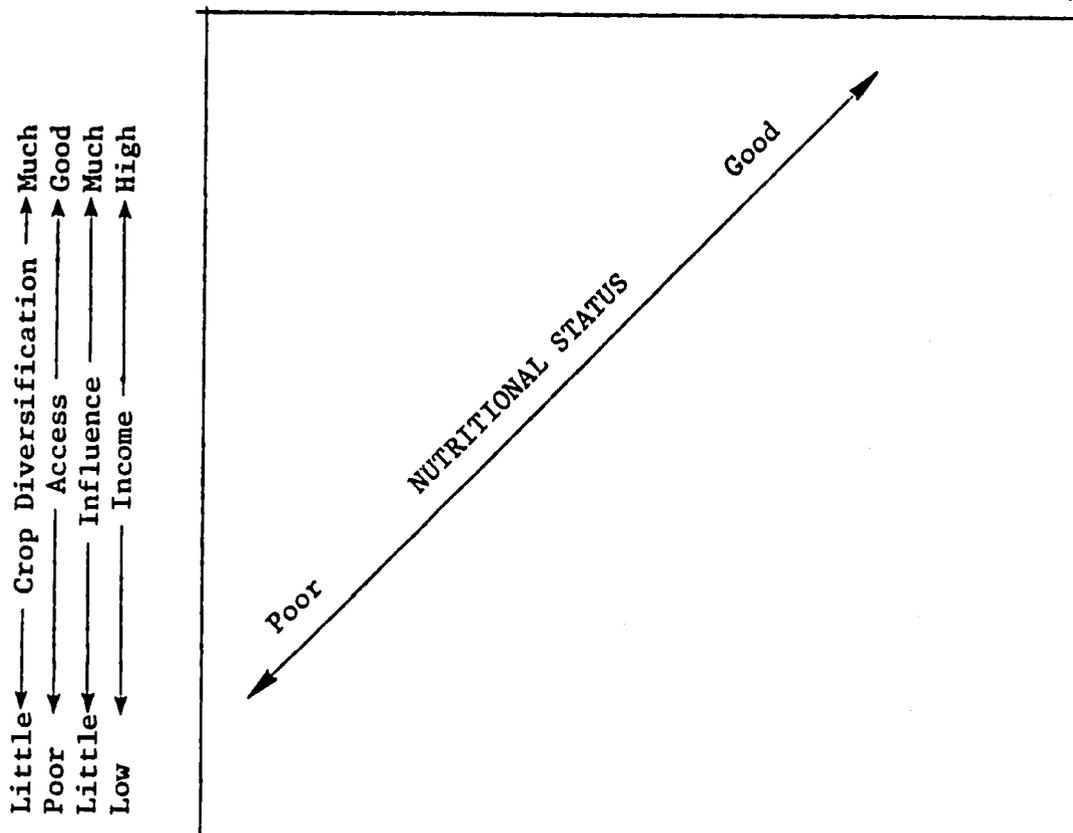
The low income stratum of rural residents includes three major overlapping sub-divisions, each of which displays a spectrum of potential nutrient risks.

1. Small Farmers. Small farmers and their families derive most of their income (including the value of farm production consumed on the farm) from land which they farm themselves. Most tasks are performed by unpaid family labor, but some paid labor is normally hired in the community. The primary criteria for the small farmer category is not acreage but income and its source. In general terms income is below the national average and farm products are the source of more than fifty percent of farm family income. The average small farm family will obtain about one-fourth to one-third of its income from off-farm employment as farm labor or from sale of handicrafts, retail store operations, etc.

Land may be owned outright or held under secure tenure (long term squatter rights, leasehold or semi-permanent sharecropping arrangements). It may also be leased on a temporary basis from other farmers or may just be occupied with no security whatsoever. Most "landless laborers" in Region V are really small farmers with insecure tenure who occasionally work as farm laborers.

There are no data on the extent of nutritional deficiencies among small farmers. The "rural" sample of the 1966 INCAP nutritional survey consisted of residents of the municipal capital - the cabecera municipal - and not farmers or their families. One may speculate that small farm families are nutritionally comparable with that sample, or in better or worse condition, but without any certainty, since the reasons given as the basis for such speculation tend to be offsetting. What is almost certain is that there is a spectrum of nutritional conditions within the small farm population, which are associated with a similar spectrum of conditions that characterize the farm. In a rough sense, these may be diagrammed as follows:

Poor ← Soil and Climatic Conditions → Good
 Short ← Period of Residency → Long
 Small ← Farm Size → Large
 Insecure ← Tenure/Tenancy → Secure



The factors on the horizontal axis are reflected in (and may cause) the conditions listed on the vertical axis. All are in some way associated with nutritional status. Low values in any of these factors may be associated with malnutrition, and low values in a majority are almost certainly indicative of nutritional impoverishment. A review of Region V statistics shows that many of the small farms in that region have low values for many of these characteristics.

2. Non-Farmers. In rural areas, these are usually artisans, small store-keepers, clerks and other employees, the unemployed and the unemployable. They are found in greatest concentration in the rural towns such as those measured by the INCAP "rural" sample. Some of these non-

farmers do indeed farm land which they lease. However, most do not derive a significant proportion of income or sustenance from this agricultural sideline, compared with their other employment.

Their nutritional status is normally associated with their income, which is a function of their skill and continuity of employment. Although they grow little if any of their own food, they have access through commerce to as varied a nutrient supply as they can afford. As the INCAP study demonstrated, this group is at severe nutritional risk, with the following deficiencies in consumption:

<u>Item</u>	<u>% Consuming Less Than the RDA</u>
Calories	57
Proteins	40
Retinol (Vitamin A)	94
Thiamine	35
Riboflavin	73
Niacin	78
Vitamin C	59
Iron	24
Calcium	37
Iodine	32*

*Prevalence of endemic goiter.

3. Farm Labor. Farm labor draws temporary membership from both of the above groups. The nutritional status of these temporary laborers tends to reflect the nutritional status of the group from which they come, and is changed only temporarily by their role as laborers.

Two groups of workers and their families maintain a relatively permanent status as farm laborers: (1) resident laborers, and (2) transient laborers. The former are regular employees on a particular farm. Some may be given use rights to land in return for their occasional availability as farm labor, in which case their economic and nutritional condition may approximate that of equivalent small farmers. Others may receive a regular wage, with or without some in-kind payment of farm products, in which case their condition may approximate that of poorly paid non-farmers. While both types of resident laborers tend towards extreme poverty and accompanying malnutrition, their permanent status and the noblesse oblige of their patron -

the large farmer - may limit the severity of deprivation.

Transient farm labor, on the other hand, is normally the most malnourished of all classes. Transients are commonly ignorant, poorly paid, and required to live in unsanitary, overcrowded conditions, isolated from adequate food sources (either from farmstead or store). Since they follow the cropping cycle, moving from one farming area to another in response to need for their services, they lack the protection of either a permanent community or a patron. No study has yet been made of this class in Nicaragua, but their status in both developed and undeveloped countries is so poor that they should automatically be considered to be one of the most at risk subpopulations.

B. LOCATION

USAID/Nicaragua is following a policy of concentrating resources in the Interior Central Region (Region V), where a significant part of the Rural Sector Loan is being used to develop the Instituto de Bienestar Campesino (INVIERNO) as a coordinating and delivery system for improving the status of poor farmers. A subsequent health sector loan was directed to the same area, building the PLANSAR organization, while a third loan dealing with educational development will also be focused on the region. It has been suggested that the proposed nutrition loan also be concentrated in this Region.

Although the concentration of development resources is generally recognized as desirable, there are a number of reasons for broadening the program in this case:

1. Distribution of Malnutrition. Region V is primarily a zone of small farmers, with few permanent farm laborers. Non-farmers included in the INCAP "rural" survey of Region V were relatively better off nutritionally than those in six of Nicaragua's eight agricultural regions. While we are almost certain that serious malnutrition may exist among small farm families in Region V, it is improbable that this risk is more severe here than in other small farmer regions, and it is almost certain that larger numbers of the farm laborer and non-farmer rural subpopulations in other regions suffer equally serious problems.

2. Desirable Interventions. The most practical interventions for dealing with malnutrition in farm families (iodine fortification of salt, Vitamin A fortification of sugar, health and nutritional education by radio and in the primary school) are programs which should be executed on a national scale. These same programs will also benefit the non-farmer and farm laborer subpopulations of rural areas and urban residents as well.

3. Replicability. The presence of INVIERNO and PLANSAR has both favorable and unfavorable aspects. On the favorable side, the competence and penetration of these organizations and their specific focus on the small farm community provide an institutional infrastructure for carrying out highly targeted nutritional interventions. Negatively, the replicability of interventions requiring such an infrastructure is questionable, since their near term radius of action is restricted to Region V.

4. Absorptive Capacity. The loan resources required to execute in Region V interventions of the type which are basic to the primary nutritional mission of each of the technical ministries are already or soon will be authorized. The resource constraints for implementing additional interventions are the availability of technical and managerial personnel and the recurrent budget to pay and support them. These local resources, which are normally provided by the host country, are seldom financed by an AID loan.

III. FRAMEWORK FOR ANALYSIS

The possibilities for interventions to improve the nutritional status of a population are almost limitless. Virtually any action, from improving an access road to hospitalization of a patient or literacy training can be said to have a nutritional impact. The problem is not to find possible interventions, but to be able to select from among them those which will most economically and effectively reach the largest numbers of the nutritionally at risk population.

A first step in cost-effectiveness analysis is the identification of the problem which the interventions are intended to solve. Nutritional problems have many dimensions. The appropriate response is governed not only by the deficiency to be corrected but by the particular characteristics of the target population and the opportunities and limitations of the major classes of interventions and intervenors.

In the following pages, I have attempted to define the different characteristics of the small farm family which are most instructive in defining the nutrition problem as it applies to them. Successively, I then examine the nutritional risk of that population, the types of nutritional deficiencies encountered and rational interventions to overcome them and the characteristics of primary classes of intervenors who might implement them.

A. CHARACTERISTICS OF THE SMALL FARMER RURAL SUBPOPULATION

The small farm community has a number of characteristics which set it apart from the urban community, and which determine the suitability of nutritional or other interventions designed to improve their welfare:

1. Farm Family Subsistence is Dependent on Farm Production. The small farm family produces most of the food which it eats and sells farm products for the income needed to buy that which it doesn't produce. From one-fourth to one-third of farm family income may be derived from off-farm employment, but much of this is used to sustain the earning member employed elsewhere. Even when relatively well endowed, the farm family has very limited disposable income, and this tends to be concentrated

in the post harvest quarter. Food purchases tend to be limited to items not produced on the farm, or not available at that season. Rational interventions should increase farm production, increase farm income and improve utilization. They should not require purchase of any item not now purchased. Primary food purchases include salt, sugar, fats, basic grains not produced on the farm or which are purchased to offset inadequate production or storage, and limited quantities of meat.

2. Farm Family Well Being is Seasonal. Farm production follows the seasons and farmers' fortunes follow production. The farm family's income and/or nutrition depends on its ability to produce something when needed or to store it. Poor planning leads to high food costs and/or hunger.

Nicaragua's agriculture is primarily rainfed. The main crop (primera) is planted in May to be harvested in August-September-October. A second planting (postrera) in September matures on the final rains of the season and conserved soil moisture, for harvest in November-December-January. April through July is a period of rising basic grain prices in the market and increasing scarcity on the farm.

Interventions at the farm family level to reduce the severity of this seasonal hunger might include improvements in grain storage on the farm, and extension of the period of food availability by cultivation of fruit trees and irrigated gardens and raising farm livestock. Interventions at the community level might include relief feeding of the most at risk population (MARP) or establishment of a food reserve in a community granary.

3. Farm Families Lack Security Against Crop Failure. The possibility of disastrous crop failure is a normal condition of farming. Individual farmers have little control over either the weather or the market. In some of the drier areas of Region V, yields will be below average in three years out of five, and one of those years will be a total crop failure. Even when the farmer is able to find off-farm work, crop failure or severe curtailment of yield usually means short rations, indebtedness against future harvests, or both. Since weather effects tend to be widespread, good yields are usually associated with low prices, so the farmers' ability to recoup from a bad year is limited.

Improved technology has provided the farmer with some tools against damage by disease or insects. This has reduced, but not eliminated, the risk of disastrous infestation. Individual failures also occur because of other natural events such as fire, flood, hail and wind.

Suitable interventions generally take the form of relief: cash payments, food payments, food-for-work. A national crop insurance scheme would help those who could afford the premium. A food reserve, stocked in a community granary, would be useful for immediate relief. The granary might also provide a mechanism for storage and distribution of donations of food not produced on the farm.

4. Farm Families are Dispersed and Isolated. Nicaraguan farmers tend to live in villages, but there is considerable dispersion of houses within villages. This dispersion increases the costs and decreases the effectiveness of most interventions. For example, water and sewerage programs are pretty much limited by cost considerations to latrization and a central well. However, the dispersed families continue to use other sources of water for laundry, bathing and drinking, and these sources continue to be contaminated by excreta not deposited in latrines.

It is difficult to reach villages, difficult to assemble the population, difficult to find particular individuals. Literacy is low, newspapers and magazines rare, and television is non-existent, but transistor radios are common and radio transmission coverage is excellent. Most villages are too small to support significant services. Of the 408 villages of 25 or more families in Region V, only one-fourth have both all-weather access and a school*. INVIERNO operates in only 198 of these localities; of these, only 153 have schools (18 without a teacher)**. In other words, there is little public or private infrastructure which can be used as a delivery system for any intervention.

Under these conditions, the most effective delivery systems for nutritional interventions are those which the farm family seeks out themselves. Materially, these would include fortified sugar and salt. Radio is the most widespread medium for reaching adults with health and nutrition

* See study by Dean F. Schreiner in preparation of Rural Development CAP.

** Rural INVIERNO Education Survey.

education information. Primary schools probably serve one third of the eligible children.

5. Farm Families are Strongly Traditional. Rural families tend to have more traditions and to be more strongly bound by them than city folk. This traditionalism is enforced by the insecurity of rural life where innovation is accompanied by unacceptable risk, strengthened by peer group pressure, and reinforced by the lack of exposure to alternative modes of behavior.

Any intervention which requires a significant change in customary practice should be accompanied by a variety of extensive, intensive and sustained educational activities. Given the dispersion of farm families and the very limited service infrastructure in their villages, interventions which require frequent or sustained personal contact to bring about a significant change in customary practice should be avoided.

B. A CLASSIFICATION OF NUTRITIONAL PROBLEMS

The major nutritional problems of the farm family are believed to be the same as for urban dwellers: protein-calorie malnutrition, nutritional anemias caused by iron deficiency in presence of endoparasitism, iodine deficiency, and insufficient intakes of vitamins A, B-complex, and C. These problems may be more severe in rural areas due to seasonality or crop failure, low cash income, isolation and ignorance, or they may be less severe, due to the capacity to produce for home consumption. Either outcome is speculative, since there has never been a nutritional survey of Nicaraguan farm families per se. The "rural" population examined by the basic 1966 INCAP survey was that found in municipal capital towns, and may not represent the farm family nutritional status at all.

The major nutrient deficiency problems can be segregated roughly by principal causative factors: gross intake deficiency, selective intake deficiency, disease-caused or biological deficiency, and physical or soil deficiency. Such a classification is an admitted over-simplification, but it is useful for identifying the interventions which will probably be most cost effective in dealing with small farm malnutrition, given the characteristics of the rural subpopulation.

1. Gross Intake Deficiency. These deficiencies are the result of an inadequate intake of the customary diet and would be largely overcome if that diet could be increased. Most protein-calorie malnutrition and B-complex vitamin deficiency would be overcome by an expanded consumption of the predominantly grain-pulse diet commonly eaten by farm families.

Practical interventions to increase gross intake include higher production, improved storage, greater income, and more appetizing preparation of foods. Reduction in incidence of disease by immunization and environmental sanitation would improve biological utilization and have the same effect as increased consumption. An increase in the animal product component of the diet would significantly improve quality of protein as well as intake of calories and B-complex vitamins. Although an increase in proportion and frequency of animal products would change the diet, this does not require a departure from traditional preferences. Children under five may have difficulty in consuming enough of the customary diet to obtain all the calories required, and this might require a change in weaning practice and/or diet.

2. Selective Intake Deficiency. These deficiencies require a significant change in customary dietary habits and traditional preferences if they are to be overcome directly by the farm family through their own efforts. Vitamin A, which is deficient in more than 90% of "rural" diets can be readily overcome by increased consumption of the carotene found in ripe yellow fruits (mango and papaya), carrots and yellow sweet potatoes, and dark green leafy vegetables. Vitamin C, deficient in over half of "rural" diets, is available in oranges and other citrus fruits, tomatoes, cabbage, potatoes and other vegetables. Nicaraguan farm families use very limited quantities of these fruits and vegetables, eat them at stages when their vitamin content is low, or prepare them improperly for preservation of vitamin content.

Dietary habits are exceptionally difficult to change. In rural areas such a change will require agricultural interventions to assure availability of the proper fruits and vegetables throughout the year, accompanied by educational interventions through mass media, school curriculum content, and extension programs to promote the importance of

good diet and to encourage proper food preparation. Indeed, dietary habits are so hard to change and it is such a long term process that vitamin fortification is a preferable shortrun intervention*. Vitamin A fortification of sugar is a realistic possibility and should be pursued vigorously. The major question is whether per capita sugar consumption by the farm family MARP is sufficient to provide the recommended dietary allowance. The twenty families in the farm accounting sample (4 per CEDE in Region V) consume an average of 32 lbs. of refined sugar per week. Only two families consumed between 12 and 18 lbs. per week. If intrafamily consumption is equitably distributed, all members should receive close to the RDA of vitamin A at the proposed fortification level.

Vitamin C deficiency is probably less significant than the vitamin A deficiency. General acceptance of citrus fruit and tomatoes probably limits vitamin C deficiency to certain seasons of the year and to the most unsettled families. Therefore, its incidence in farm families could probably be reduced or eliminated by a farmstead fruit tree and home garden program.

3. Biological Deficiency. Nutritional anemias are common in Nicaragua. They are usually associated with a limited intake of iron combined with a high incidence of intestinal parasitism which prevents absorption and/or causes excessive loss of hemoglobin. Iron deficiency per se can be overcome by dietary change (more meat, eggs, vegetables) or by direct supplementation with iron compounds. However, since nutritional anemias are commonly associated with diseases caused by contaminated water and inadequate waste disposal, improvements in personal hygiene and environmental sanitation (which also affect other nutritional problems) would appear to be a more desirable and permanent solution.

* The fact that cultural change is difficult does not mean that it should be avoided. As argued in Chapter IV, most health and nutrition problems in rural areas must be dealt with by the individual through improved personal hygiene and dietary preferences. The long term solution requires society to make the effort to inform its individual members so that all may benefit. However, the availability of a low cost method for Vitamin A fortification of sugar (one of the few products regularly purchased by farm families) provides an alternative to the traditional "eat your carrots and liver" routine.

4. Soil Deficiency. Nicaraguan soils are apparently deficient in iodine, and the foods commonly consumed in the country are not effective concentrators of this element. Approximately one-third of the population suffers from goiter. The most practical intervention for overcoming this deficiency is the iodization of salt.

C. THE POPULATION AT NUTRITIONAL RISK

1. The General Small Farm Population. Almost three-quarters of the population of Region V are owners or operators (including squatters or lessors) of small farms. Most live in villages of 10 to 100 families, many of which have limited access to markets and services. The average per capita farm family income of this region is less than half the national per capita income, even counting the value of home grown food consumed. Cash income from sale of products and off-farm income is probably not over half the total farm family income.

Undoubtedly, this general population could be subdivided vertically into risk groups based on income, or horizontally into risk groups based on isolation, or by other categories. In practice it is difficult to segregate risk groups in the general population and provide separate treatment for them. Given the generally low income levels and expected low nutritional status of the Region, it is probably wise to think of the entire farm family population as nutritionally at risk. Most are characterized by the same factors described under A., above, and should respond to the same interventions.

2. The Most At Risk Population (MARP) Within this generally at risk population, children under six and pregnant or lactating women are the groups which are most susceptible to nutritional deficiencies. This most-at-risk-population (MARP) reflects the nutritional status of the general population, but its members are more susceptible to nutrient deficiency and its causes: low intake, due to low availability, physiological incapacity or custom; poor utilization due to disease and parasitism; and greater need, for fetal growth or lactation.

Programs which improve the nutritional status of the general population will help the status of the MARP. However, selected subpopulations of the MARP, particularly weanling children, women in late

pregnancy and lactation, and the ill in the poorest families may require more direct assistance if they are to escape malnutrition. The most certain relief is specially targeted Maternal and Child Health (MCH) feeding and education programs, both in health centers and in community operated programs.

D. CHARACTERISTICS OF PRINCIPAL INTERVENORS

1. Industry and Commerce. The profit-motivated private sector tends to be the most efficient producer and distributor of goods in a competitive economy. Private sector participation is essential for any program of mass fortification, as well as for the manufacture of special supplemental foods. Commercial distribution is usually the most cost effective way to make a product available to the general population. It doesn't guarantee acceptance, which is based on the customer's perception of need, but private commercial distribution will get desired items into places that public services can't afford to go.

One must never forget that the continued participation of the private sector in any scheme for nutritional improvement is dependent on the businessman's ability to profit from it. As near as I know, none of the specialized, nutritional supplementary foods has been a commercial success in rural areas. Therefore, industry and commerce have most effectively served nutrition programs in two ways: (1) production of specialized nutrient foods under contract to government for use by government in welfare feeding programs, (2) low cost, universal fortification of products of general acceptance (milk, flour, bread, salt, sugar).

2. Public Agricultural Sector. The primary nutritional function of the public agricultural sector is to plan and execute policies and programs which lead to the effective production and distribution of food-stuffs. The primary optimizing criteria used in agricultural planning are farm income and consumer prices, seeking both equity and stability. Both producers and distributors of agricultural products are members of the private sector, whose decisions are primarily motivated by profit. Therefore, the principal tools of the public agricultural sector are policies and programs which attempt to adjust supply to demand by affecting the

decisions taken by thousands of individual producers and distributors in their own self interest.

Nutritional interventions, like other equity-oriented interventions, should be harmonized as much as possible with this basic free market supply-demand-price formula, lest the distortion created to solve one problem create another and worse problem. In practice this means that interventions should be concentrated on the correction of established distortions in the operation of the free market system, programs designed to enable deprived classes to compete more effectively in the system, and welfare programs to provide relief to classes who are temporarily or permanently unable to compete*.

3. Health Services. Disease is a major contributing factor to protein-calorie malnutrition and to nutritional anemias. Reduction of febrile disease and endoparasitism is not only an end in itself but will contribute significantly to good nutritional health as well. Rural residents are seldom able to afford traditional private medical diagnostic and treatment services. Their access to public medical services or even the paramedical services of a drugstore is restricted by isolation. Dispersion limits the cost effectiveness of water and sewerage programs which are traditional ways to break the cycle of intestinal diseases and parasites.

Relief from most health problems must come primarily from occasional mass treatments of the population (e.g., immunizations) or from the rural community itself, by the individual practice of good preventive health and environmental health practices. A heavy premium must be given to the use of radio for health education as a means of informing and motivating the population to follow these practices.

Primary responsibility for both immunization and health education lies with the Ministry of Public Health. In addition to its own resources, the MPH should use the organization and extension services of the Public Agricultural Sector and the Ministry of Education for both immunization and

* The policy decisions taken in the public agricultural sector to influence the decisions of producers and distributors also influence the decisions of consumers (including the small farmer, as a consumer). A policy which encourages or discourages exports of one product or another influences the relative price of that commodity and thus determines the amount which will be consumed. These policy decisions are usually taken for economic, rather than nutritional reasons. However, their nutritional impact is so widespread that nutrition should be considered when agricultural policy is being made.

education programs. It might also look innovatively at possible uses of the private drug distribution system as a health education medium.

4. Education Services. Ignorance contributes to both malnutrition and other forms of disease. Its correction takes three primary forms: (1) formal education through the school system; (2) informal education through mass media; and (3) extension activities of the formal education system, other public agencies and the private sector.

The formal education system provides an important if long range means for influencing a large part of the population. Even in rural areas such as Region V it probably reaches one-third of the school age population. Practical nutrition and health education training should be a repetitive subject in all primary schools.

The only mass medium system of practical value for Nicaraguan use is the radio. This medium should be available to each of the three major technical agencies involved in the nutrition program (i.e., the Ministries of Agriculture, Education and Health). CTAN might provide a coordinating mechanism for nutritional messages, but the content should be determined by the technical agencies.

The extension programs of the formal education system as well as other public agencies and private firms provide additional vehicles for nutrition-related messages. Few of these extension programs reach more than a fourth of the population. Since they are concentrated by access, they probably reach a segment of the same basic population. As a practical measure, the nutrition message imparted should relate to the primary function of each program. CTAN might wish to provide an information and adaptation service to such programs.

IV. INVIERNO'S ROLE AND LIMITATIONS

A. THE NEED FOR CHOICE

INVIERNO's role in the AID-supported Nicaraguan National Nutrition Program will probably be less important than as originally conceived*, although INIVERNO's demonstrated capacity to deal with small farmer problems and to reach more of the poorer, members of this class than other PAS institutions makes it a pro forma candidate for implementation of nutritional interventions in Region V. INVIERNO's purpose - to promote the integrated, sustained and continuous betterment of the lower income population - and its general effectiveness make it a preferred vehicle for coordinating and implementing nutrition programs in Region V. INVIERNO has a dual role to play: First, it is responsible for planning and executing its own programs to increase agricultural production and raise the income of its clientele. Second, it serves as an intermediary between the programs of other public service agencies and the community, acting as a community motivator, organizer and arranger to effect the delivery of these services. Its detailed penetration of almost 200 localities makes it a most effective organizing and delivery service.

Despite these favorable considerations, I think that INVIERNO can perform only a limited additional role in a rural nutrition program. In the first place, INVIERNO's action area is limited to Region V (and part of Region II), and it is targeted primarily on small farm families. Many of the most recommended interventions for farm families, as well as other rural subpopulations, require a national focus and an orientation which is distinctly foreign to INVIERNO. Finally, INVIERNO's ability to absorb additional or different types of programs is necessarily constrained by its current programs, its own budget and its established operating principles.

* INVIERNO already has a most important role in basic nutrition - that of achieving a significant improvement in food output (which is probably the best way for improving protein-calorie-vitamin B-complex malnutrition of farm families) and increasing farm income (which permits purchase of foods not produced on the farm). These programs are already financed. Here, we are speaking of additional interventions.

INVIERNO is interested in nutrition and recognizes both the ultimate objective of food production and its importance in the welfare of its clients. However, despite its broad mandate and evident efficiency, INVIERNO's ability to implement additional nutrition interventions is limited by the realities which affect all public agencies: budget and staff. In the near term its recurrent annual budget is restricted to a maximum of C\$ 20 million, which limits the number of Agromocs and Promotores Sociales -- the primary agricultural and community change agents -- to approximately the current number. Even if the budget problem were overcome, few social workers are willing to transfer to the country to take on the rigorous role of Promotor Social - the staff member primarily responsible for coordinating other public sector interventions. These Promotores Sociales carry out the community organization for these interventions and for women's homemaking and gardening activities.

These constraints impose the need for program choices on INVIERNO. While it is at least theoretically possible for INIVERNO staff to carry out an exceptionally broad array of programs, the saturation point is near. The addition of voluntary leaders to help care for the increasing number of clients extends the reach of staff but increases its supervisory role establishing a new limiting barrier.

The major factors to be considered in program choices are the constraints established by INVIERNO's own operating principles. INVIERNO is an effectively managed organization, and these principles were not established casually; many other organizations should adopt them. Any nutrition program proposed as a substitute for or in addition to current programs must stand certain tests.

1. Self Help. The proposed program must include a strong self help component which is acceptable to the farmer. In other words, the client must be sufficiently convinced of the benefit to put his own effort into it; the need must be apparent to the client before the program is launched. This applies to individual borrowers or community action. The job of Promotor Social and Agromoc is less to promote programs than to inform about their availability and self help requirements and to identify priorities, as perceived by the community.

2. Choice Among Programs Based on Return. INVIERNO recognizes the limits of its personnel and budget. Personnel are pretty well occupied with current programs and with additional activities coming on stream. A project in nutrition must demonstrate that it has an equivalent value to that which it replaces. For example, an Agromoc might spend his time to increase production of corn or to reduce post harvest losses of same. If his time can produce significantly more in additional yield than it may save in avoidance of loss, the time should remain concentrated on the former, if the two are in conflict.

3. Limited Risk. INVIERNO programs are based on what the farmers know when they enter the program. They are designed to systematically move the farmer from low technology production of traditional crops, primarily for subsistence, to high technology production of diversified crops, primarily for sale to raise real net income. Predictability is particularly important in limiting risk. Predictability has tended to concentrate INVIERNO programs around well known agricultural crops whose management is relatively simple and whose potential net return is predictable, rather than on more nutritionally desirable livestock which is neither simple to manage nor easily predictable.

4. Non-Subsidization. The small farmer must pay for his own development. This is sound development economics and actuarially realistic. There is no way that small farmers can be permanently subsidized when there are so many of them. INVIERNO believes that maximum self help is the only rational way to rapidly move large numbers of small farmers and their communities into postures of self sustaining development. To this end, INVIERNO programs are designed so that the farmer must contribute his effort and pay all costs, including interest at commercial rates. INVIERNO gives nothing away but technical advice.

The costs which the farmer must absorb are a significant part of his gross income. INVIERNO is reluctant to recommend a project which either subsidizes the farmer or exposes him to unpredictable innovative risks. This has tended to limit the rapidity with which new commodities and innovative programs can be introduced.

B. NUTRITIONALLY DESIRABLE PROGRAM CHOICES FOR INVIERNO

Despite the aforementioned limitations, there are a number of actions which INVIERNO might take to improve the nutritional orientation of its production programs. Four of these - Crib Drying and Storage of Maize, Farmstead Livestock, Patio Crops, and a Community Granary - can be designed to avoid conflict with INVIERNO's basic operating principles or with periods of major work concentration.

1. Crib Drying and Storage of Maize. Current handling of basic grains (particularly maize) from harvest to consumption or sale leaves much to be desired. The practice of doubling and field drying allows insect infestation which causes continued loss in storage and reduces grade when sold. Sale of high moisture corn leads to price penalties and lower receipts. Inability to hold corn because of poor storage conditions (rat and insect infestation, heat and moisture damage) prevents retention for a higher price. The excessive loss (probably 25-40%) of corn held for home consumption causes both an economic loss and a nutrient penalty when a farmer has to pay high retail prices to replace the loss or go hungry.

Crib drying and storage of corn, combined with insecticide treatment of stored corn is a cheap and effective way to overcome these storage problems in most producing areas. Cribs can be prepared from readily available local materials during the off season, so the program should not conflict with other INVIERNO program emphases.

2. Farmstead Livestock. INVIERNO has concentrated on traditional field crop and vegetable production in order to secure for its clients a quick return based on a predictable, low risk technology. This was a rational choice for initiation of its program. However, for both income and nutritional reasons, INVIERNO should move rapidly into the livestock field. Small "non-commercial" numbers of cows, goats, swine and chickens provide a means of converting crop residues and other forage resources into desirable products of high nutritional value for home consumption or sale and a diversified source of income. Most of the farms in Region V already have some type of farmstead animals, so this will not require a significantly new technology. Small numbers of livestock do not require excessive amounts of either the farmer's or the Agromoc's time. And they provide a nice bank to draw on when other sources of income or food are scarce.

3. Patio Crops. INVIERNO's concentration on the production of annual crops for sale in order to increase income (to expand consumption) tends to ignore the significant nutritional (and deferred income) benefits to be derived from perennial food crops. The term "patio crops" is used here as a generic term to include fruit trees (mangos, citrus, papaya, banana) and perennial vegetable crops (gandul, yuca, asparagus, etc.) grown in limited numbers around a farmstead, primarily for home consumption. These plants begin to bear in two to five years and provide a continuing and diversified source of preferred foods for the family. Like farmstead livestock, patio crops require frequent but limited care by the farm family, and only occasional involvement by the Agromoc.

4. Community Granary. Individual small farm families and small rural communities need a method for compensating for nutritional problems caused by disastrous fluctuations in the availability of basic grains. In the rainfed agricultural environment, food shortage is a frequent result of crop failure, loss of stored grain or simply the inability to forecast need. Because of isolation, these problems must be met in the community or not at all. One approach to resolution of these problems is the establishment of a community granary to serve as an emergency food resource.

The community granary consists of a stock of basic grains, maintained in the village under good physical security. It is created by community action to acquire or construct suitable storage and to establish the contribution quotas required for eligibility in the program. The stock of grain is established by a contribution in kind made by each family in the community. Management of the stored grain is by an elected committee whose responsibilities include acceptance and recording of individual family contributions, management of the stored grain (inspection, fumigation, rollover of stock), and determination of the distribution of grain in the community in case of need.

INVIERNO's major contribution would be to design the program, help organize the community for its action and provide information on construction or acquisition of storage facilities.

V. A RECOMMENDED PROGRAM OF NUTRITIONAL INTERVENTIONS FOR RURAL FAMILIES

These program recommendations are the resultant of the foregoing analysis. They include interventions of four major types, which involve three of the five agencies of the Nicaraguan National Nutrition Committee as well as CTAN. The interventions would be applied on a nationwide basis, perhaps with Region V as the locus of initial operations.

The recommended interventions are not intended as replacements for existing programs, although this may be a natural result over time. The recommended INVIERNO interventions are program variants to be implemented with existing resources. The regulatory (mass fortification) programs probably won't require external resources. The utilization (information) programs will require significant additional funds, as will supplemental feeding of the MARP. AID loan funds could usefully be allocated to each of these programs, in addition to funds already authorized for existing programs of each agency.

These recommendations are directed at interventions which are practicable in improving the nutrition of small farm families. As indicated in Chapter I, two other rural subpopulations - non-farmers and farm laborers - may suffer equal or worse levels of nutritional deprivation.

These latter groups commonly lack the opportunity to produce and store food for their own consumption, but the remaining interventions suggested for improving the nutrition of small farm families would also benefit these groups. Beyond these nutritionally targeted interventions, improvement of the food supply of non-farmers and farm laborers alike depends primarily on increasing their incomes and reducing the prices which they pay for food. These are very large Public Agricultural Sector and social welfare policy issues which transcend nutrition, and should be dealt with in a different forum.

A. REGULATORY INTERVENTIONS (MASS FORTIFICATION)

Iodization of salt and Vitamin A fortification of sugar are termed regulatory interventions because such fortification must be universally enforced if it is to achieve the desired nutritional impact. I understand that the studies leading to nationwide programs are well-advanced, that

costs are known and known to be low. With political will, these programs could be in nation-wide operation within two years.

Both interventions are considered to be essential to sound rural nutritional health. The only possible alternatives for correcting iodine and Vitamin A deficiencies require drastic changes in the traditional diet and/or are too expensive for most farm families. The only remaining technical issue is whether consumption of refined sugar by the farm family MARP is sufficient to provide the RDA for Vitamin A.

B. INTERVENTIONS TO INCREASE FOOD AVAILABILITY (PRODUCTION AND STORAGE)

Programs to increase food availability are the responsibility of the Public Agricultural Sector. To be successful, such programs must integrate the delivery of technical recommendations, productive inputs, credit and marketing services. INVIERNO is the only agency currently providing a fully integrated program to small farmers, so the following suggestions apply directly only to INVIERNO. However, similar interventions might also be applied usefully by the Ministry of Agriculture Extension Service or other public or private agencies working with rural groups.

The primary nutrition impact of INVIERNO's program is the increase in production and income of small farmers achieved from the application of better agricultural technology. For reasons indicated in the previous chapter, INVIERNO's ability to add to or depart significantly from current program emphases is constrained by budget, staff and operating principles. The following interventions, which were summarized in the previous chapter and are discussed in greater detail in the annexes to this report, are modest alterations of INVIERNO's existing program which can be carried out within current program limitations and resources:

1. Crib Drying and Storage of Corn
2. Farmstead Animals
3. Patio Crops
4. Community Granaries

INVIERNO is also initiating a program of commercial home gardens which may result in greater use of vegetables in the community and/or more income. INVIERNO also organizes homemaker clubs in which food preparation

and health care are a part of the program. It already organizes farm families for community health services (primarily immunization, latrinization and water supply) operated by the Ministry of Public Health, and could help with the organization of a MARP supplemental feeding program if this were sponsored by that Ministry (see D., below).

C. PROGRAMS TO IMPROVE BIOLOGICAL UTILIZATION (INFORMATION)

Effective food utilization by the body requires a balanced diet combined with freedom from disease and parasitism. In rural areas where dispersion prevents engineering solutions to environmental sanitation problems, freedom from intestinal diseases and endoparasitism is largely the result of personal hygienic practices which primarily have to do with food preparation and storage, drinking water, and waste disposal. Given limitations in quantity, quality and variety of food available, good nutritional practice may necessarily have to concentrate on food combinations which provide complementary amino acids, preparation methods which preserve nutrient content, and avoidance of destructive beliefs and practices. In other words, much of the responsibility for nutritional improvement will have to be personal and will require behavioral change.

The threshold condition leading to behavioral change is information related to opportunity. That is, the target individual must receive information which describes a desired behavior modification, which motivates him to want to make the change, and which shows him how to make the change within the context of his own environment. This is the kind of information which must be directed to farm families if they are to achieve effective utilization of the foods available to them.

Two information delivery systems are widely available in rural areas - primary schools and the radio. Both should be used for delivery of nutritional and health methods. The following three programs summarize the type of intervention and supporting services required:

1. Primary School Nutrition and Health Curriculum. Primary schools probably reach close to one-third of the school age population in rural areas. Nutritional and health education should be built into the primary education system, both as regular repetitive course units and as

reinforcement messages associated with other units (reading, writing, history, arithmetic). These materials must be designed for the particular conditions which the students know and the limited food and other resources which they have, so that the knowledge is associated with a realistic opportunity to use it.

Achievement of the desired level of saturation is both costly and complicated. It will require preparation, publication and distribution of course modules and message units. It will require training of teachers in the use and adaptation of this material and supervision and evaluation of the results.

Primary responsibility for this activity should be assigned to the Ministry of Education, with assistance in nutrition content from CTAN and in health content from Ministry of Public Health.

2. Radio Nutrition and Health Messages. The primary school health and nutrition education program aimed at children is a long range program which should reinforce and be reinforced by adult understanding in the near term. The best way to achieve this is by dramatized radio transmission of similar messages to the parents. These radio messages and their transmission should be the responsibility of the three technical agencies (Ministries of Health, Agriculture and Education), developed with the assistance of the Nutrition Information and Adaptation Service of the CTAN (see below).

3. Nutrition Information and Adaptation Service. The effectiveness of the primary school and radio information diffusion programs depends on having a reliable source of sound nutritional information and the ability to program it effectively to reach the target group. Nutrition, as a subject, cuts across the disciplines of health, education, agriculture and other fields. The operating agencies should retain responsibility for preparing messages and broadcasting them, not only to correlate them with their regular programs but to build mass communications into their normal programs. However, CTAN should have responsibility for accumulating information on nutrition and for coordinating or orchestrating these messages so that they have a reinforcing character.

The programs of operating agencies might include a significant nutritional impact, but the professional managers of those programs may

be less concerned with that impact than with what they conceive to be the primary role of the program. In order to assure the transmission of the nutritional message, CTAN should maintain a Nutrition Information and Adaptation Service to collect, catalog, and distribute nutrition information, and to assist other agencies to adapt this information for inclusion in their radio transmission.

D. SUPPLEMENTAL FEEDING OF THE MARP (Children 0-5, Pregnant or Lactating Women)

Selected members of the MARP, particularly women from poor families, weanling children and the ill, probably do not receive adequate nutrition from the predominantly grain-pulse diet common to small farm families. About the only way to assure that these people receive an adequate diet is by providing some additional food, at least during critical periods.

This additional food could be provided by augmenting the supply of food that farm families have available, and/or by supplementing this food supply with foods specially designed to offset the deficiencies of the MARP. The former is probably cheaper, the latter more effective.

The particular advantages of the supplemental route are: (1) Foods are designed to offset the particular nutritional problem, e.g., weaning foods have high energy to bulk ratios, so that a small child obtains the calories he can't obtain from common grain-pulse diets. (2) Special foods can be targeted directly at the MARP. A food labeled as "child's" or "woman's" is less likely to be eaten by other members of the family. (3) Supplemental foods have a mystique which can encourage their consumption ("It's like a medicine!"), carry a nutritional message, or provide justification for organization of mothers' clubs or other MCH centers.

A supplemental food program requires a source of supply and a delivery system. Development of a national source of supply will require the design of one or more supplemental foods acceptable to the MARP, and based on cheap local foods. It will then require the production of these foods in quantity by the food processing industry under contract with a government agency - preferably the Ministry of Public Health.

Widespread distribution of this supplemental food in rural areas will require development of community feeding committees in each of the

farming villages. Such committees would have the responsibility for identifying those members of the MARP who should be fed and arranging for them to receive the special food.

It is recommended that this entire program, including the design of the supplement, procurement of its manufacture, and distribution of food through the community feeding committees be assigned to the Ministry of Public Health. The Ministry would establish the ground rules for community feeding committee operation and evaluate the program, but individual community feeding committees might be established by INVIERNO or any other public or private agency which works with rural communities.

Supplemental feeding programs present difficult policy choices and are hard to plan and administer. The initial choice is how far to go in trying to reach the at-risk population. Some feeding is already built into curative treatment of critical malnutrition cases in clinics and hospitals. However, there is a wide range between this type of feeding and preventive feeding of a significant proportion of the MARP. The choice comes down to the tradeoff between the resources which must be expended to correct malnutrition and the benefits which will accrue to society by its correction. The benefits tend to increase with the severity of the problem (hence concern with reaching that segment of the MARP most susceptible to damage) and with the certainty of the method used to correct the deficiency (hence the concern with programs of great sophistication). However, the unit costs and the complexity of management tend to rise with greater selectivity and with the sophistication of the program. At this point, I know of no data in Nicaragua which will decide this issue. The level of feeding and the sophistication of the program used will have to be a political decision.

A N N E X E S

CRIB DRYING AND STORAGE

PROBLEM:

Losses of corn held in storage against future sale and/or consumption are excessive. These losses are the result of inadequate drying, insect contamination in the field under current drying methods, and consumption by rodents.

BACKGROUND:

Corn is commonly stored for family consumption, for later sale at more favorable prices, or both. When held for subsequent sale, there is something of a tradeoff between the higher price obtained late in the year and the amount of physical loss and price penalties caused by insect and rodent consumption and contamination. Research in other countries has shown that post harvest losses of stored grains under conditions similar to farm storage in Nicaragua normally range from 20 to 40 percent of the stored crop.

In Nicaragua, storage losses of ear corn are almost certainly related to the way in which the corn is prepared for storage and the way it is stored. Corn is commonly held in the field until its moisture content drops to 15-18 percent. In order to keep rainfall out of the ear, the stalk is doubled over, leaves are stripped for fodder and to prevent shading of interplanted crops, and the corn left in the field. During this period, considerable insect infestation of the ears takes place, particularly in some of the higher yielding varieties where the husk does not entirely cover the ear.

When the corn is brought into the house for storage, it is usually still above the 14% required for safe storage, is infested with insects which will continue to consume it, and is usually stored in a manner which permits further consumption and contamination by rodents. When it is sold, price penalties will be assessed for excessive moisture and contamination (formally by INCEI, informally by commercial buyers) and the farmer's return is lowered. Similar losses occur in grain held for family consumption, but here the penalties are frequently paid in hunger or in

the need to purchase replacement grain at high retail prices.

PROPOSED SOLUTION:

Crib drying and storage of corn, combined with treatment of the stored ears with insecticides is a cheap and effective way to reduce these losses. Cribs are narrow (under four feet), roofed containers with open work sides which permit free circulation of air. Ears are dried by ambient air as they would be in the field doubling method, but cribbing permits the judicious use of insecticide to prevent insect infestation. Cribs are usually built off the ground, with rat guards to prevent rodent access. They are easily constructed from locally available materials.

FEASIBILITY:

A major Peace Corps reference manual on farm level storage practices includes a publication by the Ministry of Agriculture describing the application of this system in Nicaragua.

DESIGN:

Program design should be assigned to INVIERNO. Design issues include:

(1) Information on the extent of on-farm storage and the pattern of consumption and sale throughout the year, together with estimates of current losses and penalties.

(2) Design of a program for dissemination of the technique, including appropriate designs, demonstrations, costs, etc.

COMMUNITY GRANARIES

PROBLEM:

Small farm families need nutritional protection against disastrous crop failure or seasonal insufficiency caused by poor planning or loss of home-stored grain.

BACKGROUND:

Small farmers who depend on rain-fed agriculture for their sustenance are subject to a variety of conditions (drought, flood, fire, hail, insects, disease) which may reduce yields severely or destroy the entire crop. Few are able to forecast or provide for individual loss, nor to acquire insurance. Inaccessibility of most small farm communities limits the possibility of developing a more centralized relief program.

Most small farmers retain some of their basic grain crops in home storage for family consumption between harvests. Normal losses in home storage due to insects and rodents are frequently severe, other family requirements may force the sale of grain intended for consumption, or simple lack of foresight may leave the family short. This shortage leads to off-farm work (if available), consumption of savings (if available), high cost and restrictive borrowing from merchants (if available), and either purchase of grains at high prices, acceptance of hunger or both. In any case, both nutrition and future plans and earnings are impaired by the farmer's inability to absorb this emergency at the most basic subsistence level without severe penalty.

PROPOSED SOLUTION:

Establish community granaries, managed by local residents, filled by grain quotas assessed against each family. Collected grains are stored against emergency and distributed within the community in accordance with community assessment of need. Distributed stocks are to be replenished by the recipient from the following harvest.

Note: This is a nutritional insurance program and is not expected to substitute for traditional home storage of grains for family consumption.

FEASIBILITY:

Farm family consumption of basic grains produced on the farm (primarily corn and beans) is estimated at 600 kgs. per year, including that which is lost to rats and insects. The family usually stores considerably more than that amount for feeding to livestock or for later sale, unless required by credit conditions to sell at harvest. At harvest time the family usually has grain available whose immediate sale has a low opportunity cost. Transfer of an amount equal to, say, one-half of the family's annual personal consumption to a community granary would not tax most family's economic or nutritional status.

Construction of a weather and moisture proof storehouse for a community granary with local materials is neither technologically difficult nor expensive. The capacity required to store all the home-produced grains required for the personal consumption of fifty families would only amount to 30 MT (600 qq). An infinite variety of designs for storage houses, sheds, bins, and silos, to be built from mud, bricks, baskets, ferrocement, metal, wood, blocks, etc., is available.

The only operating costs are the insecticide needed to maintain the grain free from insects and the volunteer time required for periodic inspection of the grain and maintenance of intake and distribution records.

PROGRAM DESIGN:

Responsibility should be assigned to INVIERNO.

Design issues include the following:

- (1) Procedures for selection of community management and its responsibilities
- (2) Establishment of quotas (amount, level of community participation, participation by non-farmers)
- (3) Grain management procedures and records
- (4) Criteria of need
- (5) Replacement of stock. Should an in-kind use charge be added?
- (6) Selection of facility designs
- (7) Rate of use (estimate of frequency and severity of drought and catastrophic loss from other causes)
- (8) Projections of growth in number of granaries and participants.

PRIMARY SCHOOL NUTRITION AND HEALTH CURRICULUM**PROBLEM:**

Some of the characteristics of small farm families (low cash income, dispersion, traditionalism) tend to limit the correction of many malnutrition problems to changes in personal behavior, e.g., proper combination and preparation of available foods, personal hygiene. This is a difficult problem which requires early, persistent and effective education in order to be successful. The primary school system should become heavily involved in this effort.

BACKGROUND:

A recent INVIERNO study indicates that approximately half of the school age children in communities served by INVIERNO actually attend school. Considering the relative isolation of other communities and their lower populations, one could reasonably estimate that one-third of all school age children in Region V attend school, and this does not appear to be an unreasonable estimate for other rural areas. This would be a very worthwhile audience, particularly if information provided to school children were coordinated with radio messages to adults.

The effectiveness of education for behavioral change depends on providing information on the desired change in a form which motivates the person to wish to change, and which shows him how to change, using the resources available to him. Any intervention in primary schools must be preceded by a study of the target groups' current practices, environment and resources, in order to provide a suitable basis for devising the educational program. Since conditions and practices vary from region to region as well as among different rural subpopulations, this study should be appropriately stratified.

Rural primary schools are commonly staffed with a single overworked teacher who is responsible for all pedagogy. To become effective health/nutrition intervenors, these teachers should receive suitable preparation in their pre-service training and regular in-service reinforcement training.

The ability of the teachers to impart effective and persistent health and nutrition information to their classes can be enhanced if they are provided with appropriately correlated examples, teaching aids and exercises for incorporation into each subject. Wall posters depicting desirable practices can be an effective reinforcement.

Overburdened teachers may have limited motivation to take on this additional work. Good supervision and comparative student testing will improve their motivation. In addition, each school should be visited at least twice a year by a health/nutrition specialist who would present a half day program in his specialty. The impact of this well-structured information program is reinforced by the novelty of a change in classroom routine.

FEASIBILITY:

The approach outlined above was used successfully in the US during World War II (and has been a fixture in the Arizona and some other states' school systems since the twenties). A survey now underway by CTAN may provide the basic information needed for designing classroom interventions, or will at least show what additional information will be needed. The Ministry of Education, which is responsible for this design effort, is of course the national authority on the feasibility of any curriculum intervention.

DESIGN:

The Ministry of Education should have primary responsibility for this intervention, with assistance from CTAN and the Ministry of Public Health.

Design issues include:

(1) Adequacy of information on target groups' culture, environment and resources. A decision should be made on the degree of regional and subpopulation specialization required. It is probable that a basic national rural program can cover most of the material, but some additional variations will have to be included.

(2) Preparation of a program for pre-service and in-service training

of teachers in health and nutrition.

(3) Preparation of a program for development of teaching aids and exercises for incorporation into regular course work, including wall posters coordinated with these exercises.

(4) Preparation of a program for specialist visitation to rural primary schools.

HEALTH AND NUTRITION RADIO MESSAGES

PROBLEM:

The control of malnutrition depends on the adequacy of the people's food supply, their knowledge of how to use it, and a state of health which permits effective utilization of ingested nutrients. These are primary responsibilities of the Government at the most elemental level, through its Ministries of Agriculture, Education and Public Health. These Ministries are unable entirely to fulfill these responsibilities, at least in part because their messages do not effectively reach a significant part of the rural population.

BACKGROUND:

All three Ministries carry out activities which have an impact on the nutritional status of the population. These are primarily in the form of policies designed to affect citizen decision and behavior, public works, and programs to equip citizens to deal more effectively with their environment. Increasingly, over time, the Government has extended these programs to larger segments of the population, and has deliberately tried to improve citizen wellbeing through expanded extension activities.

Government penetration of rural areas has always been limited by access, funds and human resources. These limitations are inherent to the methods now used and the dispersion, relative isolation and low incomes of rural residents. Extensive penetration under these conditions will require a change in methods.

Fortunately, the almost universal household ownership of battery operated transistor radios and Nicaragua's excellent radio coverage provide a medium for reaching large numbers of the rural poor. The established techniques of commercial promotion are being adapted to civic information requirements in ways which have improved the effectiveness of public information programming.

PROPOSED SOLUTION:

It is proposed to establish within each of the three Ministries an

appropriate diffusion unit whose function will be to design, stage and tape instructional messages, and to fund their diffusion through commercial radio stations by buying radio spots.

It is intended that these radio programming operations will be used to promote the behavior changes sought by the individual Ministries and not be limited exclusively to nutrition messages. However, it is hoped that, with the assistance of CTAN's Nutrition Information and Adaptation Service, these messages can serve to carry a direct nutrition message as well.

The reasons for this construct are as follows: The messages of the individual Ministries are important in their own right and for their indirect relationship to nutrition programming. These Ministries have the capacity to establish and maintain a significant radio programming and time buying effort which can serve to carry messages reflecting both the Ministries' objectives and the nutritional component. CTAN can play a very important role by helping to establish and develop these units and by supporting them in the future. However, CTAN is not an operating agency and must rely on the operating agencies to carry much of the information load.

FEASIBILITY:

Data on costs and on the feasibility of the technique itself should be available from Manoff International, based on their recent experience in Nicaragua. The political interest of the Ministries must be determined by discussions with their leadership.

DESIGN:

Project design should be the responsibility of the individual Ministries, with assistance from CTAN. It is probable that CTAN will need to contract assistance from a firm with experience in the use of radio communications to transmit non-commercial messages. Such a firm should be in a position to define the design issues.

NUTRITION INFORMATION AND ADAPTATION SERVICE

PROBLEM:

Most government agencies lack both the detailed knowledge of the nutritional consequences of their programs and the skills to incorporate effective nutritional considerations into their programs. Their public information systems are not generally oriented to achieve behavioral change in mass audiences.

BACKGROUND:

The programs of the Ministries of Agriculture, Public Health and Education include a wide array of activities which influence the nutritional status of the rural population. The managers of these activities may be more concerned with non-nutritional aspects of the programs, or may not even be aware of the nutritional implications of their program choices. A first step in sensitizing program management to taking nutrition into account in decisions on program design and implementation is to develop a capability to provide these managers with facts and to assist them in adapting these facts to their own program conditions.

All three agencies have some form of outreach program, and some form of public information service. The outreach programs include extension activities designed to reach adults, usually on a low-multiplier, selective audience basis by personal contact. Public information services tend to be limited to newsworthy items of general importance; few public information releases are intended to lead to changed behavior. Extension programs which may be highly effective in changing the behavior of those they reach, reach only a small fraction of the potential audience, since they seldom use mass media.

A mass media program aimed at creating conditions for desirable behavioral change would be useful for the primary message of the three operating agencies, and could also serve to transmit nutritional messages. The objective of a mass media program (see Radio Nutrition and Health Messages) is not just to provide a nutritional message but to install the

concept of regular use of radio as an education tool in each of the agencies, so that this will continue to be a vehicle for nutrition messages.

The ability to impart an effective nutritional message depends on (1) a knowledge of nutrition, (2) an ability to adapt that message to the program which acts as a carrier, and (3) understanding of effective techniques of information transmittal. The nutritional impact of the carrier information programs depends on an ability to provide both the nutritional information and assistance in its adaptation to the agencies' needs.

PROPOSED SOLUTION:

Establish within CTAN a nutrition information and adaptation service to perform two major functions: (1) to maintain a nutrition information service, including a library of nutrition information and circulation of a newsletter to operating agency program managers; and (2) to provide a staff of media experts to work with each of the operating agencies to help develop their mass media carrier programs and to adapt nutrition information to those programs.

FEASIBILITY:

Manoff International has recently conducted a series of tests of the use of mass media in nutritional education in the Philippines and in Nicaragua. Their studies should be useful in deciding on feasibility and in designing the proposed service.

PROGRAM DESIGN:

CTAN should be responsible for design of this program. Major design issues are:

(1) Characteristics of the desired information service, including the focus and circulation of the newsletter.

(2) Design of a program for providing an adaptation service, specifying the number, type and quality of specialists required, and their relationships to operating agencies, media, and message producers.

(3) An assessment of the enthusiasm with which the operating agencies will implement mass media programs which can serve as carriers of nutritional messages.

SUPPLEMENTAL FEEDING OF THE MARP**PROBLEM:**

Selected members of the most at risk population (MARP) are unable to satisfy their nutrient requirements from the traditional rural diet. Supplemental feeding of this group is required to reduce nutrition related morbidity and mortality, mental retardation and stunted growth.

BACKGROUND:

Children up to 6 years of age, lactating women and women in late stages of pregnancy are the part of the population which is most vulnerable to the damages of malnutrition. Pregnant women need particularly high levels of nutrients in late pregnancy to provide for fetal growth and to prepare for birth and subsequent lactation. Adequate nutrition during lactation is essential for the mother's health and to maintain an adequate milk flow over an extended period for the health of the growing baby.

Early childhood is a dangerous period. A weanling child has great difficulty consuming enough of the grain-pulse diet of his elders to provide needed calories. This diet is also limited in good protein, vitamins and minerals. Epidemic gastrointestinal diseases and parasites reduce the child's vitality and his capacity to utilize the calories which are consumed.

The nutritional risks of the rural MARP increase in late spring and early summer because of the seasonality of agriculture. They are particularly severe among the poorer and least provident sectors of rural society, and those who are physically weakened by illness. About the only way to assure that this part of the MARP receives adequate nutrition is to provide some type of assistance through a government-sponsored feeding program.

Supplementation of the diet of the rural MARP is particularly difficult because of the isolation and dispersion of the population and the lack of institutional infrastructure. Any feeding program must be founded on the ability of a community to receive donated food and distribute it to its most needy members. Foods to supplement rural diets in

such programs must be easily transported and stored, require no refrigeration or special care in preparation, and be acceptable to the recipient. They must already be available or be cheap to manufacture locally from common ingredients, and easily stored and distributed from central warehouses.

PROPOSED SOLUTION:

Develop a national MARP feeding program, consisting of: (1) design of diets based on varying proportions of normal food (augmentation) and special nutritional foods (supplementation); (2) design of a number of supplemental foods which may be manufactured nationally from predominantly national ingredients; (3) production of supplemental foods by local manufacturers under contract to the Government; and (4) distribution of foods through Community Feeding Committees (CFCs) located in all rural communities, as well as through traditional MCH outlets.

FEASIBILITY:

The national MARP consists of approximately 250,000 preschool children and 110,000 pregnant and lactating mothers. Approximately half of these are in rural areas, many dispersed in farming communities of ten to more than 100 families. Of the total rural and urban MARP, perhaps two-fifths (weanling children, late pregnancy women, lactating mothers and the ill from poorer families) require significant nutritional assistance. Urban members of this group may require additional nutrients for a full year, while the others are rural and require support during at least four months of the year.

These assumptions yield a total of 96,000 per capita MARP feeding years. Assuming an all-in cost of \$27* per feeding year, the total annual cost would amount to about \$2.6 million (C\$19 million), which appears to be well within the continued financial capability of the GON.

This figure could be increased by expanding the proportion of the MARP reached. It could also be reduced by (1) reducing the proportion reached, (2) expanding the proportion of non-processed foods, or (3) by

* Based on Table Rec-A of Joyce King's report.

using a food stamp approach combined with a means test. The last has offsetting increases in administrative costs. The other two solutions reduce the effectiveness of the program.

A number of nutritionally sound supplemental foods have been developed in the U.S. from grains, legumes and dry milk. These and similar agricultural products as well as indigenous products like jicaro are grown and used in Nicaragua. Nicaraguan agriculture has demonstrated an excellent capacity to respond to market demand. The technologic capacity to produce special supplemental foods either already exists in the Nicaraguan food processing industry or could be readily developed.

Major design issues which will determine costs and feasibility are: (1) the relative requirements for manufactured food (supplements) to the basic grains (augments) of the feeding program; (2) the sophistication of the nutritional activities of the Community Feeding Committees; and (3) the delivery system(s) to be used.

Supplementation/Augmentation Considerations. Weanling children generally require more calories than they can obtain from a normal grain-pulse diet. A special weaning food (such as milk or a milk substitute) is usually required to overcome this lack of capacity. Special supplements may also be required by pregnant and lactating women in order to ensure that their own physical reserves are not depleted in the process of meeting the infant's needs. A special "women's food" is also useful for assuring that the women get it, rather than other family members, and to provide motivation for the woman to consume it regularly, like a medicine. Special foods tend to be costly, so it may be desirable and feasible to reduce the amount of supplemental food required by design of some system which would allow the high risk families to augment their normal diets by drawing a basic grain-pulse ration from local sources. The amount of food which they require from both sources would depend upon the ration which they already receive at home, and this in turn usually depends on the level of income.

Nutritional Role of CFCs. Community Feeding Committees' functions may be limited to receipt and distribution of food to needy families selected by their own subjective judgment. Or they may introduce an

objective measure into the selection process by weighing babies. Or, instead of simple food distribution, they may organize clubs of mothers which are used to impart health, nutrition and other information. As the design becomes more sophisticated, the costs for program preparation and for CFC selection, training and supervision grow rapidly.

Delivery System. The seasonality of rural malnutrition and the dispersion of rural communities determine the characteristics of the distribution systems needed to supply these rural communities. It may be possible to design a comprehensive rural-urban system in which the warehousing subsystem permits absorption of the heavy rural feeding period, without significant additional costs. It may also be possible to arrange with commercial food distributors to handle the physical distribution - not the sale - of supplemental foods through their existing infrastructure.

PROGRAM DESIGN:

Primary design responsibility is assigned to Ministry of Public Health.

The program should be designed in three separate but interlocking segments:

(1) Food Design and Manufacture. (a) Determination of desirable proportions of supplementation: augmentation for different subclasses of the MARP and different levels of dietary deficiency; (b) establishment of desired characteristics of the supplemental foods to be designed; (c) determination of the conditions for supplemental food manufacture acceptable to local industry; (d) design of a detailed program, including procedures, schedules and costs for design of foods, test of product acceptability, pilot production runs, and development of production contracts.

(2) Food Distribution. (a) Design of a detailed system, including a warehousing network, for achieving distribution of the supplemental food to the CFCs. This plan must demonstrate the feasibility of dealing with the seasonality of rural requirements. (b) Design of a system, e.g., food stamps through commercial channels or distribution from community granaries, to allow the special MARP to augment their basic grain-pulse diet.

(3) Community Food Committees. (a) Guidelines for selection and operation of the CFCs, including their use under various assumptions of

program sophistication. (b) Assumptions about growth in numbers of CFCs and numbers of MARP to be fed. (c) Methods for supplying the less accessible communities. (d) Plan for supervision and evaluation of CFCs.