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**ASSESSMENT OF SOLAR DRYING
FOR VITAMIN A
in the
DOMINICAN REPUBLIC**

Implementing Institution: FUDECO

**Participating Groups: Seven Women's Clubs
in San Juan and Elias Peña provinces**

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**Conducted by
Ronald Toussaint and John McKigney
VITAL Consultants**

Edited and Produced by

**Vitamin A Field Support Project (VITAL)
International Science and Technology Institute, Inc.
1616 North Fort Myer Drive, Suite 1240
Arlington, VA 22209
Phone: (703)841-0652
FAX: (703)841-1597**

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Any inaccuracies or misrepresentations in this report are the sole responsibilities of the authors.

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ASSESSMENT OF SOLAR DRYING FOR VITAMIN A IN THE DOMINICAN REPUBLIC

I. Background

1. The Setting

This project is being carried out in the provinces of Elias Piña and San Juan in the extreme western part of the country (see Annexes I and II). Elias Piña is one of the border provinces with Haiti. The participating communities lie on a plateau adjoining the foothills of the cordillera of Hispaniola, with rolling hills, many small isolated valleys and very rocky soil. Being located south of the cordillera, the area has sparse rainfall; however there are periodic heavy rainstorms. The climate is sub-tropical, with a year round growing season.

2. Land Tenancy

Historically farming families in the Dominican Republic have had title to their land. Farms have been passed down from generation to generation, being sub-divided when brothers inherited the farm from their father. Consequently, most farms in the project area are quite small, providing enough food for the family and a limited amount of produce to sell in good years. Many families harvest an inadequate amount of food in poor years. In addition to farm size and the rainfall pattern, this situation stems from long-term poor management practices and resultant erosion, infertile soil, etc. This has contributed to migrations of young people from these provinces to cities. In dry years many young men seek employment as day laborers in other parts of the country. In short, although owners of their land, most families barely eke out a living.

3. Relevant Political Developments

As in most countries, the central government paid little attention and addressed few resources toward development of the more distant and isolated areas, particularly in provinces such as Elias Piña and San Juan where the population was comprised of small farmers. This situation led to the formation of the *Movimiento Campesino Independiente* (Independent Farmers Movement) by progressive leaders of the region during the 1960's. Subsequently, the *Confederación Nacional de Mujeres Campesinas* (National Confederation of Farm Women) was formed during the 1970's. Their primary objectives in organizing were to achieve meaningful representation in government and to improve their communities by working together. Nearly all communities in the area have men's associations and women's clubs.

4. Historical Involvement of FUDECO in the Project Area

The Foundation for Community Development (FUDECO), a national NGO, was created in 1979. Its objective is to assist in resolving basic problems of low income families in the western

provinces by providing technical assistance and resources. FUDECO initiated assistance to the two subject provinces in 1979. Its services to men and women include: Public Health (including Child Survival since 1988); Developing Infrastructure (including wells, irrigation, improvement of roads and dams); Education and Training (including school construction); Conservation of Natural Resources (including provision of improved seeds, timber and fruit tree seedlings); and Economic Sustainability (credit for crops, animals, small enterprises). One hundred and twenty communities in Elias Piña and San Juan provinces are collaborating with FUDECO at the present time.

5. Vitamin A Status of Preschool Children in the Project Area

The National Center for Research on Mother and Child Health (CENISMI) carried out a vitamin A deficiency survey of children between one and six years of age in the Southwest region of the Dominican Republic in 1991. The survey was conducted in San Juan, Elias Piña and five neighboring provinces during May and June. This region of the country had long been known to have low literacy rate, poor sanitary conditions, high infant mortality rate and a serious problem of childhood malnutrition. The immediate stimulus for the survey was the diagnosis that 2.8 percent of hospitalized and malnourished children from this region were suffering from Xerophthalmia--a severe form of vitamin A deficiency. This is nearly twice the prevalence rate of Xerophthalmia which constitutes a public health problem as defined by the World Health Organization.

CENISMI, in collaboration with the Institute of nutrition of Central America and Panama, and with the financial and technical support of VITAL studied six hundred and forty- eight children to determine the vitamin A status of preschool children in the general population of the region. Twenty percent of the children had blood retinol levels indicating a moderate vitamin A deficiency; four percent had levels indicating a severe deficiency. A dietary assessment indicated that the usual diet of forty-four percent of the children placed them at high risk. Judging from their food intake during the past twenty-four hours, thirty-one percent were at high risk of poor vitamin A intake. Since the study was conducted during the mango season, mango consumption was subtracted from the consumption figures. This indicated that if mangos are discounted, over ninety percent of the children had such a low intake of vitamin A that they were at high risk of suffering Xerophthalmia.

The CENISMI survey results led to three recommendations of great relevance to the solar drying project:

- The need for immediate, intermediate and long term interventions to resolve the vitamin A deficiency in the region;
- The need to promote production and consumption of vitamin A containing foods, other than mango, so as to diversity the sources of vitamin A in the diet;

- That mango, currently the principal source of vitamin A in the diet, be preserved during the harvest period for consumption during the remainder of the year.

II. Introduction of the Project

1. Rationale of VITAL and FUDECO

From the point of view of VITAL, the situation in this FUDECO operational area seemed to present almost textbook conditions for testing the promotion of increased production and solar drying of vitamin A-rich fruits and vegetables as a means of achieving sustainable resolution of the defined vitamin A deficiency problem in preschool age children. FUDECO concurred, viewing technical and financial assistance from VITAL as a means of adding a new dimension to its health, human resources development, preservation of natural resources and economic sustainability services. Collaboration between these organizations began in February 1992.

2. Objectives

A. FUDECO

The specific objectives of FUDECO in sponsoring the project were:

- train participants in appropriate techniques of solar drying;
- to improve health status through integration of solar drying with nutrition education;
- increase the utilization of FUDECO seedlings and plants for fruit production;
- promote economic security by introducing principles of packaging and marketing of excess production;
- through the above, to reduce emigration of young people from the project area.

B. The Women's' Clubs

The objectives of the women in requesting FUDECO assistance were:

- increase availability of vitamin A-rich foods throughout the year;
- preserve excess foods in the harvest season for family consumption during periods of food scarcity;

- reduce sickness and medical expenses by having a healthier family; and
- market excess dried food products in order to have some income for the club.

III. Training and Monitoring

1. Training

The club "Maria de los Remedios" was the first group to receive training in solar drying. Twenty-nine members of the club attended the one-week course in February 1992. Training was provided by FUDECO staff with technical assistance from Mary Linehan of VITAL and Ronald Toussaint, field director of the Save the Children solar drying project in Haiti. Follow-up training was provided by FUDECO in March and April, during which the women's club facility was constructed, more dryers were built at FUDECO and transported to the sites, and other necessary equipment and supplies were acquired. This was in anticipation of being able to dry substantial amounts of mango during the period of abundant availability beginning in May. Unfortunately frequent heavy rains during the whole month of May prevented any drying.

Thus, members of "Maria de los Remedios" actually began acquiring experience during June through August 1992. A limited quantity of mangos were available. In addition, the women initiated drying of papaya, carrots, pumpkin, sweet potatoes, banana and green leaves of various vegetables and fruits, with ongoing technical assistance by FUDECO. During this period, a nutritionist from the National Center for Research on Mother and Child Health (CENISMI) assisted in providing classes in nutrition and in testing recipes based on the dried products. This provided the women sufficient experience to continue, with periodic monitoring/technical assistance visits by FUDECO and CENISMI.

The ongoing experience of the "Maria de los Remedios" club was sufficiently positive that in May, 1993 FUDECO and VITAL signed an agreement to provide training and solar drying equipment (10 dryers/club) to six additional women's clubs and schools in the area. Selected women from "Maria de los Remedios", with supervision from the FUDECO training coordinator, trained members of six women's clubs, interested husbands, students, and whenever possible, teachers from community schools. This has resulted in nearly 350 persons receiving solar drying training in the Matas de Farfan area to date. No problems have been encountered during training. Drying in these additional communities was initiated in October, 1993.

2. Curriculum

The Spanish version of the VITAL manual on "Solar Drying for Vitamin A" was used for initial training of the club members of "Maria de los Remedios". It was found to be completely satisfactory. FUDECO has printed its own version of the manual, with slight modifications and some additional recipes, attuned more specifically to the Dominican Republic. The FUDECO

version has been used in training members of the six additional communities in 1993 and will be used in training future groups.

3. Monitoring

As mentioned above, members of the club "Maria de los Remedios" have received ongoing (monthly) monitoring visits by FUDECO--specifically by the FUDECO training coordinator and/or Las Matas de Farfan area trainer. Monitoring under the FUDECO/VITAL agreement has been provided to the second generation of clubs by selected members of "Maria de los Remedios" with FUDECO oversight. Members of the six clubs trained in October, 1993 have committed themselves to serve as future trainers at such time as FUDECO agrees to sponsor additional clubs. Thus, the curriculum and human resources development aspect of solar drying for vitamin A has already become institutionalized in this area of the Dominican Republic.

IV. Implementation Experience to Date

1. Participants and Products Dried

Review of Annex IV, which is based on the interviews with five of the seven groups participating in the FUDECO solar drying project, demonstrates the great diversity among the apparently similar communities. There is great diversity in the percentage of women in each community who are members of the club, percentage of members of the club who attend the solar drying classes, in sites where the solar drying activity is based and in selection of out-of-the-ordinary products for drying. All of the clubs prepare a soup mix, probably because this was included in the curriculum. However, only one club, "La Solución", has taken the initiative to develop a weaning food mixture which is being used for rehabilitation of malnourished children in conjunction with the FUDECO Child Survival interventions. The club members view this as a means of interesting more mothers to join the solar drying activity. The "Maria de los Remedios" club also donates dried mangos to mothers of malnourished children--partly to stimulate community interest in solar drying. Columns seven and nine of Annex IV also indicate considerable differences in degree of interest and involvement of men and schools in the various communities. This will be discussed later.

Problems have been encountered in drying two products--Irish potatoes and tomatoes. Unless properly blanched, Irish potatoes turn a dark color when dried. However, Irish potatoes are not an important item in the local diet. All clubs had tried, unsuccessfully, to dry tomatoes, which could be an important vitamin A source. Consultant Toussaint recommended removing the seeds before drying.

2. Management

The initial impression received on visiting the drying sites and interviewing the participants is that this component has been seriously slighted. There are no bulletin boards, no seasonal drying

schedules, no sheets assigning use of dryers to teams or individuals for specific hours of days, no documentation of dates or amounts of products dried, nor drying times, nor degrees of satisfaction with the results. In this regard, there is no difference between the various clubs, nor between the club which has been drying since June, 1992 and those which started in October, 1993.

Further exploration of this issue showed that, by and large, all these aspects of management are being practiced but not documented. In three sites, all drying activities are done on an entire group basis; in one locale, days are allocated to different teams; in another locale, all members of the group use the equipment Monday through Friday and Saturday is reserved for teachers and students. The seasonal drying schedule is set in peoples minds. Recording of this, of differences experienced over time (ie. times of sunrise and sunset, predictable rainy periods, etc.), percent yield of different products, varieties, or recording drying times do not seem especially meaningful or important concepts to the participants.

3. Drying Times

The drying times reported by the five clubs for the eighteen products being dried at the present time are tabulated in annex V. The first observation is that drying times are perceived as portions of days, rather than hours. This is related to the general practice of most or all of the participants of walking to the locale in the morning, processing and putting the fresh product in the dryer, returning home, then returning to the drying locale either at mid-day or end-of-day depending on the anticipated required drying period. The concepts of making maximal use of the dryers, or removing the product at precise degrees of dryness have not been introduced yet. Apparently, neither has that of division of labor, beyond the agreement that sub-groups will accept responsibility for certain tasks each day.

Another observation in reviewing annex V is that of apparently systematic differences by location in drying time required. All groups received the same instructions with regard to processing, slicing and placement of fresh product in the dryers, the same dryers are used in all sites, and placement of dryers is the same in all sites. The difference seems most likely related to micro-climates. We were informed that San Jose, adjacent to a high hill, frequently has early afternoon fog. The La Meseta drying locale is located on a hillock, which may have more steady air movement than some of the other sites. There are substantial differences in altitude between the communities.

4. Storing of Dried Food

To date, dried products--whether in the form of dried leaves, slices/chunks or ground into flour, are stored only in a single size of plastic bags which are being provided to the clubs by FUDECO. The bags are stored in well built wood cabinets with screen front doors until products are allocated to participating families. Since four of the five clubs interviewed have been drying only since October, 1993, their experience regarding storage periods is not relevant, since October-January is during the dry season. However, "Maria de los Remedios" members state that

properly dried products in properly sealed bags can be stored for up to a year, based on their experience.

5. Preferred Foods for Drying

All clubs uniformly listed mangos, sweet potatoes, papaya and pumpkin as the foods they prefer. Although it is impossible to quantify, the discussion of the reasons make it clear that availability, ease of drying and ease of grinding into flour are important factors regarding their preference. The women stated this without hesitating. But, mango is the only product which they immediately think of as a rich source of vitamin A. No data is available on actual amounts of each product which has been dried.

6. Consumption of the Foods

To date, monitoring of food preparation or consumption has not been carried out. It was reported that dried mango is always consumed by all members of the family as a snack item, with preference by young children. The preferred foods seem partly to be considered so as, when ground into flour, they can easily be combined with milk and sugar into a gruel to feed young children. The soup mixes are consumed by all family members. As stated earlier, one club is preparing a weaning food mixture. All clubs indicated that extending the period of availability of each food for the family is an important advantage of drying, so it seems clear that some portion of all dried products is consumed by all family members. As near as it could be determined, it appears that all dried products are shared equally to families on a per capita basis.

The members of each club, individually and as a group, have developed some new recipes and FUDECO-CENISMI plan to document these and develop additional recipes. Since the members of each club are in almost daily contact with one another, new experiences with the products are rapidly transferred within each community. In addition, expositions of dried products have been held in Quemado and Palo Seco.

Since the initial stimulus for this activity is serious vitamin A deficiency among preschool children, the assessment included consideration of the extent to which this remains an uppermost consideration. The women are fully cognizant that green vegetables and leaves, papaya, sweet potato, carrots and mamey are good sources of the vitamin. However, for some reason, mango is the source which automatically comes to mind.

There are simple posters evident in each locale, listing good sources of vitamin A, including appropriate animal sources.

7. Dryers

The women stated a preference for the "family" size dryer, over the "community" size, both developed in Haiti, because it weighs less. However, the difference is not great and the preference seems to be only minor. There is no criticism regarding the design and no suggestions

were made for change or perceived improvements. Annex VI lists the materials and cost of constructing a 42 x 98 cm dryer at the FUDECO carpenter shop in Las Matas de Farfan. The price is equivalent to \$65.50 U.S.

V. Husbands' Support/Involvement

1. Rationale

Although the degree of involvement seems to vary considerably between communities, the women uniformly stated unequivocally that they received the concurrence and moral support of their husbands in the solar drying endeavor. The rationale given by men was their anticipation that (a) drying would permit preservation of foods which otherwise would be wasted in periods of excess production; (b) drying would permit the family to maintain a more plentiful and varied diet during periods of food scarcity, (c) this would reduce food expenditures, and (d) points a and b would result in better nutritional status of family members, thus reducing expenditures for medicines.

2. Husbands support and participation in solar drying

As seen in Annex IV, the men's association in Palo Seco provide space in their building to the women for the solar drying activity, men and women's organizations jointly use the community centers in Los Jobos and San José, and community leaders agreed to include an extra room for the drying activity in the recently completed new school in Quemado. Actual involvement of men in the drying process (except for teachers) seems to be primarily limited to assisting in grinding the dried products into flour. However, in Los Jobos, one of the husbands works together with the women in all stages of drying when he has time available. Time limitations precluded attempting to assess the relative percentages of men's and women's labor in producing each product, in collecting mangos for drying, and in transport of fresh products to the drying locale.

VI. The Role of Schools

1. Rationale

The rationale for involving schools in the solar drying endeavor is central to the objectives of FUDECO in assisting the communities to become self sustaining, economically diversified, healthier, better educated and to conserve natural resources. Involvement of schools can theoretically have a favorable impact on these objectives in many ways, including integration of food preservation concepts and practices into the curriculum, school garden and school lunch; students can assist in reducing food spoilage in glut periods and food shortage during gap periods; the experience can assist in orienting students' thinking regarding future studies, employment and health/nutrition practices; and solar drying and the marketing potential it offers can assist in community sustainability and reduce the temptation for youth to emigrate to urban areas.

2. Participation of Schools

It was very difficult to assess this dimension of the activity due to time limitations, the diversity of situations in different communities and the fact that actual drying of products began only in late October, 1993 in four of the five communities which were visited. In La Meseta, the community where drying was initiated in mid-1992, it was found that neither teachers nor students have had any contact with the solar drying activity. The reason is that children from this community are currently attending school in an adjacent community which is quite distant from the drying locale. However, a new school is being built in La Meseta about five blocks distance from the locale. The plan is to establish collaboration as soon as the school is open.

In section IV.2. it was mentioned that in the community of Los Jobos, the drying facility is reserved for use by teachers and students of the community school on Saturdays. Although the drying locale in Quemado community is physically located in the school building, there is no formal working relationship between the school and drying activity. The explanation given was that the teacher who had been in contact with the women's club has recently been transferred to another location. However, three male students and one female were assisting in grinding dried products during our visit. We were informed that in Palo Seco the school is nearby but there is no collaboration. The teacher is from another community and the students live a long distance from the drying locale. The club in San José community invited the teachers and students from their school to a demonstration but there has been no follow-through. The female teacher is not a member of the women's club.

VII. Marketing

As stated earlier, prevailing conditions in the Las Matas de Farfan region are such that preservation of food for family consumption during periods of scarcity is the primary objective of the solar drying activity. Eventual marketing of some products has been given some thought, although this is clearly of secondary interest at the present time. The possibility of selling some products, in the near term or eventually, has been given some consideration by all five of the women's clubs interviewed. It is interesting that, as near as could be determined, marketing has uniformly been viewed as a means of generating income for the club, rather than on an individual family basis. Also, the "Maria de los Remedios" club, which has sixteen months more experience in solar drying, has not formulated its concepts or plans for marketing as far as some of the new clubs.

Marketing projections of all five clubs contemplate selling produce within their own communities or possibly in Las Matas de Farfan, a town of some 25,000 population. All clubs anticipate that the plastic bags they are currently using will be adequate packaging, with paper labels pasted on or possibly a painted label. All clubs assume that there will be ready markets for dried mango, which is apparently a highly desired item in the country. Sweet potato flour, dried banana and banana flour are also expected to have good demand. "La Solución" club is considering the possibility of marketing their weaning food mixture within the community. The hope is that the product could initially be purchased for rehabilitation of malnourished children in the Child

Survival program and that this would create a broader market for them. When questioned, the women responded that, so far, they have not considered pricing strategy nor determined what price they would have to charge to adequately compensate them for materials, labor and produce a profit.

VIII. Plans for the Future

1. The Women's Clubs

Members of all five clubs interviewed are anxiously awaiting arrival of the mango season in May. They view this as the first opportunity to really capitalize on the solar drying approach in terms of having the satisfaction of processing large quantities of a product which will make a major contribution to their families' well being and health, as well as generate income for the clubs in subsequent months. They also look forward to drying the various products in substantial quantities and with confidence, now that they have gone through the experimentation stage. They likewise know that the products are acceptable to their families, know new recipes, and know that the products can be stored for a considerable period. In addition, they look forward to the opportunity to teach additional members of their community, and of other clubs, the techniques and benefits which can be derived from solar drying. No members of the clubs, however, mentioned plans to plant mango seedlings, to plant additional papaya trees, to acquire new varieties or expand areas devoted to production of fruits or vegetables for drying.

2. FUDECO

The institution has received about a dozen requests from women's' clubs in the Las Matas de Farfan area for training and assistance in initiating solar drying. FUDECO has prepared a proposal seeking funds which would enable continuation of current inputs to the communities where solar drying is now operational and to as many new communities as possible in this area. It is believed possible to achieve much greater integration of solar drying with year round and intensified crop production in the communities where irrigation has recently been introduced. Likewise, it is believed that solar drying has the potential of being an important enhancement to child survival services, based on the experience to date. In addition, it is felt that there is sufficient marketing potential in the Las Matas de Farfan area to not only return a profit (above all direct and imputed costs) to the clubs but also to directly enhance the income of participating families. This will require more than a few years of concentrated effort but FUDECO is prepared to stay the course as long as solar drying is viewed as a plus by members of the communities.

FUDECO also plans to introduce solar drying in its other project area--the province of Loma de Cabrera--which is just north of Elias Piña province and bordering with Haiti. This area presents a vastly different setting--less hilly, richer soil, adequate rainfall pattern, and quite prosperous compared to Las Matas de Farfan. Nevertheless, FUDECO has a child survival project in Loma de Cabrera. Since, by and large, there are not periods of serious food gaps and families do not often experience hunger, FUDECO plans to present the activity as a new means of marketing

products and having more variety in the diet rather than placing primary emphasis on the potential nutritional benefits. There is a tradition of processing excess fruit into preserves and other sweets for sale. It is believed that, while the immediate attention of participators will be addressed to marketing, it will be possible to introduce and maintain sufficient emphasis on use of the products to improve the nutritional status of at-risk family members. Since the same women are participators in child survival activities, these will provide a means of reinforcing the nutritional potential of solar dried products. It is likely that the Loma de Cabrera drying activity will provide an opportunity for marketing research and development (R & D) which can be transferred to Las Matas de Farfan.

FUDECO also feels that once solar drying activities are well established in both project areas, it will have the institutional structure, qualified administrative and technical personnel, appropriate field settings and experience to serve as an international center for training and solar drying R & D.

IX. General Discussion and Conclusions

1. Timeliness of Current Assessment

It must be emphasized that the timing of the current assessment of the Las Matas de Farfan solar drying activity resulted from factors beyond the control of VITAL and FUDECO--the funding and implementing agencies. As has been mentioned earlier, it was carried out when the initial women's group had approximately eighteen months of experience and the other groups less than three months experience. Thus, discussion and any tentative conclusions regarding results to date and future prospects is based on preliminary impressions of implementors and evaluators.

2. Appropriateness of the Project Site

While presenting the usual challenges of isolated, underdeveloped communities with limited natural resources and rainfall, Las Matas de Farfan also offered many advantages to this type of intervention activity. The families own their land, thus are able to plan for the future and have been willing recently to contribute the labor for construction of irrigation ditches. When and if convinced of the desirability of acquiring and planting more and new varieties of mango and other fruit trees on their property, they know that their families will reap the future benefits. They have confidence in FUDECO, based on a long term, mutually beneficial working relationship. The women have been organized and working together for several years. They have sufficient self confidence to embark on an ambitious project and were encouraged to do so by their husbands. They have been motivated to practice solar drying as a means of improving nutritional status and reducing vitamin A deficiency based on the child survival activity since 1988 and results of the 1991 vitamin A deficiency survey. Finally, FUDECO and CENISMI, who know the area and nutritional problems, are collaborating in providing moral, material and technical assistance.

3. Perceived Benefits to Date

A. The Women's' Clubs:

It is clear that the solar drying activity has been a satisfying experience to date for the participating women. When queried regarding the benefits, they uniformly listed all their objectives as having been met, plus perceived health benefits even though it is certainly too soon for this to have occurred in four of the five clubs. They admit that being able to experiment with new products is one of the positive factors and also that it has provided additional opportunities for socialization. What remains to be determined is whether the present degree of satisfaction can be maintained or whether it primarily reflects the first burst of enthusiasm and novelty of being able to experiment and socialize with their friends on nearly a daily basis. They state that the two to four trips daily to the drying locale does not interfere with their housework, but will this opinion change over time? Also, the data presented in Annex IV indicate that from 20 to 80 percent of women in the communities are not members of the clubs nor participating in the solar drying activity, although the clubs state that non-members are being encouraged to do so. Certainly, some means of getting a large percentage of the non-participants involved will be essential for the activity to produce maximum benefits in each community. If this is largely a function of distance of the non-participants' homes from the drying center, location will need to be considered more carefully in the future.

Nevertheless, to a visitor from the outside, it is impressive how in these communities solar drying has provided a means for the women to change their thinking of nutrition education from being an abstract, dull subject to something practical, interesting, even exciting.

B. FUDECO

As reflected in its plans for the future, FUDECO is likewise very satisfied with results to date. An important element of this satisfaction is the demonstrated capability of members of "Maria de los Remedios" club to learn, faithfully practice and transfer the drying techniques and concepts to other clubs. This means that the basic technique and expansion of solar drying to other clubs in the community can be self-sustaining. Thus, FUDECO will need to expend only minor efforts on monitoring and can concentrate on improving methodology, marketing (at least to generate funds to maintain and replace dryers and purchase plastic bags) and recruiting new members and schools in the Las Matas de Farfan area.

FUDECO has also been impressed by the imagination of the women in devising simple, no cost means of sealing the plastic bags, creating new recipes, food mixtures and preparing the dried foods for consumption. Also, on their own initiative, the women have initiated integration of solar dried products into child survival nutrition activities and donations of solar dried samples as a means of stimulating other women to join the project.

4. Interest/Involvement of Husbands and Schools

It seems clear that there is adequate, and perhaps enthusiastic, support of the husbands of current members of the women's clubs. It could be that attitudes of the husbands are an important factor

influencing the other women to not join the clubs or participate in solar drying. The results so far seem mixed with regards to involvements of schools. However, in three of the five communities there seems to be reluctance by the schools to collaborate. This could be a function of time needed to establish rapport and satisfactory scheduling, a problem of personal relationships, possible concern by school officials that non-joining families view the clubs as cliques, or a combination of timing, logistic, political, and other reasons. At any rate, this issue needs to be monitored by FUDECO to assure that the schools assume their proper role in the solar drying endeavor in each community.

5. Management

Although not an issue of concern to date, there will be a need to formalize management practices in each club over time and as additional women and schools become involved. As this occurs, pressure will build regarding equal access to the dryers and the need for maximal utilization of drying time. Each club will also need to develop a recorded memory of seasonal availability of each product, proportion of wet vs. dry weight drying times of each product, hours of labor required to harvest, process and dry each kilogram of finished product, etc. Although it takes some time and effort, good management is the key to success in any endeavor. Good records will be particularly important over the long run in collaborative activities such as this with many partners. If for no other reason, documentation of the experience will be needed by FUDECO to provide quantified evidence of the degree of success.

V. Recommendations

1. FUDECO

Based on its experience, FUDECO* considers the following factors to be of particular importance for solar drying:

- Selection of communities that have sufficient infrastructure, access to water for irrigation and appropriate locale;
- That the implementing institution has qualified personnel, adequate facilities and proven experience in community development;
- That there be sufficient access to participating communities so that the project will have the visibility required to serve as a demonstration;
- That the setting provide or have the potential to provide sufficient fresh produce throughout the year;

* personal communication, National Director of Program Planning

- That the project can become self-sustaining after a reasonable period of time;
- That once the project families have successfully become self-sufficient with regards to food supply and nutrient content, efforts will be directed toward marketing of excess supplies so as to generate profits; and
- That the lead agency for solar drying in each country seek collaboration with and involvement of other appropriate NGO's.

The Consultants

Additional recommendations, based partly on observations in Las Matas de Farfan, are:

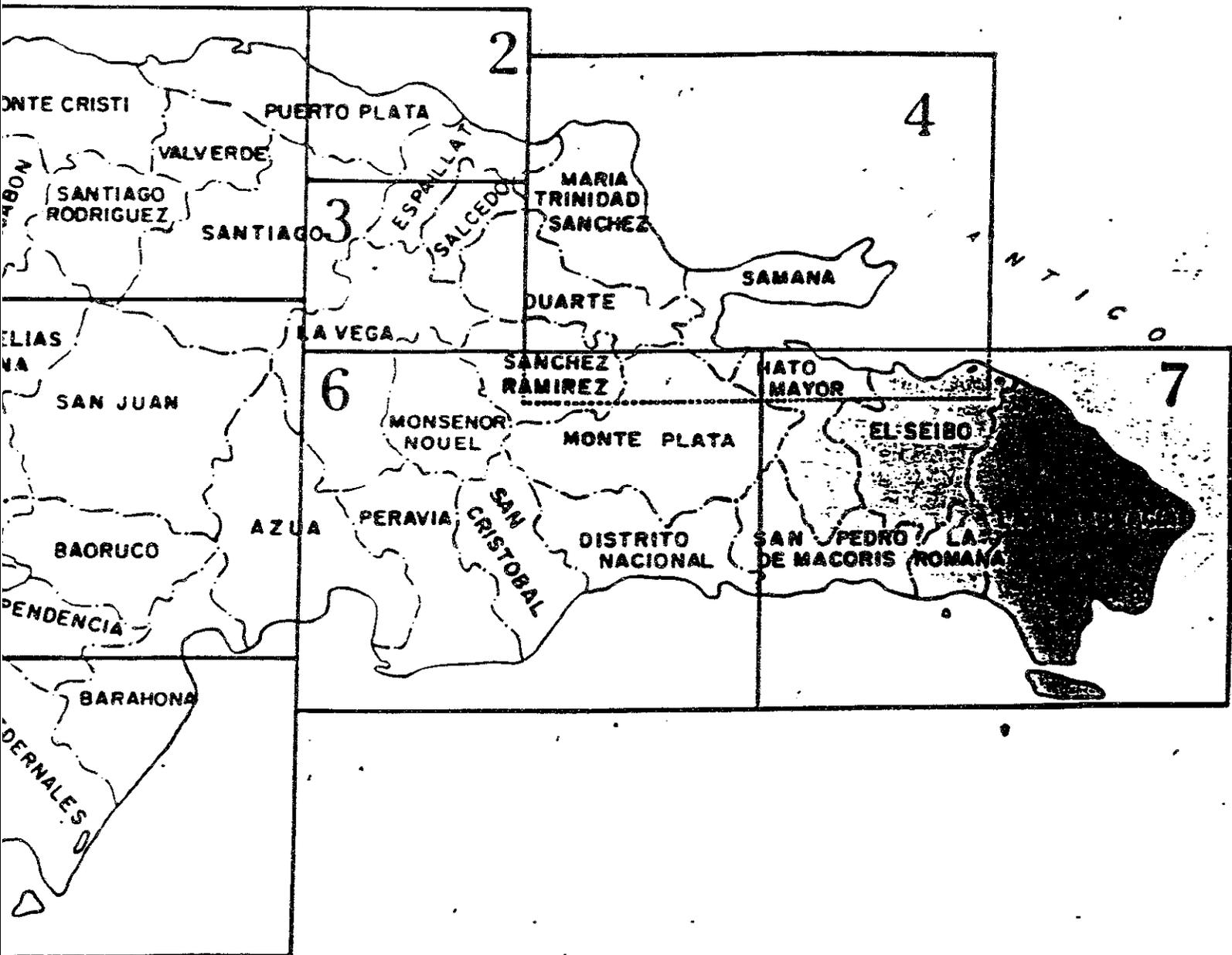
- That from its conception, the project should involve a nutritionist with field experience to provide ongoing practical advice on how to achieve maximum nutritional benefits within the capabilities and constraints at each drying site (this is the role of CENISMI in the present project);
- That project management include the documentation of methods and experience from the outset; and
- That when the project area consists of geographically distant, isolated communities a simple periodic newsletter could facilitate communication of helpful information between participating groups. Contents might include general reports of activities, successes, lessons learned, and new recipes.
- There is a need to develop basic information and additional guidelines concerning solar drying, including:
 - proportionate weight of fresh vs. dried weight of each product
 - labor costs/unit dried weight for drying of each product
 - total labor costs/unit dried weight for production, transport and drying of each product
 - cost of firewood required for blanching/unit dried weight of products which require blanching
 - tables of vitamin A content of dried products as compared to the fresh product
 - recipes and or feeding practices which permit maximal utilization of vitamin-A rich dried products in young child feeding

PHOTO CAPTIONS

1. A member of the "Maria de los Remedios" club teaching solar drying methods to another club.
2. Preparing the solar dryer (placing black stones in the base to absorb heat from the sun).
3. Washing a pineapple before peeling and slicing.
4. Preparing other fruits to dry.
5. Preparing products for blanching.
6. Checking to assure that the water is boiling prior to blanching.
7. Blanching
8. Placing products on the tray for drying
- 9, 10, 11. Inserting the tray in the dryer.
- 12, 13. Removing the dried product from the dryer.
14. Grinding the dried product into flour.
15. Placing the dried product in plastic bags for storage.
16. Expelling air from the bag before sealing.
17. Weighing the dried product.

GENERAL MAP OF DOMINICAN REPUBLIC

GENERAL MAP OF DOMINICAN REPUBLIC



LOCATION OF SOLAR DRYING PROJECT

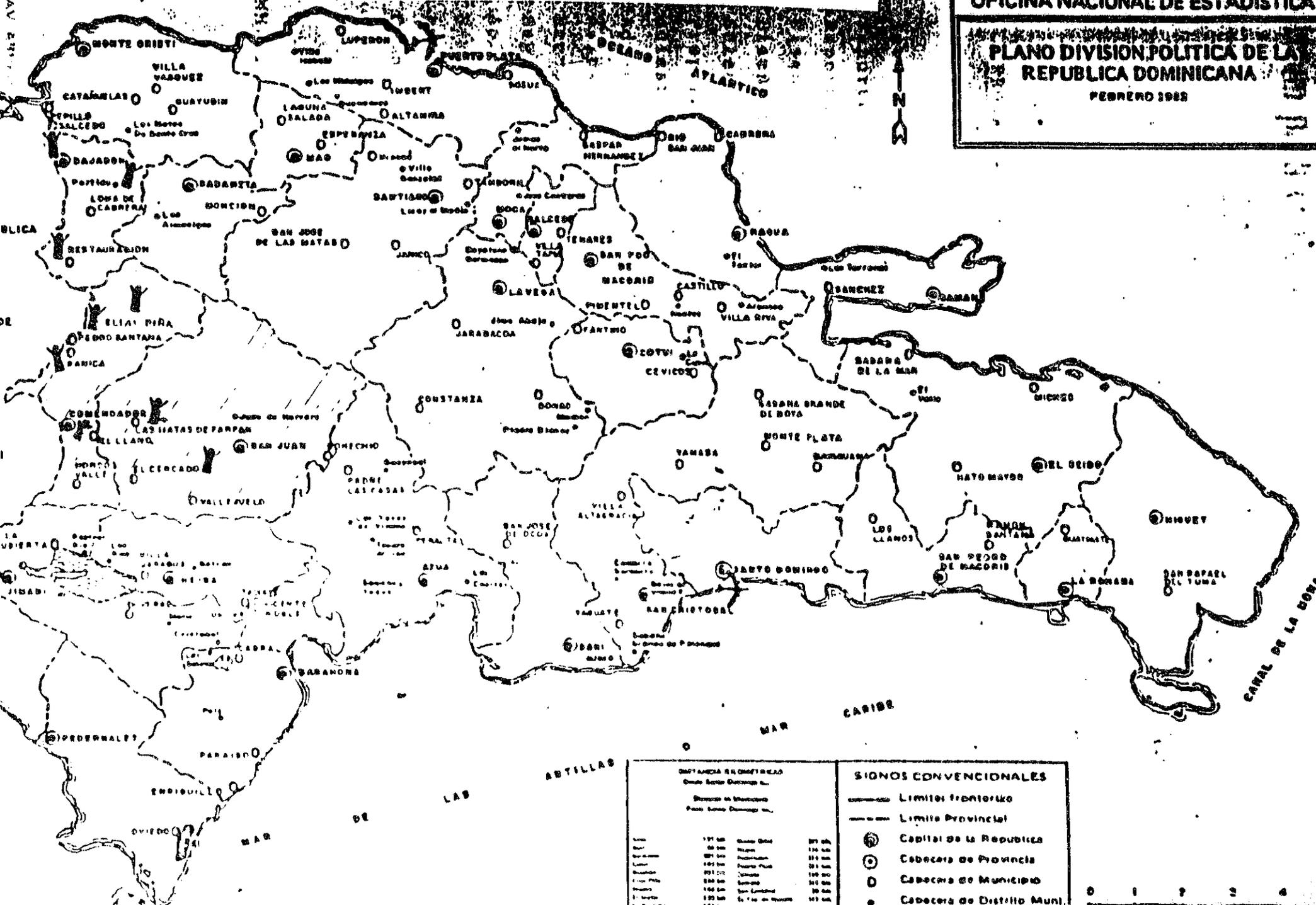
18

LOCATION OF SOLAR DRYING PROJECT

Secretariado Técnico de la Presidencia
OFICINA NACIONAL DE ESTADISTICA

**PLANO DIVISION POLITICA DE LA
 REPUBLICA DOMINICANA**

FEBRERO 1968

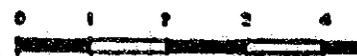


DISTANCIA EN KILOMETROS
 Desde Santo Domingo D. N.

Distancia en Kilometros	Desde Santo Domingo D. N.	Desde Santo Domingo D. N.
171 km	Sanchez	171 km
165 km	San Juan	165 km
160 km	San Pedro de Macoris	160 km
155 km	San Cristobal	155 km
150 km	San Rafael del Yuma	150 km
145 km	San Juan de los Rios	145 km
140 km	San Pedro de Macoris	140 km
135 km	San Juan de los Rios	135 km
130 km	San Juan de los Rios	130 km
125 km	San Juan de los Rios	125 km
120 km	San Juan de los Rios	120 km
115 km	San Juan de los Rios	115 km
110 km	San Juan de los Rios	110 km
105 km	San Juan de los Rios	105 km
100 km	San Juan de los Rios	100 km
95 km	San Juan de los Rios	95 km
90 km	San Juan de los Rios	90 km
85 km	San Juan de los Rios	85 km
80 km	San Juan de los Rios	80 km
75 km	San Juan de los Rios	75 km
70 km	San Juan de los Rios	70 km
65 km	San Juan de los Rios	65 km
60 km	San Juan de los Rios	60 km
55 km	San Juan de los Rios	55 km
50 km	San Juan de los Rios	50 km
45 km	San Juan de los Rios	45 km
40 km	San Juan de los Rios	40 km
35 km	San Juan de los Rios	35 km
30 km	San Juan de los Rios	30 km
25 km	San Juan de los Rios	25 km
20 km	San Juan de los Rios	20 km
15 km	San Juan de los Rios	15 km
10 km	San Juan de los Rios	10 km
5 km	San Juan de los Rios	5 km

SIGNOS CONVENCIONALES

— — — — —	Limite Fronterizo
- - - - -	Limite Provincial
⊙	Capital de la Republica
⊙	Cabecera de Provincia
⊙	Cabecera de Municipio
⊙	Cabecera de Distrito Muni.



LAS MATAS DE FARFAN
SUMMARIZATION OF SOLAR DRYING EXPERIENCE*

Name of Club	Locale and Date of Training	Number of Families in Community	Number of Members in Club	Number who Received Training	Number Active in Drying	Location of Dryers	Special Products+	Number Interviewed
SAGRADO BRAZON DE JESUS	Los Jobos 10/93	115	25	21	29	Community Center (men and women)	14, 17, 18	9 Women 1 man
LAS MERCEDES	Palo Seco 10/93	92	32	13	13	Men's Association Building	11, 13	8 Women
SANTISIMA CRUZ	Quemado 10/93	54	36	18	18	School	11, 14	15 Women 1 Girl 3 Boys
LA SOLUCION	San José 10/93	111	15	35	37	Community Center (men and women)	15, 16, Infant Food Mix	7 Women 10 Men
MARIA DE LOS REMEDIOS	La Meseta 2/92	60	33	29	29	Womens Club	11, 12, 14, 17	9 Women

based on interviews with members of five clubs. Seven clubs are currently participating.
see ANNEX V. All groups dry products 1-10 and prepare soup mix.

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AVERAGE DAYS DRYING TIME
EXPERIENCE IN FIVE LOCALITIES

	PRODUCT	LOS JOBOS	PALO SECO	QUEMADO	SAN JOSE	LA MESETA
1	MANGO	1	2	2	1.5-2	1
2	BANANA	1.5	2	2	2	1
3	SWEET POTATO	1	1.5	1	1	3/4
4	PAPAYA	1	2	1-1.5	1-1.5	1
5	PUMPKIN	1	1.5	1	1	.75
6	TARO	1	2	1	1	1
7	CARROT	1.5	2	2	2	.75
8	GREENS	1	1	1	1	.5
9	BEET	1	1.5	1.5	1.5-2	1
10	PINEAPPLE	1.5	2	1.5	1.5-2	1
	SOUP MIX (1)	N.A	N.A	N.A	N.A	N.A
11	POTATO		1	1		.75
12	AMARANTH					.50
13	BROCCOLI		1.5			
14	MAMEY	1.5		2		.75
15	EGGPLANT				1	
16	ACOYOTE				1.5	
17	CASSAVA	1				.75
18	COCONUT	1				
	WEANING FOOD (2)	N.A	N.A	N.A	N.A	N.A

(1) Typical contents= sweet potato flour, carrots, pumpkin, greens, spices

(2) Mixture of sweet potato, chick pea, pigeon pea, peanut, corn and toasted wheat flours

SOLAR DRYER COST (92CM X 48CM)
 JANUARY 1994
 CAOTACO WORKSHOP of FUDECO

DESCRIPTION	QUANTITY	PRICE	TOTAL
Plastic screen. 1/16 inch mesh	6 sq.ft.	1.50	9.00
Metal screen. 1 inch mesh	4 sq.ft.	6.50	26.00
No. 34 zinc sheet	13.5 sq.ft.	2.50	33.75
3 inch latch	1	3.00	3.00
3 inch hinge	2	3.00	3.00
Black paint	1 qt.	50.00	50.00
Carpenters glue	1 small bottle	7.50	7.50
Nails. 3/4, 1 and 1 1/2	1.5 pounds	10.00	15.00
No. 50 discs	1 box	12.00	12.00
1/4 inch plywood sheet	13 sq.ft.	9.50	123.50
Transparent plastic sheet	6 1/10	5.00	30.50
wood for legs and tray frames	13.5 sq.ft.	12.50	168.75
transportation	1	18.00	18.00
Labor	1	325.00	325.00
General Total			R.D.\$825.00

\$12 DR = \$1 U.S.

PERSONS CONTACTED

I. FUDECO

Nestor Sanchez, Director of Program Planning
Magdalena Jiménez, Coordinator, National Health Program
San Tomas Perez Quevedo, Director of Operations- Las Matas de Farfan area
Efrain Mansueto Lugo, Local Training Coordinator
Mary Richards, Assistant to Child Survival Coordinator

II. USAID/ DR

Jack Thomas, HPN officer

III. Communities in San Juan and Elias Peña provinces

- A. Los Jobos, Members of Sagrado Corazon de Jesus club
- b. Palo Seco, Members of Las Mercedes club
- C. Quemado, Members of Santisima Cruz club
- D. San José, Members of La Solución club
- E. La Meseta, Members of Maria de los Remedios club