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# A Garden-Based Nutrition Intervention In The Rural Dominican Republic - Impact On Vitamin A Rich Food Consumption And Household Food Security

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A garden-based nutrition intervention in the rural Dominican Republic – impact on  
vitamin A rich food consumption and household food security

A Thesis Submitted to the  
Yale University School of Medicine  
in Partial Fulfillment of the Requirements for the  
Degree of Doctor of Medicine

by

John Christopher Binford

2012

A GARDEN-BASED NUTRITION INTERVENTION IN THE RURAL DOMINICAN REPUBLIC -  
IMPACT ON VITAMIN A RICH FOOD CONSUMPTION AND HOUSEHOLD FOOD SECURITY.  
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Garden-based nutrition interventions focus on improving food security and food diversity through the creation and augmentation of homestead food production. This study assesses the impact of a garden-based nutrition intervention on the consumption of vitamin A rich foods and household food security in rural communities of the Dominican Republic. It was hypothesized that communities participating in the intervention would experience a statistically significant increase in vitamin A rich food consumption and improved household food security compared to control communities. Validated “Vitamin A Food Frequency” and “Food Security” questionnaires were conducted by convenience sampling of households containing a pregnant woman or a child under the age of five years in two control, two intervention, and fourteen non-case/non-control communities before the initiation of a garden-based nutrition intervention. In case and control communities, interviews were conducted both before the intervention (n=69) and two years after its initiation (n=45). Pre- and post-intervention analysis revealed an increase in average weekly intake of vitamin A rich foods in both intervention and control communities ( $p < 0.05$ ) but the treatment effect did not reach significance. Both control and intervention communities experienced statistically insignificant improvements of food security. These results indicate that garden-based nutrition interventions may be a valuable means to enhance vitamin A food intake in rural settings in developing countries, though a larger sample size may be needed to reach statistical significance.

## **Acknowledgements**

I would like to thank the Office of Student Research and the Downs Fellowship for their monetary and intellectual contributions to the project. I also want to thank Meredith Camp for her collaboration and support throughout the duration of this project. It was her unwavering commitment to these communities that led to this collaboration, and it was her selfless work that led to the true rewards of this project – a sense of collective community improvement and rich interpersonal relationships. A special thanks is due for Dr. Debbie Humphries for sharing her insights, experience and enthusiasm; I could not have asked for a better mentor. Also, I have a debt of gratitude for Dr. Kaveh Khoushnood for his resolute commitment to students and his passion for international education. Also, many thanks for the staff at the Fundación de Salud y Bienestar, especially the network of health promoters that made this work possible. Finally, this project would not have been realized without the families of the participating bateyes who were gracious hosts throughout my stay in their communities. Gracias a ustedes!

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## **Introduction**

### ***Food Security***

Food security occurs when “all people at all times have physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life” [1]. Thus, food security refers to both the quality and quantity of food available to each individual person, with the additional nuance that this may be fluctuant over the course of time. The components of food security, therefore, include the availability of food, individuals’ access to food, the nutritional adequacy of that food, and the ability to utilize this food, including health factors such as the presence of intestinal parasites [2]. Food security is undeniably linked to numerous individual and societal factors, from poverty, health, and food production to political stability, infrastructure, and availability of markets. Given the complex nature of food insecurity, and its confusion with hunger, these terms must be elucidated:

Food Insecurity - “Limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.” [3]

Hunger - “The uneasy or painful sensation caused by a lack of food. The recurrent and involuntary lack of access to food. Hunger may produce malnutrition over time. Hunger... is a potential, although not necessary, consequence of food insecurity.” [4].

In 2000, when world leaders met to establish the Millennium Development Goals (MDGs), the first defined goal was “to reduce by half the proportion of people who suffer from hunger” [5]. According to the WHO, when these goals were outlined in the year 2000, 17% of the global population, totaling 821 million individuals, suffered from hunger. The newest estimates, however, indicate that from 2006 to 2008 over 15% of the population living in the developing world continued to suffer from hunger. Though a smaller fraction of the global population was affected in more recent years, these statistics reveal that the number of *individuals* affected--840 million--has actually increased since the MDGs were developed [6]. The first MDG was also coupled with decreasing extreme poverty, defined as an individual making less than \$1.25 per day. The number of people making less than this amount decreased from 1.8 billion in 1990 to 1.4 billion in 2005, though this improvement may have decreased secondary to global financial problems. More recent data regarding populations suffering from hunger is not yet available because of limitations in data collection methods [5].

### ***Consequences of Malnutrition***

Of course, food insecurity is not solely dependent on food availability; the nutritional adequacy of foods is also a central determinant. Energy and protein requirements must be met to prevent marasmus, kwashiorkor and the systemic complications that accompany these nutritional deficiencies. However, even populations who do not experience chronic hunger or caloric deficiencies may be at risk.

Micronutrient deficiencies are extremely common in rural populations that depend on staple crops for the majority of their caloric intake. These deficiencies are especially exacerbated when animal products are infrequently consumed [7].

Of the numerous documented micronutrient deficiencies, this paper focuses on Vitamin A due to its important effects on human health. The impact of Vitamin A deficiency in developing countries is profound; the World Health Organization estimates that 250 million children are currently at risk for vitamin A deficiency [8]. Vitamin A is a critical component for proper performance of the visual system, cell and tissue function and growth, red blood cell production, and immunity [9]. Vitamin A deficiency is the major cause of preventable blindness worldwide, especially in children [10]. Decreased immunologic functioning particularly magnifies morbidity and mortality; susceptibility of diarrhea and measles, for example, is increased in those with vitamin A deficiency [11]. Anemia can also be caused or exacerbated by vitamin A deficiency [12]. Women and children in resource-poor settings are most at risk secondary to increased metabolic demands [8, 10]. Of note, interventions increasing vitamin A intake alone have been documented to achieve improved health outcomes. Children between the ages of 6 and 59 months have experienced a 23-30% decrease in mortality when receiving vitamin A supplementation in developing country settings [13], indicating both the severe consequences of vitamin A malnutrition as well as the efficacy of addressing these nutritional inadequacies. In fact, a recent review of existing interventions identified increasing vitamin A and zinc as well as counseling about breast-feeding to be the most



efficacious strategies to reduce child morbidity and mortality in developing country settings [7].

### ***Standardized Measures of Malnutrition***

#### *Food Insecurity Measures*

Measurements and definitions for food insecurity at the population level are required for vulnerable populations to be targeted. Interventions sponsored by governments, NGOs, or other entities must also rely on sound measures of food insecurity to evaluate and reassess the efficacy of food security interventions. In an effort to provide a reliable and valid measure for food security at the household level, the United States Agency for International Development (USAID) funded Food and Nutrition Technical Assistance (FANTA) at the Academy for Educational Development (AED) to develop a simple, standardized tool for data gathering across populations in varied cultural and international contexts. The development of the tool occurred in two phases: “First, theoretic and evidence-based development of a food insecurity measurement instrument; and second, validation and refinement of the instrument based on empiric data” [14]. The end result was finalized in 2006 and subsequently referred to as the Household Food Insecurity Access Scale (HFIAS). Ultimately, the HFIAS was an adaptation of the Household Food Security Survey Module (HFSSM) that was already used by the United States Department of Agriculture (USDA) to measure food insecurity in the United States. This model relies on the idea that food insecurity causes predictable reactions in individuals; these reactions can then be elucidated through questionnaires

and documented accurately through the use of scaled responses. Thus, the HFIAS, applied in international settings, is essentially a derivation of a statistically validated tool used by governmental agencies in the United States since 1995 [14]. Although the HFSSM and the HFIAS are similar in their fundamental structure, there are several differences. Changes in wording, recall period, and the inclusion of frequency questions (“never, rarely, sometimes, often”) were adapted for application in international settings. Also with the HFIAS, qualitative information about the experience of food insecurity can be incorporated into the wording of the questions, making it more culturally relevant and accurate [14]. The end result is a nine-item likert-type scale focusing on 1) worries about food, 2) not being able to eat preferred foods, 3) eating limited varieties of foods, 4) eating undesired foods, 5) eating smaller meals, 6) eating fewer meals, 7) having no food in the house, 8) going to sleep hungry, and 9) passing the entire day without eating. The interviewee is asked to recall an average week in the past month; they must respond either “never, rarely, sometimes, or often” - terms that are defined by specific frequencies before initiation of the interview [15].

Subsequent to the creation of the HFIAS in 2006, a systematic validation of the instrument was sought by researchers. Through consideration of internal and external validity in numerous developing country settings, the authors conclude that the first six items cannot be used cross-culturally without significant local adaptation. It was concluded that notions of worry, desired foods, the appropriate amount of food and number of meals per day may be too variable in different cultural contexts. Ultimately, the final three questions--having no food in the house, going to sleep hungry, and passing

the entire day without eating--are most consistent across cultures. Deitchler et al, as a result of these findings, suggest a new score called the Household Hunger Scale (HHS) that consists of only the final three questions of the HFIAS [14]. The HHS may have limitations given its focus only on certain aspects of food insecurity, notably, the absence of food and the experience of hunger. Thus, this tool may not be as sensitive to limitations in dietary quality, since it may not identify households with sufficient caloric intake but insufficient micronutrients and food diversity. However, the HHS, at present, appears to be the most widely applicable, culturally invariant measure of household food insecurity that has been validated through rigorous study.

The need to validate these measures in specific cultural settings may still be important to ensure the validity and reliability of the data. This thesis focuses on communities in the Dominican Republic. Therefore, of note is one particular qualitative assessment of the U.S. Household Food Security Survey Model conducted through interviews with 110 rural, low-income household members in the Dominican Republic. The validity of this model was tested through comparing the questionnaire score to associations with household characteristics that were expected to cause or result from food insecurity. The authors concluded that the U.S. Household Food Security Survey Module was an acceptable means of identifying at risk populations in the Dominican Republic [16].

#### *Vitamin A Food Frequency Measure*

Given the significance of vitamin A deficiency, accurate assessment of risk and

deficiency is important. However, the assessment of vitamin A levels in vulnerable populations has historically not been a straightforward endeavor. Vitamin A deficiency was traditionally identified through xerophthalmia or biochemical assays, but these methods have proved expensive and unavailable in low-cost settings [17, 18]. In response, Hellen Keller International has validated a “Vitamin A Food Frequency” questionnaire. This measure operates at the household level and asks the interviewee to identify how many times certain vitamin A rich foods have been consumed in the past week. Specific times and quantities are not included, but the measure attempts to offer a broad indicator of eating habits with a particular focus on foods with more than 100 retinol equivalents per 100 grams. This Vitamin A Food Frequency questionnaire was studied in three developing country settings--Tanzania, Guatemala, and the Philippines. In each study, serum retinol values correlated with self-reported consumption of Vitamin A rich foods, identifying this method as an alternative means of identifying vitamin A deficient individuals and populations [18].

### ***Vulnerable populations***

#### ***Women***

Overall, in developing countries, it is estimated that 19 million pregnant women have vitamin A deficiency secondary to poor diet. Furthermore, approximately 40% of women in developing countries of child-bearing age are anemic [19]. These estimates indicate a large burden of food insecurity and micronutrient deficiencies for women in these countries; poor health and economic projections for both these women and their

offspring are therefore thought to be central issues that might be systematically addressed.

It is also important to note that women experience special dietary needs during pregnancy, including sufficient iron, folic acid, calcium, vitamin A, and zinc. The detrimental outcomes associated with micronutrient deficiencies may be very significant in this population. Numerous studies suggest relationships between “(1) malnutrition and obstructed labour; (2) calcium deficiency and preeclampsia; (3) iron deficiency and anemia; (4) vitamin A deficiency and anemia or infection; and (5) zinc deficiency and haemorrhage or infection” [20]. In particularly high-risk populations, including pregnant women due to increased metabolic demands, micronutrient supplementation serves as a possible intervention to reduce maternal and fetal morbidity and mortality [21]. One large, randomized, placebo-controlled double-blind study in Nepal, for example, suggested that vitamin A or  $\beta$ -carotene supplementation correlates with a 40% reduction in maternal mortality [22]. The possible teratogenic effects of high vitamin A doses suggest a need for further study and consideration of adverse effects. However, the existing research surrounding pregnant women and their dietary needs reveals that high-risk populations can be targeted through cost-effective and long-lasting nutrition interventions that decrease both maternal and fetal morbidity and mortality [7].

### *Neonates*

Not surprisingly, neonates and infants are also at increased risk for the ill effects of food insecurity and micronutrient deficiencies. Each year, 4 million infants die in the

perinatal period; 99% of these deaths occur in developing countries [23]. The WHO defines low birth weight as a birth weight less than 2500 grams [24]. Although only 14% of births are classified as low birth weight, they account for 60-80% of neonatal deaths globally. Ultimately, either pre-term birth or intrauterine growth restriction may account for low birth weight. Of note, the risk of intrauterine growth restriction secondary to low-energy intake or micronutrient deficiencies in the mother may be particularly paramount in developing countries. Short-stature, low prepregnancy BMI, and poor diet all carry increased relative risk for intrauterine growth restriction, and, secondarily, low birth weights and increased neonatal morbidity and mortality [25]. Some preliminary research indicates that nutritional interventions may improve neonatal outcome in high-risk populations. In a randomized trial from Gambia, protein and caloric supplementation were associated with increased gestational weight gain and a reduced risk of stillbirth [26].

Indeed, other maternal nutritional interventions have been well-established and integrated into allopathic medicine to improve neonatal outcomes. For example, Hibbard, in the 1960s, was the first investigator to identify an increased risk of neural tube defects in women with folic acid deficiency. Anencephaly, craniorachischisis, and meningomyelocele have thus been demonstrated to be significantly less prevalent in neonates born to women with adequate folic acid stores. As a result, periconceptual folic acid supplementation is a key public health effort to minimize these abnormalities [27].

*Children*

Young children are also at increased risk in food insecure settings. Increased metabolism and complex neural growth during this developmental timeframe make children particularly susceptible to energy and micronutrient deficiencies. Poor physical development is an obvious concern in the food insecure, but there is also ample evidence supporting a link between poor physical growth and insufficient or delayed development of mental faculties [28]. It is difficult to ascertain a causal pathway for this relationship given numerous environmental factors that could be detrimental to both physical and mental development. However, the presence of decreased energy stores or metabolic derangements from micronutrient deficiencies is certainly thought to be globally detrimental for the overall well-being of young children. Regardless of etiology, impaired growth tends to be most damaging in children under five years of age; once growth retardation is well established in an individual, recuperation does not typically occur despite possible changes in nutrition [29]. The child with nutritional deficiencies suffers not only from impaired growth and decreased school and intellectual achievement, but also from decreased immunological functioning, with increased risk for diarrhea, pneumonia, malaria, and meningitis [30].

### ***Garden-based Interventions***

Garden-based nutrition interventions focus on improving food security and food diversity through the creation and augmentation of homestead food production. Though these interventions may vary in methodology, at the core of garden-based nutrition interventions is the enabling of households to have direct access to food that can be

grown, harvested, and consumed by members of the household. In developing countries, households with gardens “typically obtain from them more than 50% of their supply of vegetables and fruits” [31]. Some interventions include animal-raising, augmenting protein and micronutrient intake from meat or other animal products. The benefits of garden-based interventions may be more widespread:

“Food-based strategies such as homestead food production have the potential to increase micronutrient intake and improve the health and nutritional status of nutritionally at-risk women and children through various pathways, including increased household production for own consumption, increased income from the sale of products, and improved social status of women through greater control over resources” [32].

Garden-based nutrition interventions have been shown to successfully reduce micronutrient deficiencies and improve associated health outcomes. One review article noted that of thirteen gardening interventions reported, eleven of these projects demonstrated improvements of nutrition using a total of nineteen nutrition indicators (including diet, anthropometric, biochemical and morbidity indices). These projects were implemented in a broad range of community settings from Asia, Africa, and Latin America, revealing a potentially vast geographic applicability for this type of intervention [33]. However, these types of agricultural interventions are very difficult to conduct and evaluate rigorously; a recent systematic review suggests that the quality of the evidence



supporting the benefits of garden and agricultural interventions is less convincing than has previously been presented [34].

Spurred by this philosophical framework and reports of efficacious projects, numerous non-governmental organizations and governmental entities have invested in garden-based nutrition interventions. However, opponents have challenged the premise of increased food production augmenting local nutrition of vulnerable populations. Some critics claim that these projects, when implemented, suffer from poor design, planning, and follow-up. Furthermore, critics state that this top-down project creation from governments and NGOs may fail to incorporate local conditions, attitudes, and beliefs [35]. Others state that gardening is not cost-effective when compared to fortification or supplementation of micronutrients through other means [31]. Also, many food insecure households may lack property, water, or technical support to successfully participate in a garden-based intervention. Proponents of garden-based interventions counter that, when properly adapted to local conditions, homestead production is sustainable and not dependent on the ongoing support of NGOs or governmental support; in effect, it enhances self-efficacy of marginalized populations [36].

### ***The Dominican Republic***

The Dominican Republic lies on the eastern two-thirds of the island of Hispaniola. Its closest neighbor, Haiti, occupies the western one-third of the island. The climate is tropical with temperatures oscillating between 22 and 32 degrees centigrade and rainfall between 400 mm in the driest areas and 2,300 mm in the most humid areas

[37]. The environment allows for abundant agriculture, although the service sector has overtaken agriculture as the leading employer of Dominicans mainly as a result of growth in tourism and free-trade zones. More than one million tourists visit the DR every year, contributing close to US\$1 billion to the economy. Remittances from the United States also help to support 30% of all Dominican families. However, the country has high levels of inequity in income distribution. In 2002, the wealthiest 20% obtained 53% of gross income whereas the poorest 40% only 14% [38]. An average agricultural day laborer still earns approximately 150 pesos per day (less than \$6 per day), and the unemployment rate is nearly 20 percent. The nation's \$7 billion foreign public debt represents nearly half of its GDP, and less than 5% of GDP is spent on education, health and social welfare [38]. Poverty incidence in the rural areas is three times higher than in urban areas, and it reaches extreme levels on the Haitian border and in the batey communities--former sugarcane plantations. In 2000, 54% of the population lived in poverty and 28% in extreme poverty; in 2003, these figures rose to 62% and 33%, respectively, after banking fraud caused losses of 20% of GDP, a fiscal deficit, and inflation of 42.7 percent [38].

### ***Monte Plata***

This paper specifically addresses the nutrition of pregnant women and children under the age of five in the poor, rural regions of Monte Plata, located north of Santo Domingo. The vast majority of the inhabitants are subsistence farmers, growing yucca, sweet potato, and other root varieties to feed their families. The small communities of 50 to 100 houses scattered throughout the regions are connected by dirt roads and most are

the remains of sugarcane settlements, also known as bateyes. As bateyes historically consisted of a large Haitian workforce, many of the people in the area are Haitian or of Haitian descent. Of note, there is a strong and unrelenting prejudice against Haitians in the Dominican Republic; people of Haitian descent are denied most of the already limited public services in the area, such as medical care and access to building aqueducts.

After the sugarcane plantations were shut down at the end of the Trujillo dictatorship, the large pineapple company Dole was a source of prosperous employment for people in the area for twelve years. However, Dole abandoned operations in Monte Plata in 1996. Since there is no longer a significant employer in the area, the majority of the working-age class has moved to the cities and small towns, leaving grandparents to raise grandchildren with what they can produce from the land. Although the cities and small towns are familiar with many of the modern technological advancements, the poor, rural areas of the country are still overwhelmed by a lack of even basic infrastructure--unpaved roads, faulty bridges, expensive and unreliable transportation, inadequate schools, and few rural clinics or medical services of any kind. A recent unpublished needs assessment conducted through Peace Corps identified that many families in the rural batey communities of Monte Plata rely on starchy roots such as yucca whereas meat, vegetables, and dairy products are less available. These dietary patterns carry a high risk of micronutrient deficiency and malnutrition [39]. Indeed, Chilean researches revealed that risk of stunting in children due to malnourishment was more than doubled in rural areas of the Dominican Republic compared to their urban counterparts [40]. Another study identified Monte Plata as one of the worst areas for nutrition-related health

outcomes. Though this study was conducted two decades ago, it revealed 13% of school age children with goiter and 25% with anemia [41].

Of note, the batey communities of the Dominican Republic may be particularly ready to benefit from homestead food production given the existing agricultural infrastructure. The field crops that are already utilized and relied upon provide the bulk caloric intake, but lack essential nutrients that are required for optimal well-being. Indeed, the diets of the poor are often characterized by a heavy reliance on cereals or starchy tuberous roots with vegetables, fruits, and meats often unavailable [30]. The homestead garden, therefore, offers a means to supplement the starches with vitamin-rich vegetables and fruits and provide financial means to further augment diet or provide for other necessities.

### ***Fundación de Salud y Bienestar and Peace Corps***

The principal collaborators of this research are the national NGO Fundación de Salud y Bienestar, Inc (FUSABI) and Peace Corps. FUSABI was founded in 1989 by its director Guarionex Almonte Mora. The mission of the institution is to promote the sustainable development of local economies for the betterment of the quality of life, health, and environment in the poorest, most marginalized rural communities of the southeast, specifically the province of Monte Plata and the municipality of Jarabacoa [42].

Within Peace Corps, there are approximately 150 volunteers working in 29 provinces of the country in five main technical sectors: Environment; Education;

Community Economic Development; Health; and Youth, Family, and Community Development [43]. Within the Health technical sector, the Healthy Communities project targets low income, at-risk infant/maternal and youth populations living in small rural villages of the Dominican Republic in order to increase health education opportunities and access to resources that will result in healthier lives. It is the health sector that contributed towards the realization of this project.

### **Statement of purpose**

These two cross-sectional studies assess the effects of a garden-based nutrition intervention in rural communities of the Dominican Republic.

### **Study aims**

1. To document the extent of food insecurity in rural batey communities of the Dominican Republic, and to identify household variables that correlate with food secure households.
2. To characterize the effect of a garden-based nutrition intervention on vitamin A food frequency and food security measures.
3. To further understand and consider local sociocultural dynamics that may influence responses to standardized food security measures.

## **Hypotheses**

1. Rural batey communities of the Dominican Republic experience high rates of food insecurity as defined by validated food security measures.
2. The initiation of a garden-based nutrition intervention will increase vitamin A food frequency in participating communities compared to control communities.
3. The initiation of a garden-based nutrition intervention will decrease food insecurity in participating communities compared to control communities.
4. Structured interviews will offer insights into local sociocultural dynamics that may influence the vitamin A food frequency and food security interview questions.

## **Methods**

### ***Pre-Intervention***

A pre-intervention interview was designed to gather baseline data from vulnerable communities in the Monte Plata region where implementation of the food security pilot project was planned. The questions were selected from validated surveys in the relevant literature and modified by experts in the field. Additional on-site modifications to the questions were made after pilot interviews with community members of the target population as well as input from the local director of FUSABI.

In May of 2009, the FUSABI community health promoters were introduced to the purpose and format of the survey and were trained on how to administer the interview to members of their communities. Potentially problematic questions were clarified using a mock interview as an example. An emphasis was placed on how to read and clarify the

questions without insinuating the desired responses and how to avoid having the opinions of neighbors and family members skew the responses of the interviewees. The community health promoters were instructed to interview the head woman of households with children under the age of five and pregnant women. The head woman of all qualifying households was informed of the purpose of the interview and asked to participate.

Between May and June of 2009, 17 FUSABI community health promoters representing 16 different batey communities throughout the region of Monte Plata each conducted between 3 and 27 interviews<sup>1</sup>. In total, the community health promoters obtained 209 personal interviews. Additionally, the author personally performed 15 interviews in one batey community, Jabonico. Therefore, 224 unique families were surveyed. As some households contained multiple pregnant women and/or children less than five years of age, data on 326 individuals were collected--19 women and 307 children.

The interview consisted of seven sections<sup>2</sup>. For all children under five years of age and pregnant women living in the household being interviewed, Parts I and II asked for the age and sex of each child and for the pregnant woman's gestation as well as how frequently in the last three months each consumed six different vitamin A-rich foods prevalent in the community: green leaves (root leaves, spinach, lettuce), fruits (guayaba, passion fruit), mangos, carrots, milk or yogurt, and beets. Part III measured the household's food security status using the HFIAS. The vitamin A food frequency and

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<sup>1</sup> A map of the batey communities can be found in Appendix A.

<sup>2</sup> The pre-intervention diagnostic interview can be found in Appendix B.

food security measures served as the central quantitative indicators. Part IV included resource questions such as land and water availability and whether or not the household currently had gardens, fruit trees, or animals. Part V consisted of behavioral questions on division of garden and animal responsibilities and whether the household sold garden, fruit tree, or animal production yields. Finally, Parts VI and VII asked about knowledge regarding benefits and common problems with gardens and interest in participating in a future gardening project.

The standardized USAID/FANTA HFIAS questionnaire consists of nine occurrence questions that represent a generally increasing level of severity of food insecurity. For each of the nine questions, the frequency of occurrence experienced in the previous four weeks is categorized as rarely, sometimes, or often. The questions relate to three different domains of food insecurity found to be common to the cultures examined in a cross-country literature review as discussed in the introduction. The generic occurrence questions, grouped by domain, are:

- 1) Anxiety and uncertainty about the household food supply
- 2) Insufficient quality (includes variety and preferences of the type of food)
- 3) Insufficient food intake and its physical consequences

The food security status questions in Part III of the questionnaire were coded according to standard HFIAS protocol. The HFIAS score is a continuous measure of the degree of food insecurity in the household in the past four weeks. The response to each of the nine



questions is coded as follows: no = 0, rarely = 1, sometimes = 2, and often = 3. The HFIAS score variable is then calculated for each household by summing the codes for each frequency-of-occurrence question. The maximum score for a household is 27 (the household response to all nine frequency-of-occurrence questions was “often”, coded with response code of 3); the minimum score is 0 (the household responded “no” to all occurrence questions). The higher the score, the more food insecurity the household experienced. The lower the score, the less food insecurity a household experienced.

Subsequently, the Household Food Insecurity Access Prevalence (HFIAP) indicator categorizes households into four levels of household food insecurity: food secure, and mild, moderately and severely food insecure. Households are categorized as increasingly food insecure as they respond affirmatively to more severe conditions and/or experience those conditions more frequently. A food secure household experiences none of the food insecurity conditions, or just experiences worry, but rarely. A mildly food insecure household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely. Of note, the mildly food insecure household does not cut back on quantity nor experience any of three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating). A moderately food insecure household sacrifices quality of food more frequently by eating a monotonous diet or undesirable foods (responding “sometimes” or “often”), and/or has started to cut back on quantity of food by reducing the size of meals or number of meals, rarely or sometimes. However, the moderately food insecure

household does not experience any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating). In contrast, a severely food insecure household has graduated to cutting back on meal size or number of meals often and/or experiences any of the three most severe conditions noted above, even if the response is “rarely.” In other words, any household that experiences one of these three most severe conditions even once in the last four weeks is considered severely food insecure<sup>3</sup>.

The vitamin A food frequency questions in Part II of the questionnaire were tallied to quantify the total number of servings of vitamin A-rich foods consumed by pregnant women and children under five years of age in a normal week of the previous 3 months. Parts IV through VII consist largely of qualitative questions. Several questions had predetermined categorical responses. Others with open-ended questions were scored using categorical responses when applicable in order to facilitate statistical analysis and concrete interpretation while maintaining the flexibility necessary to address the myriad of potential obstacles and difficulties associated with launching a garden-based nutrition intervention.

The statistical analysis was carried out using iWork Numbers and SPSS. The data was entered with each pregnant woman and child under five years of age serving as an observation. Descriptive statistics for vitamin A food frequency, household food security, availability of resources, and interest in a garden-based food security intervention were tabulated and graphed. Finally, associations among food security measures and resource

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<sup>3</sup> The coding chart can be found in Appendix C.

variables were tested using a chi-square analysis.

### ***Post-intervention***

The pilot food security intervention was implemented in two of the 16 vulnerable batey communities assessed in the pre-intervention interview. The two intervention communities, Jabonico and Los Guineos, were chosen on the basis of management feasibility as Peace Corps and FUSABI had a substantial on-ground presence at these sites. The project consisted of nutrition education, patio vegetable gardens, and laying hens and was implemented between September 2008 and September 2010. The program theory underlying the intervention consists of boosting household self-efficacy by providing multiple means to provide more vitamin A rich foodstuffs and, subsequently, other household resources (Figure 1).

The post-intervention interview was designed to evaluate the effectiveness of the intervention in raising the vitamin A food frequency and food security measures of the most at-risk community members, pregnant women and children under five years. Therefore, identical vitamin A food frequency and food security questions to the pre-intervention survey were repeated with this population<sup>4</sup>. The survey was administered in July 2011 during the same time of year as the pre-intervention interview in order to control for seasonal variability in food availability. For each intervention community, a control community was chosen from the original 16 batey communities surveyed that had similar baseline food security indicators and background characteristics (water reliability,

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<sup>4</sup> The post-intervention interview can be found in Appendix D.

school zone, form of income, proximity to larger towns). Las Arenas served as the control to Jabonico, and Hato San Pedro served as the control to Los Guineos.

Similar to the pre-intervention analysis, the vitamin A food frequency responses were tallied, and the food security status questions were coded according to standard HFIAS protocol. Additionally, the data were coded using the HHS protocol in order to compare the culturally sensitive food security responses. This HHS analysis consisted of only the final three questions of the HFIAS (running out of food, going to bed hungry, or going a whole day and night without eating). In accordance with this scale, the categorical responses of the final three questions were given values such that never = 0, rarely or sometimes = 1, and often = 2. The value of each of the three questions were summed, and these sums were used to designate each household as “no household hunger” (scores 0-1), “moderate household hunger” (scores 2-3), and “severe household hunger” (scores 4-6). This HHS analysis was also applied to the pre-intervention data retrospectively for pre vs. post comparisons.

Data was collected for a total of 44 households, with vitamin A food frequency data for 14 women and 58 children. Again, the statistical analysis was carried out using iWorks Numbers and SPSS. Each pregnant woman and child under five years served as an observation. Given the limited sample size of pregnant women, only the data from children was used for the Vitamin A Food Frequency measure, whereas each household served as a data point for the food security measures. An independent analysis was also included excluding milk and mangos, since these foods should not be directly influenced by the creation of a garden-based intervention. Thus, only green leaves,

carrots, and beans were included in a sub-section of the analysis.

Logistic regression was conducted with the outcome of severe and moderate food insecurity vs. mild and no food insecurity to evaluate the effect of case/control status while controlling for pre-post intervention time on household food security status. A similar analysis was conducted for “no hunger” vs. “any hunger” with the HHS scoring rubric to elucidate possible treatment effect. Furthermore, a mixed effects model was developed to evaluate the effects of case/control status and pre/post intervention time on the frequency of garden vitamin A foods, while controlling for the effect of age and clustering within households. A repeated measures univariate analysis of variance (ANOVA) was conducted using SPSS 19.0 (IBM).

### ***Focus Group***

Upon completion of the interviews, a focus-group session was conducted with the head women of the participating households in Jabonico. Efforts were made to select a diverse group of women with varying educational backgrounds and different food security levels. Important culturally variable themes were discussed:

- 1) Concept of worry (question 1) - at what level of food insecurity is it experienced
- 2) Difference between questions 2, 3 and 4 (2: not able to eat preferred foods, 3: eat limited variety of foods, 4: eat foods that don't want to)
- 3) What is a meal portion? (question 5)
- 4) What is meal frequency? (question 6)

A transcript of the discussion was evaluated for repeating themes in order to gain insights into how participants may have understood the questions and how this may have influenced the outcome of the study.

## **Results<sup>5 6</sup>**

### ***Pre-intervention***

Data was collected in 224 distinct households, with vitamin A food frequency data collected for 313 children and 19 women residing in these households (Figure 2).

Primarily, baseline resource measures were calculated, including the percentage of households with access to food-producing land (56%), the percentage of households that have fruit trees (62%), the percentage of households that raise animals (70%) (Figure 3). 57% of households reported access to sufficient water for irrigation. The average monthly household income was RD\$ 3600 or US\$ 100; two households were excluded from the analyses due to incomes greater than four standard deviations above the mean. Only 12% of households cultivated vegetables in a garden at the time of the interview (Table 1). Those participants that had a garden reported difficulties with the amount of work (50%), the need for expertise (30%), animals destroying the crops (30%), and flooding (30%) as principal difficulties (Figure 4a). Of the households with gardens before the intervention, 29% of households sold their garden yields, 18% sold their fruits, and 37% sold their animal products. Of those without a garden, the principal concerns

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<sup>5</sup> See appendix E for figures and appendix F for tables

<sup>6</sup> See Figure 2 for outline of data collected

with gardening were animals destroying the crops (60%), lack of manpower (40%), lack of funds to get started (36%), and lack of land (31%) (Figure 4b). Ultimately, 98% of interviewees reported that they had sufficient time to care for and manage a vegetable garden and 91% were interested in participating in a garden-based nutrition project if information and materials were readily available.

A total of 69% of all households included in the study were found to be severely food insecure by HFIAS guidelines. Of these food insecure households, 40% responded positively to a question asking if they or someone in their household, within the last four weeks, passed an entire day without eating because of a lack of resources. In contrast, only 9% of households were labeled as food secure (Table 1).

Chi-square analysis was utilized to examine the associations between food security and other household measures. Of all resource indicators used, raising cows had a significant positive relationship with food secure households ( $p < 0.01$ ). There was no significant relationship between the raising of chickens or goats with household food security status. Of the behavioral measures, the selling of animals in market had the strongest positive relationship with food security ( $p < 0.01$ ). Furthermore, logistic regression was used to look at household resource variables associated with HHS household status, but none reached significance.

The vitamin A food frequency measurements before initiation of the intervention reveal that consumption of vitamin A rich foods did not vary significantly between different age groups in non-case/non-control communities. In these communities, vitamin A food frequency was highest in pregnant women with an average of 12.8

vitamin A rich food servings per week; children under one year of age average 9.8 vitamin A rich food servings/week and children between one and five years of age average 12.5 vitamin A rich food servings/week (Table 2).

Before the intervention, the percentage of households in the two control communities were similar to the percentage of households in the two intervention communities in several demographic and SES indicators: possession of fruit trees (36% vs 43%), raising of animals (50% vs 64%), average monthly household income (RD \$2295 vs RD\$2565), and households with vegetable gardens (0% vs 3%). However, there were differences in the availability of land to farm (18% vs 43%) and the availability of sufficient water for irrigation (100% vs 25%). The control and intervention communities shared similar distributions of HFIAS and HHS scores before the intervention. Of particular interest were the similar severely food insecure HFIAS (95% vs 82%) and HHS measurements (23% vs 29%) which were used to choose the control communities to match the intervention communities. Regarding pre-intervention vitamin A intake, the difference in consumption was more pronounced, with 13.9 servings/week in case communities and 6.6 servings/week in control communities (Table 3a). Mangos and milk were the most frequently cited vitamin A rich food source in these particular communities. The mean age of children in control communities was 2.4 (SD=1.1) compared to 2.5 (SD=1.5) in case communities.

### ***Post-intervention***

Data was collected for a total of 44 households with pregnant women or children



under 5 years: 15 in Jabonico, 9 in Las Arenas, 15 in Los Guineos, and 15 in Hato San Pedro (Figure 2). Of these 44 households, some contained multiple pregnant women and/or children under five years of age, so vitamin A food frequency was obtained for 14 women and 58 children. The mean age of children in control communities was 2.2 (SD=1.3) compared to 2.7 (SD=1.4) in case communities.

Post-intervention, both case and control communities revealed a dramatic increase in vitamin A food frequency measures. Children in case communities averaged 48.3 servings of vitamin A rich foods/week compared to 44.0 servings/week in control communities. The increase in the all communities' vitamin A food frequency scores was attributed primarily to the large increase in mango and milk consumption (Table 3b). The consumption of garden-specific vitamin A rich foods (green leafy vegetables, carrots, beats) was noted to be greater in case communities compared to the controls (Figure 5). However, multilevel linear model controlling for the nested nature of the data (children living in the same household) and the effect of age, found no effect of either time (pre/post) or case/control status on these garden-specific vitamin A food frequencies (Figure 6).

Ultimately, there was no statistically significant changes in food security using the HFIAS scale between case and control communities based on logistic regression. All communities revealed improved HFIAS scores over time, but that improvement was statistically independent of the intervention. Of note, there was a larger shift in percentage of severely food insecure to the moderately food insecure and mildly food insecure categories among the control communities compared to the intervention

communities (Table 4).

Using the HHS scale, there was also no statistically significant improvement in food security. Similar to the HFIAS measurement, both control and intervention communities improved over time, but that improvement was independent of the intervention. Also in parallel to the HFIAS measurement, there was a larger shift in percentage of severely food insecure to the moderately food insecure category among the control communities versus the intervention communities (Table 5).

### ***Focus Group***<sup>7</sup>

*Category 1: Concept of worry (HFIAS question 1) - at what level of food insecurity is it experienced*

Women in the focus group expressed worry for food as a principal concern in the community, comparable to the concern for far-away family members and the sick. One participant commented that proper nutrition is essential to keep the body functioning. It was noted that the time of year of the discussion was a particularly difficult time to find food because there were few starchy roots ready to be harvested. A woman stated that she begins to worry about food after she has passed a day without food, an indicator of severe food insecurity, and another woman echoed that it is a constant worry throughout the day that begins immediately upon awakening. Participants also commented on the connection between other resources, such as currency, as other worries that are integral to food availability.

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<sup>7</sup> A transcript of the focus group discussion can be found in Appendix G (English version) and Appendix H (Spanish version).

*Category 2: Difference between HFIAS questions 2, 3 and 4 (2: not able to eat preferred foods, 3: eat limited variety of foods, 4: eat undesired foods)*

One principal overarching theme was the preference of starchy foods; their value is contingent upon their ability to provide satiety. In contrast, readily available foods (such as okra and breadfruit) are not as valuable as foods that are obtained intermittently (such as salad and peas). For one woman, a limited variety of food was a limited quantity of food. Another participant commented that a diet is not deemed of limited variety until the same foods are consumed for a week.

*Category 3: What is a meal portion (HFIAS question 5)*

Participants disagreed on what is a limited quantity of food, but their discussion focused solely on the quantity of rice. One woman indicated that one does not need to be concerned about a decreased quantity of food if the food still provides satiety.

*Category 4: What is meal frequency (HFIAS question 6)*

Meal frequency is an indicator of food availability, but based on participants' attitude toward the question, quantity is more of a concern than frequency.

## **Discussion**

### ***Pre-intervention***

A primary aim of the pre-intervention component of this study was to document the extent of food insecurity in these rural batey communities of the Dominican Republic.

In this regard, 69% of participating households were found to be severely food insecure based on HFIAS scoring guidelines. The staggering prevalence of severe food insecurity in this at-risk population indicates the need for an effective intervention to mitigate adverse outcomes associated with food insecurity and micronutrient deficiency. The severity of this issue is well characterized by the finding that 40% of households have a member that passed an entire day in the previous four weeks without eating due to a lack of resources. These findings, coupled with the widespread presence of subsistence agricultural practices, indicate a potential need to expand avenues for household food acquisition. Since only 12% of households currently cultivate vegetables in a garden, a garden-based nutrition intervention may be of primary value in these batey communities for expanding both the quantity and diversity of household food consumption. The potential for local support is large, with 91% of individuals interviewed expressing a definite interest in participating in a garden-based project if information and materials were readily available through FUSABI, a local NGO with a history of project management in the area.

A secondary aim of the pre-intervention component of the study was to identify household variables that correlate with food secure households. It was noted that household that raise cows or sell animals at market have less severe food insecurity. This information may be used in the future to target vulnerable households, though the widespread prevalence of severe food insecurity indicates that all households containing a child under the age of five years or a pregnant woman may need to be included, as was the approach in this study. Also, though no causal associations can be inferred from this

data, the intervention, in theory, could improve one of these predictive household variables--the selling of animals at market--by providing chickens and education regarding their propagation.

### ***Post-intervention***

The principal aim of the post-intervention analysis was to characterize the effect of the garden-based nutrition intervention on vitamin A food frequency and HFIAS/HHS food security measures. Thus, two years after the initiation of the garden-based nutrition intervention, it was noted that there was a statistically significant increase in average weekly intake of vitamin A-rich food in both control and intervention communities. Although the difference in the intervention communities was greater than the control communities, it did not reach statistical significance. The increase in vitamin A rich food consumption in both intervention and control communities could be accounted for by factors experienced by all communities, including variability in annual crop yield and other local economic factors. Specifically, the drastic increase in mango and milk consumption accounts for much of this increase. Since these two foods were not directly involved in the intervention, it is unclear what may have resulted in their increased consumption, but shared local factors may have led to increased consumption on a regional scale. Alternatively, the trend of increased vitamin A rich food consumption in intervention compared to control communities may be an indication of project success with further study required for elucidation. However, for the program to have caused an increase in milk and mango consumption, an indirect pathway would have to be

identified. If this were the case, either money that was raised by selling produce or eggs was diverted towards the consumption of milk and mangos or the education component of the intervention caused widespread behavioral changes. This is unlikely, though, since similar increases in control communities would not be expected. Ultimately, it is more likely that data collection techniques may have influenced this increase, as discussed below.

Also of principal importance in the post-intervention component of the study was the evaluation of pre- and post-intervention food security measures. Using the HHS and HFIAS scales, there were no statistically significant improvements in food security. Both control and intervention communities did evidence improvement in food security over time, but that improvement was statistically independent of the intervention. There was a larger shift in percentage of severely food insecure to the moderately food insecure category among the control communities versus the intervention communities in both HHS and HFIAS, further indicating that the intervention was likely not responsible for these changes in food security.

It should be noted that during the post-intervention data collection, participation and evaluation of the garden-based nutrition intervention was not included. Casual observation by the author noted that some households in the intervention community were not actively participating in the intervention program. Others stated that their gardens were not currently being utilized secondary to economic and environmental barriers, such as lack of water availability. Also, some participants noted that they ate their egg-laying hens that were a part of the program. Since the HHS and HFIAS tools

only measure recent household food security, conducting the study during a time of difficulty may not show the average effect of the intervention. Thus, an intervention that is intended for longitudinal benefit may fluctuate according to numerous confounding factors; if the data is collected during a nadir of project efficacy, the overall influence of the intervention may be deemed inappropriately ineffective. Alternatively, the intervention may have succeeded in the first year, but afterwards the intervention effects decreased as seeds, education, and other resources were not readily available.

Ultimately, this research does not indicate that a garden-based nutrition intervention in rural batey communities was associated with statistically significant increases in vitamin A rich food intake or in household food security compared to control communities. However, positive trends are noted in all principal measures, indicating the possible utility of such interventions in this high-risk population. The mode of data collection before and after the intervention as well as the fluctuation of local environmental and economic variables may complicate these findings as in other similar studies [34]. In the future, more standardized data collection coupled with increased sample sizes may yield more promising results. Furthermore, comparing actively participating households with control households may be a more reasonable means of identifying positive outcomes.

### ***Limitations***

Regarding the quality of the pre-intervention data, two of the 18 bateyes eligible for participation in the study were excluded due to the absence of both communities'

health promoters during the training session. Overall, the interview data was legible and followed the protocol for most questions. Some of the more qualitative or labor-intensive questions, however, yielded poorly characterized results. One question, for example, asked what household foods and what quantities of these foods are purchased (not cultivated) during a normal week. The responses to this question were so highly varied in the level of detail, that it was impossible to organize this data meaningfully. Also, a few health promoters expressed feeling uncomfortable asking about household income, and did not record these values. Overall, however, the “Vitamin A Food Frequency” and the “Food Security” questions were answered completely and correctly, as were the majority of other household variables.

Other quality issues confounded the post-intervention data. Of note, the same individuals did not conduct the interviews before and after the intervention. Before the intervention, local community health promoters conducted interviews in all but two communities, including both control communities and one intervention community (Hato San Pedro) whereas interviews in only one intervention community were conducted by the author (Jabanico). In contrast, all four post-intervention interviews were conducted by the author and a Peace Corps volunteer. Though the post-intervention data collection ensured correct protocol and interpretable data, it may have caused other complications. For example, since the author is not of Dominican origin, participants could have inflated their vitamin A rich food intake in the presence of a visitor for numerous reasons. Alternatively, explanations of the meaning of certain questions could have differed between the community health promoters and the author despite community health



promoter training. Also, regarding the increase in mango and milk consumption in the post-intervention analysis, the author, while conducting the interviews, clarified repeatedly that the questions asked for the number of total servings. It was noted that numerous times interviewees answered “seven” to milk and mangos, only to increase this number once they knew that more than one serving per day should be included as such. Though this clarification may have led to the collection of accurate post-intervention data, this data may have yielded dubious comparisons when placed alongside the same data collected by a health promoter who accepted the original response without ensuring correctness.

Finally, the sample size may not have been sufficient. Specifically, the overall positive trend in increased vitamin A rich food consumption in intervention compared to control communities could be indicative of project efficacy, but the small sample size limits the ability to reach statistical significance. A post hoc power analysis revealed that on the basis of the between-groups comparison of overall vitamin A rich food consumption, given the effect size observed in the present study ( $d = .21$ ), a total sample size of 536 individuals would be needed to obtain statistical power of 0.80. Thus, if the difference between case and control community vitamin A food frequency is truly indicative of broader patterns of community vitamin A food consumption, a much larger sample size is needed to establish this as a significant difference. Also of note, in order to increase sample size, all households with a pregnant woman and/or a child under the age of five were asked to participate regardless of their current participation in the intervention. Thus, if the interviews were conducted only with actively participating

households, it is possible that effect size would be greater and the sample size would not need to be as great to identify a statistically significant increased consumption of vitamin A rich foods in case communities.

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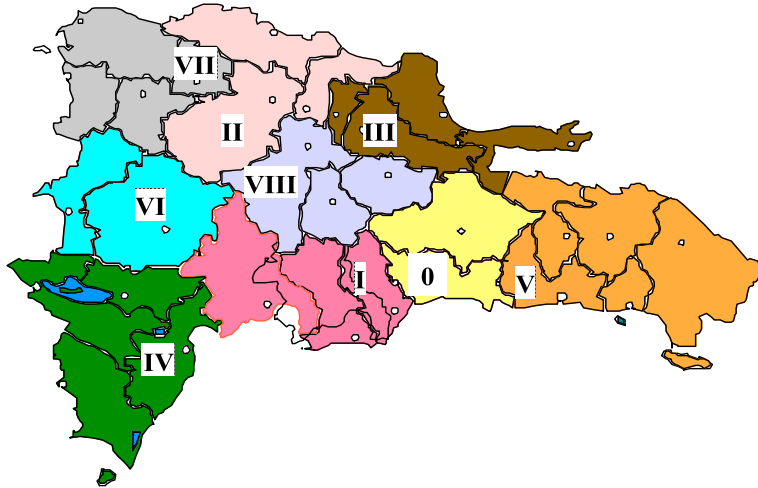
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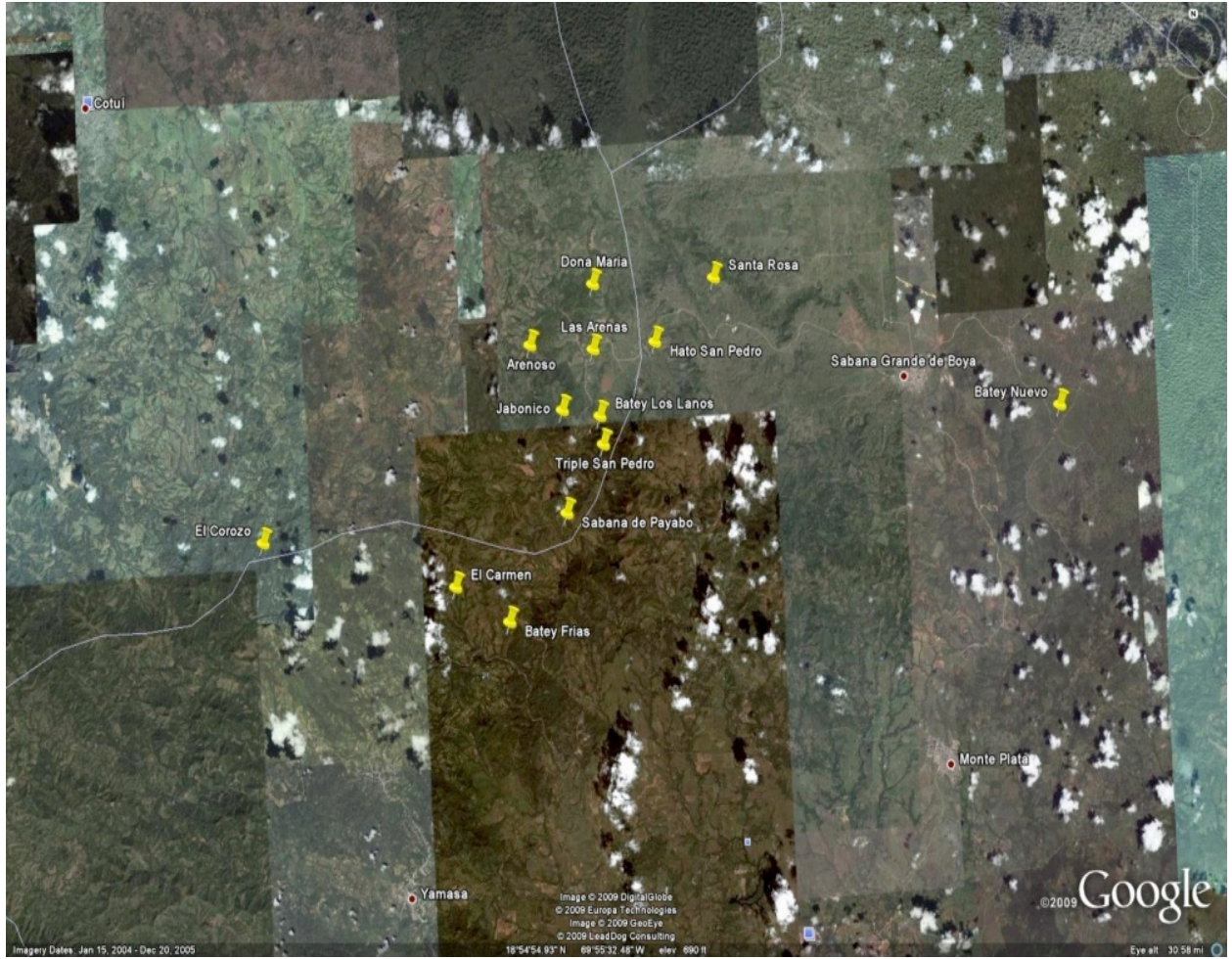
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# Appendix A

Maps of Participating Batey Communities in the Monte Plata region of the Dominican Republic



- **Region Zero:**  
Distrito Nacional & Monte Plata
- **Region I:**  
San Cristóbal, Azua, Peravia & Ocoa.
- **Region II:**  
Santiago, Espaillat & Puerto Plata.
- **Region III:**  
Duarte, Salcedo, Samaná & María Trinidad Sánchez
- **Region IV:**  
Barahona, Bahoruco, Pedernales & Independencia.
- **Region V:**  
San Pedro de Macorís, La Romana, El Seybo, Hato Mayor & La Altagracia.
- **Region VI:**  
San Juan de la Maguana & Elías Piña.
- **Region VII:**  
Valverde, Santiago Rodríguez, Dajabón & Montecristi.
- **Region VIII:**  
La Vega, Sánchez Ramírez & Monseñor Nouel





# Appendix B – Pre-intervention Interview

## Entrevista Nutritiva del FUSABI

Entrevistador(a): \_\_\_\_\_ Nombre de la comunidad: \_\_\_\_\_  
 Fecha de la visita: \_\_\_\_\_ Nombre de la persona entrevistada: \_\_\_\_\_

Nombre de niño menor de 5 años o mujer embarazada	Edad (indique años o meses)	Sexo (M= masculino, F= femenina)

### Parte I. Información Familiar

¿Quiénes viven en esta casa que tiene menos de cinco años o está embarazada?

### Parte II. Preguntas sobre frecuencia de alimentos ricos en Vitamina A

Nombre de niño menor de 5 años o mujer embarazada	¿Cuántas veces come hojas verdes en una semana?	¿Cuántas veces come frutas en una semana normal?	¿Cuántas veces come mangos en una semana normal?	¿Cuántas veces come zanahoria en una semana normal?	¿Cuántas veces come boruga o leche en una semana normal?	¿Cuántas veces come remolacha en una semana normal?

Para cada niño menor de 5 años y mujer embarazada que apuntó arriba, escriba cuantas veces **POR SEMANA EN UNA SEMANA NORMAL** en los últimos tres meses come algo abundante en hojas verdes, fruta, mango, zanahoria, boruga o leche, y remolacha:

### Parte III. Cuestionario de Seguridad Alimenticia

Para cada una de las nueve preguntas siguientes, ponga uno de estos números para indicar su respuesta:

0 = *Nunca*

1 = *Raramente (una o dos veces durante las cuatro semanas)*

2 = *A veces (tres a diez veces durante las cuatro semanas)*

3 = *A menudo (más de diez veces durante las cuatro semanas)*

III-1. ¿Durante las últimas cuatro semanas, estuvo preocupado/a que no hubiera suficiente comida en su hogar? Ponga un número para su repuesto: \_\_\_\_\_



a. ¿Puede usarla todos los días?  
 Si No Si la respuesta es no,  
 explique: \_\_\_\_\_

b. ¿Generalmente, hay agua suficiente para regar las plantas?  
 Si No Si la respuesta es no, explique: \_\_\_\_\_

IV-10 ¿Más o menos, cuál es su ingreso cada mes? o ¿Con cuánto dinero vive cada mes? Pesos: \_\_\_\_\_

**Parte V. Medidas de comportamiento**

V-1. ¿Quién realiza la mayor parte del trabajo de cultivo?  
 Doña Don Muchachos 15 a 18 anos Muchachos menos de 15 anos Otro: \_\_\_\_\_

V-2. ¿Quién realiza la mayor parte del trabajo de cuidar a los animales?  
 Doña Don Muchachos 15 a 18 anos Muchachos menos de 15 anos Otro: \_\_\_\_\_

V-3. ¿Alguna vez vende sus cultivos?  
 Si No ¿Qué vende? \_\_\_\_\_

V-4. ¿Alguna vez vende sus frutas?  
 Si No ¿Qué vende?  
 \_\_\_\_\_

V-5. ¿Alguna vez vende sus productos de animales?  
 Si No ¿Qué vende?  
 \_\_\_\_\_

V-6. ¿Qué tipo de comida compra generalmente para completar sus cultivos, frutas y productos animales? ¿Con que frecuencia los compra?

<i>Tipo de comida</i>	<i>¿Con que frecuencia los compra? (indique día, semana, o mes)</i>

**Parte VI. Conocimiento y experiencias con hortalizas**

¿Tiene una hortaliza (jardín vegetal)?

- Si dijo sí, vaya a A
- Si dijo no, vaya a B

**A. Si la casa tiene una hortaliza, haga las siguientes preguntas:**

VI-1. ¿Qué tipos de vegetales cultiva?  
 \_\_\_\_\_

VI-2. ¿Cuáles son los mejores beneficios de tener una hortaliza? (¿Por qué le parece bueno tener una hortaliza?)  
 \_\_\_\_\_  
 \_\_\_\_\_

VI-3. ¿Cuáles son los mayores problemas que ha tenido con la hortaliza? (Lea cada opción y apunte la respuesta.)

Inundaciones:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
Animales/ pestes:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
Demasiado trabajo:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
El costo:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
La pérdida de tierra:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
Los robos:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
No dio frutos o vegetales:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema

Algo más: \_\_\_\_\_

**B. Si la casa NO tiene una hortaliza, haga las siguientes preguntas:**

VI-4. ¿Tuvo alguna vez una hortaliza?

Si No Si dijo sí, ¿por qué no tiene una ahora? \_\_\_\_\_

VI-5. ¿Cuáles son las razones principales que no tiene una hortaliza? \_\_\_\_\_

VI-6. Si usted tuviera una hortaliza, estaría preocupado por cuales de las siguientes razones: (Lea cada opción y apunte la respuesta.)

Inundaciones:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
Animales/ pestes:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
Demasiado trabajo:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
El costo:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
La pérdida de tierra:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
Los robos:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema
No dio frutos o vegetales:	Gran Problema	Frecuentemente un problema	A veces un problema	Nunca es problema

Algo más: \_\_\_\_\_

**Parte VII. Interés**

VII-1. Si usted fuera a construir una hortaliza, cómo le gustaría recibir ayuda?

- Lecciones comunitarias sobre nutrición
- Lecciones comunitarias sobre hortalizas
- Materiales – semillas, madera, vallas o material para cercar
- Uso de la tierra (Lecciones sobre cómo usar y preparar la tierra)
- Otro: \_\_\_\_\_

VII-2. Si usted creara un jardín comunitario ¿quién cree que haría la mayor parte del trabajo?

Doña Don Muchachos 15 a 18 años Muchachos menos de 15 años Otro: \_\_\_\_\_

¿Cree que esta persona tendrían tiempo para trabajar en la hortaliza?

Si No

VII-3. Si FUSABI iniciara un proyecto de hortaliza ¿estaría usted interesado/a en participar?

Seguro que si Tal vez No Otro: \_\_\_\_\_

# Appendix C

Household Food Insecurity Access Scale (HFIAS) Coding Chart

Question	Frequency		
	Rarely 1	Sometimes 2	Often 3
1a			
2a			
3a			
4a			
5a			
6a			
7a			
8a			
9a			



- food secure



- moderately food insecure



- mildly food insecure



- severely food insecure

# Appendix D – Post–intervention Interview

## Entrevista Nutritiva del FUSABI

Entrevistador(a): \_\_\_\_\_ Nombre de la comunidad: \_\_\_\_\_  
 Fecha de la visita: \_\_\_\_\_ Nombre de la persona entrevistada: \_\_\_\_\_

Nombre de niño menor de 5 años o mujer embarazada	Edad (indique años o meses)	Sexo (M= masculino, F= femenina)

### Parte I. Información Familiar

¿Quiénes viven en esta casa que tienen menos de cinco años o está embarazada?

Nombre de niño menor de 5 años o mujer embarazada	¿Cuántas veces come hojas verdes* en una semana?	¿Cuántas veces come zanahoria en una semana normal?	¿Cuántas veces come remolacha en una semana normal?	¿Cuántas veces come auyama en una semana normal?	¿Cuántas veces come mangos en una semana normal?	¿Cuántas veces come lechosa en una semana normal?	¿Cuántas veces come chinola en una semana normal?	¿Cuántas veces come otras frutas en una semana normal?	¿Cuántas veces come boruga o leche en una semana normal?	¿Cuántas veces come huevos en una semana normal?	¿Cuántas veces come carne roja en una semana normal?

### Parte II. Frecuencia de Alimentos Ricos en Vitamina A

Para cada niño menor de 5 años y mujer embarazada que apuntó arriba, escriba cuantas veces POR SEMANA EN UNA SEMANA NORMAL en los últimos tres meses come algo abundante en hojas verdes, fruta, mango, zanahoria, boruga o leche, y remolacha:

**\*Incluye lechuga, espinaca, arrúgala, hoja de auyama/yuca/yautía/ñame, etc.**

### Parte III. Cuestionario de Seguridad Alimentaria

Para cada una de las nueve preguntas siguientes, ponga uno de estos números para indicar su respuesta:

- 0 = Nunca
- 1 = Raramente (una o dos veces durante las cuatro semanas)
- 2 = A veces (tres a diez veces durante las cuatro semanas)
- 3 = A menudo (más de diez veces durante las cuatro semanas)

III-1. ¿Durante las últimas cuatro semanas, estuvo preocupado/a que no hubiera suficiente comida en su hogar? Ponga un número para su repuesto: \_\_\_\_\_

III-2. ¿Durante las últimas cuatro semanas, usted o algún miembro de su hogar no pudo comer la clase de alimento que prefería por falta de recursos? Ponga un número para su repuesto: \_\_\_\_\_

III-3. ¿Durante las últimas cuatro semanas, usted o algún miembro de su hogar tuvo que comer una variedad limitada de alimentos/comida debido a la falta de recursos?  
Ponga un número para su repuesto: \_\_\_\_\_

III-4. ¿Durante las últimas cuatro semanas, usted o algún miembro de su hogar tuvo que comer algo que realmente no quería comer debido a la falta de recursos para obtener otro tipo de comida/alimentos?  
Ponga un número para su repuesto: \_\_\_\_\_

III-5. ¿Durante las últimas cuatro semanas, usted o algún miembro de su hogar tuvo que comer menos cantidad de comida/alimentos de la que necesitaba debido a que no había suficiente comida/alimentos?  
Ponga un número para su repuesto: \_\_\_\_\_

III-6. ¿Durante las últimas cuatro semanas, usted o algún miembro de su hogar tuvo que comer menos comidas por día porque no había suficiente comida? Ponga un número para su repuesto: \_\_\_\_\_

III-7. ¿Durante las últimas cuatro semanas, no hubo ninguna clase de comida para comer en su hogar por falta de recursos para tener comida? Ponga un número para su repuesto: \_\_\_\_\_

III-8. ¿Durante las últimas cuatro semanas, usted o algún miembro de su hogar tuvo que ir a dormir con hambre porque no había suficiente comida? Ponga un número para su repuesto: \_\_\_\_\_

III-9. ¿Durante las últimas cuatro semanas, usted o algún miembro de su hogar tuvo que pasar todo el día sin comer porque no había suficiente comida? Ponga un número para su repuesto: \_\_\_\_\_

#### **Parte IV. Participación en el Proyecto de Seguridad Alimentaria**

IV-1. ¿Participó en el proyecto de seguridad alimentaria entre 2009 y 2010?  
Si No Comentarios opcionales: \_\_\_\_\_

IV-2. ¿Construyó una hortaliza en su patio o en el patio de un familiar como parte del proyecto de seguridad alimentaria?  
Si No Comentarios opcionales: \_\_\_\_\_

Si:

- a. ¿Qué plantas sembró? \_\_\_\_\_
- b. ¿Cuales plantas produjeron bien o le dieron más vegetal? \_\_\_\_\_
- c. ¿Cuales plantas no produjeron bien o no le dieron mucho vegetal? \_\_\_\_\_
- d. ¿Cuáles vegetales les gustaron comer Ud. y su familia? ¿Por qué? \_\_\_\_\_
- e. ¿Cuáles vegetales no les gustaron comer Ud. y su familia? ¿Por qué? \_\_\_\_\_
- f. ¿Cuáles vegetales comieron con más frecuencia Ud. y su familia? ¿Por que? \_\_\_\_\_
- g. ¿Cuántos veces en una semana comieron vegetales de la hortaliza Ud. y su familia? \_\_\_\_\_
- h. ¿Quién realizó la mayor parte del trabajo en la hortaliza?  
Doña Don Muchachos 15 a 18 años Muchachos menos de 15 años Otro: \_\_\_\_\_
- i. ¿Vendió sus vegetales? Si No  
Si: ¿Qué vendió? \_\_\_\_\_  
¿Cómo y dónde los vendió? \_\_\_\_\_

- j. ¿Cuáles fueron los mejores beneficios de tener la hortaliza? (¿Por qué le parece bueno tener la hortaliza?) \_\_\_\_\_
- k. ¿Cuáles fueron las dificultades de tener la hortaliza? \_\_\_\_\_
- l. ¿En su opinión, cómo funcionó el proyecto de hortalizas? \_\_\_\_\_
- m. ¿Cómo mejoraría Ud. el proyecto de hortalizas? \_\_\_\_\_

IV-3. ¿Tuvo una hortaliza antes de empezar el proyecto de seguridad alimentaria?  
 Si \_\_\_\_\_ No \_\_\_\_\_ Comentarios opcionales: \_\_\_\_\_  
 No: ¿Por qué no? \_\_\_\_\_

IV-4. ¿Tiene la hortaliza ahora?  
 Si \_\_\_\_\_ No \_\_\_\_\_ Comentarios opcionales: \_\_\_\_\_  
 No: ¿Por qué no? \_\_\_\_\_

IV-5. ¿Sembrará la hortaliza este año?  
 Si \_\_\_\_\_ No \_\_\_\_\_ Comentarios opcionales: \_\_\_\_\_  
 No: ¿Por qué no? \_\_\_\_\_

IV-6. ¿Crió gallinas ponedoras como parte del proyecto de seguridad alimentaria?  
 Si \_\_\_\_\_ No \_\_\_\_\_ Comentarios opcionales: \_\_\_\_\_

- Si:
- a. ¿Cuántas gallinas ponedoras recibió? \_\_\_\_\_
- b. ¿Cuántas murieron en los primeros meses? ¿De que murieron? \_\_\_\_\_
- c. ¿Después de los primeros meses, que comida le dieron? \_\_\_\_\_
- d. ¿Se enfermaron? ¿De que? \_\_\_\_\_
- e. ¿Cuándo empezaron a poner huevos? \_\_\_\_\_
- f. ¿Cuántos huevos pusieron en una semana? \_\_\_\_\_
- g. ¿Cuántos veces en una semana comieron los huevos Ud. y su familia? \_\_\_\_\_
- h. ¿Quién realizó la mayor parte del trabajo de cuidar a las gallinas ponedoras?  
 Doña Don Muchachos 15 a 18 años Muchachos menos de 15 años Otro: \_\_\_\_\_
- n. ¿Vendió sus huevos? Si No  
 Si: ¿Qué vendió? \_\_\_\_\_  
 ¿Cómo y dónde los vendió? \_\_\_\_\_
- i. ¿Cuáles fueron los mejores beneficios de tener las gallinas ponedoras? (¿Por qué le parece bueno tener las gallinas ponedoras?) \_\_\_\_\_
- j. ¿Cuáles fueron las dificultades de tener las gallinas ponedoras? \_\_\_\_\_
- k. ¿En su opinión, cómo funcionó el proyecto de gallinas ponedoras? \_\_\_\_\_
- l. ¿Cómo mejoraría Ud. el proyecto de gallinas ponedoras? \_\_\_\_\_

IV-7. ¿Crió gallinas ponedoras antes de empezar el proyecto de seguridad alimentaria?  
 Si \_\_\_\_\_ No \_\_\_\_\_ Comentarios opcionales: \_\_\_\_\_  
 No: ¿Por qué no? \_\_\_\_\_

IV-8. ¿Tiene las gallinas ponedoras todavía?  
 Si \_\_\_\_\_ No \_\_\_\_\_ Comentarios opcionales: \_\_\_\_\_  
 No: ¿Por qué no? \_\_\_\_\_

IV-9. ¿Seguirá a criar gallinas ponedoras este año?



Si \_\_\_\_\_ No \_\_\_\_\_ Comentarios opcionales: \_\_\_\_\_  
No: ¿Por qué no? \_\_\_\_\_

- IV-10. ¿Tiene frutales o matas que le da fruta?  
Si \_\_\_\_\_ No \_\_\_\_\_ Comentarios opcionales: \_\_\_\_\_  
a. ¿Ha sembrado frutales nuevos en los últimos dos años? Si \_\_\_\_\_ No \_\_\_\_\_  
Si: ¿Qué ha sembrado? \_\_\_\_\_  
b. ¿Vende sus frutas? Si \_\_\_\_\_ No \_\_\_\_\_  
Si: ¿Qué vende? \_\_\_\_\_  
¿Cómo y dónde las vende? \_\_\_\_\_

### Parte V. Opiniones Del Proyecto de Seguridad Alimentaria

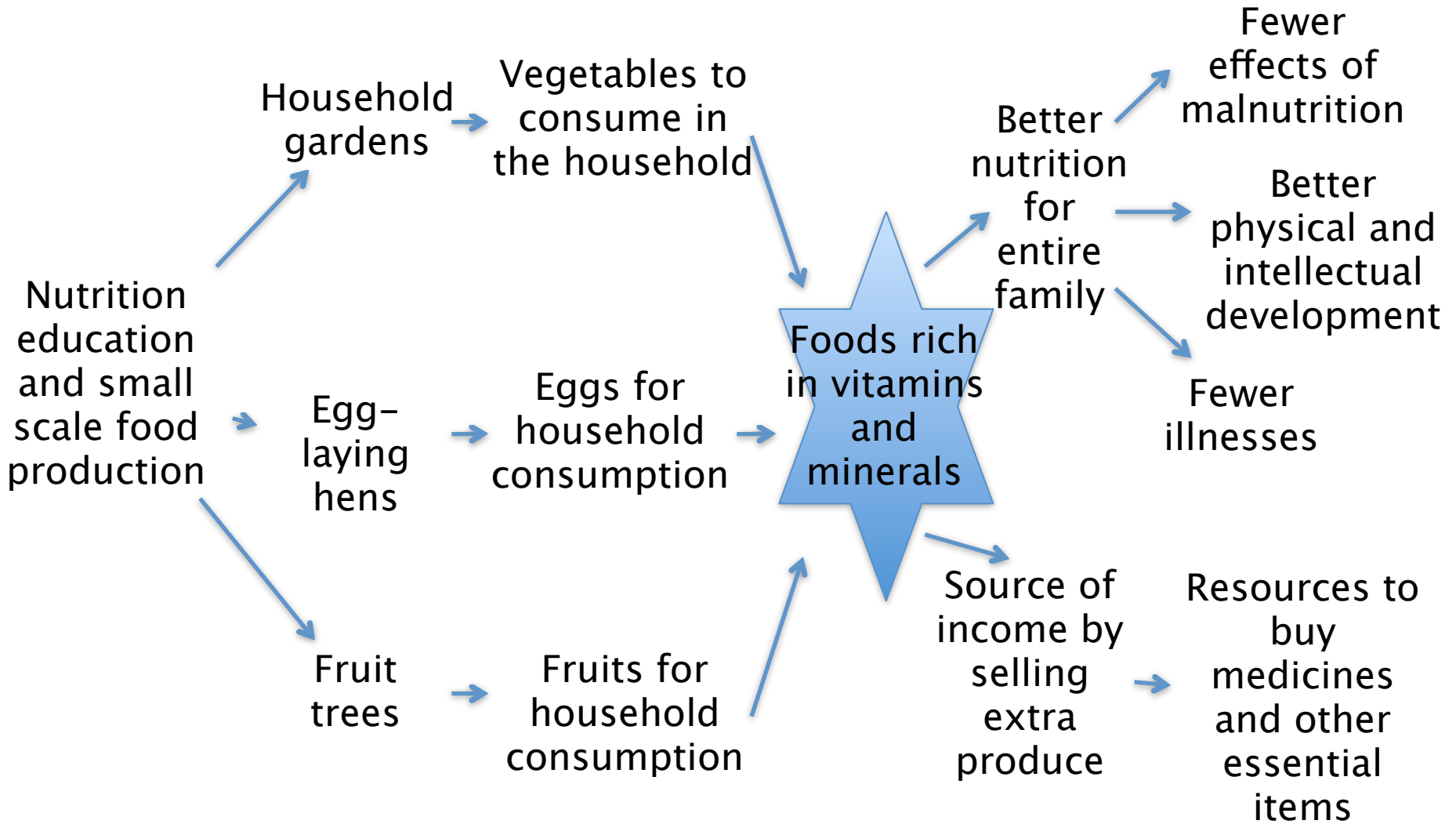
- V-1. ¿En su opinión, como funcionó el proyecto de seguridad alimentaria? \_\_\_\_\_  
V-2. ¿Como mejoraría el proyecto de seguridad alimentaria? \_\_\_\_\_  
V-3. ¿Participaría en le proyecto otra vez? \_\_\_\_\_  
V-4. ¿Piensa Ud. que otras comunidades pueden beneficiar de este proyecto? \_\_\_\_\_

### Parte VI. Conocimiento de nutrición

- VI-1. Un ejemplo de una cena balanceada sería:  
a. Sopa de fideo con auyama  
b. Yuca, aguacate, cebolla  
c. Mangú de plátano, huevo frito con tomate  
d. Chocolate y pan con queso
- VI-2. ¿Cuál alimento de la pareja tiene más vitaminas por su color?  
a. La Lechosa o la manzana  
b. La tallota o la auyama  
c. Las hojas de yuca o la lechuga
- VI-3. Nombre los nombres de 3 hojas verdes del patio que se puede comer para darle mejor nutrición (que no sea cilantro, verdura, ni orégano)  
a. \_\_\_\_\_  
b. \_\_\_\_\_  
c. \_\_\_\_\_

# Appendix E

## Figure 1. Food Security Program Theory



## Pre-intervention

### Los Guineos Community

Children screened- N=37  
Women screened- N=2  
Households- N=28

### Jabanico Community

Children screened- N=15  
Women screened- N=3  
Households- N=15

### Hato San Pedro Community


Children screened- N=19  
Women screened- N=4  
Households- N=16

### Las Arenas Community

Children screened- N=13  
Women screened- N=1  
Households- N=10

### Other Communities

Children screened- 229  
Women screened- N=10  
Households- N=155

 Treatment Communities

 Control Communities

## Post-intervention

### Los Guineos Community

Children screened- N=23  
Women screened- N=5  
Households- N=15

### Jabanico Community

Children screened- N=11  
Women screened- N=0  
Households- N=10

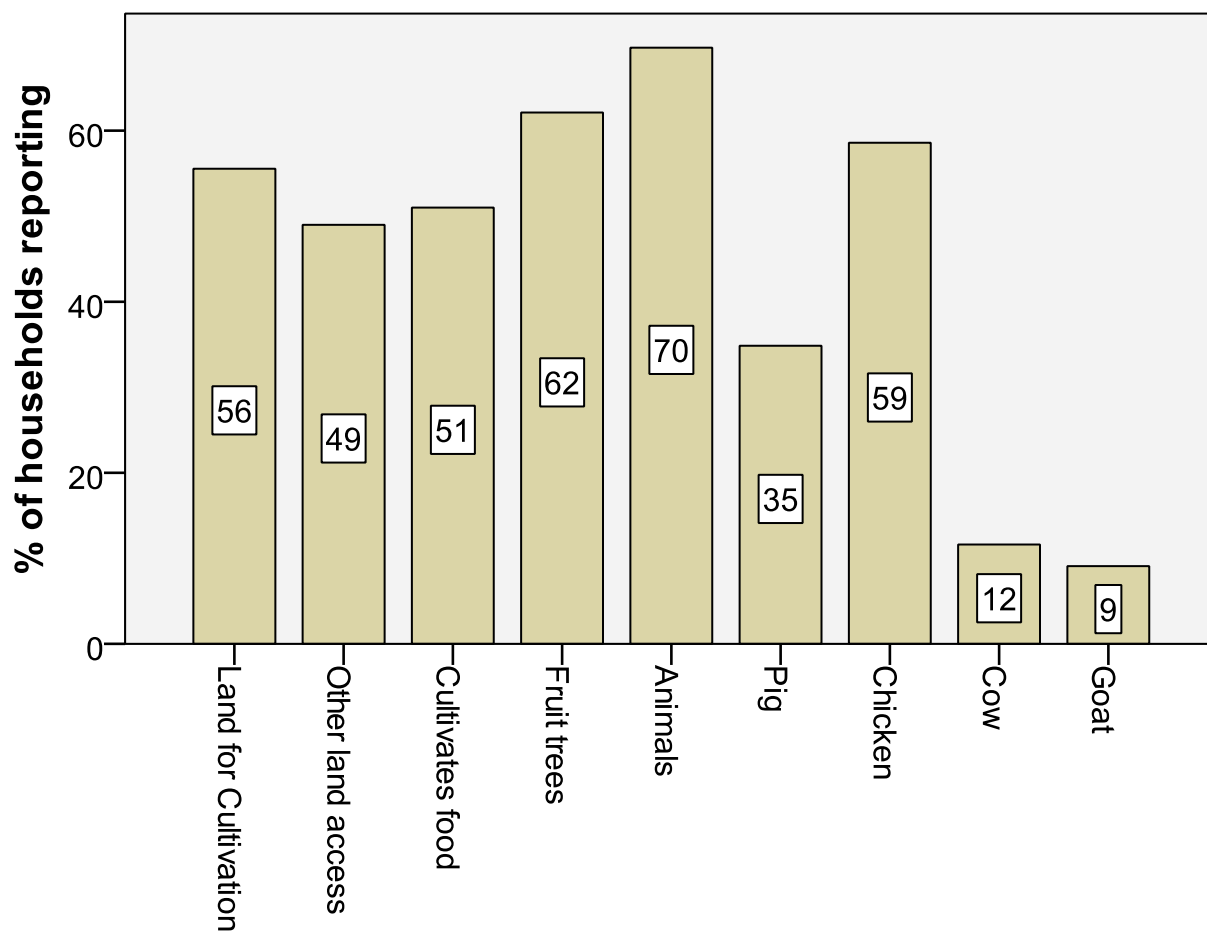
### Hato San Pedro Community

Children screened- N=13  
Women screened- N=8  
Households- N=15

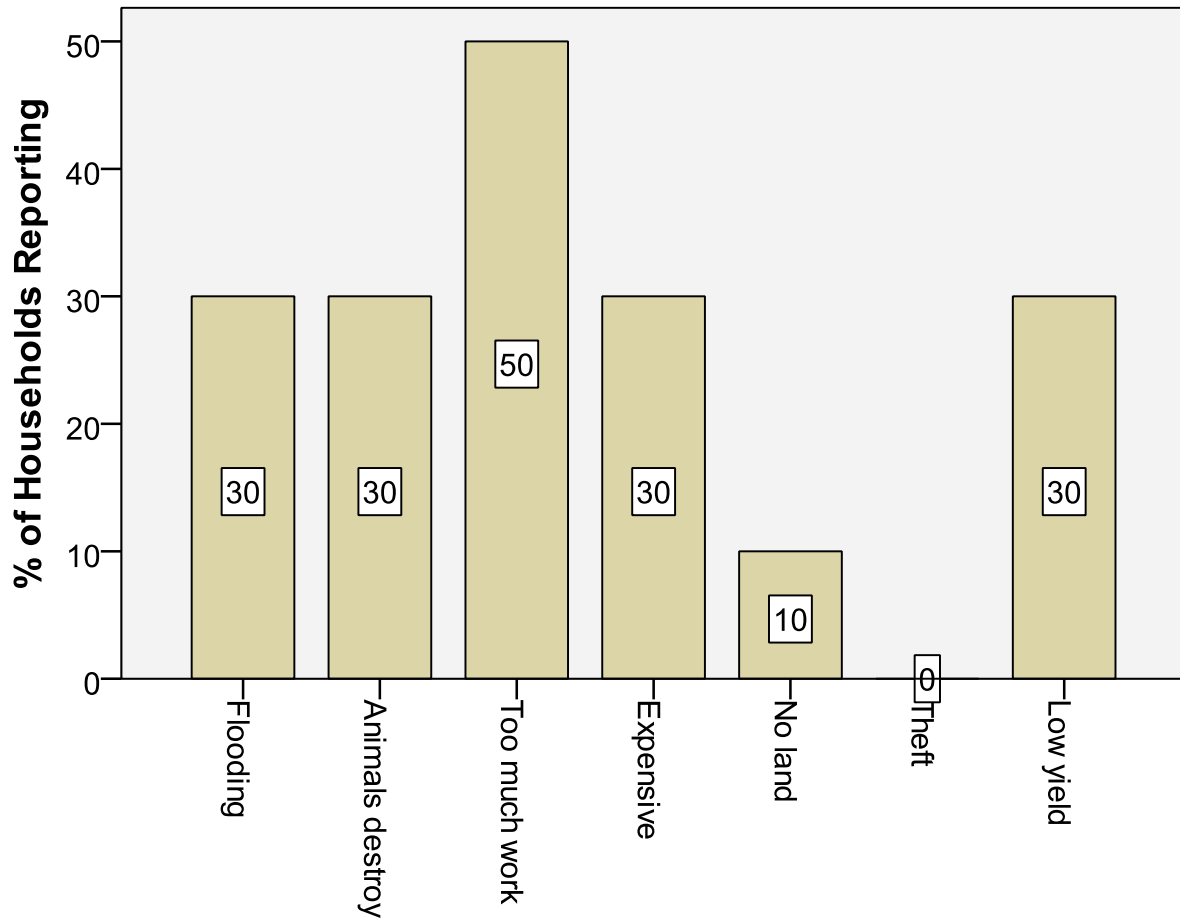
### Las Arenas Community

Children screened- N=11  
Women screened- N=1  
Households- N=9

**Figure 3: Baseline horticulture and animal husbandry activities**

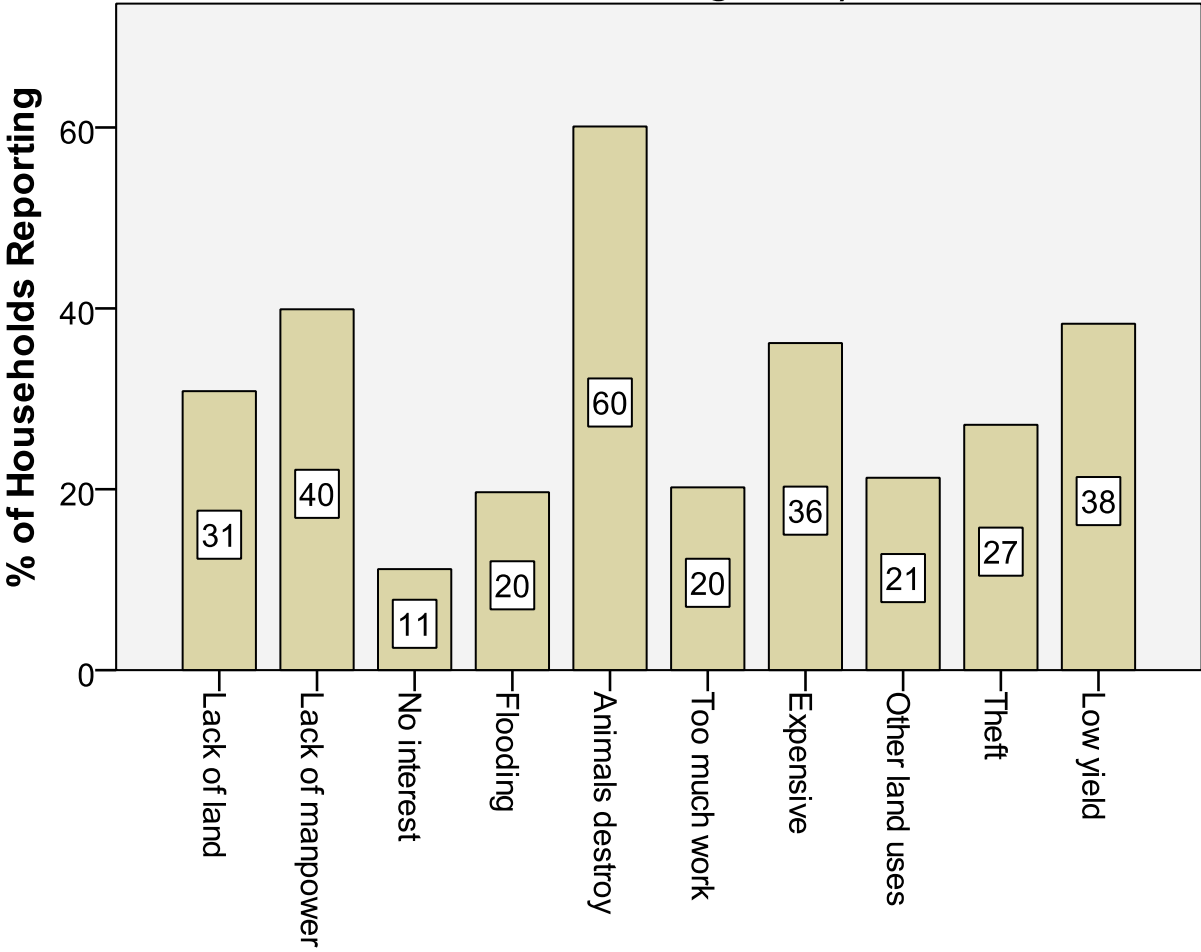


**Figure 4a: Experienced challenges with gardening (only households with current gardens)**



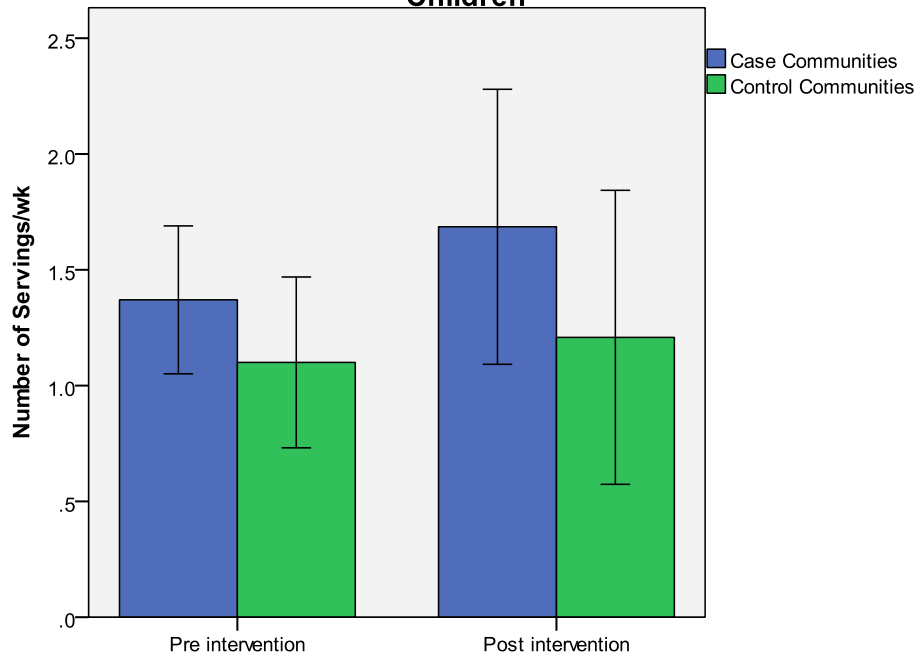
\*Number of households responding to these questions varied from 12 to 19.

**Figure 4b: Anticipated challenges with gardening (only households with no garden)**



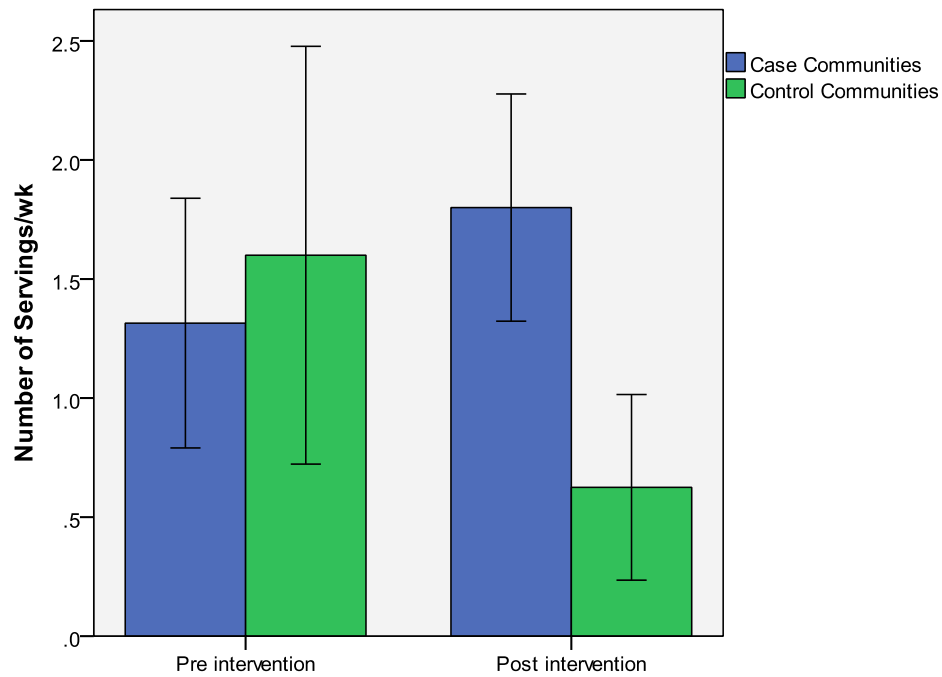
\*Households responding to these questions (n=188).

**Figure 5a: Food Frequency of Green Leafy Vegetables for Children**



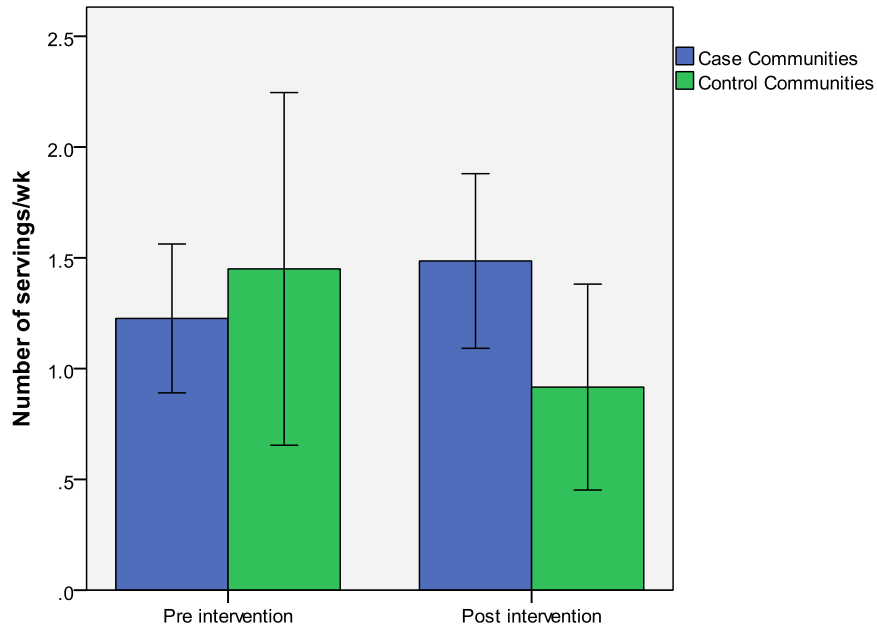
Error bars: 95% CI

**Figure 5b: Food Frequency of Carrots for Children**



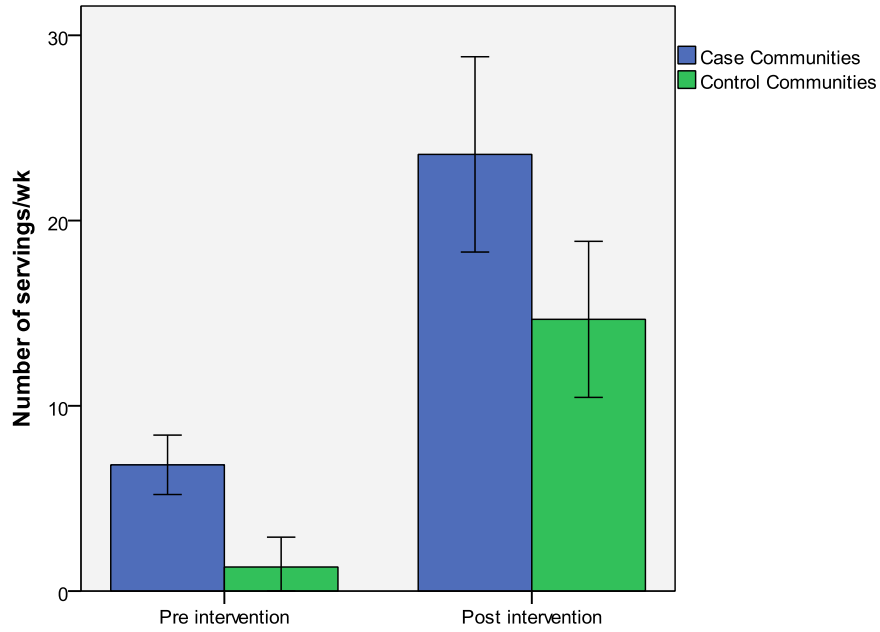
Error bars: 95% CI

**Figure 5c: Food Frequency of Beets for Children**



Error bars: 95% CI

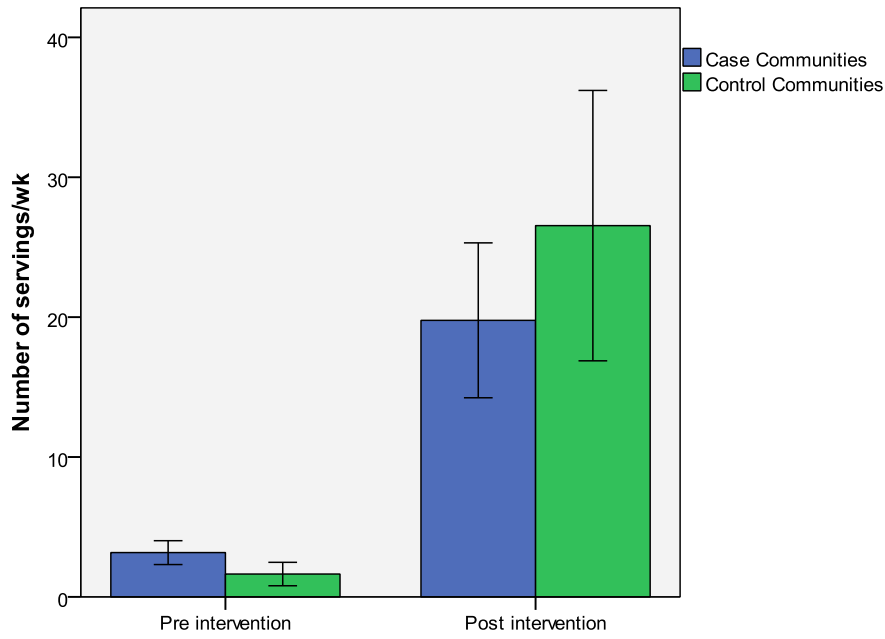
**Figure 5d: Food Frequency of Milk for Children**



Error bars: 95% CI

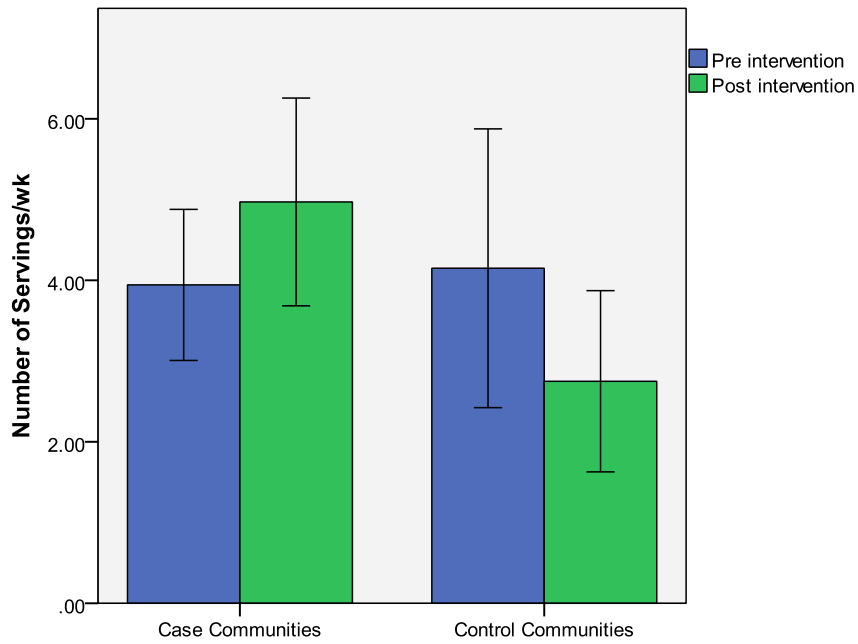


**Figure 5e: Food Frequency of Mangoes for Children**



Error bars: 95% CI

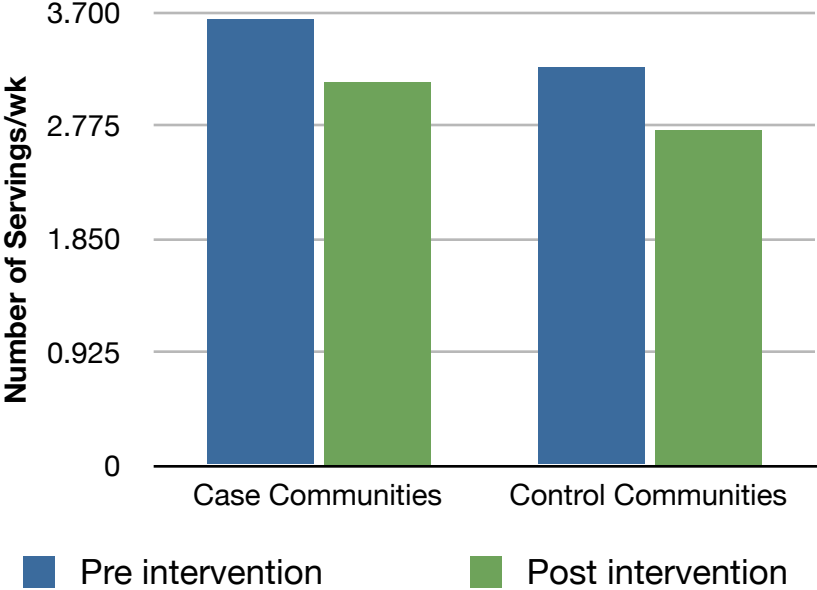
**Figure 6a: Food Frequency of Garden Vegetables for Children**



Error bars: 95% CI

\*This includes beets, carrots and greens only.

**Figure 6b. Estimated marginal means for garden vegetables for children**



## Appendix F

**Table 1. Resources and food security status pre-intervention in 17 communities**

Household Indicator	Mean (SD) or % (n)
<b>Resources</b>	
Land to farm	56% (114)
Fruit tree	62% (132)
Raise Animals	70% (152)
Average monthly income	3600 RD ( $\pm$ 2500)
Households with vegetable garden	12% (27)
Sufficient water for irrigation	57% (128)
Water source is reliable	81% (181)
Sufficient time for gardening	98% (220)
Sufficient interest in gardening	91% (204)
<b>HFIAS Food Security Level</b>	
Food Secure	9% (20)
Mild Food Insecurity	8% (18)
Moderate Food Insecurity	14% (31)
Severe Food Insecurity	69% (155)

**Table 2. Vitamin A food frequency measures pre-intervention in pre-communities only**

Foodstuff	Pregnant women (N=9)	Children under 1 year (N=20)	Children over 1 year old (N=149)
Green leaves (root leaves, spinach, lettuce)	2.4 ( $\pm$ 2.1)	1.3 ( $\pm$ 1.5)	1.9 ( $\pm$ 1.4)
Mangos	3.8 ( $\pm$ 2.8)	1.1 ( $\pm$ 1.2)	2.1 ( $\pm$ 2.1)
Carrots	1.9 ( $\pm$ 1.6)	1.5 ( $\pm$ 1.9)	1.6 ( $\pm$ 1.5)
Milk	2.9 ( $\pm$ 2.1)	4.8 ( $\pm$ 2.7)	5.4 ( $\pm$ 3.8)
Beets	1.8 ( $\pm$ 1.2)	1.2 ( $\pm$ 1.4)	1.5 ( $\pm$ 1.4)
<b>All Foods</b>	<b>12.8 (<math>\pm</math>3.7)</b>	<b>9.9 (<math>\pm</math>4.9)</b>	<b>12.5 (<math>\pm</math>6.1)</b>

**Table 3a. Vitamin A food frequency measures for children under the age of five years pre-intervention in control and intervention communities**

<b>Foodstuff</b>	<b>Children in case communities (N=53)</b>	<b>Children in control communities (N=19)</b>
Green leaves (root leaves, spinach, lettuce)	1.4 ( $\pm 1.2$ )	1.1 ( $\pm 0.8$ )
Mangos	3.2 ( $\pm 3.1$ )	1.6 ( $\pm 1.7$ )
Carrots	1.3 ( $\pm 1.9$ )	1.6 ( $\pm 1.9$ )
Milk	6.8 ( $\pm 5.9$ )	1.3 ( $\pm 3.4$ )
Beets	1.2 ( $\pm 1.2$ )	1.5 ( $\pm 1.7$ )
<b>All Foods</b>	<b>13.9 (<math>\pm 8.3</math>)</b>	<b>6.6 (<math>\pm 4.2</math>)</b>

**Table 3b. Vitamin A food frequency measures for children under the age of five years post-intervention in control and intervention communities**

<b>Foodstuff</b>	<b>Children in case communities (N=53)</b>	<b>Children in control communities (N=19)</b>
Green leaves (root leaves, spinach, lettuce)	1.7 ( $\pm 1.7$ )	1.2 ( $\pm 1.5$ )
Mangos	19.7 ( $\pm 16.1$ )	26.5 ( $\pm 22.9$ )
Carrots	1.8 ( $\pm 1.4$ )	0.6 ( $\pm 0.9$ )
Milk	23.6 ( $\pm 15.3$ )	14.7 ( $\pm 10.0$ )
Beets	1.5 ( $\pm 1.1$ )	0.9 ( $\pm 1.1$ )
<b>All Foods</b>	<b>48.3 (<math>\pm 19.2</math>)</b>	<b>44.0 (<math>\pm 21.7</math>)</b>

**Table 4: HFIAS categories pre- and post-intervention in control and intervention communities**

	Control communities % (n)		Intervention communities % (n)	
	Pre (N=26)	Post (N=24)	Pre (N=43)	Post (N=25)
Severely food insecure	95% (25)	58% (14)	81% (35)	68% (17)
Moderately food insecure	0% (0)	25% (6)	9% (4)	28% (7)
Mildly food insecure	0% (0)	8% (2)	5% (2)	0% (0)
Food secure	5% (1)	8% (2)	5% (2)	4% (1)

**Table 5: HHS categories pre- and post-intervention in control and intervention communities**

	Control communities		Intervention communities	
	Pre (N=26)	Post (N=24)	Pre (N=43)	Post (N=25)
Severely food insecure	23% (6)	10% (2)	29% (12)	21% (5)
Moderately food insecure	35% (9)	44% (11)	30% (13)	25% (6)
Little to no food insecurity	42% (11)	46% (11)	41% (18)	54% (14)

# Appendix G

## FOCUS GROUP Questions and Responses

### 1. What is food security?

-Food security for me is milk, potatoes, and beef. And also vitamins.  
-For me, food security is to have everything together in a food, everything that we need daily, from morning to night. And following from there because we all need to nourish ourselves. So it comes included in every type of food, vitamin, carbohydrate, mineral, everything. For me, this is food security.

### 2. What does it mean to be hungry or to go hungry? What is the time frame?

-Not to have food to eat.  
-It means malnutrition in the body. The body is destroyed until physical wasting attacks.  
-To be hungry and to go hungry are two different things. Because right now I can be hungry. But maybe I am not on the course of going hungry. Because someone, in the moment someone says, "Oh, I'm hungry," may not have something to eat right then. But not all the time are you going to be like that, going hungry. For me, they are different. For example, in my home, I say, "I am going hungry right now." For me, it is that I am not getting the desired, necessary nutrients. Maybe at breakfast, but at noon maybe food is difficult. I make rice with an egg to fill us up and not stay like that. And at night I make whatever nonsense because food is difficult. This, for me, is going hungry because one is not bringing the necessary nutrients to the body.

### 3. What does it mean to eat food?

-To eat well.  
-To nourish yourself well.  
-To make yourself strong.  
-To be full as well.

### 4. Why is rice so important in the diet?

-Because it agrees more with the body.  
-To be Dominican is to eat rice.  
-It fills you up more quickly.  
-It fills you more because when someone cooks a few roots, after you want to eat rice compulsively.  
-Because of custom.

### 5. What does it mean to worry?

-This we know about! I see everyone quiet because we all know!

### 6. What makes you all worried?

-One's children makes one worried, so far away. A far away friend that you love so much. This worries the body. It worries the soul. It makes you concerned. You want to know how is Fulano. How is he? It is a concern. How

is my son? How is that friend of mine that we were together so long ago?  
These are concerns. You worry about the patient that you have in your house that you can't find him medicine. You worry about people that can't find milk to give to the kids. Concern is a lot of things.

-Since we are talking about daily food, this exact thing worries some. To not have food is a priority concern because it is something that is needed everyday.

7. Are there people that worry about food more than others? Why?

-Of course.

-Because they are attacked by hunger more often.

-We know that we are people that worry more about food because we understand that this is something important in our lives. If someone does not eat well, it all goes down. Because everything depends on your state. So I am going to say that we worry about this because we know people right here, we know that we don't have the food. But we buy a rum and we drink it or we buy a beer and we drink it. So we are not giving priority to the food that, for me, should be more important. And we are giving priority to a drink. So they understand that, for them, this is more important.

-Yes, this is a bigger concern for them.

8. Are there times or seasons during the year when people worry about food more than in other times or seasons?

-Because it is more work to find it. If a person doesn't have money. More or less in this exact time. At this exact time, a person worries more about food because food is scarcer. You save and do not find a small root and tire of looking for the root. Rice, if you did not find money to go and buy it, it is a lot of work to get rice. You know. Oil and all those things we worry about a lot. And if you don't have a source of money, this worries us a lot during this time. And these times are the times, they are more intense for people because there is little of everything, money, little pleasure. It is a lot of work to find a yucca right now here. It is a lot of work to get together a yam. It is a lot of work. It is a lot of work for everything. You almost can't find it.

9. When do people begin to worry about food? When they don't eat rice for one day, two days, a week...?

-When I don't have it for one day, I am already worried.

-When you get up, you have to look for roots for breakfast. What are you going to eat today? You are already worried about it.

10. What is a class of food?

-Black beans, pumpkin, papaya.

-There are a lot of classes of foods.

11. What is a preferred food?

-What one likes.

-This depends on the person. But there are cases that also come from the culture. Everyone likes his or her rice!

-Rice and yucca.

12. What is a limited variety of food?  
-For me, it is what one likes or what one eats but with limits. Even though you like it, you can't eat a barrel. Food with control.
13. Is a limited variety when you don't have different foods for one day, one week, one season, one year...?  
-One week.
14. If there were not sufficient food in the house, what foods would you eat that really you would not want to eat?  
-I would eat okra.  
-Spaghetti is what I do not like.  
-Bread fruit. I don't eat bread fruit.
15. What does it mean to eat a lesser quantity of food?  
-You reduce the food, eat less food, if you have a good food in the stomach, if you have a food that loads up the stomach well, reduce the food.
16. What does it mean to eat fewer meals in a day?  
-There isn't where there isn't.
17. What is a sufficient quantity of food? How many pounds of rice, beans, meat, salad... per person per day?  
-A plate.  
-There are people that eat a pound of rice.  
-A pound per person, no! There are people that eat it but... don't eat like that. It will make you diabetic. Don't eat like that.  
-I eat a pound of rice every day and I stay the same. What happens is that I eat rice all the time. There is not a fixed amount. I eat a lot. I ate a pound in one day like this, a little bit now and a little bit later. But not all at one time.
18. What is a good or valued food? Examples. Why is it good or valued?  
-Rice with peas.  
-Salad because the food calls my attention because I like it and it has more vitamins.  
-For Easter people always make peas with rice, meat, salad, things like that.
19. What is a bad or inferior food? Examples. Why is it bad or inferior?  
-Rice with okra.  
-It is bad in one sense but maybe in another sense it is better food.  
-Inferior food for me is food that one does not make complete. That is to say... because if you eat rice with eggs, you are missing the grain legumes. If we agree that we are going to provide vitamins. The meal wasn't balanced. It is not good. You are going to be missing something. So there are inferior foods. We eat inferior foods all of the time.
20. What is a balanced or varied meal?  
-Beans, rice meat, eggs, salad, and fish.



-Not all of this together! Lets make a balanced meal. We have rice, we have grain legumes (lets say peas or beans), we have salad. If we don't have the salad, every time we try a piece of avocado. And there it is complemented.  
-And after the meal a juice.

21. What foods are best to fill up the belly?

-What one likes.  
-Soup is the only thing that doesn't fill you up.  
-White yam.  
-No. Yellow yam. If you eat a barrel of white yam, later you will be dying of hunger.  
-The yellow one weighs a lot, that is for sure.  
-One piece and you are full.

22. How much rice does one need to eat in a day?

-A tiny bit.  
-A spoon full.

23. How much rice does one want to eat in a day?

-We only need a tiny portion.  
-Our bodies, of every one of us, needs a small portion. Now, that you want to eat a mountain is another thing. But what every body needs is a small quantity. Now, people eat a truckload, that's it.  
-But a small amount nourishes better than a large portion.

24. Is there a time of the year or season when there is less food in the house/people go hungry more/people worry more about food? What foods are people lacking?

-Almost always it is planted in terms of what we have in the house. It is planted by time. So there is a time when there seems to be nothing. At this time that we are in now there are almost no roots. Because here we plant them by time period. Also, so that the food arrives at the house, we need employment. If we don't have from where to obtain, the lack of employment or something, that is missed. Because if you don't have a little work to get your money, how are you going to have food? Or you are going to have little.

25. Is there a time of the year or season when there is more food in the house/people go hungry less/people worry less about food? What foods do people have more of?

-When you work, they give you money to buy the food and it is insured.  
-When the rice is ready that they are planting. There are almost piles of rice here in Jabonico. You only have to look for beans, oil, etcetera.  
-In my house there is a time period.  
-The thing most insured is the rice.

26. What does one do when there isn't enough food in the house?

-You look for what you are missing and if you don't find it, you cook less as well.  
-We are in savings! You have to use less.

# Appendix H

## Focus Group Questions and Responses in Spanish

1. ¿Qué es la seguridad alimentaria?

-La seguridad alimentaria yo la tengo como la leche, como las papas, con la carne de res. Y también las vitaminas.

-Para mi, la seguridad alimentaria es como tener todo en conjunto de comida, de alimentos, todo que necesitamos diario, desde la mañana hasta en la noche. Y seguido de allí porque todo necesitamos alimentarnos. Entonces viene incluido todo tipo de alimento, de vitamina, carbohidrato, minerales, todo. Para mi, este es la seguridad alimentaria.

2. ¿Qué significa tener hambre o pasar hambre? ¿Qué es el tiempo?

-No tener comida para comer.

-Significa desnutrición en el cuerpo. Se destruye el cuerpo hasta ataca desgaste físico.

-Tener hambre y pasar hambre son dos cosas diferentes. Porque yo ahora mismo puedo tener hambre. Pero quizás no estoy pasando hambre en el transcurso. Porque uno, en el momento uno dice, "Ahí. Yo tengo un hambre," puede ser que no tenga que comer allí. Pero no todo el tiempo usted quizás va a estar así, pasando hambre. Para mi, son diferentes. Por ejemplo, en mi hogar, yo digo, "Yo estoy pasando hambre en este tiempo." Para mi, es que no estoy consiguiendo los alimentos queridos, necesarios. Que quizás al desayuno, pero a la doce quizás es difícil la comida. Que hago un arrozito con huevo para hartarnos y no quedarnos así. Y en la noche hago cualquier otro disparate porque la comida esta difícil. Eso, para me, estar pasando hambre porque no se esta llevando al cuerpo los nutrientes necesarios.

3. ¿Que significa comer la comida?

-Comer bien.

-Alimentarse bien.

-Ponerse fuerte.

-Estar tan lleno también.

4. ¿Por qué arroz es tan importante en la dieta?

-Como que conviene mas para el cuerpo.

-Ser dominicano es comer arroz.

-Es mundial, donde quiera.

-Llena mas rápido.

-Llena mas porque cuando uno cocina un chin de víveres, después quiere comer arroz obligado.

-Por costumbre.

5. ¿Qué significa estar preocupado/a?

-¡De esto sabemos! ¡Nos veo callados porque esto sabemos toditos!

6. ¿Qué les hace preocupados/as?

-Le hace preocupación los hijos de uno, tan lejos. Tan lejos de un amigo que uno quiere mucho. Este le preocupa el cuerpo, le preocupa la alma. Da uno preocupación. Quiere saber como esta a Fulano. ¿Como esta? Es una preocupación. ¿Como esta a mi hijo? ¿Como esta aquel amigo mío que estábamos juntos hace mucho? Estas son preocupaciones. Le preocupa un enfermo que tenga usted en la casa que no le encuentra medicina. Le preocupa una gente que usted no halla la leche para darle a los niño. Preocupación es cantidad de cosas.

-Como estamos hablando de la comida diario, a uno le preocupa este mismo. No tener comida es una preocupación prioritaria porque es algo que se necesita todos los días.

7. ¿Hay personas que se preocupen por la comida más que otras? ¿Por qué?

-Claro.

-Porque le atacan mas el hambre.

-Por eso no! No es el hambre. Es que no tienen el dinero.

-Sabemos que somos personas que nos preocupa mas la comida porque entendemos que este es algo importante en nuestra vida. Que si uno no come bien, todo se va al suelo. Porque todo depende en tu estado. Entonces, yo voy a decir que nos preocupa por eso porque sabemos personas aquí mismo, sabemos que no tenemos la comida. Sin embargo compramos un ron y lo tomamos o una cerveza y la tomamos. Entonces no estamos dando prioridad a la comida que, para mi, debería ser mas importante. Y estamos dando prioridad a un trago. Entonces ellos entienden que, para ellos, este es mas importante.

-Si. Este es una preocupación mas grande para ellos.

8. ¿Hay tiempos o temporadas durante el año cuando personas se preocupen por la comida más que en otros tiempos o temporadas?

- Porque da mas trabajo para encontrarla. Si uno no tiene dinero. Mas o menos para este mismo tiempo. Para este mismo tiempo uno se preocupa mas por la comida porque esta mas escasa la comida. Uno ahorra y no se encuentra un viverito y se cansa de buscar un viverito. El arroz, si no halló dinero para iba a comprarlo, da mucho trabajo para conseguir arroz. Usted sabe. El aceite y todas estas cosas nos preocupamos mucho. Y si usted no tiene un manejo de dinero, este nos preocupamos mucho por este tiempo. Y este tiempo son los tiempos, son mas fuerte para uno porque hay chica de todo, de dinero, y chica de gusto. Usted le da mucho trabajo para hallar una yuca ahora aquí. Le da mucho trabajo para juntar una yautía. Le da trabajo. Para todo le da trabajo. Usted no lo encuentra casimente. Y eso lo preocupa.

9. ¿Cuando empiezan a preocuparse por la comida? ¿Cuando no comen arroz por un día, dos días, una semana...?

- Cuando no tiene por un día, ya estoy preocupada.

- Cuando uno amanece, tiene que buscar estos víveres para el desayuno. "¿Que tu va a comer hoy?" Ya tu estas preocupada por eso.

10. ¿Qué es una clase de alimento?

-La habichuela negra, la auyama, la lechosa.

-Hay una cantidad de clases de alimentos.

11. ¿Que es un alimento preferido?

-Que le gusta a uno.

-Este depende en la persona. Pero hay en casos que también se da la cultura. Aquí tenemos una cultura siempre de la arroz. Ya es una cultura. ¡Todo el mundo le gusta su arroz!

-El arroz y la yuca.

12. ¿Qué es una variedad limitada de alimentos?

-Para mí, es de lo que uno le guste o lo que uno coma que sea con límite.

Aunque uno le gusta, no se coma un cajón. Con control la comida.

13. ¿Es una variedad limitada si no tienen alimentos diferentes durante un día, una semana, una temporada, un año...?

-Una semana.

14. Si no hubiera suficiente comida en la casa, qué comidas comerían que realmente no querrían comer?

-Yo comería molondrones.

-Espagueti es que a mí no me gusta. Si yo no encuentro otra cosa, yo preparo espagueti.

-Buen pan. Yo no como buen pan.

15. ¿Qué significa comer menos cantidad de comida?

-Uno reduce la comida, come menos comida, si usted tiene un alimento bueno en el estómago, si usted tiene una comida que haga carga bien en el estómago, reduce la comida.

16. ¿Qué significa comer menos comidas por día?

-No hay donde no hay.

17. ¿Qué es una cantidad suficiente de comida? ¿Cuántas libras de arroz, habichuelas, carne, ensalada... por persona por día?

-Un plato.

-Hay gente que come una libra de arroz.

-Una libra por gente, no! Hay gente que lo come pero... no come así no. Se pone diabético. No come así, no.

- Yo como una libra de arroz todos los días y me quedo igualito. Lo que pasa es que yo como arroz cada rato. No hay una cantidad plantado. Como mucho. Yo me comí una libra en un día así, un ratito ahora y un ratito ahorita. Pero no una vez todo.

-A mí me como una cuarta de arroz por día. Una cuarta de arroz cocinada no es un chin. Mire, si usted concina una cuarta de arroz, este es mucho.

-Si crece el arroz. Si no crece se come la libra de arroz. Pero si crece, no come una libra de arroz.

18. ¿Qué es una comida buena o valorada? Ejemplos. ¿Porqué es buena o valorada?

- Arroz con gandules.

- La ensalada, como que llama mucha atención la comida para mi porque me gusta y tiene mas vitaminas.
- Para la Pascua uno siempre hace guandules con arroz, carne, ensalada, cosas así.

19.¿Qué es una comida mala o inferior? Ejemplos. ¿Porqué es mala o inferior?

- Arroz con molondrones.
- Está mala en un sentido pero quizás en otro sentido es mejor comida.
- La comida inferior para mi es la comida que uno no le hace completo. Es decir... porque si tu comes un arroz con huevos, a ti te falta los granos. Si estamos de acuerdo a la vitamina que vamos a aportar. No estaba balanceada esta comida. No esta bien. Va a faltar algo. Entonces hay comidas inferiores. Cada rato comimos comidas inferiores.

20.¿Qué es una comida balanceada o variada?

- Habichuelas, arroz, carne, huevos, ensalada, y el peje.
- Todo este junto, no! Vamos a hacer una comida balanceada. Tenemos el arroz, tenemos granos (vamos a decir guandules o habichuelas), tenemos la ensalada. Si no tenemos la ensalada, en todo tipo tratamos de una tajada de aguacate. Y allí se complementa.
- Y después de la comida un juguito.

21.¿Cuales comidas son mejores para llenar la barriga?

- Que uno le guste.
- La sopa es la única cosa que no te llena.
- Ñame blanco.
- No. Ñame amarillo. Si te comes un cajón de ñame blanco, ahorita tu tiene un hambre muriendo.
- El amarillo si pesa, es la verdad.
- Un pedazo y tu estas lleno.

22.¿Qué cantidad de arroz necesitan comer en un día?

- Un chidadin.
- Una cuchara.

23.¿Qué cantidad de arroz quieren comer en un día?

- Nada mas necesitamos una porcioncita.
- El cuerpo de nosotros, de cada uno de nosotros, necesita una porcioncita. Ahora, que tu quiere comer una loma es otra cosa. Pero lo que necesita cada cuerpo es una pequeña cantidad. Ahora, uno se come un camión, así mismo.
- Pero alimenta mas un poquito que una porción grande.

24.¿Hay un tiempo del año o temporada cuando haya menos comida en la casa/pasen más hambre/se preocupen más por la comida? ¿Qué les hacen falta?

- Casi siempre se siembra en cuanto a lo que tenemos en la casa. Se siembran por época. Entonces hay una época que no parece nada. En este tiempo que estamos ahora casi no hay víveres. Porque aquí los siembran por época. Cuando hay, todo el mundo tiene. Cuando no hay, todo el mundo no tenga. Tengan mas

comida, tengan arroz porque también se siembran por época. También para que la comida llegue a la casa, necesitamos los empleos. Si no tiene de donde conseguir, la falta de empleo o algo, que hace falta. Porque si tu no tiene un trabajito para conseguir tu dinero, ¿como tu va a tener comida? O va a tener poca.

25. ¿Hay un tiempo del año o temporada cuando haya más comida en la casa/pasen menos hambre/se preocupen menos por la comida? ¿De que comida tienen más?

- Cuando trabaja, que le dan el chulito para comprar la comida y esta asegurada.
- Cuando estén el arroz que están sembrando. Hay arroz por pila casamente aquí en Jabonico. Nada mas tiene que buscar habichuelas, el aceite, etcétera.
- En mi casa hay una época.
- La cosa mas segura es el arroz.

26. ¿Qué hace uno cuando no haya suficiente comida en la casa?

- Se buscan lo que hace falta y si no lo encuentra, cocina menos también.
- ¡Estamos en ahorro! Hay que echar menos.