



Education for a Sustainable Future Educación para un Futuro Sostenible

I Dreamt of Africa, but Awoke to Find Myself in Costa Rica

*My Experiences working at
The Monteverde Institute*

Garrett Feddersen
2003 Ruan-Borlaug Intern



**Garrett Feddersen conducting a traffic study in Los Llanos,
Costa Rica**

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I would also like to thank Lisa Fleming, my superhero and guardian angel while I was in Costa Rica.



Santa Rosa Beach, Guanacaste, Costa Rica

Introduction

It is impossible to describe my summer experience with words alone. Such a phenomenal thing is just too powerful to be put down on paper; I will try to explain it, but if you need further proof, just take a look at the way my eyes light up when I talk about my summer. My name is Garrett Feddersen, and I spent the summer of 2003 working at The Monteverde Institute in Costa Rica.

My story has a rather interesting beginning. I was originally scheduled to go to Kenya and work at the International Center for Insect Physiology and Ecology (ICIPE). Unfortunately, about three weeks before I was scheduled to depart, the U.S. government issued a travel warning for Americans going to Kenya. It said something about a danger of planes being shot down with handheld rockets, embassy bombings, that sort of thing, but I still wanted to go. The World Food Prize, however, decided that it would not be a wise decision to send me there. So, extremely disappointed, I waited in limbo for another two weeks. Finally, Lisa Fleming emailed me asking if I would like to intern at the Monteverde Institute in Costa Rica. Of course, I accepted, and a week later I was on my way to Central America.

Initial Impressions

I arrived at the airport in San Jose about 11:00 p.m. After finally finding my luggage, I made my way outside, looking for someone who was supposed to take me to MVI. After much searching, I found a sign with my name on it and followed the man to a little yellow Volkswagen van. After a little confusion due to my broken Spanish, I discovered that my driver was also going to be my host father in Costa Rica. I had plenty of time to get to know him in the five to six hour drive up to Monteverde that night; there was no chance of me falling asleep on that rough road. Eventually I arrived at my new home around five a.m., found my bedroom, and bone-weary I collapsed on a bed that was way too small—and I loved every minute of it.

Costa Rica

Costa Rica is part of the land bridge between North and South America; bordered by the Pacific Ocean on the west and Caribbean on the east. Panama lies to the southeast of the nation and Nicaragua lies

to the northwest. About 10 degrees north of the equator, Costa Rica covers less than 20,000 square miles-- it is Central America's second-smallest nation. A mountainous spine runs the length of the country dividing it into three general areas: the Pacific coastal plains, the Central Valley, and the Caribbean coastal lowlands. Regardless of its size, its geographic location and climatic conditions give rise to an incredible diversity of ecosystems. The country was explored and colonized by the Spaniards throughout the 1500s. However, Costa Rica achieved independence from Spain in 1821 by joining the Central American Federation. In 1823 the capital was established in San José. The country's National Liberation movement abolished the Costa Rican army in 1948 and established a tradition of democratic elections and a free, democratic and independent republic. The country is often referred to as the 'Switzerland of Central America'.¹

Costa Rica has a population of about 3 million people who are largely of Spanish descent, with a relatively smaller proportion of *mestizos* or people of mixed European and Indian origin, and a very small Indian population. There is a sizable black Creole population on the Atlantic coast. The literacy rate, more than 90 percent, is the highest in Central America and among the highest in the world. Costa Ricans, or *Ticos* as they call themselves, maintain a strong sense of national pride in their educational and governmental accomplishments.¹

There is such a rich and diverse culture in Costa Rica, it is unbelievable. Ticos are a very social people. They welcome you into their homes and treat you as if you are family, and after a time, they make you forget that you aren't Costa Rican.

My Host Family

While in Costa Rica, I stayed in the wonderful home of Rolando McAdam and Sonia Montiel. My Tico parents, as I proudly referred to them, made every effort to ensure that I was happy, comfortable, and well-fed. At first I presented a problem to them. How in the world are they supposed to accommodate for a 6'7" tall American teenager? With the average height of Costa Ricans being significantly less than that, it was very difficult for my host family to find a bed that was suitable, meaning a bed that my feet hung off less than foot. Eventually we put two couches together to make a bed that was both long enough and wide

¹ Instituto Monteverde Student Orientation Handbook: APDO 69-5655, Monteverde de Puntarenas, COSTA RICA, América Central

enough. That was the first among relatively few adjustments that had to be made, and everything worked out great. I was, in effect, an “only child” since their kids were, for the most part, out of the house.

However, usually one of the three kids was always around.

Some things took getting used to. I had three years of Spanish before my travels to Costa Rica, and I figured that I knew Spanish pretty well. I was wrong. I found out very shortly that my Spanish was pretty pitiful. Though as it worked out, I was extremely lucky, for my mother was a Spanish teacher and both my parents spoke English. Not that they would ever speak in English to me, but if I didn’t understand something, they could explain it in English. Needless to say, throughout my time in their household, my Spanish improved significantly. While I would not call myself fluent by any means, I am at least now competent.

Another thing that was difficult to adjust to was the constant diet of gallo pinto, or rice and beans. I never had to ask what was for breakfast, lunch, or dinner; I knew we would be having rice with some sort of beans. Maybe together, maybe separate, but always present at every meal. While tasty, it tends to get a little boring after two months. I am very glad my family was understanding of this and went out of their way to make diverse and varied meals. However, it wasn’t too long before they started calling me a zorro, which means “fox” in Spanish. This was a reference to my “carnivorous” preferences in food. They didn’t seem to understand that in my family in Iowa, a meal isn’t a meal without at least one meat-dish. I must say though, they opened my taste buds to new and exciting dishes and ingredients. I especially enjoyed the variety of fresh fruits that were everywhere—mangos, bananas, platanos, papaya, apples, pineapple; the list could go on for a while.

Without the fantastic host family I had, my experiences in Costa Rica would have been decidedly different. I will cherish the time I was able to spend with them and plan on returning to Monteverde in the future. When I do, I know I will have a place to stay.



My Tico parents Sonia and Rolando



My House (on the outskirts of the Monteverde Cloud Forest Preserve)

Monteverde

Monteverde is at the end of a long dirt road approximately 100 miles from San José. A dirt road that winds and twists, goes up and down mountains, and is filled with potholes and ruts that a car can disappear into. It is a very beautiful road; the canopy opens up every once in a while giving you brief glimpses at huge valleys and expanses of tropical forests.

The community now known as Monteverde was first settled by eleven Quaker families, mostly from Fairhope, Alabama, who decided to leave the United States and settle in Costa Rica in the early 1950's. They did so because of strong beliefs against the military system in the US and because Costa Rica had chosen to abolish its army, putting the money saved into health and education. The founding families intended Monteverde to be a community which seeks the good of everyone, to live in such a way that might naturally lead to a more peaceful world. Monteverde was founded as a religiously motivated community. The center of the Friends' community was, and still is, an unprogrammed Friends Meeting.²

The Quakers initiated a change in Monteverde, getting away from the coffee and fruit plantations and encouraging dairy production as a new way of life. The Monteverde Cheese Factory plays a very large role in the community, as it was a way for the Monteverde people to get their products to the coast without spoilage.

² Monteverde Friends School website, obtained September 03, 2003 www.mfschool.org



A pasture surrounded by jungle: A common sight in Monteverde

About El Instituto de Monteverde



The Monteverde Institute



The Monteverde Institute (MVI), founded in 1986, is a member-based Costa Rican non-profit educational and research association. The MVI blends international study with a commitment to the local community. In partnership with universities around the world, it designs and administers courses in tropical ecology, sustainable development, conservation biology, political economy, woman studies, agricultural ecology, and public health. As a local institution deeply rooted in and committed to the Monteverde community, the Institute also provides local educational, cultural, and social programs, including the annual Monteverde Music Festival.³

They stress education as a means for a sustainable future. The Institute works within all aspects of the community to promote ecological conservation, new farming techniques, public health, landscape design and architecture, and the list could keep going on and on.

³ Monteverde Information Sheet APDO 69-5655, Monteverde de Puntarenas, COSTA RICA, América Central

The Changes Within

So how has this experience changed me? I mean, that is probably the biggest, most important question anyone could ask me about my journey. It is difficult to explain the impacts this opportunity has had on my future. There are so many diverse and significant transformations inside of me because of my internship. I remember standing in the pouring rain about a week before I was scheduled to leave; I was thinking about life back in the states and how different everything in Costa Rica is in comparison. Stepping off the plane back in Iowa was both relieving and stressful at the same time; it was as if I was seeing my whole world with new eyes. It is such an amazing experience to be completely immersed in a culture so different from your own and to be exposed to the traditions, the foods, the languages, and the thought processes every single day! I learned so much about myself, about my country, about humanity in general. Since it was about a 2.5 km hike from my house to MVI, I had plenty of time to reflect each evening while walking to my house. I realized that I learned more about myself than I had ever imagined. This internship has helped me realize in part what I want to accomplish in life and it has helped me set higher goals for myself. When I enter college this fall, I plan on working towards a double major of Political Science and Pre-medicine. It seems like an odd combination, but after Costa Rica it is something I know I will enjoy. I am in love with Costa Rica, its people, its music, its culture; I won't be able to stay away for long.

One of the hardest adjustments was returning to Iowa and talking with my friends. This might not seem like a big deal, but they can't comprehend the things you have done and seen. These things I wouldn't have seen either, if it weren't for the World Food Prize.

My Projects

When I began to write my paper, I knew I would have some difficulties explaining all my different jobs at MVI. When I first arrived, they weren't real sure what to do with me. After all, it was sort of a last minute thing. But they started me out working with a group of college students from all over the U.S. with a program called Sustainable Futures. I was to design a wastewater treatment system for part of the town of Santa Elena. I immediately got to work, and although I didn't know much about the subject at first, Stewart Dallas and others at MVI were more than happy to help. Upon completion of this project, I started to work with a group of Public Health students who were there for a field science study abroad course.

Along with these two projects, which I will explain in greater detail later, I also had many other tasks at the center. I also worked with Stewart Dallas collecting water samples of surrounding area streams and rivers, testing to see the various pollutants and their impacts on local watersheds. I helped two students from Smith College in Boston collect samples from a true-fall collector, which measures the amount of water that actually reaches the ground in dense cloud forest. One of the more interesting little projects was the reed bed we built to treat MVI's water. This was a very interesting project, as it involved a large amount of physical labor. Director of MVI Nat Scrimshaw had asked me before coming to Costa Rica if I minded "some difficult physical work." My first weekend in Monteverde I helped Nat Scrimshaw, Stewart Dallas, and Nacho (a very hard-working Tico) fill the already dug reed bed full of gravel. There were four of us and we each had a wheelbarrow and a shovel; we worked all day Saturday, but we got it done. Then, several days later, I went out with Stewart and Nacho in the pouring rain to dig up plants to put in the reed bed that filter the water. Needless to say, it was a great experience.

Constructed Wetlands Project

Constructed Wetlands for the Treatment of Gray Water in Santa Elena

Introduction

The treatment of grey water is a very large problem in the Monteverde region. Currently, grey water is being piped out into streets, streams and rivers. This creates a serious problem with the quality of drinking water further down the mountain. One of the proposed ways to treat the grey water is using constructed wetlands.



Costa Rican children playing in untreated grey water in Santa Elena.

Constructed Wetlands to Treat Grey water

- Low Startup/Initial Cost
- Natural form of water treatment
- Low environmental impact
- Low maintenance
- Can clean and filter the water so it can be used for irrigation

Constructed wetlands are fairly easy to build. First, excavate a depression .5 meters deep. The area of the depression is dependent upon the number of people and therefore the amount of grey water the reed bed will be handling. Next, put a layer of geotextile in the excavated area. A layer of plastic goes over that, and then another layer of geotextile covers the plastic. This prevents the rocks or shredded plastic bottles from puncturing the plastic and the grey water from seeping into the ground or leeching into the groundwater. Put the bed medium (gravel, sand, shredded plastic, etc.) on top of the textile, filling the hole completely. Finally, the plants are then planted every 30 to 40 cm. A grease trap is also needed to filter the water before it goes into the reed bed to ensure no rice, beans, or other small particles enter the reed bed.⁴

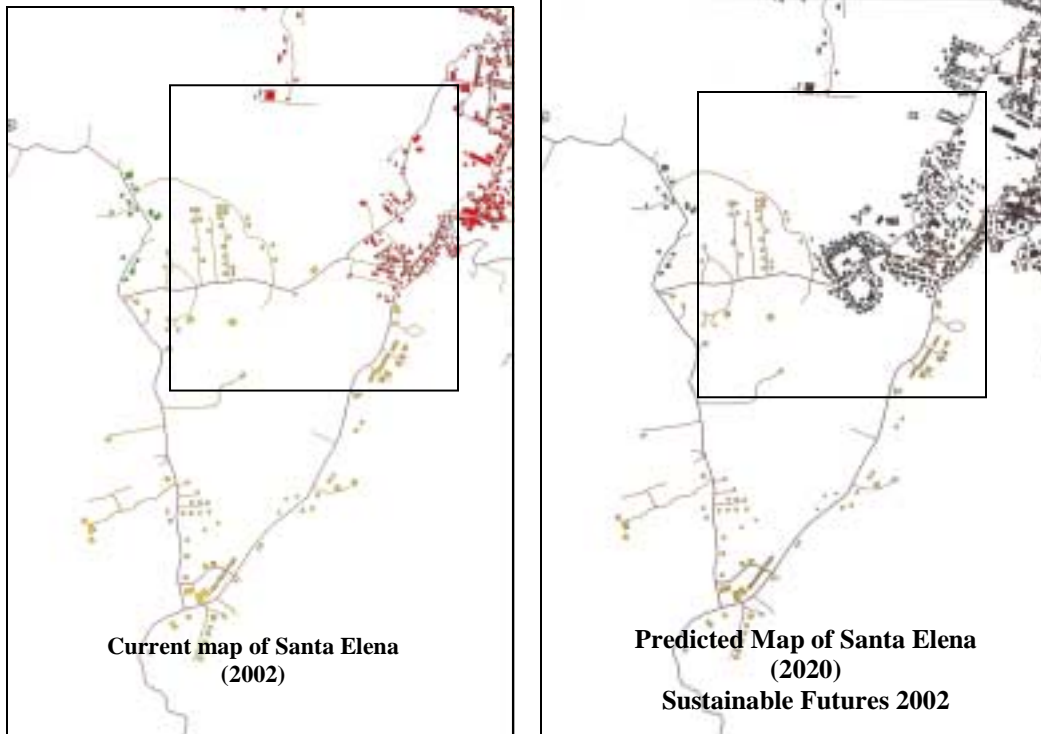
Project Specifications

The proposed plans for the Visitors' Center in the Los Llanos area include the plans for a large constructed wetland that would treat part of the grey water for the town of Santa Elena, as marked on the map. This is about one third of the town, an area that would naturally flow to the Los Llanos site using gravity. No grey water would have to be pumped to the treatment site. This part of Santa Elena is also the area with the most predicted future growth.

Included are the calculations for several different reed beds. The first two calculations are for the area needed for the reed beds to effectively treat the grey water for the current buildings in the area of Santa Elena we chose. The second two are for the area needed to effectively treat the projected number of buildings in the year 2020.

Besides the population growth, bed medium will also be taken into account. For one calculation, crushed rock will be the medium. The other calculation will be for using shredded plastic bottles, which drastically reduces the required area of the constructed wetlands. However, the use of shredded plastic as a bed medium is currently being researched by Monteverde Institute.

⁴ Sustainable Futures 2002. *Feasibility Study of Sustainable Sanitation Options for Santa Elena in the zone of Monteverde*. Monteverde Institute, Costa Rica, 2002



Calculations

The formula used in calculating the required reed bed area is as follows⁵:

$$A = \frac{(Q_{ave})(t)}{(n)(d_w)}$$

A = Area required for reed bed to effectively treat grey water
(square meters)

Q_{ave} = Average daily input (cubic meters)

T = Retention time (days)

N = effective porosity of bed medium (what percent of the volume is
left for the water after gravel or plastic has been put in)

d_w = Depth of bed (meters)

Current - 2003

There are currently 200 buildings in the area of Santa Elena we selected. Each building uses about .81 cubic meters of potable water per day. 60 % of that ends up as grey water.

$$\begin{aligned} .81 \text{ m}^3 \times 200 \text{ houses} &= 162 \text{ m}^3 \\ 162 \text{ m}^3 \times .60 &= 97 \text{ m}^3/\text{day} = Q_{ave} \end{aligned}$$

⁵Crites, Ron, and Tchobanoglous, George. *Small and Decentralized Wastewater Management Systems*. New York: WCB/McGraw-Hill, 1998. (p. 563 to 608)

Gravel

- To treat the current population in Santa Elena as marked on map
- Using crushed rock as the medium for the reed bed (porosity or $n = .4$)
- The grey water is held for 2.5 days (t), in order to effectively treat the grey water
- The reed bed is .5 meters deep (d_w), this is the most effective depth for the plants to treat the water

$$A = \frac{(Q_{ave})(t)}{(n)(d_w)}$$

$$A = \frac{(97)(2.5)}{(.4)(.5)}$$

$$A = 1215 \text{ m}^2$$

If gravel or crushed rock is used as the bed medium, the reed bed is .5 meters deep, and the grey water is held for 2.5 days, then 1215 m² of land will be required to treat the current grey water output of Santa Elena for the area we selected.

Shredded Plastic

- To treat the current population in Santa Elena as marked on map
- Using shredded plastic bottles as the medium for the reed bed (porosity or $n = .75$)
- The grey water is held for 2.5 days (t)
- The reed bed is .5 meters deep (d_w)

$$A = \frac{(Q_{ave})(t)}{(n)(d_w)}$$

$$A = \frac{(97)(2.5)}{(.75)(.5)}$$

$$A = 650 \text{ m}^2$$

If shredded plastic is used as the bed medium, the reed bed is .5 meters deep, and the grey water is held for 2.5 days, then 650 m² of land will be required to treat the current grey water output of Santa Elena for the area we selected.

Future - 2020

In the year 2020, it is predicted that there will be approximately 350 buildings in the area of Santa Elena we selected.⁶ Each building uses about .81 cubic meters of potable water per day. 60 % of that ends up as grey water.

$$\begin{aligned} .81 \text{ m}^3 \times 350 \text{ houses} &= 284 \text{ m}^3 \\ 284 \text{ m}^3 \times .60 &= 170 \text{ m}^3/\text{day} = Q_{\text{ave}} \end{aligned}$$

Gravel

- To treat the predicted population for Santa Elena in the year 2003 for the area marked on map
- Using crushed rock as the medium for the reed bed (porosity or $n = .4$)
- The grey water is held for 2.5 days (t), in order to effectively treat the grey water
- The reed bed is .5 meters deep (d_w), this is the most effective depth for the plants to treat the water

$$A = \frac{(Q_{\text{ave}})(t)}{(n)(d_w)}$$

$$A = \frac{(170)(2.5)}{(.4)(.5)}$$

$$A = 2125 \text{ m}^2$$

If gravel or crushed rock is used as the bed medium, the reed bed is .5 meters deep, and the grey water is held for 2.5 days, then 2125 m² of land will be required to treat the grey water output of Santa Elena for the area we selected in the year 2020.

Shredded Plastic

- To treat the predicted population for Santa Elena in the year 2003 for the area marked on map
- Using shredded plastic bottles as the medium for the reed bed (porosity or $n = .75$)
- The grey water is held for 2.5 days (t)
- The reed bed is .5 meters deep (d_w)

⁶ Sustainable Futures 2002. *Monteverde Report*. Monteverde Institute, Costa Rica, 2002.

$$A = \frac{(Q_{ave})(t)}{(n)(d_w)}$$

$$A = \frac{(170)(2.5)}{(.75)(.5)}$$

$$A = 1133 \text{ m}^2$$

If shredded plastic is used as the bed medium, the reed bed is .5 meters deep, and the grey water is held for 2.5 days, then 1133 m² of land will be required to treat the grey water output of Santa Elena for the area we selected in the year 2020.

Removal of Treated Grey Water

After the grey water has been cleaned by the reed bed, where is it going to go? One-hundred and seventy cubic meters of water cannot just be dumped out; it would have serious ecological repercussions. One possible solution would be to pipe the water to the Quebrada Sucia, a small river to the east of the site. However, while this is the closest and easiest place to go with the water, the pipe would either have to go through a primary forest area or go up over the ridge to get to the river. The water could also be piped to the Quebrada Rodriguez, a river on the far west side of the site. Unfortunately, this river is a very long distance from the reed bed site.⁷ Another possibility would be to release the filtered water into the environment at multiple points. The water is safe for the ecosystem, containing nutrients the plants need. If it was piped out to different parts of the forest, this would be a convenient and easy way to eliminate the excess water. The last outlet possibility discussed was the creation of a small pond, with native species of fish introduced into it to control the mosquito population.⁸

Conclusion

When deciding what option would be best for the Monteverde Region Visitors Center, many factors must be taken into account. The available area at the site is limited, especially with key conservation areas on the site. The impact the reed bed would have on the surrounding environment must

⁷ Stewart Dallas provided information on the resources available in the region of Monteverde.

⁸ . Foster, Vivian. *Lower Costs with Higher Benefits: Water and Sewerage Services for Low Income Households*. Swedish International Development Agency, 2001

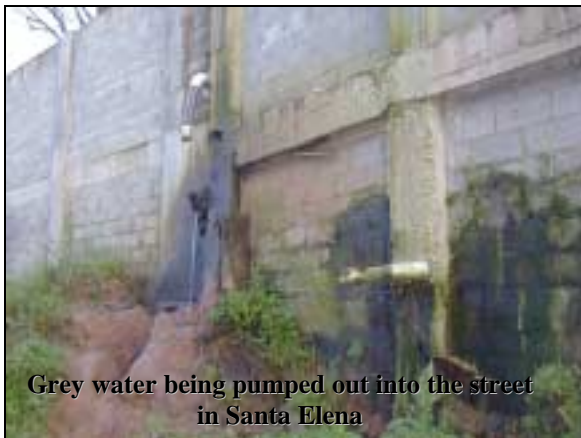
be taken into account. Also, the geographic and climatic variables must be considered. The land has varied topography which the constructed wetland must be designed around.

With those limitations in mind, the best option for waste water treatment would be the use of shredded plastic bottles to form the medium of the reed bed. This greatly reduces the required area, and is a very sustainable solution. The region of Monteverde also has a problem with an over abundance of plastic bottles, more than the region has capacity to recycle.

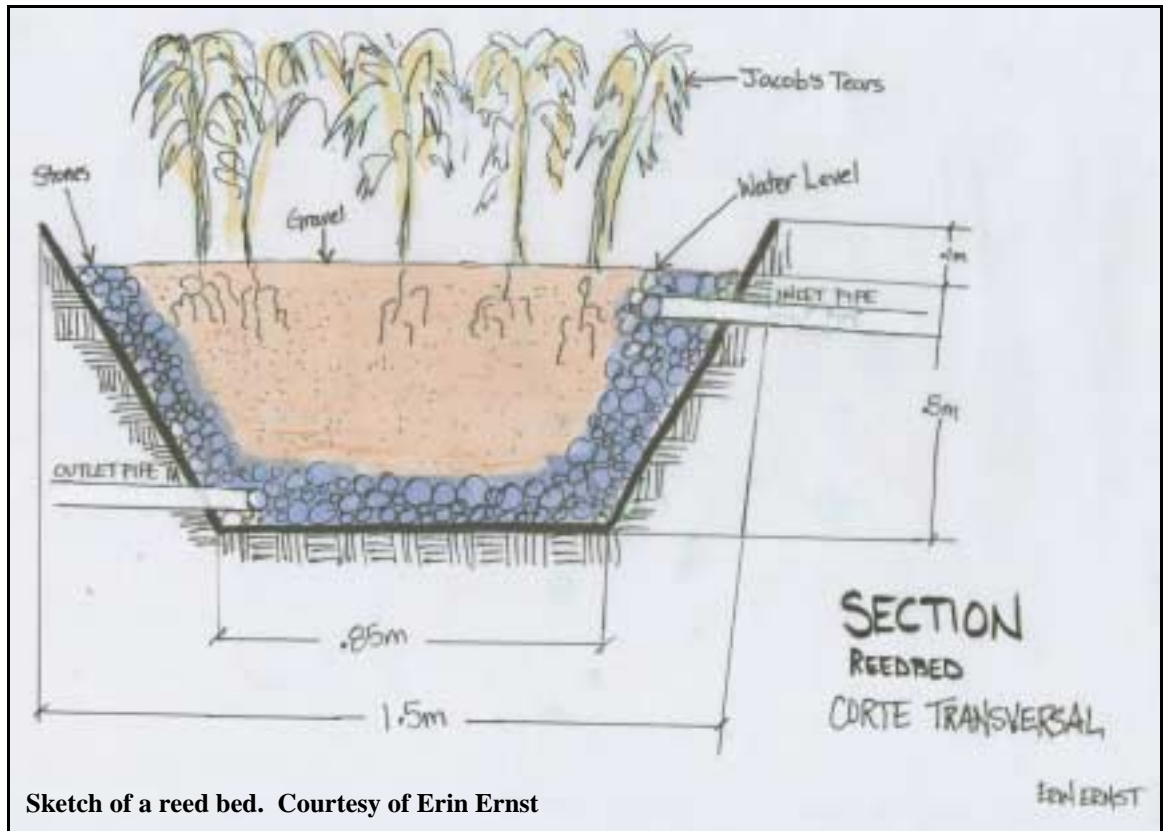
Propositions for the Monteverde Region Visitor Center

- Reed bed that would treat the area of Santa Elena as marked on map
- The reed bed would be large enough to handle the waste water requirements in the year 2020
- A bed medium composed of shredded plastic
- Bed would be .5 meters deep, and the waste water held for 2.5 days
- Required area would 1133 m²

However, if need be, a smaller reed bed can be built, and as long as area is left for growth, the reed bed can be increased at a future date.



Photographs courtesy of Stewart Dallas



Nutrition Project

An Exploratory Study on Food Security, Diet, and Perceptions of Nutritional Health in the Monteverde Zone

Field Methods in Community Health

Research Team Background

Our team consisted of six full-time members and one faculty advisor. *Tamara Cranfill* is a doctoral student in Rehabilitation Sciences at the University of Kentucky. Her research interests include the examination of social networks of individuals with chronic illness and on the cultural influences on community health issues. *Kate Bowler* is pursuing a B.S. in anthropology and human biology and a minor in political sciences at Emory University. Upon graduation, she plans to earn a Masters in Public Health with a concentration on international health. *Kimberly Kossler* completed her B.S. in Nutrition and Dietetics at East Carolina University in North Carolina. She plans to earn a Masters in Public Health at

East Carolina University. *Meghan Reusser* graduated from the University of Vermont with a B.A. in sociology. Her recent experience in Latin America consisted of a 5 month study in Bolivia on the health care system. *Lynley Rappaport* is fluent in Spanish and English. She has a Masters in education and is pursuing her MPH at Boston University. *Garrett Feddersen* is a senior at the Battle Creek-Ida Grove High School in Ida Grove, IA. He is a 2003 Ruan-Borlaug intern to the Monteverde Institute through the World Food Prize Foundation Youth Institute.

Introduction

Recently, “globesity” has been used to describe the escalating worldwide epidemic of obesity and to underscore the need for immediate action to combat this largely preventable disease through alterations in dietary and physical activity behaviors (WHO, 2002, 1997). There is strong evidence that obesity is a risk factor for chronic health conditions including cardiovascular disease, lipid disorders, type II diabetes, certain cancers, and physiological disorders (NIH, 1998). While the impact of obesity-related health problems is most severe in industrialized countries, countries undergoing rapid demographic and nutrition transition find increased consumption of high fat and carbohydrate-dense foods and decreased consumption of grains, fruits, and vegetables along with decreased activity common. These changes in diet and physical activity are leading to skyrocketing increases in the prevalence of overweight and obesity, especially in Latin America. The nutritional situation in Latin America has shifted away from under-nutrition, to one in which over-nutrition and chronic disease (e.g., type II diabetes) are the predominant causes of death (Uauy et al., 2001). Recently, studies in San Jose, Costa Rica, and its urban and rural environs demonstrated a correlation between life styles changes associated with the nutrition transition and obesity (Nunez-Rivas et al., 2003). Also, two recent health assessments by Monteverde Institute students in the Monteverde Zone show higher than expected prevalence for overweight and obesity for children and adults (MVI, 2002, 2001).

Food insecurity, defined as limitations to the acquisition and availability of nutritionally adequate and safe foods (Anderson, 1990), may be one factor leading to increases in the prevalence of overweight and obesity. The Radimer/Cornell Scale (Frongillo et al., 1997) has been used to reflect the perspective of people, including Latino communities, who experience hunger and food insecurity (Himmelgreen et al., 2000).

Purpose

While not systematically testing a hypothesis in this study, we did have a set of general research objectives. They are as follows:

1. Are there instances of food security in households of the two communities (i.e., Cañitas and Cerro Plano)?
2. What are the characteristics of diets ages 7 to 12 years in Cañitas and Cerro Plano?
3. Are mother's perceptions of their children's diets differing from those reported by the children?
4. What, if any, obstacles exist to food access?
5. What is the knowledge base of mothers of children in this age group related to obesity, nutrition, and exercise?

Finally, our last objective was to develop a coloring book related to healthy nutritional choices for the children that participate in the schools. In addition to our primary findings, we would give back something to these communities in the form of an interactive activity that promotes healthy eating habits.

Methodology

The exploratory study used in quantitative and qualitative methods in data collection in one rural (Cañitas) and one peri-urban (Cerro Plano) area of the Monteverde Zone in the central mountain region of Costa Rica. Participants include nine mothers or adult female guardians and their children between the ages of 7 and 12 years (N=11). After obtaining informed consents, the Radimer/Cornell Hunger and Food Security Scale (Frongillo et al., 1997) and a semi-structured interview of each mother or adult female guardian was performed in the home by an interviewer in Spanish (see Appendix 1). Thirty Children, 7 to 12 years of age, were provided activities at their respective schools in Cañitas and Cerro Plano related to nutrition. The activities included: 1) oral readings of fictional children's stories related to eating habits, 2) maintenance of daily food diaries for 3-4 consecutive days, and 3) development of a prototype for a coloring book for nutritional education (see Appendix 2 for specific activities).

Variable measures included: 1) frequency of food consumption for children in 24 hour period collapsed into the Latin American Food Group Pyramid (2003) for comparative purposes (see Appendix 3 for food categories), 2) methods of food acquisition and preparation, 3) reported knowledge of obesity,

nutrition, and exercise, and 4) demographic data. Data were analyzed using SPSS data entry statistical and software package. Descriptive data for nine households were examined and comparisons made between different types of households (e.g., households that have full-time annual employment versus seasonal employment). Interview data were reviewed and themes related to the research questions were qualitatively analyzed.

Results

Eighty-nine percent of the participating households own their own home. Multiple motor vehicle modes of transportation (e.g., car, truck, four-wheeler, motorcycle) were reported by 33.3% of the households with 44.4% of the households having only one mode and 22% having no means other than walking (Appendix 4, figure 5). Most of the women (88.9%) worked in addition to household duties to supplement household income. The range of education level was from no education to high school with 77.8% having completed middle school level or less. Televisions were owned by 100% of the participating households, telephones in 89%, stoves in 78%, ovens in 67%, microwaves in 44.4%, and computers in 22.2%.

Food insecurity is divided into three categories according to the Radimer/Cornell Scales (Frongillo et al., 1997). Thirty-three percent of households reported being food secure (Appendix 4, Figure 1). Household insecurity (e.g., suggests general food-anxiety) was reported by 34% of the households in Cañitas and Cerro Plano noted from responses to the Radimer/Cornell Scales (Frongillo et al., 1997). Twenty-two percent reported Adult Hunger (e.g., compromises in quantity and quality of food eaten by adults), and 11.1% reported Child Hunger (e.g., decreases in the quantity of food eaten by children).

Reported obstacles to food included:

- Limited transportation (e.g., have an unreliable car to get to the store, walk and have to take a taxi home [33.3%])
- Limited food variety (M1⁹: “It’s not easy to have all ingredients in the house.” / M2: “I would like to buy more varied food but I don’t have the resources. We only have meat 1-2 times a month.” / M3: “It is hard to eat balanced because it is hard to get to the store because of time.”)

⁹ M1, M2, M3, M4, M5, M6 indicate individual mother’s responses

- Food costs influenced by tourism (M4: “I get food from [other communities] because it’s cheaper and it’s less far to travel to the store.” / M6: “there are some things I would like to give them like vegetables and salads, but there is no way. The kids prefer rice, beans, eggs, bananas...but they won’t eat the vegetables.”). (Appendix 5 provides additional statements from the interviews). Sixty-seven percent of food purchases are made at a grocery store while twenty-two percent are bought from a cooperative and a traveling produce vendor or neighbor (Appendix 4, Figure 4).

Eighty nine percent of the mothers interviewed were aware and knowledgeable about nutritional programs in Costa Rica and the Monteverde Zone, referring to a nutritionist on the news, and programs and lectures at clinics. Mothers reported decreasing the amount of oils used in cooking, measuring amounts of oils and sugars in foods rather than random additions to dishes, decreasing the amount of candies and sweets consumed by their children, and decreasing the use of salt. Nevertheless, mothers reported difficulties following recommendations. These difficulties are due to food preparation techniques and preferences, access to food variety, and a lack of compliance among the children. As quoted from one mother, “Knowing what to do and actually doing it are different things.” Significant differences were not noted between food consumption reported by the mothers and their children. One of the primary sources of sugar in the diet was a variety of natural juice drinks with sugar added to taste. These “frescos” and “agua dulce” were generally consumed multiple times on a daily basis. The reported range of sugar consumption was 4 to 20 kilograms per month per household or 2.3 kilograms per person per month (Appendix 4, Figure 3).

Conclusions

Regional economics contribute to food insecurity indicated by influences of limited transportation and higher prices from tourism that impact food variety choices. These in turn may increase the likelihood that high sugar and high fat foods are consumed on a daily basis. Another related component of overweight and obesity in the communities examined are limited opportunities for exercise outside of work and school for families. Leisure time is limited and frequently spent watching television. Participants reported a lack of access to recreational areas in the Monteverde Zone.

The nutritional activities in the respective schools were met with positive responses from the children, parents and school staff. The children were actively engaged throughout the readings, the food diaries, and the development of the coloring books. Final classroom discussions revealed basic knowledge related to food groups and awareness of healthier cooking methods (e.g., using low amounts of oil in empanada preparation, the importance of eating more vegetables and fewer sweets). This exploratory activity was an effective means of assessing simple nutritional understanding as well as to provide a permanent document (individual coloring book) to the participating students.

Acknowledgements

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Limitations of Study

Time limitations resulted in completion of fewer interviews than desired. Schools were on vacation for two weeks prior to data collection, resulting in delays in obtaining consents. Difficulty in food classifications as were noted were due to preparation differences and phrasing of survey questions that resulted in general rather than specific information. Specifically, high fat foods were difficult to identify because the amount and type of oil used in each dish varied. Additionally, Cerro Plano was chosen for comparison with Cañitas because the students frequented a soda near the school during the day. However, the week before our activities, the newly assigned Cerro Plano school director prohibited the students from going to the soda during the school day. Of minor significance, the children were observed copying data from each other during some of the activities. It was unclear whether their purposes were simply for spelling accuracy or expansion of ideas. However, this may have distorted the content of reported preferences and diets.

Recommendations

We believe it important to report recommendations suggested by mothers interviewed. They included: a) a desire for cooking classes, cookbook, and lectures held at community sites; b) a need for

school curriculums that encourage healthy food selection, consumption and preparation from an early age; c) tools for behavior change to better enable implementation of nutritional knowledge base; d) access to a broader variety of foods is needed in both communities; e) national programs are needed to balance current fast food advertising with healthy food choice advertising, particularly targeting children; f) neighborhood walking groups for women; g) a need for recreational areas for children.

Increased participant numbers using this topic and design are recommended to obtain data for determining significant relationships between food insecurity, food access, and obesity. Participants were supportive of this effort and expressed a desire for further information and opportunities to communicate concerns. Qualitative methods (e.g. participant observations) for obtaining more accurate information on food preparations are recommended. Additional quantitative data from local grocers related to volume of oil and sugar sales would offer another perspective on consumption.

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Appendix 1

Interviews for Mothers or Adult Female Guardians

1. Demographic information:

* Age & sex

*Education level

*Household composition

*Employment status

Seasonal or year-round

*Transportation sources

*Length of living in the area

*Where from originally

*Have a phone? TV? Computer and/or internet? Own or rent home? Microwave? Hot water system?

2. Examples of possible questions:

*What would you want your children to eat to be healthy?

*What do you often prepare for your family?

*What type of oils are used?

*What cooking methods do you use? How do you prepare your foods?

*What are healthy ways to prepare foods?

*How often do you use canned foods? Processed foods? (Daily, weekly, monthly?)

*Have you heard about the nutrition studies in Costa Rica? If so, what?

*Have you changed your methods or diets as a result?

*Where do you buy your foods?

*What do you think would be ideal ways of preparing foods and choosing foods?

*How do you get there? Who buys the food for the family?

*Are you able to get the foods you want? If not, why?

*When are times you are unable to get the foods you want?

*How many kilos of sugar are used each week?

*How many hours of physical activity are pursued each week? Hours of TV per week?

Appendix 2

Day 1: Team of investigators will go to the schools at Canitas and Santa Elena. At each location, a story will be read orally to the students. The book is entitled “The Very Hungry Caterpillar,” and is a story using the character of a caterpillar to illustrate the importance of healthy eating. The team will then present the steps to maintaining a food diary. The students will be asked to document their food consumption each day on a provided sheet of paper and return the paper the following day. The students will transfer the information daily from the individual sheets to a larger sheet. This permits week-long documentation of their food consumption that can be taken home by each student at the end of the activities.

Days 2, 3, 4: Students' individual food documents *will be placed by the student in a communal envelope without identifiers. The daily logs will be encoded to enable confidentiality. The communal envelope will be collected by team members each day from the teacher.*

Day 5: Team of investigators will return to the schools for a follow-up activity reading the book, “Mr. Sugar Comes to Town.” This is another book that informs children about healthy nutrition practices. Using the data from the daily food diaries, team members will lead general discussions related to nutritional habits. Healthy foods identified by students will be used to develop a prototype coloring book using the character of a quetzal following the model of “The Very Hungry Caterpillar.” Illustrations for the coloring book will be provided by local artists in the community. *Every child in the study will receive a copy of the coloring book.*

Day 6: Team will complete interviews if needed. Data compilations and examination will begin.

Day 7, 8, 9: Data analysis, report and public forum/poster presentation preparation.

Day 10: Public forum including written report, coloring book prototype, and poster presentation of data results.

Appendix 3

Food Categories

Meat/Eggs: included salchicha (sausage), jamon (ham), costillas (ribs), mortadela (bologna), torta de huevos (omelette), huevo (eggs), carne (meat), and empanadas.

Fish: atun (tuna)

Poultry: pollo (chicken)

Dairy: helado (ice cream), queso (cheese), leche (milk), fresco de leche, queso, pinito (powdered milk)

Fruits: only included actual fruits (not juices). Fruits included platanos, guayaba, banano, manzano, etc.

Grains, breads, rice, beans: sandwich counted as 2 (for slices of bread), avena (oatmeal), chorreadas (fried corn pancake), arroz (rice), pan (bread), gallo pinto (rice and beans) counted as 2, tortilla, frijoles, empanada, arepas, tamales, empanadas de frijoles counted as 2, pizza.

Vegetables: included picadillo de chayote o de yoyote, papas

Coffee: only included plain/black coffee, coffee ice cream

Juice: “frescos”, “jugos”, (de pina, naranja, etc.) NOT fresco de chocolate, NOT fresco de leche.

Soda: Coca-Cola, Fanta, etc.

Sugar/Sweets: miel do coco (honey), mermelada, jalea (jelly), cookies, ice cream, pan de chocolate, cakes, confites (candies), agua dulce (sugar water), frescos, jugos, hot chocolate, fresco de leche, fresco de chocolate, postres, sirope (syrup), azucar, crema de chantilly (whipped cream in canister), platanos.

Fat/Sweets: galletas (cookies), ice cream, queque (cake), postres, pan de chocolate (brownie), numar (butter/margarine), frita (fried), pizza, empanandas.

Water/agua: only water/agua

Notes: We could not categorize food related to serving sizes or preparation of the food. However, we included juices (jugos, frescos) as a sugar/sweet because we observed numerous accounts of preparation with adding large amounts of sugar. Sopa (soup) was not categorized because the lack of description. Café con leche (coffee with milk) was not counted as a dairy because it was considered an insufficient amount. Salsa was not categorized unless it specifically said it was made with a vegetable.

Appendix 4

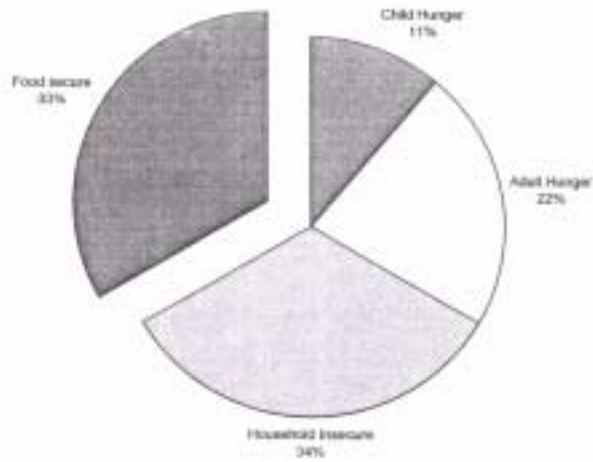


Figure 1: Food Security and Food Insecurity as Indicated by the Radimer/Cornell Scale (1997)

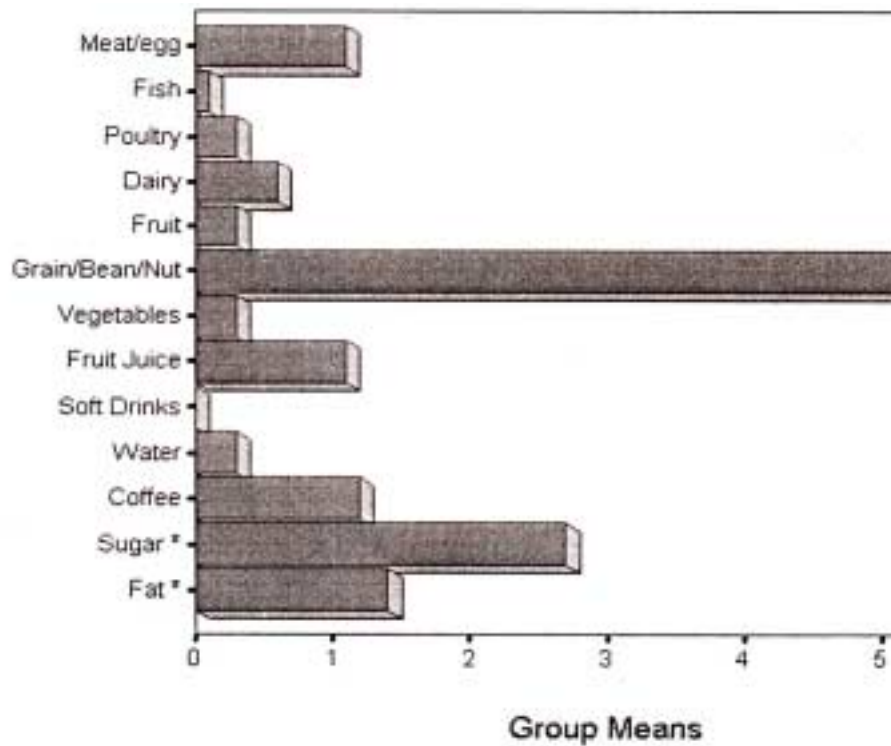


Figure 2: Child Reported Frequency Means for Random 24 hour Food Group Consumption

* Due to limitations in the methodology, we were unable to classify all the foods that contain fat and sugar in these categories. We were limited to classifying only those foods that we positively could identify as containing sugar and fat. Food preparation techniques that add sugar and fat to foods were not catalogued by the children in their food diaries.

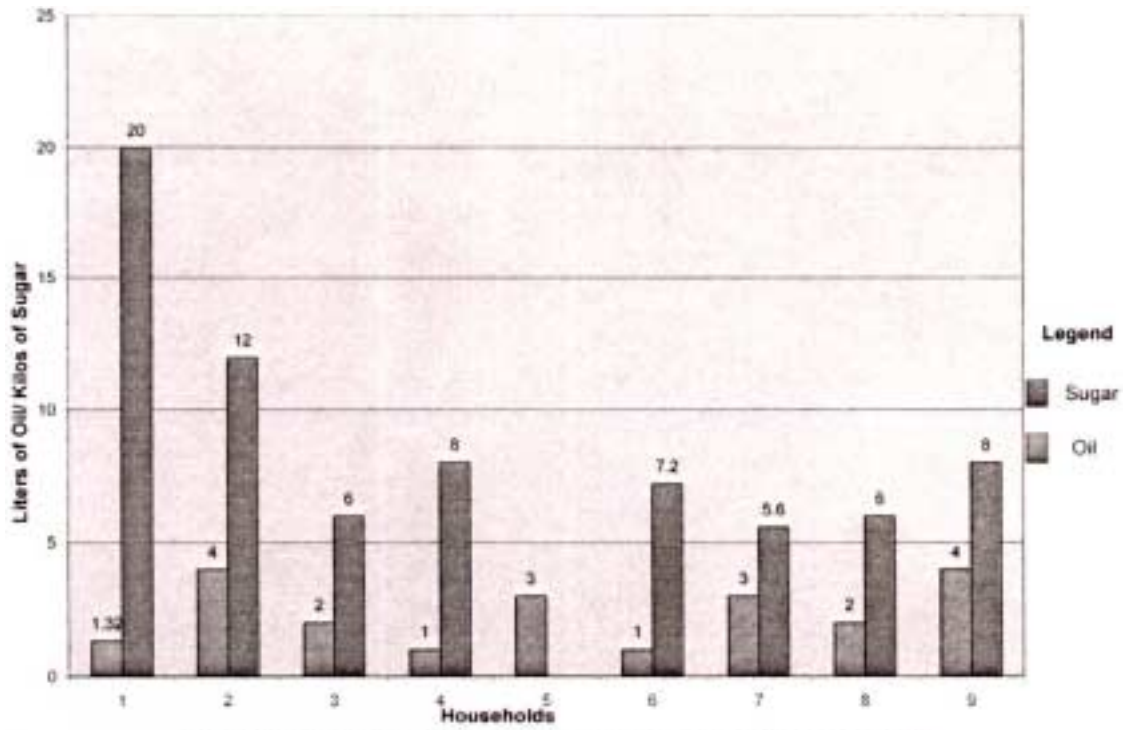


Figure 3: Monthly Household Consumption of Sugar and Oil

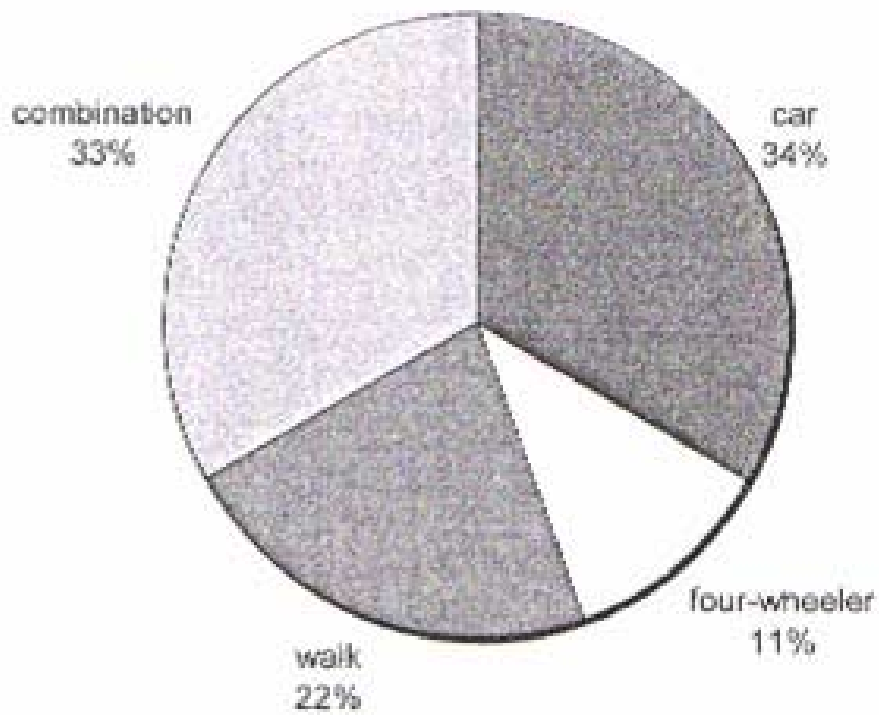


Figure 4: Transportation to Buy Food

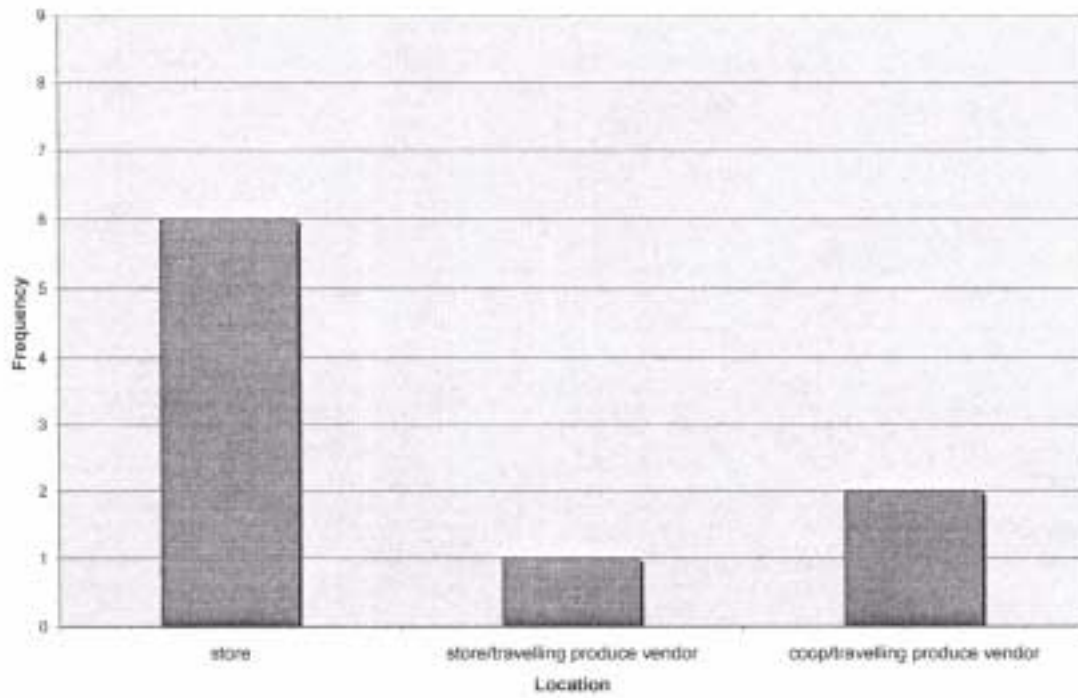


Figure 5: Where Food is Bought

Appendix 5

Food Access Issues / Statements from Semi-Structured Interviews
/
The kids are eating, but maybe are not getting the nutrients they need.
Once a month I go to the supermarket because it is too expensive.
We usually buy fruits and vegetables from the fruit and vegetables produce vendor.
I have a car to go to the supermarket but it's not that reliable.
Sometimes I go to other towns to buy food because it is cheaper and it is not as far to travel.
It is hard to eat balanced because it is hard to get to the store because of time.
It is not easy to have all ingredients in the house.
I would like to buy more varied food even though I don't think we eat bad, but don't have the resources. We eat meat maybe one or two times a month.
All kids should be given breakfast at school so they can concentrate and learn without going hungry.
Nutrition Knowledge and Education Issues / Statements from Semi-Structured Interviews
I have seen a lot on television.
I have gotten information at clinics, health fairs, and from television.
It is easier for kids to learn and grow up with healthy behaviors than it is for adults to learn.
I think that since the kids are in school a lot that the schools could utilize the time to teach children healthy behaviors and ways of living.
I know a lot but it's one thing to know and another to do it.
I have knowledge of what are 'good' and 'bad' foods.
Avoid sugar, salt, and fats as much as possible because I know it is not good for our health.
People need to do exercise and not eat a lot of meat.
Don't reuse burnt oil because it is bad.
Foods need to be fresh and not left in the refrigerator for more than about eight days because they lose a lot of vitamins.
Gallo pinto is good for kids to gain weight and it should not be given to fat people.
Know where food comes from. For example, not in cans.
Don't use too much of anything. Measure out oil, less frying, and don't cook vegetables all the way through to prevent loss of nutrients.
Have everything 'natural' and not a lot of salt, fat, or really spicy foods.
Kids don't like vegetables.
I know that meats aren't good for the kids but they love them so I give them meat.
Eat meat, beans, milk, fruit, and more of fruit, milk, and eggs.
The problem is putting it into practice.
Little fat, sugar, salt, not a lot of junk (only 'some' cookies) vegetables, measure oil, and don't add oil to chicken because it has its own oil.
Have seen nutritionists on television.
Not a lot of fat and salt. More vegetables, salad, and white meat.
If you need to lose some weight, eat less starch, more vegetables and fruits.
There are things that I want to give the children but they won't eat vegetables or salads.

Consent for Participation in Research Study
Monteverde Institute

Why am I being asked to be a part of this study? We are interested in finding out about the foods people eat in Monteverde communities, how they are cooked, and where they get their foods from. We are asking mothers of children from 7 to 12 years old in Canitas and Cerro Plano to take part in the study.

What will I have to do? We will be asking you a series of questions about what kinds of foods you eat, how you prepare them, and other questions related to nutrition. We also will be asking your children what they like to eat, to write down what they eat for four days, and reading them books about food at school. It will take no more than one hour to ask you these questions. You are free to answer or not answer any questions asked of you. Your child will also be asked to participate in activities for about one hour at school. They will also be asked to keep a food diary during the week.

How will the information be used? The answers from you and your child(ren) will be put together with those received from other families to determine the foods most often used. Once combined, the results will be reported at a public presentation at the Monteverde Institute on July 30, 2003. We will also be writing a report that will be printed and kept in the library at the Institute. You are free to come to the meeting and to read the report whenever you choose.

Will my neighbors know what I have said? No. Your name and your child's name will not be used when reporting any of the information. Without using your name, it would be difficult to identify your answers from those of other Monteverde residents.

What if I have questions about the study? If you have questions during or after we are done, or change your mind about including your answers, you can contact David Himmelgreen or Sophia Klempner at the Monteverde Institute (506-645-5053).

How will I benefit from the study? You will not receive compensation for participating in the study. But you will provide valuable information that can help in increasing knowledge about the nutrition strengths and needs of Monteverde.

Yes___ No ___ I agree to participate fully in the study.

Yes___ No ___ I give permission for my child(ren) to participate in the study.

Yes___ No ___ I give permission to be photographed and understand the picture may be used as part of the report.

Date

Signature

Printed Name of Participant

Signature of Person Gaining Consent

Consentimiento Para Su Participación En Un Estudio de Investigación
Instituto Monteverde

¿Por qué se me está pidiendo que participe en este estudio? Estamos interesados en identificar las comidas consumidas en las comunidades de Cañitas y Cerro Plano, como se preparan, y donde se consiguen. Estamos invitando a madres o responsables (adultas femeninas) de niños de 7 a 12 años de edad en Cañitas y Cerro Plano a ser parte de este estudio.

¿Qué tendré que hacer? Le estaremos haciendo una serie de preguntas sobre las comidas que se consumen en su hogar, como las prepara, y otras preguntas relacionadas con la nutrición. También le estaremos preguntando a sus hijos/hijas lo que les gusta comer, y les pediremos que registren lo que comen durante cuatro días. Como parte de la actividad le estaremos leyendo libros a sus hijos/hijas en la escuela acerca de la nutrición. Tomará no más de una hora hacerle estas preguntas. Puede sentirse libre de contestar o no contestar a las preguntas. A su hijo/hija también se pedirá que participe en actividades por aproximadamente una hora en la escuela. También se le pedirá a sus hijos/hijas que apunten todas las comidas que comen en el día por cuatro o cinco días seguidos.

¿Cómo se utilizará la información? Las respuestas obtenidas de usted y sus hijos/hijas serán juntadas con las recibidas de otras familias para identificar las comidas consumidas más a menudo. Una vez analizados, los resultados serán presentados en un foro público en el Instituto Monteverde el 30 de julio de 2003. También estaremos escribiendo un reporte que estará en la biblioteca del Instituto. Está invitada a participar en la presentación y de leer el reporte.

¿Mis vecinos sabrán lo que dije? No. Su nombre y el nombre de su hijo/hija no será utilizado al reportar la información. Sin utilizar su nombre, sería difícil identificar a sus respuestas entre las de las otras participantes en Cañitas y Cerro Plano.

¿Y si tengo preguntas sobre el estudio? Si tiene preguntas mientras o después del estudio, o si decide que no quiere incluir sus respuestas, puede contactar a David Himmelgreen o Sophia Klempner en el Instituto Monteverde (506-645-5053).

¿Cómo voy a beneficiar de este estudio? No será compensada por su participación en el estudio. Pero si proveerá información importante para ayudar a aumentar el conocimiento de la buena alimentación y las necesidades acerca de la nutrición en Monteverde y Guanacaste.

Sí _____ No _____ Yo quiero participar en el estudio.
Sí _____ No _____ Doy permiso a mis hijos/hijas participar en el estudio
Sí _____ No _____ Estoy de acuerdo con que se tomen fotos y entiendo que mi foto (o el de mis hijos/hijas) podrán ser parte del reporte.

Fecha

Firma

Nombre Escrito de la Participante

Firma De La Persona Pidiendo El Consentimiento

Pictures



The kids from the Los Llanos school proudly displaying their coloring books



Los Llanos school children



Lunch at the Los Llanos school



The Health Fair in Cañitas



A weekend adventure to the Monteverde Cloud Forest waterfall



Working at the Health Fair in Cañitas



Beginning stages of Reed bed we built for MVI



The reed bed completed!





One proposed site plan for the Los Llanos Visitor's Center. Note location of my reed bed design in top center of sketch (the light green rectangular shape).