Gardens at Home, Gardens at School: Diet and Food Crop Diversity in Two Q'eqchi' Communities in Southern Belize

by

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ABSTRACT

A district-wide school garden project has been initiated in the Toledo District of Southern Belize in response to reported high rates of poverty and undernutrition. This paper will discuss research conducted in the summer of 2007 with Q'eqchi' Maya in the Toledo District to determine the effect of school gardens on household diet and gardening, the composition of the household diet, and the makeup of homegardens. Food frequency questionnaires and semi-structured interviews were conducted in two rural villages, one with a school garden program and one without. Various members of NGOs working on school garden projects in the district were also interviewed about the functionality and purpose of the projects. Results discussed herein include the limited effects of the school garden program, the role that both homegardens and school gardens play in household diet and nutrition, the diverse array of fruit trees utilized by the Q'eqchi, and a description and inventory of a typical Q'eqchi' homegarden in Belize.

Figure 1.1: Q'eqchi' Homegarden in Indian Creek

Chapter One: Introduction

Contextualizing the Study Site: Gardens and the Toledo District

The Toledo district of southern Belize is home to the largest population of Maya in the country. Often referred to as "the forgotten district," Toledo still does not have a completely paved highway connecting it to the rest of Belize, contributing to its seeming isolation. The district lacks a public transport system, and roads are rough dirt drives, some accessible only with four-wheel drive vehicles. There is only one hospital in the district, in the largest town of Punta Gorda, which is over an hour away by vehicle from

most villages. Jobs are scarce in the region, and many households rely on their surrounding environment for subsistence – the *milpa*, the bush, and homegardens. Toledo is also a zone undergoing tremendous change, ranging from a significant increase in tourism, to an increase in large scale agriculture. Incidentally, it is the recently improved roads that are making transportation into and out of the region easier than ever, further affecting change in the district. Despite these changes, the district is still one in which poverty and undernutrition are common in many communities (PAHO 2007). Nearly half of Maya households in the district are considered poor, and studies have shown that some Maya children in the district suffer from chronic undernutrition (PAHO 2007, FAO 2007, Crooks 1994b).

In response to such studies and surveys, and in concert with the Belize Ministry of Health, the non-governmental organization (NGO), Plenty Belize, has initiated over 25 school garden projects throughout the Toledo district in an effort to improve nutritional intake of primary school students and their families. The school gardens grow a mix of local and introduced species and provide fresh vegetables for school lunches. The program has met with some success, as ten of these schools have graduated from the program, and continue to operate the school garden on their own. Previous research on school gardens has shown that they have a beneficial effect on the nutritional intake and knowledge of students who have access to such school activities and programs (Hermann et.al. 2006, Graham et.al. 2005, Morris et.al. 2000, Lieberman and Hoody 1998). However, these benefits remain undocumented among the communities with school gardens in Toledo.

This paper will discuss research conducted during three months (June through August) in 2007 with Q'eqchi' Maya in the Toledo District to determine the effect of school gardens on household diet and gardening, the composition of the Q'eqchi' diet, and the makeup of homegardens. Food frequency questionnaires and semi-structured interviews were conducted in two rural villages, one with a school garden program and one without. Various members of NGOs working on the school garden project in the district were also interviewed about the functionality and purpose of the project. The project also sought to document what foods are grown in the school gardens, and how this compares to the composition of homegardens in the two communities.

While school gardens are not often found within indigenous communities around the world, homegardens are a widespread and often vital part of the household. Homegardens play an important role in the health of children and adults alike, a role which is increasingly noted and studied by anthropologists and other researchers (McDade et.al. 2007). Production from such gardens has a variety of benefits, but perhaps most important is the resulting enhanced dietary intake and nutrition. The Food and Agriculture Organization (FAO) of the United Nations recognizes that homegardens offer "great potential for improving household food security and alleviating micronutrient deficiencies" (FAO 2008). With the possibility of improved nutrition, comes the potential for improved health. The World Health Organization (2007) states:

> Better nutrition means stronger immune systems, less illness and better health. Healthy children learn better. Healthy people are stronger, are more productive and more able to create opportunities to gradually break the cycles of both poverty and hunger in a sustainable way. Freedom from hunger and malnutrition is a basic human right and their alleviation is a fundamental prerequisite for human and national development.

The importance of good nutrition and dietary intake and their effects on the health of children and their communities underscore the significance of conducting a study that examines the impacts of home and school gardens.

Plenty Belize reports that the school gardens are created at the request of the communities and/or schools themselves, and the list of supporting groups includes many local, national, and international organizations (Plenty 2007). The Plenty project, *Garden-based Agriculture for Toledo's Environment* (GATE) "aims to create a replicable model of local sustainable livelihood and environmental benefit based on organic school gardens" (Plenty 2007). Working in conjunction with the GATE program is the *Toledo School Feeding Program* (SFP), which provides hot lunches to primary school children in 13 schools in the district. "Food from the gardens at the 13 SFP schools goes to help feed the school children, while those schools in the GATE program that are not yet in the SFP currently use their food to supplement what is available in the student's homes" (Plenty 2007). The goals of the GATE program are not only to improve child nutrition and nutritional knowledge, but also to enable youth to bring gardening practices home. What has not been noted by Plenty, or their partner organizations, however, is the fact that nearly every household in the communities surveyed in this study currently cultivate a variety of plants around the house. These 'traditional' homegardens[1] are not typically organized and planted in beds like the western-style school gardens, and therein likely lies this disconnect. These findings will be further discussed later in the paper.

[1] The use of the term "homegardens" is derived from Kumar and Nair, who define homegardens as "intimate, multi-story combinations of various trees and crops, sometimes in association with domestic animals, around homesteads" (2004:135). See the section on homegardens in Chapter 2 for more a detailed description.

Research Aims: an Overview

Like rural agrarian communities around the world, Maya communities in Belize are always changing and adapting as they engage with the many processes of globalization, such as development projects like the GATE program. As part of this process, indigenous knowledge[2] also changes, as many Maya are involved in new industries and jobs such as small business ownership, shrimp farming, logging, and tourism in addition to small scale farming. Homegardening remains an important reservoir of indigenous knowledge, in that cultivation techniques, plant knowledge, and plant use are all locally derived bases of knowledge that have been passed from generation to generation. This project explores the intersection of school gardening and gardening around the home, each representing in its own way global and local forces respectively.

Presently, little is known about the overall effects of the GATE school gardens on child or household health and nutrition, or their perceived impacts on children, families, or communities. Because school was out of session when the research was completed, interviews were not conducted with the children in the school gardens. This research sought to document what foods are grown in school gardens and how this compares to the composition of homegardens. In order to explore the effects of the school garden program on homegardens and cultivation, a comparative study was conducted that investigates the dietary differences found in a community with a school garden and a community that does not have a school garden. In an effort to understand the impacts of

[2] "Indigenous knowledge" refers to any knowledge shared by a group of people living in a particular place over the course of generations. See the section on Traditional Ecological Knowledge in chapter 2 for more a more in depth description.

the school garden projects for children and their families, one aspect of the research sought to determine how residents of villages with school gardens perceive the benefits and challenges associated with school gardening and the ability of the GATE program to assist with providing food for school children and their families.

This research focuses on two general themes: 1) to determine the differences between household dietary intake in a village with the GATE program and a village without the program; and 2) to determine the differences in homegarden composition between these same two villages. The research was designed to better understand and answer the following questions:

1. Does dietary intake vary across villages, and if so, how?

2. How have school gardens affected the household diet?

3. What are the perceived effects of the school gardens on the community from the perspectives of both Plenty Belize, and community members?

4. What are the species and varietal composition of the school gardens?

5. What types of plants would community members like to be included in the school gardens?

6. How does school garden composition compare to what is grown in homegardens?

7. How do homegardens differ in communities with school gardens compared to those without school gardens?

8. Is there interest on the part of the schools, communities, or Plenty Belize in infusing local or "traditional" species into the school garden?

A Brief Look at the Findings

Research was conducted in two Q'eqchi' Maya communities in the Toledo district, one with an active school garden that is a successful graduate of the GATE program, and another that does not have a school garden. The project can be seen as having two major parts, both revolving around the GATE program. Originally, research was designed to determine what effects the GATE program had on the diet of children participating in the program, and whether those children had different diets than children in villages without the program. The timing of the project ruled this possibility out, as school let out for the summer holiday within a week of the start this research project. Instead, food frequency questionnaires (FFQs) were conducted orally in households with children in primary school in each village. This allowed for an analysis of dietary intake that was comparable across villages. Analysis suggests there were no significant differences in the dietary intake between the two communities. Perhaps more significantly, when compared to the United States Department of Agriculture (USDA) Food Guide Pyramid, dietary intake appeared to be at or above the recommended levels in all categories except one: the Milk group. The possible significance of this is discussed in more detail in chapter four.

Similarly, garden inventories showed no significant differences in homegarden content between villages. A full 97.5% of households surveyed (39 out of 40) had what I term here, "homegardens," or plants growing around the house. There appeared to be age-related differences in homegarden content, as older members in both communities had more plants and greater species diversity. The school garden may appear to influence garden content to at least a small degree, as varieties common in school gardens were more frequently grown in the community with the GATE program. This observation

could point to an increased desirability of these plants due to their connection with the western-style school garden. Finally, traditional species[3] are reportedly grown in some school gardens, and the most successful schools in the GATE program reportedly grow what they want, usually including a number of these traditional food species, such as callaloo and chaya.

This research appeared to show no significant dietary or nutritional differences due to the GATE program, although this finding should be confirmed with a more thorough study of participating children. As the benefits of homegardens and school gardens are better understood, and the reach of globalization is perhaps greater than ever, an understanding of the roles school and homegardens play in child and community health and nutrition is vital. Furthermore, ways to optimize the potential benefits of both school and homegardens must be understood and studied, so as to have the greatest impact on the health and nutrition of communities like those in the Toledo district. In the communities studied, it appears that dietary intake is adequate, except possibly for the Milk Group (as defined by the USDA). Further research can now be conducted to identify particular nutritional deficiencies, allowing groups like Plenty to address more specific problems through the GATE program or other means. This research demonstrates the interaction between the global and the local, and how these forces interact to produce various outcomes in communities, households, and individuals. School gardens, here seen as representing global forces, can be seen as perhaps influencing what people grow, and thus, what they consume. Ultimately, these food

[3] "Traditional species" are those that have been cultivated by multiple generations, and/or are native to the surrounding environment.

choices will impact the health of people and their communities – whether this influence is positive or negative is yet to be seen.

Chapter 2: Literature Review

Introduction

Food consumption (or diet) is the means through which humans satisfy one of the most basic human needs – nourishment. However, food consumption has a larger role as well, as food and diet are one of the most obvious distinguishing characteristics of human groups across the globe. Sidney Mintz notes: "Food choices and eating habits reveal distinctions of age, sex, status, culture, and even occupation" (1985:3). Tied to these social functions is the fact that the food that one eats is directly related to health and health outcomes. This connection between diet and health is perhaps most obvious in low-income and other marginalized groups in which food choices are limited and often do not satisfy daily minimum needs of nutritional intake. In turn, high rates of child mortality, under- or malnutrition, and increased risk to other diseases due to compromised immune systems often result (West et al 2006).

Some of these health outcomes have been demonstrated among many Maya communities in the Toledo district of Belize, where undernutrition and certain vitamin deficiencies have been reported to be widespread (PAHO 2007, Crooks 1994a, 1994b). The present research, conducted in Toledo, sought to identify the effects of a school garden project (GATE) on diet and nutrition among Maya communities where undernutrition has been reported. A review of the literature on the Maya, and the Q'eqchi'

in particular, will provide a context for the research, as well as offer a background on how Q'eqchi' communities are organized and how dietary needs are typically met.

As described by Wilk (2006), Belize offers a distinct picture of the mixture of local and global forces, and this is nowhere more evident than in the food customs of the region. Despite its relative remoteness, the Toledo District is within the encroaching reach of globalization, and that reach extends to the many Q'eqchi' communities that dot the countryside. The impact of global forces on the food choices in the region will be discussed, along with how this may affect the Q'eqchi'. Somewhat distinct from, and merging with, these global forces is the locally-based traditional ecological knowledge (TEK) of the Maya, the importance of which will be discussed along with how such knowledge relates to the diet and health of indigenous groups.

This meeting and mixing of the local and global is particularly evident in two types of gardens in the district, also a focus of this research project. School gardens are a relatively recent attempt to bring increased vegetable consumption and nutritional knowledge to communities in need of such dietary improvements. The Plenty GATE program was started in response to the reports of undernutrition in the district, and aims to improve child nutrition in the district. Research on school garden projects brings to light a number of other potential benefits to students and others involved in such garden projects (Hermann et al 2006, Graham and Zidenberg-Cherr 2005, Graham et al 2005, Morris et al 2000). The GATE program attempts to replicate these benefits in the Toledo district by bringing North American gardening techniques to communities that continue to practice “traditional” methods of cultivation.

These methods, namely *milpa* agriculture[4] and homegardening, represent uniquely Maya ways of satisfying dietary needs with traditional Maya foods. With a particular focus on homegardens, these traditional methods will be examined in the context of the Q'eqchi' and other Maya in the region. In the lives of Q'eqchi' in Toledo, the homegarden represents a place where TEK continues to be utilized and shared. The knowledge and practice of homegardening is important because it represents an essential part of everyday life by assisting in meeting the dietary needs of nearly every Maya household in the district.

Southern Belize and the Maya

The Toledo district of Belize occupies the southernmost sector of the small Central American country. It is a coastal district that borders the Caribbean on the east and Guatemala on the south and west and is composed of lush tropical forest-covered mountain ranges. While the Maya make up about 10% of the total population of Belize, they likely comprise over half of the population of Toledo (PAHO 2007, TMCC & TAA 1997). The numerous Mayan archaeological sites that have been excavated throughout Belize and Toledo offer evidence of their long history in the region. "Belize, together with the Tobasco region (on the southern edge of the Gulf of Mexico) and the Peten, was at the epicentre of this culture in its full flowering" (Thomson 2004:4). Belize historian, P.A.B. Thomson, describes how Maya in Belize were living in small communities at the time of Spanish contact, and likely were pressured out of the region through violence,

[4] *Milpa* agriculture (often referred to as "swidden" agriculture) is a farming practice in which a chosen plot of land is cut and allowed to dry. After a period of drying time, the land is then burned clear, and planted (TMCC & TAA1997).

"but the organizational, intellectual, artistic and architectural achievements of the Classic period of the Maya civilization are a part of Belize's heritage" (2004:1). However, the fact remains that Maya people have resided in the region now known as Belize and Guatemala for thousands of years. While direct lineage with the ancient Maya has been contested, this heritage remains evident among the Maya who continue to reside throughout all of Belize, but with a presence that is especially common in the southern Toledo district.

With a population of around 24,000 of the 280,000 total in Belize, the Toledo district is primarily comprised of rural communities with roughly 80 percent of the populace living rurally (PAHO 2007). Maya people account for over half of the population of Toledo (about 14,000), and reside in small rural villages throughout the Maya Mountains and lowland areas toward the coast (TMCC & TAA 1997:14). The rural livelihood consists of a reliance on subsistence agriculture to meet the day-to-day nutritional needs of district residents. Many families practice swidden agriculture, a technique of agricultural production, which is commonly referred to as *milpa*, and most families have some sort of homegarden around the house. These practices, combined with collecting food from "the bush," or secondary and primary growth forest, supply much of the food in the Q'eqchi' diet.

Corn, which can be considered the main staple of the diet, is described by Wilk as the Q'eqchi' "staff of life," and all aspects of corn production were traditionally carried out communally and steeped in ritual (1997:88). While corn is *milpa* grown, the entire physical environment represents a significant aspect of production for the Q'eqchi' diet. The *milpa*, the bush, and homegardens, about which traditional knowledge remains

widely shared, are vital in satisfying everyday nutritional needs. “The *milpa* system, a subsistence strategy based on the cultivation of maize in swidden plots, enriched by chopping and burning, or mulching and planting nitrogen-fixing legumes, is a way of life for all Maya in southern Belize” (Zarger 2002b:85). *Milpa* production consists of primarily corn, but also additional food-producing and otherwise useful plants. The bush provides an important source of game meat and wild-harvested food and medicinal plants. Even the land immediately around the house is used for homegardens (also referred to as kitchen-gardens), which are cultivated to produce a range of fruits, vegetables, herbs, medicines, and other useful plants.

With the continuing pressures brought on by the increasingly visible effects of globalization, the Maya in Toledo negotiate their unique social environment on an everyday basis. Maya diet continues to be primarily based on traditional foods, and around ideas of what food is good, healthy, appropriate, and desirable. At the same time, an increase in tourism, and NGO projects like the Plenty GATE program, are increasingly influencing these traditions. Finally, technology also plays a role in the Q’eqchi’ diet, from homegardening and swidden agriculture, to new modes of production like organic gardens, and agriculture without chemical inputs. All of these interact with each other and intersect to create the ever evolving and uniquely Q'eqchi' diet of southern Belize.

Although many Maya families farm, they are increasingly involved in multiple livelihood strategies, which often vary seasonally and may be either opportunistic or long term. Income generation is among the many challenges facing Maya communities in

southern Belize. The Toledo district has the greatest concentration of poor in Belize (58%), which makes up nearly half of the households in the region (PAHO 2002). The majority of the poor are Maya, reflecting the fact that the population of the district makes up over one half of the Amerindian population of Belize (Crooks 1994a).

According to PAHO (2007), malnutrition is a continual problem, especially in deficiencies of Vitamin A, Calcium, and Iron. In a study conducted in 1993 in the Toledo district by Deborah Crooks (1994b), a sample of 328 Maya children from a rural village exhibited growth patterns typical of chronic undernutrition and 66% were found to be "stunted" in growth (i.e. low height for age). Further, PAHO notes that the decade old 1996 National Height Census of children aged six to nine years old is the only reliable source on the nutritional status of children in the country. This study shows that while nationally, about 15% of children suffer from low-height-for-age, nearly 40% of the children in the Toledo district suffer from stunted growth (PAHO 2007). Fertility rates are also higher in the district where the rate stands at about 5.6 children per woman compared to 3.7 children at the national level (PAHO 2007). Additionally, the prevalence of both vitamin A deficiency among children (aged 2 to 8 years) and anemia among pregnant women is high in the district (FAO, 2007). The Food and Agriculture Organization (FAO) of the United Nations agrees with PAHO that national data on nutritional status are lacking, and also recognizes that "special attention should be directed to the district of Toledo which has a high prevalence of stunting among under fives" (FAO 2007, PAHO 2007). While these are the only reliable nutritional studies available on Toledo, their age must call into question how accurate they remain. Without updated nutritional information on the district, it appears that this is a region that would

benefit from programs and services, like those Plenty designed, that can address some or all of these reported health problems.

The Maya of the Toledo District

The Maya living in the scattered villages of the Toledo District of Southern Belize are comprised of two groups, the Mopan Maya, and the Q'eqchi' Maya. Both groups claim continuous occupation of the district, and both claim to be directly descended from the ancient Mayans commonly known to have existed throughout southern Mexico and Central America. As evidence, Maya groups in Belize cite anthropologists and other Mayan scholars that refer to Maya groups living in Belize at the time of the arrival of the Spanish in the 16th century. Despite these claims, the Maya in Toledo have struggled for rights to their land, as Belizean law fails to recognize such rights (TMCC & TAA 1997:3). Anthropologist Anne Sutherland describes this issue between the state and the Maya as "very hotly contested" (1998:86). However, this may be changing, as a Supreme Court case in Belize in October, 2007 ruled in favor of recognizing the land claims of two Maya villages in the Toledo district. According to the ruling, Belize must "determine, demarcate and provide official documentation of Santa Cruz's and Conejo's [two Mayan villages] title and rights in accordance with Maya customary law and practices" (Survival International 2007). This ruling bodes well for the other 34 communities in the district, although as of this writing, these land rights have not been extended to other villages, and it remains unclear whether all communities will choose to pursue collective land tenure agreements with the government. The issues around land rights are of vital importance to Maya communities, as the majority of their diet is

obtained from their surrounding environment, whether grown on their *milpas* and in homegardens, or collected and hunted in the bush. Without land rights, these communities risk losing the source of their livelihood to outside interests, often represented by transnational corporations.

The diet of the Maya remains largely based on the traditional foods produced in gardens around the home, on *milpas* around the village, or collected in the surrounding bush. As in times past, corn is the staple of the contemporary Maya diet, and is used in many forms, including in tortillas, as a drink, in dumplings, and eaten whole. Other traditional foods consumed by Maya of the Toledo district include cacao, ground foods like yams, beans, greens, fruits, vegetables, and wild game. Caldo is one of the most common dishes in Maya households. This meat-based soup is seasoned with a variety of local plants and herbs, particularly garlic and cilantro (TMCC & TAA 197:34-35). Still, global food items have made their way into many of the homes and villages in Toledo. Canned meats, ice cream, and soft drinks are all readily available and commonly consumed in most homes, as will be discussed in chapter four.

Globalization, Food, and Belize

The history of Belize illustrates the process of globalization, and it is unique in the sense that from the time of contact, there was little interest in the settling of the territory, but instead in the bounty that it could produce. The small Maya communities that inhabited Belize at the time of contact were overmatched by the arms of the exploring Spanish, and the Maya quickly resettled inland. While the Spanish interests lay elsewhere in the region, British adventurers were quick to discover the rich bounty of

logwood that could be harvested in Belize. Still, nearly 100 years passed before the area that is now Belize was settled by colonialists (Wilk 2006, Thomson 2004). Thomson reports the first official documentation of a permanent settlement occurred in 1682, a place "where the English for the most part load their logwood" (2004:17). So already at this early point in history, Belize was a place where the influences of the global (in the form of the Spanish and English) were interacting with the local (the Maya) in untold ways. Still, to this day, Belize remains the nation in Central America with the smallest population density and a distinct mix of the global and the local (Wilk 2006).

Food and the food industry represent one of the primary symbols of globalization around the world. Today these symbols take the form of transnational corporations like McDonalds or Starbucks, both recent targets of anti-globalization protests (Lyon 2006, Pilcher 2006). However, such symbols have not always been so obvious. In his classic work, *Sugar and Power* (1985), Sydney Mintz traces the transformation of sugar from a rare luxury from the Caribbean to one of the most commonly consumed foods around the world. *Sugar and Power* is also the story of how food (in this case sugar) has at the same time connected people, and differentiated them, and how global desires can affect local lives. Mintz notes:

> It is of course common to find that the poorest people in less developed societies are in many regards the most traditional. A product that the poor eat, both because they are accustomed to it and because they have no choice, will be praised by the rich. (1985:xxi-xxii)

This irony is evident in Belize, and Toledo especially, where the Maya, one of the region's poorest groups, produce cacao for an international company (Green and Black's) that transforms the traditional food into a gourmet organic chocolate bar sold in health

food stores in the U.S. and Europe at premium prices. Green and Black's have increased the profitability of cacao in the region, as evidenced by their reported nearly 600 new cacao farmers and 500,000 cacao trees planted in 2004 alone (Green and Blacks 2005). However, at the time of my research (2007), it remained unclear what proportion of benefits from the increase in cacao production remained in Toledo.

In his book, *Home Cooking in the Global Village*, Richard Wilk (2006) draws on over 30 years of experience working in Belize to describe the intersection of the local and the global in the food and diet of the country. Wilk explains that the effects of globalization in Belize have not necessarily eroded or subsumed other traditions, but instead have been integrated or mixed to create something new and unique. "Food connects politics to health, mega-corporations to the kitchen table, and our everyday imaginations, wants and hungers to a whole sweep of time and history" (Wilk 2006:14). While the Toledo district has been a relatively isolated part of the country for much of its history, these connections and mergings of the local and global are readily evident.

The Toledo district offers an interesting picture in that the typically globally based, corporate entities (like McDonalds or even fast food in general, for instance) have not made obvious inroads into the district capital of Punta Gorda, let alone other areas of the district or even Belize in general. A Subway restaurant in Belize City remains the only transnational fast food restaurant in the country. Still, food cannot be seen as completely local here either. Instead, one finds a blend of globally produced ideas about food with locally based traditions and food products. The picture of publicly offered food is definitely global, but uniquely local at the same time. Punta Gorda has a number of restaurants for locals and tourists alike, including Chinese, East Indian, Garifuna,

Belizean (or Creole), and Vegetarian. And while the effects of these restaurants on the Maya diet remain unknown, as more Maya move into or spend more time in Punta Gorda, some influences would seem expected. A short description of some of these restaurants will make this hybridity clear.

Gomier's is a small vegetarian restaurant with a view of the Caribbean Sea out the front door. Guests can sit outside under a thatch roof, constructed with the help of local Maya men. The owner, Gomier, is an older dreadlocked man from the island of St. Lucia, and he has spent time in North America and Europe. His decision to consume a vegetarian diet and open a vegetarian restaurant stems from health issues he had as a child. His menu changes daily, and is based on the food he has available, but usually includes a mix of tofu (which he makes himself), locally grown vegetables, many of which he grows himself or purchases from Maya at the four-times weekly market, and the occasional fish which he obtains from local Garifuna teens (another Belizean indigenous group in the area) who fish in dugout canoes and off the shore in efforts to generate some income for themselves in this region with so few employment options. His soybeans are shipped to him from out of the country, but he processes all of his soy products in the restaurant – tofu, soymilk, soy/veggie burgers, and more – and he is able to utilize all of the products of the processing, thus producing zero waste. The rest of his food is grown locally, and goes into recipes that are a blend of Caribbean and typical U.S. vegetarian influences.

Earth Runnin's is another eatery in Punta Gorda, popular with some young locals, and especially with the many expats that reside in town or visit for extended periods. This restaurant is owned and staffed by locals of Garifuna descent. The owner left Belize for

university training, and has come back to open an eatery that is distinct in its very combination of the local and the global. Dishes at Earth Runnin's run the spectrum from the traditional Garifuna dish of Culture Soup, with fish and local seasonings, to the distinctly international Mediterranean platter with hummus, olives, and pita. Again, the fare varies daily, and is comprised mostly of locally produced vegetables and meat, supplemented with a number of items shipped from outside of Belize. The menu reflects the melding of the global and local, with a distinct mix of Garifuna and international tastes and dishes produced or blended for each meal.

Garay's Kitchen is a third example of the mix of the global and local that exists in Punta Gorda. Situated on the outskirts of the town, and right on the edge of "Indianville," the small area where Maya have come to resettle out of the surrounding villages, Garay's is run by an East Indian family that lives outside of town. Their meals are all distinctly East Indian, comprised mostly of various curry dishes; however, most of the food is locally produced – from the breadfruit, to the fresh river shrimp, to the eggs, carrots, and cabbage that accompany every dish. Again, there are the supplemented rice and beans that the owners purchase from a distributor and may originate from outside of the country, but are likely grown in Belize.

While the food choices in the district regional market town exhibit a perfect example of the merging and mixing of global and local, they also provide a glimpse of how food differentiates people and groups. The end products in all of these eateries are at one in the same time products that link the global to the local, and also products that reveal the distinct nature of each group behind the product. While to date, the Maya have no restaurants in Punta Gorda to share their cuisine, their diet is at once distinct and

similar, a mixed pot of the local and traditional with the global and new. Still, as Mintz noted, as the poorest group in the region, it could be argued that the Maya diet remains one of the most traditional. Yet, while the merging of global products with the Maya diet is not as obvious as among other groups in Toledo, it is occurring in more subtle ways which will be explored in chapters four and five.

Traditional Environmental Knowledge (TEK)

Traditional environmental knowledge (TEK), also referred to more broadly as indigenous knowledge (IK), is knowledge shared by a group of people living in a particular place over the course of generations. It is local knowledge that is linked to a way of life and in particular ecological niches (Nazarea 2006, Purcell 1998, Nader 1996). The cultivation of homegardens, along with the associated plant knowledge and usage, in and around the households of indigenous communities may be considered a form of TEK. A more complete understanding of how traditional or indigenous knowledge affects or relates to human health and nutrition is integral to addressing perceived health problems in indigenous communities around the world.

Hunn (1999:23) notes the varying terminology used to describe such ways of knowing: ethnoecology, local environmental knowledge, indigenous knowledge, and traditional environmental knowledge (TEK). While the terminology may differ, according to Hunn, the concept remains the same:

> TEK is both local and fragile. That TEK is local rather than global in scope is a consequence of the context of its acquisition, transmission, and use. It is acquired via direct personal experience, is transmitted orally within a community, and is validated by its relevance to the daily struggle to wrest a livelihood from one's land. (1999:23-24)

In the Americas, TEK has been devalued and subjugated for centuries — since the arrival of Europeans — and to varying degrees continues to be today. With globalization, indigenous knowledge is not only changing, but is under threat of diminishing as well (Nader 1996). While the changes in TEK extend back through many generations, local knowledge has by no means been halted. "Globalization currently poses a threat to such knowledge to the extent that formal schooling and integration into emerging market economies devalue folk knowledge, prioritize alternative sources of information, and provide access to substitute products not made from local resources" (McDade et.al. 2007:6134). Nearly all researchers of the subject remark on the effect of change in, or potential loss of TEK, which underlies the importance of working to maintain and enhance such knowledge systems (Nader 1996, Purcell 1998, Hunn 1999, Nazarea 2006, McDade et.al 2007).

As is true in many parts of Latin America, the stresses mentioned above could describe the situation in the Toledo district, where Maya are increasingly being integrated into the national culture of Belize. For instance, there are English speaking schools present in the more than 30 Maya villages in the district (Zarger 2002), and tourism to the region is encouraged and continues to grow, both of which present potential obstacles to the maintenance and transmission of TEK. Within this context, it is important to develop means through which indigenous knowledge can be maintained and transmitted.

Homegardens and diet represent important sources of indigenous knowledge in communities around the world (Kumar and Nair 2004), and garden projects may be a useful way to integrate local, traditional environmental knowledge into the educational

training of the youth in Maya communities while offering the benefits of not only the gardens themselves, but also of the under-studied benefits of such knowledge (which include improved diet and health). But why is the continued transmission of TEK important to communities? We are just now becoming aware of the important role TEK plays in the lives of people whose livelihoods depend on such a deep understanding of the environment that surrounds them.

The role of TEK in maintaining the health of indigenous groups is a significant focus of ethnobotanical and ethnoecological research. Johns (1999) presents instances in which traditional diets that have developed in reference to their unique physical environments have played a vital role in maintaining the health of the peoples who live in those environments. Plant foods can supply important nutritional supplementation while at the same time provide important medicinal benefits as well, such as protection against diabetes, cardiovascular disease, and cancer. "Indigenous resources and the knowledge of them... are important to the health of people; they are often superior to alternate foods and provide biological benefits that may be unrecognized" (Johns 1999:169). The Maya of Toledo utilize a number of local plants in their diet, many of which may have nutritional and dietary values that are not understood.

While traditional environmental knowledge has been documented by researchers and indigenous communities, the measurable benefits often remain unclear. Among the Tsimane' in Bolivia, McDade and colleagues (2007) found that parents' knowledge and use of local ethnobotanical knowledge (LEK) corresponded to a variety of health outcomes in their children. In particular, high maternal LEK was associated with better child health, including reduced risk of elevated C-reactive protein (CRP), higher skinfold

thickness, and lower likelihood of severe child stunting. Further, parents with lower levels of LEK had children with worse health outcomes, pointing to the importance of the continuing dissemination of such knowledge among marginalized groups who have limited access to resources.

Among the Maya, ethnobotanical knowledge appears to be somewhat resilient in the face of the pressures of globalization. Zarger and Stepp (2004) conducted a study among Tzeltal Maya children in Chiapas, Mexico that reconstructed a plant-trail from a 1968 study, to compare ethnobotanical knowledge of children today with those from the time of the original study. Despite many changes that could be the result of the forces of globalization, including new roads into the village, household electricity, television, and changes in subsistence patterns, children exhibited little to no change in their ability to name plants.

In a study with Q'eqchi' Maya in the Toledo district, Zarger (2002:596) reports that most households cultivate small plots which average 34 and range up to 76 different species. Furthermore, child-guided garden surveys conducted for her research "demonstrate the extensive knowledge children share about different plants in their immediate landscapes" (596). Results suggest that children learn the bulk of TEK from siblings, parents, and grandparents of the same gender. Significant to this study, children between the ages of 4 and 7 exhibit the most striking increase in TEK. This same population participates in the school garden programs that have been initiated by Plenty Belize. This finding may suggest that this age group is best suited to understand and learn not only the techniques of gardening and proper nutrition that the school garden program seeks to instill, but also TEK that may be integrated into the garden program.

Homegardens

A review of the current state of knowledge on homegardens from around the globe is provided by Kumar and Nair, who define homegardens as "intimate, multi-story combinations of various trees and crops, sometimes in association with domestic animals, around homesteads" (2004:135). They note that homegardens have been part of a way of life for centuries in communities in such diverse regions as Asia, Africa, and the Americas, and may be among the oldest land-use activities. The authors further describe homegardens:

> A typical homegarden is an integral part of the farmer's farming system and an adjunct to the house, where selected trees, shrubs and herbs are grown for edible products and cash income, as well as for a variety of outputs that have both production and service values including aesthetic and ecological benefits. (136)

They explain how garden composition is determined by specific community needs and preferences, while providing significant sources of food, calories, nutrients, and minerals in the diets of gardening families and communities.

Homegardens supply an array of products for many different uses and needs of families around the world in both resource-rich and resource-poor communities. Perhaps most importantly, homegardens can provide a means of satisfying the dietary and nutritional needs of families and communities. The Food and Agriculture Organization of the United Nations (FAO) states that "a well-developed homegarden has the potential to supply most of the non-staple foods that a family needs every day of the year, including roots and tubers, vegetables and fruits, legumes, herbs and spices, animals and fish" (FAO 2008). In the Toledo district, where economic opportunities and available land are scarce, many households plant useful herbs, fruit trees, and vegetables around the home

(Zarger 2002:595). The gardens represent an important means to supplement and satisfy the dietary requirements of the families of the district. A variety of food crops are also typically produced on the household farm, but usually agricultural plots are located from one half to two hours' walk from the village (Zarger 2002).

Indigenous groups throughout the Latin American region have been cultivators of homegardens for centuries. Angel-Perez and Mendoza (2004) conducted an analysis of 40 Totonac households with homegardens in Veracruz, Mexico, and documented the cultivation and use of over 300 plant species. They classified four types of homegardens that were based around the garden's proximity to the household and commercially used agricultural plots and utilized what they call "marginal spaces" in the community. The various homegardens in these communities are used "to provide a flow of home supplies needed in supporting traditional Totonac daily life" (2004:341). The Totonac use of homegardens appears to be typical to the region in terms of species diversity and utility within the community.

Similarly, in their study of 30 homegardens in the state of Chiapas, Mexico, Vogl and colleagues (2002) found 241 different plant species that were used for a variety of functions, including dietary, medicinal, technical, and social purposes. "...Homegardens play an important role in growing subsistence crops, enhancing food security and producing medicinal herbs, poultry and plants for ritual and religious purposes" (Vogl et.al. 2002:613). Additionally, despite the close geographical proximity of the two villages studied, they found a great diversity in garden content, placement, and management. In the Yucatan Peninsula of Mexico, Caballero (1992) studied 60 homegardens in ten villages across the region recording a minimum of 83 species. He

found that most of the plant species in the homegardens that are native to the Yucatan are wild species that have been cultivated, thus representing resources unique to the region. Products harvested from the homegardens combined with the other forms of traditional agriculture were found to satisfy the dietary needs of communities throughout much of the region, and were sometimes able to provide a source of cash-income.

In Belize, a study of agricultural production in the San Jose community of the Toledo district conducted by Levasseur and Olivier (2000) showed that traditional crops are still favored within the community. The study reports that 94% of households depend on traditional agriculture for subsistence, and 60% of households meet their food needs through this traditional agricultural production, which includes the cultivation of homegardens. These homegardens averaged 30 different species and 240 individual plants, and of the 18 homegardens inventoried, 164 different plant species were identified. “In these gardens, there is a clear predominance of plant species whose intended use is for food... [which] indicates the importance of the homegarden for diversifying the family diet” (2000:283). The homegardens also contained plant species that were identified as becoming scarce, plants used for medicinal and cultural purposes, small amounts of marketable plants, and some small livestock.

While there is great diversity among homegardens throughout Central America, they represent a unique system of subsistence knowledge that is distinctive to each particular environment and cultural context in which they are located. Further, homegardens are consistently used to supply and/or supplement the dietary needs of communities and families, while also providing goods for medicinal and other cultural

uses. The homegarden is integral to the health and livelihood of indigenous groups throughout the region and world.

School Gardens and Plenty Belize

Figure 2.1: Typical Plenty Belize School Garden

While homegardens can play an important role in fulfilling the dietary and nutritional needs of households, they do not always satisfy all of these needs in a community. This can be due to a variety of reasons, ranging from lack of availability of plants or seeds to incomplete knowledge of nutritional and dietary needs, and even a simple lack of space to grow enough food for the household. In instances like these, school gardens can be a means of further supplementing household diets. In efforts to

address problems surrounding dietary and nutritional needs, the Belize-based NGO, Plenty Belize, has developed multiple nutrition-based projects in the Toledo district, including one in which funding and direction are provided to create small gardens for schools in each community. Food procured from the gardens is then used to supplement children's meals each day, and when available, foods are sent home with the students (Plenty 2007). With participation of 27 schools in the district, Plenty (2007) reports that the programs provide each school with:

> regular extension support; tools, seeds, and other supplies; training of village volunteers to assist with the gardens; classroom activities; educational support to teachers in integrating the gardens into their curriculum; teacher training workshops; environmental education; educational materials; encouragement to start homegardens; and nutrition and food preparation education.

While these efforts have met with success in sustaining and maintaining a number of school gardens in Toledo, it remains unclear what the measurable or perceived benefits of the project may be.

While relatively unstudied in Latin America, school gardens have been an increasingly common means of attempting to improve nutritional intake and knowledge among United States youth. Morris and colleagues (2000) discuss numerous classroom-based programs from around the U.S. that attempted to improve students' (grades 1-4) nutritional intake and knowledge. They explain that in-class methods of teaching nutritional science have met with varying success in improving nutritional knowledge and in changing behavior. In contrast to this approach, the authors conducted a study in which garden-based education in combination with in-class lessons was introduced to fourth and fifth grade students, reporting that student's nutritional knowledge and

vegetable preference were improved, and perhaps more importantly, mostly retained at a six month follow-up study (Morris etal. 2000).

The use of school gardens and other environmentally-based methods of education appear to have beneficial effects beyond nutritional knowledge and intake as well. Lieberman and Hoody (1998) report on a nationwide study of 40 schools that utilize environmentally-based education programs showing a positive effect on student performance and standardized test taking across several subject categories. Further, teachers reported renewed motivation and interest in teaching when such environmentally-based education was introduced at their schools. The state of California has made it a state-wide mandate to have gardens in every school by the year 2025. Graham and colleagues (2005) surveyed California school principals on school garden practices, as well as attitudes toward and barriers to using school gardens. The study showed that school gardens were primarily used to enhance teaching and provide extracurricular activities for students. While the effectiveness of the gardens to enhance the school meal program was questioned, most principals felt that the gardens did enhance the effectiveness of teaching—especially science. In a follow-up study to the above, Graham and Zidenberg-Cherr (2005) sought to assess California fourth grade teachers' use of school gardens for instructional purposes, along with their attitudes and perceived barriers that may prevent school gardens from being better integrated into the school system. Teachers who participated in the study largely agreed that gardens were "effective at enhancing academic instruction" (2005:1799).

Hermann and colleagues (2006) conducted interviews with 43 students before and after participating in an after-school gardening program in Oklahoma. They found a

significant increase in the number of children who reported "I eat vegetables everyday" and "I am physically active everyday." According to the authors, "Incorporating gardening along with food preparation, nutrition and physical activity education was an effective way to improve children's reported vegetable intake and physical activity in an after-school setting" (2006:202). Further, the garden also presented the opportunity for school teachers, parents, and Master Gardeners (trained experts on gardening) to interact.

These studies show that while school gardens reportedly can improve students' nutritional intake and knowledge, they can also be used in a variety of ways to enhance other educational and social activities. School gardens offer students increased interaction with their natural environment, as well as with those who become involved in the gardens with them, including teachers, parents, and others from outside of the academic institutions (like the Master Gardeners in the above study). When transferred to a rural region facing economic challenges, like the Plenty GATE program in the Toledo District, questions remain as to whether these documented benefits of school gardens are occurring. Further, when introduced into communities outside the U.S., such as the rural schools in Toledo, what other effects may school garden programs be having on students and the communities that house them?

As suggested by many of the aforementioned studies that were carried out in the U.S., school gardens offer a range of possible benefits for the Maya communities of the Toledo district. Plenty reports improved dietary intake and nutritional status of the students as the main positive impacts. Along with the potential health benefits of a diversified diet, Plenty also claims that students have a better understanding and interest in subjects taught within the setting of the garden, including science and agriculture.

Finally, Plenty believes that the school garden project offers increased food security to participating communities (Miller 2007). There has been no reported critical analysis of the Plenty GATE program, and other potential benefits remain unexplored as well. For instance, including locally significant and adapted species in school gardens may reinvigorate the youth's interest in local knowledge that has been part of their history for generations. Conversely, students participating in the GATE program may be placing a higher value on non-native species being grown in the garden, resulting in a decreased interest in TEK. While the GATE program may be providing immediate health-related and other benefits to school children and their families, this remains undocumented, and potential negative effects are not being considered. The task of this research remains an important one — to document the positive and negative effects of the GATE program on the diet and homegarden composition.

Nutritional Ecological Approach

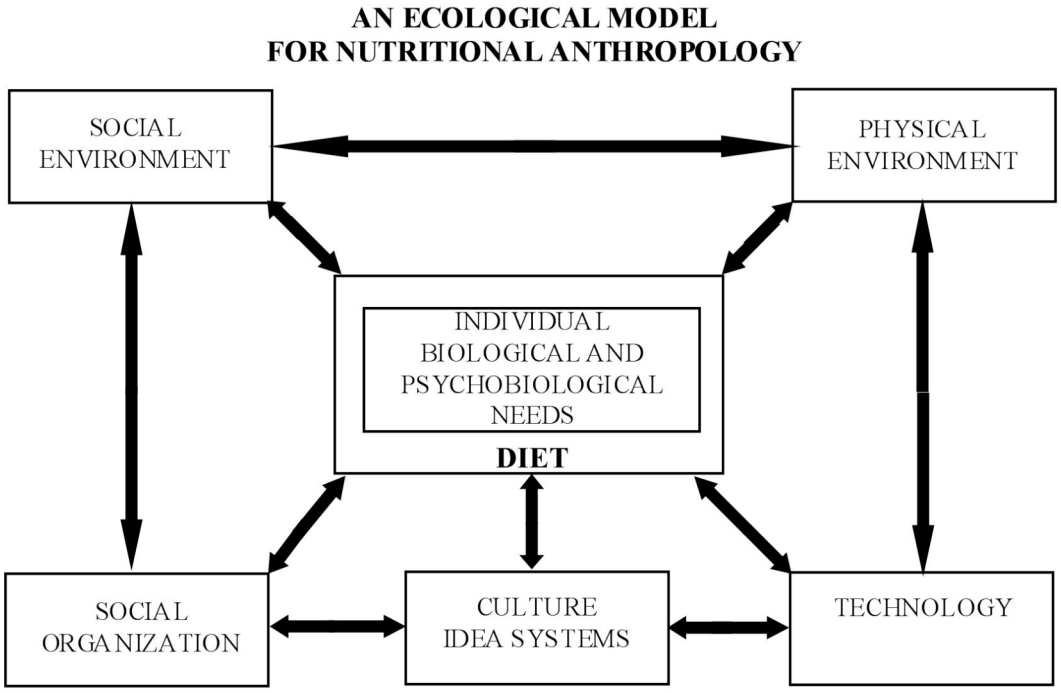
A theoretical framework that guides this study is one described by Jerome and colleagues (1980): an ecological model of nutrition called nutritional ecology that helps to explain the many factors that affect diet and dietary choices (Figure 2.1). They describe an open system with the individual (or individual diet) at the center, which is comprised of the individual's biological and psychobiological dietary needs. Surrounding the individual diet, and affecting and being affected by it, are the various aspects of any given society's food system: the social environment, the physical environment, social organization, culture and ideological systems, and technology. The authors explain the value of such an approach:

> The ecological approach is valuable for delineating elements of a dynamic system, determining how the various elements work together, identifying hazards or potential stress areas, predicting types and direction of change, and assessing adaptive and deleterious responses to both planned and unplanned change. (Jerome et.al. 1980:15)

In short, the examination of one's social and physical environment, along with interacting factors (e.g., community organization, land use, technology, outside influences, etc.) can be very instructive in understanding not only the strengths and weaknesses of the diet, but also why that diet is consumed. In the instance of this research, increasing influences of globalization (e.g., increased contact with tourists and new foods available for purchase), along with the direct influence of the Plenty GATE program (the school gardens) are examples of changes in the social environment and technology respectively, that are potentially having increased influence on the Q'eqchi' diet in Toledo.

In the case of the Maya in the Toledo district, and more specifically to this research, the ecological approach can be especially instructive. The Maya live in communities that largely function according to traditional guidelines based around a communal land system. This system is managed by a village leader, the *alcalde,* working in concert (theoretically) with a village council which is elected to office (Zarger 2002b, TMCC & TAA 1997). The continuation of this system is made possible because, as Wilk (1997) describes, the nature of their social organization has fluidity and flexibility that has allowed Maya in Belize to change and adapt to regional pressures from the likes of the national government and transnational corporations over the course of generations. Maya social organization, because it partly revolves around the planting and harvesting of corn, among other things, has a direct influence on the diet in the communities.

Figure 2.2: Ecological Model For Nutritional Anthropology (From Jerome et.al. 1980)



Globalization can come in many forms, and its effects can be seen in technology, in this case in the form of school gardens, and the social environment, as more and more Maya take jobs in national and global economies. As Messer notes, these types of '"global" influences may lead to further changes and preferences in the diet. "The careful search for 'cultural' along with material factors that govern food choices (e.g. "taste", "prestige") might provide insights on other questions well" (1984:212). Are the increasing interactions with the national and western influences in the region changing taste preferences and what is considered to be prestigious food?

The Nutritional Ecological Model allows for these influences to be investigated and explained. As will be seen in later chapters, this research suggests that changes in diet preferences are being propagated by the school garden project in Toledo. Improved infrastructure in the region is leading to increased communication and interaction with other

Belizeans and people from around the world. Employment opportunities are also expanding, leading some to migrate away from homes and communities. As development continues, land use is changing in the district as well, pressuring the traditional *milpa* systems to adapt or be abandoned. While it can not be determined which of these elements are having the greatest impact on diet and dietary choices, the Nutritional Ecological Model provides a means to examine the dynamics between them.

Chapter 3: Methods

Introduction

This chapter outlines the research environment of the project along with the methods employed. I attempt to provide a rationale for the decisions that were made before and during the research in response to unforeseen factors that emerged during the course of the field work. The research took place in the Toledo District of Belize during the months of June, July, and August of 2007. I conducted semi-structured interviews with the head of households from 40 families from two different Q'eqchi' Maya communities, as well as with four employees of three different Non-Governmental Organizations (NGOs) that assist in the operation of school garden projects throughout the district. I also orally conducted food-frequency questionnaires in each of the households that I interviewed. Finally, I conducted homegarden inventories in a sample selection of households. The combination of these methods provides a picture of the intersection of diet and food production in these two Q'eqchi' villages, and the roles played by local NGOs in this process.

The Research Environment

The Toledo District

Referred to as "the forgotten district," the Toledo District remains a relatively isolated area of southern Belize (Figure 3.1). Wilk describes the district in the 1990's as "underdeveloped" as a result of decades of extractive economics:

> A cycle of underdevelopment occurs when government fails to invest in roads, schools, communication, marketing services, or other infrastructure because it perceives the region as poor and backward. The lack of infrastructure in turn means that only extractive kinds of capitalist development are profitable or practical there, and in draining the area they further and deepen its status as backward. Today, through this cycle, it [Toledo] has become underdeveloped. (1997:66)

Ten years later, Toledo remains largely rural, with a diverse mix of tropical rainforest and agricultural fields, and ranging from the flatlands along the coast to the diverse and rugged terrain of the Maya Mountains in the interior. Guatemala borders the district to the west and south, and there is much cross-border travel and trade, especially within villages near the border. On the east are the Caribbean Sea and the mangrove-lined coast. The only hospital in the district is in the capital of Punta Gorda, which is also the home to weekly produce markets (held on Mondays, Wednesdays, Fridays, and Saturdays), and is the general central gathering location in the district. The Southern Highway, which is the district's lone paved roadway (and was paved only within the last decade), connects Punta Gorda with the rest of Belize by way of Dangriga and the capital city of Belmopan.

There are 36 Maya communities in the district, ranging in size from roughly 100 to 1000 people (although most have less than 500 residents) along with a number of Garifuna/Garinagu communities in the south and near the coast. Of these 36 communities, 24 are Q'eqchi', which make up about 62% of the Maya population in Toledo, and six are Mopan, which make up about 36% of the Maya population (TMCC &

Figure 3.1: Map of Belize (www.cia.gov)

TAA 1997:14) Unpaved roads connect the villages with each other and the Southern Highway, and are typically in good enough condition for trucks and buses. In fact, many villages have a village bus that takes community members to Punta Gorda and back on each of the market days during the week. These village buses, usually owned by a family in the village, represent the only 'public' transportation to and from most villages, and

they do not run everyday. A national busline, James Bus, runs on the Southern Highway multiple times daily from Punta Gorda to Dangriga and Belmopan in the north. The James Bus will stop in villages along the Southern Highway, giving these villages greater access to local and national resources.

In addition to the rural and underdeveloped nature of the district, there are a number of outside pressures facing its inhabitants, including, and especially, the Maya. The government of Belize has granted a number of logging contracts to international companies, without consulting Maya leaders. Without legal rights to the land they inhabit, or their communal lands, many Maya villages have seen incursions from these companies, which reportedly operate with little to no oversight (TMCC & TAA 1997:122-125). With the paving of the Southern Highway, the tourism industry has begun to grow, and many private interests are seeking to buy parcels for this and other development interests. “The road is not being paved to benefit the indigenous community, but the wealthiest people of the nation” (TMCC & TAA 1997:125). Wilk describes road construction in the district as having an immense impact beyond just the Q'eqchi':

> Roads change the underlying basis of economic decisions by farmers as well as capitalists. By turning the isolated hinterland into an open and accessible area, roads affect people’s relationships with the natural environment, their community and family, and with the market and government. (1997:71)

Existing roads throughout the district continue to be improved and new ones constructed, and there is talk of connecting the Southern Highway to Guatemala with a paved road through the heart of the Toledo District. These developments will continue to affect the Maya in the district in innumerable and unknowable ways.

While the improving road system may be bringing new pressures (as well as new opportunities) to communities throughout the Toledo District, other challenges remain. The history of Q'eqchi' experiences continue to affect everyday life. Wilk explains, "From the time of conquest, loss of political independence, land, control of labor, and even the most basic human rights have forced many Q'eqchi' into the position of dependent peasantry or proletariat" (1997:72). He explains how this experience has led to periodic forced migrations leading to a constantly evolving set of challenges to survival. *The Maya Atlas*, a book written by Maya of the Toledo District and put together by the Toledo Maya Cultural Council and the Toledo Alcaldes Association (TMCC & TAA), details how these challenges persist to this day:

> The Mayas are often called the "poorest of the poor" in Belize, with government statistics indicating that the average annual family income is only US$600 per year. Basic social infrastructure, including health care, transportation services, and communication services is sorely underdeveloped. To compound these problems, the Mayas lack a means to redress their grievances, as we have absolutely no political representation in the government of Belize and are treated as the "forgotten people" of our own country. (1997:126)

While there are many problems and challenges facing the Maya communities of the Toledo District, there remains the friendly, determined, hard working, community oriented nature of the Maya people themselves, who have persisted through the centuries in the region, and will likely persist for many more.

Obtaining Permission for Research

While the structure of the research was planned while I was still in the U.S., a couple of issues could not be addressed from home. First and foremost, I needed to meet with the Belize Institute of Social and Cultural Research (ISCR), the research arm of the

National Institute of Culture and History (NICH), for approval to conduct research in the country. I had submitted the ISCR IRB application before arriving, and I was informed that the director wished to meet with me prior to giving approval. I was able to set up a meeting while the director was visiting Punta Gorda, which happened to coincide with my first week in the country. She arrived with permit in hand, and it turns out she just wanted to chat about my project, as she grew up in the Toledo District. She also conveyed her thanks, as she explained that most social science researchers do not submit their projects to the ISCR for review.

With the Belize IRB review taken care of, it was then necessary to identify my research communities, as there was no way to know which villages I would be able to work in before my arrival. Once I arrived in Belize, I set about to identify some potential sites to conduct my research. Because the project goal was to examine the effects of a district wide school garden program, I sought two villages that were similar in as many ways as possible, but distinct in one important way – one had to be a participant in the school garden program, while the second needed to lack this experience. This would allow me to compare the reported dietary intake and the homegarden content of two communities with the distinction of either having or not having a school garden project. Once I identified a handful of villages, I needed to obtain permission from both the village council, and the village alcalde in each village.

The first village I chose to approach was Laguna (population around 300), a small Q'eqchi' village near my base of Punta Gorda that had participated in the school garden program. I introduced myself to the first people I encountered and asked for the location of the house of the alcalde. A few minutes later I was at his house, telling him about

myself, and explaining my project. After a lengthy and congenial conversation, he agreed, but mentioned that I would also have to get the permission of the village council, and pointed me in the direction of the Chairman. The chairman was also open to the idea of my research, and we talked at length about life in the village, and many traditions surrounding plants and food. He liked my research idea, but asked that I present it to the entire council, which would be meeting just a few days later.

I returned to the village on the day of the council meeting to find the chairman opening up the community center in preparation for the meeting. Within the hour, about 50 men from the community had crowded into the small cement block building (women do not typically attend community meetings in Maya communities). After a quick call to order, and a brief introduction, I was asked to speak. I explained that I wanted to interview some households about their diet, their gardens, and the school garden. There was virtually no discussion after I had finished, and the Chairman asked if anyone objected to me being there. Nobody did, and I was granted permission to conduct my research in the village. This process proved to be helpful in that the community now knew who I was, what I was doing, and more importantly, was accommodating to my conducting research in the village.

I chose the next village based on the lack of participation in the school garden program. Indian Creek, a slightly larger Q'eqchi' community (population around 750), met the criteria, and I took the bus out to the village in search of the Chairman and Alcalde. I had a contact in the village whom I met at his home upon arrival. He walked me first to the house of the Chairman, who led me into his small thatch house to explain my project. After a short conversation, he agreed that it would be fine, but that I should

talk with the Alcalde as well. Upon arrival at the Alcalde's house, I was invited into a cement block house with a couch, and kitchen table that was quite a contrast from the house of the Chairman. The Alcalde was very enthusiastic about my project, and was active in environmental issues surrounding agriculture. He gave his approval, and I was free to conduct my research in the village. Perhaps because of the relationship with my village contact, who was known to work with researchers, I did not need to present my work to the entire village council. Indian Creek proved to be a small town, as despite the lack of a public presentation, everyone seemed to know who I was and what I was doing there with incredible speed. Over the course of the research, nobody in the village declined to participate in my project.

Laguna Village

The village of Laguna was founded in 1959 by two Q'eqchi' families who left a nearby village to avoid conflicts over pigs that were damaging food crops (TMCC & TAA 1997: 82). With a population of around 350 people, all Q'eqchi', the village sits nestled at the base of two dramatic foothills of the Maya Mountains. The village is located about two miles down a dirt road from the paved Southern Highway, which is about ten miles from the town of Punta Gorda. This relative proximity to the largest town in the district and ease of access were two of the main reasons I chose Laguna as one of my research sites.

Unlike many villages in the region, Laguna has electricity, and a water system is installed, although not yet functioning. There is no indoor plumbing, and villagers use a nearby creek for bathing and washing clothes. The traditional thatch-style house is the

norm for most families, although many also have an additional one-room cement block house in close proximity. Nearly all households have extended family living together, typically with three generations, and many families have brothers and sisters living nearby as well. The village has a government health clinic, which was closed throughout the three months of my stay. There is also a thatch house that is rented to tourists through a district wide program that allows visitors to stay in Maya villages in the region. Attractions for visitors to Laguna include a number of hiking trails through the milpas and into the Maya Mountains, where there is a ceremonial cave thought to have been used by the ancient Maya. There is also Aguacliente Wildlife Sanctuary, a 6000 acre wildlife sanctuary with hiking trails that is known for its excellent bird watching opportunities, canoeing, and kayaking (Arts and Helthuis 2006).

Most families in Laguna continue to practice the traditional milpa agriculture (described in the previous chapter), with common crops being corn, rice, plantains, cacao, and bananas. Many families also raise chickens, pigs, turkeys, and a few raise gibnuts (*Agouti paca*) for consumption and sale or trade. There are also a number of other economic activities in which some members of the community participate. While people from throughout the district work in these sectors, the opportunities are more common to Laguna and a few other Maya communities (like Indian Creek) because of the proximity of the village to the Southern Highway. Some of these additional options besides farming that are available to the community include military enrollment, teaching, tourism industry employment, work for logging companies, along with a very limited number of employment opportunities in Punta Gorda. There are also three small family-run stores in the village that sell flour, sugar, beans, lard, rice, soft drinks, and a few other products to

locals and tourists. It is also common for families to leave the village for a number of months or years for employment opportunities in larger cities like Belize City or Belmopan. It is unclear how many of those who leave eventually come back, but there are at least a few families who have chosen to return. The four-times-weekly market is also a source of income for many families in Laguna, who travel to Punta Gorda each market day to sell surplus goods from the milpa, as well as pre-made foodstuff such as tamales.

The village elementary school does participate in the Plenty GATE program, and in fact was among the first schools to graduate from the program in 2005. The school garden, started in 2002, is still in operation, and continues to be a source of food for student lunches during the school year. Because it was summer and school was not in session, I was given an offer to stay in the teacher's house while conducting my research, and was thus able to stay in the village for some periods of the research project. The days I spent in the village were not all research based, as I sought to establish some connection with local families, and to broaden my picture of everyday life in the village.

One full afternoon in Laguna was spent watching the construction of a traditional Maya thatch building. This private thatch was built in a weekend, through multiple rain storms, and with the help of family and neighbors ranging in age from 15 to 75. While no payment for help in building the structure was offered, refreshments were provided, and the family receiving the help would then be expected to help others in similar projects in the future. Additionally, this thatch building was a perfect example of how traditional knowledge is passed from generation to generation. During the construction, an elder

would be stationed next to one of the youth, enabling constant instruction, suggestions, and help during what may be called this experiential learning process.

Indian Creek Village

Indian Creek is a Q'eqchi' village that is bisected by the Southern Highway about 21 miles, or one hour north (by bus) of Punta Gorda. With a population of about 750, 95 percent of whom are Q'eqchi', Indian Creek is larger than Laguna (ICCDVT 2004:5). Despite this difference in population size there were a number of reasons for choosing Indian Creek. As with Laguna, access was key, as this research was carried out under the time constraints of the three summer months, and with daily bus service, Indian Creek was one of the most accessible villages in the district. Not only was access convenient for me, the researcher, but this similarity was also shared by the community members in Laguna. While I did not spend time overnight in Indian Creek, being on a national bus route (James Bus) meant access was convenient, and I was able to get to the village any day of the week, and at any time. This ease of access allowed me to spend many long days in the village, interacting with and observing village life. Additionally, the large percentage of Q'eqchi' in the village allowed me to work with the same Maya language group. This distinction was important as there are two Maya languages spoken in the district (Q'eqchi' and Mopan), and working with the same group would ensure that plants and foods would more likely carry the same name in each village. And finally, and most important, the elementary school in Indian Creek did not have a school garden or any other Plenty project. In short, I attempted to limit differences to other factors, so as to emphasize the experience (or lack thereof) with a school garden project.

For this project, one of the main advantages of Indian Creek being on the bus route of the Southern Highway was that I was able to spend significant time with the community. I had meals with a number of different families, and was brought on a family hike to a cave system on the outskirts of the village. Along the way I was treated to a guided tour of the local flora and fauna found on the path. Upon return, I was able to participate in preparing a dinner of corn tortillas and beans, and collect a snack of various fruits, like monkey cap and craboo. I watched as three generations of women worked in the outdoor kitchen to prepare the meal, while the corresponding generations of men watched the children, and sat and talked about their day. My time in Indian Creek allowed me to experience briefly life among the Q'eqchi' that may not have been possible in a less accessible village.

Indian Creek, despite being on the main highway, does not have electric service. In fact, electric lines run by the outskirts of the village, but there is no connection. In contrast to Laguna, however, the village does have running water. The village was established in 1969 by two families who came across the land during the time that the Southern Highway was first being bulldozed, and saw potential for milpa agriculture (TMCC & TAA 1996). Similar to people in Laguna, most families in Indian creek have a traditional thatch-constructed home, and many now have one-room concrete buildings adjacent. Households are typically composed of extended family, that lives either in the same house, in an adjacent structure, or in a nearby house. There is no health clinic in Indian Creek, although a mobile health service from Punta Gorda reportedly visits roughly every six weeks. However I did not witness such a visit during my time in the village.

Agriculture remains an important economic activity in the village, although I was told that the traditional swidden technique is no longer practiced by most in the village, as there is an ongoing effort to reduce the impact of agricultural practices on the surrounding rainforest. Farmers are increasingly practicing *matambre* agriculture, a form of farming that involves mulching of the fields instead of burning. Corn remains the major crop, especially since hurricane Iris in 2001, which wiped out the local rice crop, and did considerable damage to Indian Creek and other villages in the Toledo District. Beans, cacao and citrus are the other major crops grown on the village milpas, and all families raise chickens, while a few also raise turkeys and pigs (ICCDVT 1994:9-15). Many community members leave the village for work, either for jobs in Punta Gorda, or work with citrus farms or logging companies. There is an upscale tourist lodge, Belize Lodge and Excursions, which owns 13,000 acres in and around the village. The lodge reportedly fills 50% of its positions with people from Indian Creek, although these numbers vary based on the season. The archaeological site, Nim Li Punit, also employs members of the community, although this is limited to a handful of positions.

Like the foreign owners of Belize Lodge and Excursions, the community members of Indian creek seek to capitalize on the many potential tourist activities in and around the village. There is a complex system of caves with trails and walkways, the archaeological site of Nim Li Punit, a large medicinal plant garden cared for by traditional healers from around the Toledo district, and the 13,000 acre preserve surrounding the lodge (although this is fenced off), all just a short walk from the village center. The preserve at the lodge is meant for tourists, and it is unknown if other locally-run tourist businesses would be allowed to utilize the attraction. This large plot of land is

not open for use by community members, and appears be desirable land, as plots have been occupied on its borders, and some homes on the outskirts of the plot itself have been relocated.

There is a community group actively seeking funding to improve the infrastructure of the village to make it more attractive to tourists. The group has formed a non-profit corporation hoping to start a community run tourist business. These efforts, however, have yet to result in full-time employment for anyone in the village. There are a handful of small stores that sell similar products to those in Laguna (e.g., rice, beans, sugar, lard, etc.), and there is one small bar that sells soft drinks and beer. There is also a craft stand, where many of the women in the community sell embroidered clothing, small baskets made of jippy jappa, and stone carvings. These are also brought to Punta Gorda to supply a similar stand near the market. A few families travel to Punta Gorda on market days to sell produce, but this seemed much less common than in Laguna. One of the common themes I heard constantly around the village was how jobs are scarce, and there was a palpable stress that this caused that was not noticeable in Laguna. This difference simply could have been due to the proximity of Laguna to Punta Gorda (only 15 minutes by bus compared to about 45 minutes for Indian Creek), which may provide more job opportunities to those living there.

Methods

This research sought to determine the impacts of Plenty's school garden program on Maya families and communities in Toledo. As the benefits of homegardens and school gardens are better understood, and the reach of globalization is perhaps greater than ever,

an understanding of the roles school and homegardens play in health and nutrition is vital. Through a combination of various qualitative and quantitative methods, the research sought to determine a number of questions about the effects of school gardens on diet and food production around the home. Food frequency questionnaires (FFQ) helped to determine if there were any dietary differences between the two villages, and also provided a means to discover if the school garden in Laguna was resulting in any obvious dietary changes. Follow-up interviews conducted after the FFQ revealed further dietary complexities, as well as answered a number of other questions posed at the start of the research, which are noted in chapter one.

Once permission was obtained in each village, the interview process was ready to begin. As suggested by Bernard (2002), a combination of purposive and snowball sampling was used to gather data for this type of exploratory research. Households were selected based on the existence of at least one primary-school aged student living there, and participants were utilized to help locate other like families as the research progressed. A geographically-based sampling strategy was used in efforts to cover as much of each community as possible.

In each village, I administered 20 food frequency questionnaires, each followed by a semi-structured interview based on a series of open-ended questions covering diet, school gardens, and homegardens in each household. I read the FFQs to each respondent, listing the English and Q'eqchi' name of each food. The ease with which I obtained interviews in each village led to the somewhat arbitrary movement to a different area of the village, down the road or around the corner for instance, over the course of the fieldwork. This change in location was done in an effort to distribute interview

households evenly throughout the village, although some areas may have been more heavily covered than others. Additionally, in appreciation of their participation in the research, I provided photos to interested families who were interviewed.

Garden inventories were conducted in four households. Each of the 40 participating households was asked what they grew in their homegardens; however, four interviews were actually conducted in the garden space. One garden in each village was chosen based on what I determined to be an average to above average example of a homegarden within the given community. A third homegarden was inventoried that was an exceptional example, and represented the largest, most complex homegarden witnessed through the course of the project. And finally, a fourth garden inventory was conducted in a household that had just been started by a young couple who had moved to their home in the previous months.

In-depth interviews were also carried out with four employees of two NGOs working on school garden projects in the district. These interviews, which lasted about one hour each, attempted to determine the goals and purpose of the school garden projects from the point of view of the NGO. Open-ended questions were asked of participants pertaining to all aspects of the school garden program, from initiation of the gardens, to operation, content, community perceptions, and goals of the program itself. Plenty Belize was the organization responsible for initiating the school gardens, and they remain the most active in their support. The director and main extension agent of Plenty were formally interviewed for this project. Plenty has also been working on the school gardens with two other organizations operating in the district. Interviews with one member from each of these organizations were also conducted.

Food Frequency Questionnaires

For this project I created a semi-quantitative food frequency questionnaire (FFQ), and administered it to a head of household who contributed to the household food procurement or production in some way. This was done in order to obtain a snapshot of the dietary intake of the typical household member in each community. "The food frequency questionnaire has become the standard method to collect dietary data in studies of chronic disease all over the world" (Dehghan et.al. 2005:5). Further, this method of collecting dietary information "is considered most appropriate for assessing the association of diet and clinical or biochemical parameters" (Smith et.al. 1996:779). The FFQ is composed of a list of foods believed to be consumed by the research community, and a set of categories reflecting the frequency of consumption of each food. Gibson notes: "the advantages of an FFQ include a high response rate and a low respondent burden. The method is also speedy, relatively inexpensive, and assesses usual food intake" (1993:15). Categories are designed to reflect consumption on a daily, weekly, monthly, and yearly basis. This FFQ was designed specifically for this project and was created through the use of previous research conducted by Rebecca Zarger in the Toledo District. In research conducted in 85 households in a nearby Q'eqchi' community, Zarger asked respondents to freelist commonly consumed foods (Zarger 2002). The most commonly reported foods were included on the 58 item FFQ used in this research. Efficacy of this method of creating the FFQ was reinforced through follow-up interviews. When asked, immediately after completing the FFQ, if there were any foods that are a part of the diet that were not on the questionnaire, only two foods were reported more than ten times. Designed in this way, the food frequency questionnaire allowed for the

assessment of food intake of the community members involved in the research. These intake levels were then compared to the U.S. nutritional recommendations to determine what areas may be deficient or lacking.

Method for Estimating the Average Frequency of Consumption per Day per Person

Each category of the FFQ was coded with a numerical value based on a weekly scale of seven days per week. This method was used by Speck et al (2001) in a study of the eating habits of youths in the U.S. southeast with proven validity. Numerical values were assigned as follows: the base category "once per day" was assigned a 7, one for each of the seven days in the week; the category "more than once per day" was assigned a 10.5, assuming that the average respondent ate the food in question more than once per day for half of the week, thus a 7 for each day, and 3.5 for the extra consumption; the category "1-3 times per week" was assigned a 1.5, presuming consumption at least once per week, and half the time, twice per week; the category "sometimes/seldom" was assigned a .5, presuming consumption at most once every other week; "never" was assigned a 0. With this scale in place, responses to each food were tallied, resulting in each food having a range of responses for each category, which, when added, totaled 20, the number of respondents from each village. Each value was then multiplied by its corresponding value coded for each category. When summed, this resulted in the total frequency of consumption per week per food reported by the entire sample (n=20). Frequency of consumption can be understood as the number of times a respondent eats a particular food in a particular time period (per day, per week, etc.). This number was then divided by 7, resulting in the total frequency of consumption per day reported by the

entire sample (n=20). Finally, this number was divided by 20, giving the average frequency of consumption per day per respondent, providing a snapshot of the average daily diet of each community.

To compare the average reported diet in each Q'eqchi' community, each food on the FFQ was then assigned to one of the six food groups of the USDA Food Guide Pyramid: fats, oils, and sweets; milk, yogurt, and cheese; meat, poultry, fish, dry beans, eggs, and nuts; vegetables; fruits; bread, cereal, rice, and pasta. Once the grouping of the foods from the FFQ was established, the total average frequency of consumption per person was calculated for each food group by summing each of the foods represented in the food group. This summing resulted in an average frequency of consumption per day per person for each food group and each village. The results from each village could then be compared to each other in efforts to identify any major dietary differences, especially those that may be a result of the school garden program. The results could also be compared to the USDA Food Guide Pyramid and the recommendations therein to determine what, if any, nutrient deficiencies may exist in the diet.

Finally, statistical analysis was conducted on a part of the data obtained from the FFQ. This analysis was done in order to determine if there is any significance in the differences between villages of the mean frequency of consumption per person per day of each of the food groups. Un-paired t tests were performed using tools in Microsoft Excel and Graphpad statistical software. Madrigal (1998:96) describes: "The [un-paired t] test is used if a researcher needs to compare two samples for significant differences, such as the mean age at marriage of females of two ethnic groups." In this case the t test was used

to identify significant differences in the mean frequency of consumption of the USDA food groups of two Q'eqchi' communities.

Interviews

Immediately following the completion of the FFQ, each participant was asked to answer some questions regarding their diet, the school garden program, and their own experience with homegardens. These questions were part of an interview guide, composed of about 10 open-ended questions. Questions about diet were designed to elicit any foods that may have been left off of the FFQ, but were in fact an important part of the household diet. A later question about foods grown in the homegarden, as well as questions about food obtained at the market, from the milpa, and from the store served this purpose as well.

A series of questions were asked about the school garden program, and these varied between the villages. In the village with the school garden, questions were asked pertaining to the content of the garden, perceptions of what the garden provides for the community, and what things should be grown in the school garden. In the village without the school garden program, questions centered on what ideas people had about such a program – do they think it is a good idea, what foods should be grown, and what should be done with the food.

The interview then moved to the subject of homegardens, and whether the household had one or otherwise grew useful plants around the house, and if so what they grew. If the household did not have a homegarden, participants were asked why they did not, whether or not they would like to have one, and what they would like to grow. These

questions helped to tease out food preferences, and plants that were used regularly by the household. Finally the questions of what foods were obtained from the milpa, the forest, and the store/market wrapped up the interview.

The nature of the questions had an effect on the process of the interview, especially if the household had a substantial homegarden. Households with such a garden often brought me outside and walked me around what was considered the yard, or area around the house, to point out the various plants and trees that they were growing. Families with fenced gardens especially enjoyed showing me their plots. In contrast, households that did not have a homegarden, or who perhaps only had a few species planted, were more likely to conduct the interview entirely inside the house.

Three of the interviews with the employees of the NGOs took place in the offices of each of the NGOs, and one took place over a series of email conversations. These questions were designed to elicit specific details about how the school garden program operates, from how villages are chosen to who cares for the garden, what support is provided, what is grown, and what is done with the food. Questions also sought to elicit perceived community feelings about the program, and the benefits that may result from a community having a school garden. The number of interviews of this type was limited by the small size of the organizations, the low number of employees, and the fact that it was the summer months, a time when the school gardens were not being cared for.

Interview sessions in each household, which included the administration of the FFQ and the interview, lasted on average about 45 minutes. All sessions in Laguna were conducted in English, while in Indian Creek ten sessions were done in English, and ten were conducted in Q'eqchi' using a local contact as a translator. The community contact

was chosen to translate based on his previous experience working with other social and biological science researchers, collecting plants, conducting interviews, and translating. His familiarity with English and the research process limited any barriers that language differences may have caused.

Garden Inventories

After completing each of the 20 FFQs and interviews in each village, I had an idea of what the average homegarden was like, details of which are discussed in the following chapter. While selection was admittedly unscientific, I took inventory of one homegarden in each village that I felt was an average to above-average example. Based on interview questions that asked if the household had a homegarden, and if so, what species were grown, I was able to determine what could best be described as a common or average homegarden. Gardens in each village were given a general survey and description in efforts to record any obvious differences between each village.

Through the course of my research, I encountered one exceptionally diverse and large homegarden. The household was that of an older couple, whose primary subsistence was obtained through the foods grown around their house. This garden represented an example of traditional knowledge or practice that appears to be eroding in both villages where research was conducted. I felt this type of homegarden may have been more representative of past practice, and this was confirmed by the household members as well as other residents in the village. This garden will be discussed at length in the following chapter.

A third type of garden was also inventoried for its relative uniqueness. This example was from the household of a newly married couple. The couple had built and moved into this thatch house in the two months prior to my arrival, and had just planted a number of food-producing species around the home. As a homegarden of a young couple just starting their household, I felt that this would offer an interesting contrast to the homegarden of the elderly couple mentioned above.

Chapter 4: Results

Introduction

While noting that this research is exploratory in nature, there are a number of compelling findings that can be drawn out from the data. The interrelations between the Q'eqchi' diet and homegardens begin to become apparent, and some surprising effects of the school garden program come to light. Overall, this research makes apparent that the Q'eqchi' diet appears to satisfy most nutritional requirements as recommended by the USDA Food Guide Pyramid, and points to the importance of the surrounding environment, including homegardens, in satisfying these dietary needs. At the same time it offers some exciting avenues for potential future projects in the Toledo District, which will be further discussed in the final chapter.

This chapter presents the analysis of the FFQ, and compares these findings to recommended daily servings from the USDA Food Guide Pyramid. This analysis is done to provide a comparison of the reported Q'eqchi' diet to a standardized recommended dietary intake. The USDA Food Guide Pyramid, however, may not fully capture the variety of the diet of rural communities in developing countries, such as in the Toledo District of Belize. This is because many of the foods consumed by Q'eqchi' in Toledo are not recognized by the Food Guide Pyramid. Further, many of the recommended foods of the Food Guide Pyramid may not be readily available or affordable to the communities

studied. While an imperfect comparison, the Food Guide Pyramid does provide a means of analyzing recommended dietary intake.

Following the FFQ analysis and discussion, the findings of the follow-up interviews are presented and discussed. Interview questions first sought to elicit any foods that were not on the FFQ[4], and how many meals were consumed outside of the home. Questions then centered on homegardens, and homegarden content. School gardens were discussed in each interview, and sought to elicit perceptions of what benefits or challenges a school garden project may offer the community. Participants were additionally asked what foods they would like to grow in their homegardens, and what foods they think should be grown in the school gardens. In interviews, questions were asked about where foods for the household were sourced other than homegardens (gathered in the bush, grown on the milpa, or bought at the store). Interviews with members of the NGO, Plenty Belize, and others working on the school garden project in the district will also be presented.

Food producing plants were found around all households that were a part of the research, although the status of what constitutes a garden is brought into question. Overall, there were eleven documented formal gardens, with a demarcated and fenced plot. Unlike these formal gardens, many houses had food plants growing in protected areas of the yard, and fruit trees were the dominant variety of food plants in all yards. Despite the presence of these food-producing plants, the number of species and the number of actual plants recorded are lower than in previous studies in the district and

[4] See Appendix I for a complete list of food plants used on the FFQ and elicited through follow-up interviews. English, Q'eqchi', and scientific names are provided when possible. For the purpose of flow, only the English names will be used in-text.

region. This could point to a decline in the practice in the two communities that participated in this research, or could potentially be a limitation of the sampling strategy.

The effects of school gardens become a bit clearer through the analysis of this data as well. It appears that school gardens have little effect on the diet of the host community, although some influence on garden practices may arise. In the village with the school garden, eight households had small fenced garden plots next to the home. There were no gardens like this recorded in the village without the school garden. Plenty Belize reports that children bring homegarden practices learned at the school garden, and this appears to be the case.

A surprising finding is the focus on what food is desired in the school or homegarden. When asked what foods they would like to see in the school or homegarden if they had one, 14 respondents named local species in the village without a school garden. When asked a similar question, respondents in the village with a school garden named only imported species. This may imply that as gardens become equated with the western-style fenced garden, western-style garden products follow.

The Q'eqchi' Diet

Food Frequency Questionnaire

The food frequency questionnaire (FFQ) developed for this project exhibited evidence that the foods included captured the major components of the Q'eqchi' diet in the two research communities. However, it would be best to consider the findings and implications of FFQ as exploratory in nature, and by no means should the

results reported be considered definitive. With these precautions in mind, the findings from the FFQ interviews are quite compelling.

The data obtained from the food frequency questionnaire is compared to the USDA Food Guide Pyramid daily recommendations. For both the Vegetable Group and the Fruit Group, the Q'eqchi' diet appears to be at the high end or above on the scale of daily recommendations. The mean daily frequency of consumption in the Meat Group appears to fall comfortably in the middle of the Pyramid's recommendations, while the grain group appears on the low end, but, for reasons discussed later, likely adequate. Daily intake of the Fats, Oils, and Sweets group appears to be in a safe range, although daily recommendations for this group are not provided by the USDA. Statistical analysis, using an un-paired t-test to compare the mean daily frequency of consumption for each of the five food groups, confirmed that differences in the means of frequency of consumption in the two villages were not statistically significant.

Only the Milk Group appears to be deficient in the Q'eqchi' diet, as only six of 40 participants reported any consumption of milk or other dairy products. However, dairy products are not a part of the traditional Maya diet, and there may be sources other than dairy that supplement those nutrients that appear to be missing, such as dark, leafy greens. The fact that refrigeration is uncommon in one village, and unavailable in the other, makes these potential deficiencies in the Milk Group difficult to address through the increase of typical dairy products, such as milk, cheese, or yogurt.

After a description of the project was presented, and after informed consent was granted by the participant, each interview began with the administering of the FFQ. I began by describing that the FFQ sought to determine how many times daily each of the

foods listed the respondent normally consumes, keeping the seasonality of fruits and vegetables in mind. Respondents were asked to choose one of the following categories: more than once per day; once per day; 1-3 times per week; sometimes/seldom (described as once or twice per month); never. I then proceeded to read both the English and Q'eqchi' names of each food on the FFQ, giving time for the respondent to consider each food listed.

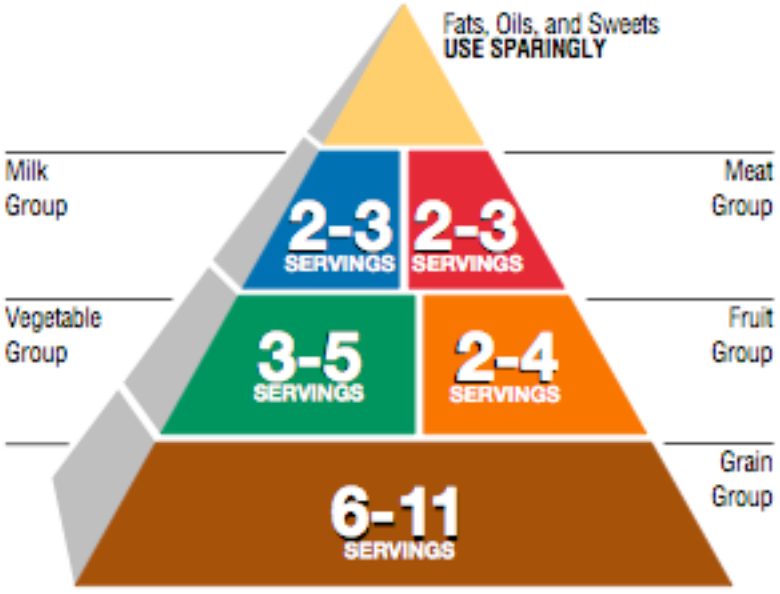
This method of reporting may over-report some of the seasonal fruits and vegetables. For instance, fruits (such as craboo, breadfruit and mango) and vegetables (such as pumpkin and wild mushrooms) that were in season at the time of the research, were reported accurately for the timeframe; however, consumption levels were reported as if they were carried on year round, when in fact, these levels are only maintained when the foods in question are in season. In the same way, fruits and vegetables that were out of season appear to be under-reported, and it may be that the frequency of consumption of out-of-season foods would be higher when in season. To improve the accuracy of this FFQ, it should be conducted multiple times throughout the year so that it could capture the varying cycles of fruits' and vegetables' seasonality. Also, respondents reported their "frequency of consumption" of the foods on the FFQ, as opposed to servings, thus they reported how often they actually ate each food on the list as a part of a meal or stand alone snack, and not how much of the food is consumed.

The USDA Five Food Groups and the Q'eqchi' Diet

The USDA has created the Food Guide Pyramid (Figure 4.1) as a research-based guide to "enjoy better health and reduce chances of getting certain diseases" (USDA

1992:2). The Pyramid is described as offering "an outline of what to eat each day" (3). The Pyramid is designed for the typical American diet, but it has been accepted as a valid guide for a healthy diet around the globe, and has been used to analyze diets other than what it was designed for (Perez-Escamilla et al 1997). For the purposes of this research, foods that are not recognized as part of the typical American diet were assigned to categories based on nutritional studies of tropical foods (Nagy and Shaw 1980), as well as the USDA National Nutrient Database (USDA b). The recommended servings of the Pyramid are presented in a range that allows for differences in age, sex, and size, and it is explained that "almost everyone should have at least the lowest number of servings in the ranges" (8). The Food Guide Pyramid is divided into six major food groups, with the base of the Pyramid representing the food group with the highest number of recommended daily servings (the Grain Group), and the apex representing the food group

Figure 4.1: The USDA Food Guide Pyramid with Recommended Serving Amounts.



that should only be consumed sparingly (the Fats, Oils, and Sweets Group). The remaining area of the Pyramid is composed of the Vegetable Group and Fruit Group on one level, and the Milk Group and Meat Group comprising the level nearest the apex.

Food Frequency Questionnaire Analysis

Each of the foods listed on the FFQ was assigned to a food group on the USDA Food Guide Pyramid (Table 4.1). Through this grouping of foods, it could then be determined which food group/s are lacking in the diet, if any. On first glance, four of the five food groups have substantial representation in the diet; however, the "Milk, Yogurt, and Cheese" food group is not represented on the FFQ. In fact, only six participants (three in

Table 4.1: 57 Foods from the Food Frequency Questionnaire grouped into the USDA Food Guide Pyramid Food Groups

USDA Food Groups (recommended servings)	Foods from FFQ
Fats, Oils, and Sweets (use sparingly)	ice-pops/ice cream, sweet lime (lime juice), sugar cane, coffee, cacao, Koolaid, canned meats, coke (soft drinks)
Milk, Yogurt, and Cheese (2-3 servings)	- (none reported)
Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts (2-3 servings)	beef, pork, duck, gibnut, armadillo, peccary, deer, fish, crab, eggs, beans, chicken
Vegetable Group (3-5 servings)	cabbage, greens (yampa), tomato, chaya, cilantro, callaloo, yam, potatoes, plantain, cocoyam, cassava, jippy jappa, avocado, onion, sweet pepper, palm cabbage, suppa palm, okra
Fruit Group (2-4 servings)	orange, pineapple, watermelon, craboo, lime, soursop, mango, papaya, mamey, coconut, banana, plum (rum), guava, cowsop
Bread, Cereal, Rice, and Pasta (6-11 servings)	rice, corn tortilla, flour tortilla, bread, corn dumpling

each village) reported consuming something from this food group at all, and only when asked what products they buy from the store or market at the end of the interview following the FFQ. This points to the reality in many Q'eqchi' communities that the Milk, Yogurt, and Cheese Group must be obtained from sources outside the home, as dairy products are not readily available in the surrounding natural environment, and are not common products in most village stores. Furthermore, dairy products are not a common ingredient in recipes, and are not commonly consumed or desirable food items in the communities studied.

Once the grouping of the foods from the FFQ was established, the total average frequency of consumption per person was calculated for each food group. This resulted in the average frequency of consumption per day per person for each food group and each village (Table 4.2). Results show only slight differences between villages in the number of times per day that each food group is consumed. Un-paired t tests were calculated on the differences between the means of each food group consumed in each village. Results of the tests indicate that the differences between the means of consumption in each

Table 4.2: Average Frequency of Consumption per Day per Person of the 6 Food Groups for each Village.

USDA Food Groups (recommended servings)	Average Frequency of Consumption per Day per Person	
	Laguna	Indian Creek
Fats, Oils, and Sweets (use sparingly)	2.7	3.76
Milk, Yogurt, and Cheese (2-3 servings)	-	-
Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts (2-3 servings)	2.82	2.4
Vegetable Group (3-5 servings)	7.06	7.59
Fruit Group (2-4 servings)	4.69	5.51
Bread, Cereal, Rice, and Pasta (6-11 servings)	3.8	3.97

village are not statistically significant. This lack of statistical significance implies that despite small differences in consumption of each of the food groups, there are no measurable differences in the diet between the two villages.

Fats, Oils and Sweets and the Q'eqchi' Diet

The Food Guide Pyramid is divided into five major food groups, with a sixth that sits at the apex of the Pyramid, and is composed of foods that are high in fats, oils, and sugars. This food group at the apex of the Pyramid is considered the least healthy part of the diet, and the USDA refrains from recommending a specific number of servings per day. "These foods supply calories, but little or no vitamins and minerals" (USDA 1992:6). It is also not entirely clear how many servings per day are considered "too many," only that one should find ways to lower and/or limit the amount of these foods in their diet.

Table 4.3 shows the average frequency of consumption per day per person of the "Fats, Oils, and Sweets" Food Group that is reported in each village. Overall, Indian Creek reports a higher frequency of consumption per day per person of this food group, with 3.76 times per day per person, compared with 2.70 times per day per person in Laguna. Coffee and Koolaid comprise the top two items in this category for each village; however, Indian Creek reports nearly one (0.8) full frequency of consumption per person per day of these beverages than does Laguna. Still, an un-paired t-test showed this difference in consumption of the fats, oils, and sweets group is not statistically significant.

Table 4.3: Reported Village Dietary Intake of the "Fats, Oils, and Sweets" Food Group.

Laguna Village		Indian Creek Village	
Fats, Oils, and Sweets (use sparingly)	Average Frequency of Consumption per Day per Person	Fats, Oils, and Sweets (use sparingly)	Average Frequency of Consumption per Day per Person
Coffee	.78	Coffee	1.30
Koolaid	.67	Koolaid	.94
Cacao	.33	Canned meats	.31
Sweet lime (lime juice)	.31	Cacao	.27
Ice-pops/ice cream	.27	Soft Drinks	.27
Soft Drinks	.20	Sugar cane	.24
Sugar cane	.07	Ice-pops/ice cream	.23
Canned meats	.07	Sweet lime (lime juice)	.20
Total	2.70	Total	3.76

Coffee is typically of the instant variety, and made weak and sweet. Koolaid is simply a flavored sugar drink made by mixing a powder with water. Despite the low amount reported, it is worth noting that Indian Creek also reports four times as much consumption of canned meat products (sausage, corned beef, and others), a product notorious for its low nutritional quality and high fat content. Sugar cane was reported at a higher level of consumption in Indian Creek, and was frequently described as being for children during the FFQ. Also of note, ice pops and ice cream are obtained from a truck that drives through the villages once a week, usually on Sunday, a sight (and sound!) that seems slightly out of place among the thatch houses of the villages.

The Meat Group: Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts.

Frequently referred to as the meat group, this category of food includes a variety of protein- and iron-rich, and high fat foods, including such non-meat items as eggs, dry beans, fish, and nuts. "Fats serve as building blocks of membranes and play a key

regulatory role in numerous biological functions. Dietary fat is found in foods derived from both plants and animals" (USDHHS & USDA 2005:29). Also included on this level of the Pyramid is the Milk Group, which as noted, is conspicuously absent from the reported dietary intake in both villages. As noted by the Food Guide Pyramid, the Milk group represents an important source of calcium and zinc. Implications of this notable absence will be discussed later.

Table 4.4 shows the reported intake of the Meat Group from each village. Laguna reports an average frequency of consumption of .81 times per day of beans, .49 times per day of eggs, and .48 times per day of chicken. In contrast, Indian Creek reports slightly different patterns in frequency of consumption, with eggs .96 times per day, and beans (.38) and chicken (.24) less than half as frequent. Overall, however, the two communities show similar levels of consumption for the meat food group, with Laguna reporting an average frequency of consumption of 2.82 times per day per person, and Indian Creek reporting an average of 2.4 times per day per person. These rates of daily consumption potentially fall comfortably within the range of the Food Guide Pyramid recommendations of 2 to 3 servings per day.

Gibnut (*Agouti paca*), a large nocturnal rodent native to the region, is raised by two families in Laguna, perhaps explaining the higher rate of consumption of this animal. The top three foods, eggs, beans, and chicken, could be expected to rank high, as chickens are raised by numerous families in each village, providing a reliable source of eggs and meat, and beans are sold at most of the small village stores in each community. Many of the meats reported are game (wild) meats, which are typically lower in fat compared to beef and pork. Turkey, while observed being raised in both villages, was

Table 4.4: Reported Village Dietary Intake of the "Meat Group."

Laguna Village		Indian Creek Village	
Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts (2-3 servings)	Average Frequency of Consumption per Day per Person	Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts (2-3 servings)	Average Frequency of Consumption per Day per Person
Beans	.81	Eggs	.96
Eggs	.49	Beans	.38
Chicken	.48	Chicken	.24
Beef	.20	Deer	.18
Fish	.18	Fish	.12
Gibnut	.14	Armadillo	.10
Pork	.13	Pork	.09
Armadillo	.12	Beef	.08
Duck	.10	Duck	.08
Deer	.06	Crab	.06
Crab	.06	Peccary	.06
Peccary	.05	Gibnut	.05
Total	2.82	Total	2.4

only mentioned by five respondents after the FFQ was administered, and reported as consumed "sometimes/seldom," thus representing a nominal part of the diet. A number of wild game were mentioned in follow up questions after the FFQ; however, none were consumed in quantities that would effect the average frequency of consumption per day per person.

The Vegetable Group and the Q'eqchi' Diet

The Vegetable Group represents a part of the diet from which it is recommended that one receives much of their caloric intake. This food group is known to be high in vitamins, minerals, and fiber, and is one of the "Food Groups to Encourage" mentioned by the U.S. Department of Health and Human Services because of the health benefits likely to result from increased consumption (USDHHS & USDA 2005:23). This food

group had the largest amount of items on the FFQ, although in the follow-up interview more fruits were mentioned, giving that group more items overall.

The Food Guide Pyramid recommends 3 to 5 servings daily of the Vegetable Group, and both villages reported higher consumption than the recommendations. Table 4.5 displays the average frequency of consumption per day per person reported for each village. Laguna reported 7.06 average frequency of consumption per day per person, compared to a reported 7.59 average in Indian Creek. The hot pepper (chile) represented the most consumed vegetable in each village, and this was evident during fieldwork, as they were used at every meal. Onions and cilantro were second on each list, with a frequency of consumption close to once per day per person on average reported in each village. Onions and cilantro also both represent foods observed to be used at most meals. Leafy green vegetables (Yampa, Chaya, and Callaloo) were reported at about equal rates in each village, with Laguna reporting an average frequency of consumption of .68, and Indian Creek an average of .72 per day per person. Similarly, the starchy vegetables (yam, potatoes, plantain, cocoyam, cassava, and jippy jappa) were reported with average frequency of consumption per day per person equaling 1.47 in Laguna, and 1.41 in Indian Creek.

Orange vegetables (tomatoes, sweet peppers, hot peppers), high in Vitamin A and carotenoids, were also reported at similar averages: 2.07 frequency of consumption per day per person for Laguna, and 2.03 for Indian Creek. In the follow-up interview after the FFQ, the first question respondents were asked was if there was anything missing from the FFQ. Pumpkin, another orange vegetable, was mentioned by 23 of the 40

Table 4.5: Reported Village Dietary Intake of the Vegetable Group.

Laguna Village		Indian Creek Village	
Vegetable Group (3-5 servings)	Average Frequency of Consumption per Day per Person	Vegetable Group (3-5 servings)	Average Frequency of Consumption per Day per Person
Hot pepper	1.32	Hot pepper	1.36
Onion	.98	Onion	1.17
Cilantro	.84	Cilantro	.69
Tomato	.45	Tomato	.56
Plantain	.42	Avocado	.50
Sweet pepper	.30	Okra	.49
Avocado	.29	Plantain	.41
Callaloo	.28	Jippy jappa	.31
Cocoyam	.28	Callaloo	.30
Greens (yampa)	.26	Cabbage	.26
Okra	.24	Suppa palm	.26
Cassava	.24	Cassava	.23
Jippy jappa	.24	Chaya	.22
Palm cabbage (cohune)	.23	Greens (yampa)	.20
Cabbage	.20	Potato	.18
Potato	.20	Cocoyam	.14
Chaya	.14	Yam	.14
Yam	.09	Sweet pepper	.11
Suppa palm	.06	Palm cabbage (cohune)	.06
Total	7.06	Total	7.59

respondents, the most of any other vegetable. Still, it was mostly reported as eaten just once or twice per month (sometimes/seldom), and the average frequency of consumption per day per person was just .03 for Laguna, and .04 for Indian Creek at minimum. No other vegetables were reported that would significantly alter the frequency of consumption per day per person average in either village.

The Fruit Group and the Q'eqchi' Diet

Another food group recognized as a "Food Group to Encourage" by the U.S. Department of Health and Human Services, the Fruit Group is recognized as an important aspect of the diet around the globe, and cultivation of many common tropical and subtropical fruits date to before written history (Nagy and Shaw 1980:1). Along with vegetables, the regular consumption of fruits is recognized as having numerous health benefits, and may even aid in the prevention of certain diseases (USDHHS & USDA 2005: 23)

The Food Guide Pyramid recommends 2 to 4 servings of fruit daily, and again, both villages reported frequency of consumption averages higher than the recommended servings. Table 4.6 exhibits the data reported on the fruit group, and in this case, Indian Creek (5.51) reported a frequency of consumption nearly one full time per day per person more than Laguna (4.69). Craboo (1.00) was the highest of all fruits reported in Indian Creek, and this was obvious during the research, as the fruit was in season, and every time I visited the village, someone had a bag full of the small cherry-like fruits, sharing them with whoever was nearby. This high rate was likely due to the fact that the fruit was in season, but it can be expected that fruits not in season were conversely under-reported.

Fruits were the most commonly reported item during the follow-up interview to the FFQ. Twenty-six different fruits were mentioned at least once, but only breadfruit (n=19), malay apple (n=17), and chayote (n=11) were reported by any of the 40 participants. Taken as a whole, all 26 fruits would amount to less than .2 increase in frequency of consumption per day per person. This large variety of fruits, however, does point to the exceptional number of options each community has in terms of fulfilling the

Table 4.6: Reported Village Dietary Intake of the Fruit Group

Laguna Village		Indian Creek Village	
Fruit Group (2-4 servings)	Average Frequency of Consumption per Day per Person	Fruit Group (2-4 servings)	Average Frequency of Consumption per Day per Person
Orange	.72	Craboo	1.00
Mango	.65	Mango	.71
Craboo	.60	Lime	.68
Banana	.49	Plum	.56
Lime	.43	Orange	.45
Mamey	.34	Banana	.40
Plum	.29	Coconut	.36
Coconut	.28	Mamey	.32
Watermelon	.25	Papaya	.30
Pineapple	.21	Pineapple	.25
Soursop	.16	Guava	.18
Papaya	.13	Soursop	.14
Guava	.09	Watermelon	.11
Cowsop	.05	Cowsop	.05
Total	4.69	Total	5.51

dietary requirements of this food group. Combined with the 14 varieties of fruit on the FFQ, the 26 additionally reported fruits bring the total inventory of potential fruits to consume to 40 varieties. Taking into consideration that all fruit bearing plants in the communities have been cultivated, this represents a fairly impressive repository of local knowledge, the implications of which will be discussed in the next chapter.

The Grain Group and the Q'eqchi' Diet

The Grain Group represents another important aspect of the diet as a main source of fiber and other nutrients. Grains, in their whole form especially, have been identified by the U.S. Department of Health and Human Services as one of the food groups to encourage. "Consuming at least 3 or more ounce-equivalents of whole grains per day can

reduce the risk of several chronic diseases" (USDHSS & USDA 2005:25). In the communities surveyed, the dietary sources of this food group come from three main sources: corn and flour tortillas, and rice.

The Food Guide Pyramid recommends 6 to 11 servings daily of items from the Grain Group, and the Q'eqchi' diet appears to fall short of this. Findings show an average frequency of consumption of 3.80 per day per person in Laguna, and 3.97 in Indian Creek. While the standard formula was used in calculating the results for this food group, they may in fact be a bit low. Through daily observations, it was noted that typically, at least two meals per day in each household included the consumption of two or three corn or flour tortillas per adult. So, while the frequency of consumption of corn tortillas, for instance, may be around once per day per person, the actual servings consumed appear to be higher. In this instance, it would prove especially useful to measure the serving size of a typical tortilla, and record FFQ results in terms of serving size as opposed to frequency of consumption. This adjustment could raise the numbers (shown in Table 4.7) closer to, or even above the minimum recommended daily servings of the Food Guide Pyramid.

Rice represents the third most common item from this group in the diet of these communities, and is a readily available product, as it is produced throughout the Toledo district. The corn dumpling is also a common food in each community, with most reporting that they consume these 1 to 3 times per week. These are usually made by mixing ground corn with water (sometimes with lard and sugar), wrapping the mixture in corn leaves, and boiling it. Here again, the size of one dumpling may be greater than what is reflected in the total averages reported below. While at first glance, daily intake of the Grain Group may appear to be low, further research should be done to determine actual

Table 4.7: Reported Village Dietary Intake of the Grain Group

Laguna Village		Indian Creek Village	
Bread, Cereal, Rice, and Pasta (6-11 servings)	Average Frequency of Consumption per Day per Person	Bread, Cereal, Rice, and Pasta (6-11 servings)	Average Frequency of Consumption per Day per Person
Corn tortilla	1.18	Corn tortilla	1.45
Flour tortilla	1.03	Flour tortilla	1.13
Rice	.93	Rice	.85
Bread	.40	Bread	.32
Corn dumpling	.26	Corn dumpling	.22
Total	3.80	Total	3.97

serving sizes consumed of tortillas and corn dumplings. It should be expected that a more accurate measurement of this aspect of the diet would bring the average servings per day per person within at least the lower range of the recommended 6 to 11 servings per day, and likely even higher.

Follow-up Interviews

Following the completion of the FFQ, short semi-structured interviews composed of a number of open-ended questions were conducted with each participant. The first question asked respondents to name any foods not listed on the FFQ. This was followed by a series of questions asking where meals are eaten, about school gardens, and about homegardens and other foods grown around the house. The final question asked respondents to list foods that they obtained from three common sources of food in the district: the bush, the milpa, and the store or market.

Foods Not on the Food Frequency Questionnaire

The first question of each interview was based on the FFQ, and asked participants: "Are there any foods that are a part of your diet that were not on the FFQ?" Questions asked later in the interview also served as a means of eliciting foods that might not have been on the FFQ. In total, 13 participants (Laguna = 8; Indian Creek = 5) answered that the FFQ covered everything they could think of, while 27 made some additions. With questions and subsequent responses later in the interview considered, only six participants did not add foods to the FFQ, with 34 making at least one addition. Foods not reported in answers to the first question were later elicited through asking about homegarden content and a final query asking respondents to list the foods that they obtain from the bush, the milpa, and the store or market.

Overall, there were 62 food items added to the FFQ, with 13 of these reported more than five times. Of the 62, none of the foods added were reported as consumed more than "sometimes/seldom," making even the most commonly reported food an insignificant part of the Q'eqchi' diet. Pumpkin was reported most often (n=23), with breadfruit (n=19) and malay apple (n=17) receiving the most mentions thereafter. Perhaps significantly, these three foods were in season and readily available at the time of the research. Wild mushrooms were mentioned 12 times, cashew and cho cho (chayote) each had 11 mentions, and palm flower, which is used in caldo (a local soup), was the last food mentioned at least ten times.

Table 4.8 lists each food and how many times it was reported, sorted by Food Group. The Fruit Group had the most additions (26), followed by the Meat Group (12),

and the Vegetable Group (11). The Milk Group had only six mentions overall, as only six households said that they sometimes purchase milk. There were no further additions to the Grain Group. There were also six items reported that are used as flavorings or colorants, usually in the preparation of caldo. Finally, sorrel was mentioned once during the interview process, and a handful of times in casual conversation while in the villages. Sorrell is used in the production of a local variety of home-made wine.

Also worthy of noting are the vegetables, fruits, and seasonings with Q'eqchi' names, and either no known English translation or simply a rough equivalent. These

Table 4.8: Foods Reported Sorted by Food Group

Food Group	Food (# of times reported)
Fats, Oils, and Sweets Group	- (none reported)
Milk, Yougurt, and Cheese Group	Milk (6)
Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts Group	Cashew (11), river snail (6), river shrimp (6), turkey (5), turtle (3), monkey (2), peanuts (2), parrot (1), ground mole (1), eel snake (1), lobster (1), iguana (1)
Vegetable Group	Pumpkin (23), mushroom (12), cho cho (chayote) (11), wild string beans (3), garlic (2), lettuce (2), carrots (1), cauliflower (1), green corn (1), wild yam (*yam pay*) (1), sweet yam (*yama chin*) (1)
Fruit Group	Breadfruit (19), malay apple (17), wild plum (8), star fruit (8), gooseberry (7), monkey cap (6), custard apple (5), golden plum (5), breadnut (4), bri bri (4), grapefruit (3), locust fruit (2), rose apple (2), *poconubuoy* (2), apple (2) *baalam* (2), tangerine (2), *ch'elel* (2), *yamuspin* (1), *jonjolin* (1), tamarind (1), sapadilla (1), grapes (1), star apple (1), blackberry (1), *k'un batz* (passion flower)(1)
Grain Group	- (none reported)
Other (spices, flowers, flavorings)	Palm flower (10), oregano (3), annatto (3), ginger (1), thyme (1), *teb'* (1 – seasoning), sorrel (1)

include the vegetables *yam pay*, and *yama chin*, the fruits *b'aalam*, *ch'elel*, *yamuspin*, and *jonjolin*, and the seasoning *teb'*. Responses to the question of whether the FFQ captured all the foods in the diet ranged from the simple to more complex. For instance, one respondent stated, "No, that was everything I can think of." In contrast, another person said, "We eat everything but possum and toad" followed by a list of ten items, seven of which were wild game meat. Of the 34 respondents who added to the list during the follow-up interview, most added around five items, with a range of additions, numbering from two to fifteen.

Meals Outside the Home

Participants were asked, "Do you or other members of your household obtain or eat food from other places outside the home? What and where?" This question aimed to elicit if household members ate meals that were produced outside of the home, whether from restaurants, or pre-prepared meals from the store. Every household obtains some food from outside the home, usually purchased from one of the few local stores in the village, which were mentioned previously. These foods include canned meat, wheat flour, sugar, salt, beans, rice, and lard, which are all items not readily available from the bush or the milpa. Still, only four participants (Laguna = 3; Indian Creek = 1) reported any family members eating meals outside the home. The remaining respondents reported only eating meals prepared in the home, although a number of participants noted eating at the home of their mothers or another family member.

All four respondents reporting meals taken outside the home were similar in that they referred to children eating at school. In Laguna, the primary school has a School

Feeding Program, which provides lunches for a small fee. The one response in Indian Creek mentioned a high school student who sometimes bought lunch at the school café. A typical response was “Nope, It’s all from here,” or “Everything we eat is from our house.” Another common response indicated the few items bought at the store: “Flour, sugar, beans, and some meat we buy. Everything else comes from around here.” This research points to members in both communities consuming meals and food almost exclusively produced in the home. The only exceptions appear to be students whose families can afford to pay for the School Feeding Program, and an occasional meal from the school café.

Homegardens and the Q’eqchi’ Diet

Q’eqchi’ Homegardens

There are two basic types of gardens that were encountered during the research. A typical Q'eqchi' homegarden could be described as a somewhat natural planting of useful plants around the immediate vicinity of the home. Useful plants can include fruit and vegetable bearing species, fruit trees, medicinal plants, and plants that may provide materials for other household uses. In her research in a nearby Q'eqchi' community, Zarger notes, “A variety of herbs, fruit trees, tubers, chiles, coffee, cacao, and flowers are all grown in homegardens (on average, 34 different varieties)” (2002b:152). A second type of garden found among the research communities is a more formal, demarcated garden. This “formal” homegarden can also be found in the immediate vicinity of the house; however, it is demarcated with fencing or some other type of barrier that marks off the garden boundaries and keeps pets and other animals from destroying the garden. Both

types were encountered in each village, although there were differences in the formal homegardens between the two villages. In Laguna, formal homegardens tended to be fenced off with some type of store-bought fencing (usually chain-link), which mimicked the style of the school garden in the village. In contrast, the few formal homegardens encountered in Indian Creek were demarcated with improvised or otherwise homemade fencing. For instance, one household used an old truck frame to safeguard the garden, while another surrounded the garden with sharpened sticks dug into the ground, and coming out to a height of about two feet. These approaches would seem to indicate that the idea of a formal garden is not new to Q'eqchi' communities, as the demarcation has a specific utility (keeping the garden free of animals). However, the use of store-bought fencing to demarcate a formal homegarden may be a practice that is encouraged through the introduction of the school garden program, in which erecting chain-link fence is a major focus of the project.

Respondents were asked if they have a homegarden or if they obtain food from plants in the immediate vicinity of the house. All households reported that they obtain at least some of their food from around the house, much of it coming from fruit-bearing trees. Just one household reported that they do not have any food-producing plants around the house: “We get all of our food from the village, or we buy it.” Incidentally, this house was recently constructed, but fruit trees were planted, simply not yet producing. Besides simply having food producing plants, many of them fruit trees, many of the households also reported having more extensive homegardens.

In all, eight of twenty households in Laguna reported having a homegarden, compared to just three of twenty in Indian Creek. The households with “formal” gardens

in Laguna were similar in type to the school garden, with a demarcated area with posts and fencing surrounding a small plot in the yard where a few varieties were planted. Indian Creek gardens were all a bit different; one was in a whole yard fenced off with sharpened sticks, one was in the old frame of a pick-up, and one appeared to have some make-shift fencing which proved no match for a group of hungry chickens. Species planted in the formal homegardens included: tomatoes, local hot peppers, habanero peppers, sweet peppers, peas, onions, okra, cucumber, and the seasonings, *teb'*, oregano, *kulantro*, and cilantro. Fencing is a necessity when planting small delicate food plants, as each village has pigs, chickens, and turkeys roaming freely that tend to eat or otherwise destroy unprotected food plants. While there are only three reported formal gardens in Indian Creek, all 20 households have some food producing plants growing around the house, including small plants like hot peppers, oregano, and cilantro. The remaining eleven households in Laguna similarly have some food producing plants around the house, fruit-bearing trees being the primary type.

Consistent with other homegarden studies in the region (Caballero 1992, Steinberg 1998, Levasseur and Olivier 2000, Zarger 2002b), nearly all respondents had some type of food plant in the immediate vicinity of the house. In Laguna, households reported a minimum of five (one household did not have any food producing plants), a maximum of 25, and an average of 10.4 food producing plants around the house. Indian Creek was similar, with a minimum of 1, a maximum of 48, and an average of 11.6 food producing plants around the house. Removing the high and low reports in each village resulted in an even more similar average of 10.1 varieties in Laguna, and 10.2 varieties in Indian Creek. In all of the homegardens in both villages, fruit trees were the dominant

variety (each village had one house with 20 different fruit tree varieties), enabling fruit acquisition through most of the year based on different fruiting cycles of the numerous varieties.

There were a number of fruit trees reported by ten or more families between both villages (see appendix 1 for a compete list of reported fruit trees and other food plants around the home). Craboo (a small, yellow, cherry-like fruit) and coconut were reported by 30 of 40 households (Laguna = 14; Indian Creek = 16 for each). Mango trees were reported by eleven households in each village, the only remaining fruit tree reported by more than half of all households. Orange trees (Laguna = 9; Indian Creek = 8), cacao (Laguna =9; Indian Creek = 6), banana (seven in each village) and plantains (six in each village) rounded out the most popular fruit trees that were reported. Overall 20 different types of fruit trees were reported, making them among the most common sources of food in both villages.

Besides fruit trees, various other food plants were commonly grown in homegardens, or otherwise around the house. Chiles were reported to be grown by 15 households in Laguna, and 12 households in Indian Creek. Significantly, seven of the eight households with formal gardens in Laguna reported growing tomatoes. The tomato turns out to be the only variety that is not grown in Indian Creek, although two households reported having grown them in the past. Avocado is grown by nine households, and cocoyam is grown by five between the two villages. Besides the other vegetables mentioned here, of all the vegetables reported on previously (those listed in Table 4.5), none are grown in more than three homegardens across both villages.

Finally, there is a wide range of variety in the Q'eqchi' homegarden. Of the two villages, one household had a particularly exceptional and diverse homegarden. The household was that of an elder healer, his wife, and their three young daughters. There were 48 varieties of plants recorded (4 of which were strictly medicinal and 42 food producing), and well over 100 plants. The garden itself filled the entire area surrounding the house, and was protected by a type of homemade fence. The fence was simply made of sharpened sticks pushed into the ground, close together so that an animal could not easily get through, and about two feet into the air. The yard was about 20 yards by 20 yards, and the plants were seemingly planted with no particular strategy in mind and in such a way that plants were growing into each other. Therefore, it was nearly impossible to differentiate plants in some areas. All of the plants were propagated by seed or cutting, and tended to by the male healer. Further, the family reported that the garden was the source of nearly all of the food for the household besides some meat that they bought occasionally from other villagers.

The rest of the homegardens were far less extensive, and typically consisted of a small fenced or otherwise protected plot, on average about two to three square yards. Within these small plots were combinations of some or all of the following: a variety or two of hot peppers, tomatoes, seasoning herbs, okra, onions, and in two cases, a small seedling of a fruit tree that would be transplanted when big enough to stand unprotected. Having a homegarden did not necessarily mean that a household had a larger variety of food producing plants around the home. For instance, one homegarden was used for tomatoes and hot peppers, and there were only four other food producing plants in the yard. In another case, the homegarden had just recently been trampled by chickens, but

did have sweet peppers and tomatoes. This household had just four fruit trees and some pineapples growing around the house. Conversely, in Laguna, six of the twelve households without a formal homegarden had ten or more food producing plants around the home. This was the case in only six of the 17 households without a formal homegarden in Indian Creek. Overall eleven of 20 households in Laguna, and eight of 20 in Indian Creek had more than ten food producing plants growing around the home.

A Desire to Garden

During the follow-up interview, participants were asked if they would like to have a more formal homegarden (if they did not already have one) with fencing, and if so, what perceived barriers prevented them from doing so. In Laguna, of the 12 households that did not have a homegarden, seven reported that they would like to have one, leaving five uninterested in the endeavor. Responses from participants in Indian Creek were a bit different. Of the twenty households, two had producing homegardens, one had a recently destroyed garden, and 16 of the remaining 17 reported that they would like to have a garden. The only negative response was a household composed of an elderly couple who said, “We’re too old to work in a garden.”

In total, out of 40 households in both communities, eleven had homegardens, 23 would like to have a homegarden, and just six were not interested in the idea. In Laguna, reasons for not wanting a homegarden included being too old, gardening being too much work, and the challenge of keeping local pigs and chickens away being too great an obstacle. One woman replied, “Gardens are too much work, and I need to mind my baby.” Two households mentioned the problem of the pigs: “I had a garden here once,

but there are too many pigs, and they ruin everything!" Another community member responded with a simple answer, but in a firm tone, "Gardens? It takes up too much time."

If a household did not have a formal homegarden, but expressed interest in having one, they were asked what was preventing them from starting one up. Responses to this question were similar in both communities. In Laguna, three of the seven households who wanted to start a formal garden reported that they needed seeds, and expressed the difficulty in obtaining them. "I would consider gardening, but I need seeds and they're very hard to get." In fact, seeds are not available for purchase in the villages, and are not common items even in Punta Gorda. Two households were less sure why they did not already have a garden, one not responding, and another simply stating "I would like a garden because my mom has one." Finally, one household mentioned the problem of the free-roaming pigs, but implied that they would like to try it anyway.

Indian Creek, while having fewer reported formal homegardens, exhibited many more households that were interested in starting a formal garden. Most people gave a combination of reasons why they did not have such a garden. "I would be interested in having a garden, but I have no capital, no seeds, and no fencing to start one." Another responded, "I would like to garden, but there are so many things I would need, like the chemicals, the fencing, and the seeds." Overall, six households mentioned needing fencing or some way to keep the chickens and pigs out, five mentioned the need for seeds, and four mentioned time constraints or the need for assistance. The common sentiment seemed to be summed up by this quote: "A garden would be nice, but I have no way to start one."

When asked the types of food they would like to grow if they could, most responses were of non-native varieties. Cabbage (n=14), tomatoes (n=13), sweet peppers (n=12), watermelon (n=7), cucumbers (n=6), and carrots (n=6) were the most common responses. In contrast, very few vegetables native to the region were mentioned at all. Callaloo was mentioned twice, and pumpkin, cassava, and cocoyam were all mentioned just once as plants people would like to grown in their homegarden.

Food Acquisition

A final question at the end of the interview session sought to determine the source of food in the household diet. Participants were asked what food they harvested from the milpa, what food was collected in the bush (the forest in which wild plants are harvested), and what foods were bought at the store. Because this question was asked at the end of a 45-minute interview, responses tended to be short, and admittedly incomplete. Despite this drawback, a few foods were elicited that were not previously mentioned in the FFQ or in the other follow-up questions. Further, while the milpa and bush were likely once primary sources of food for these communities, it is evident that there is less emphasis on obtaining food in this fashion, and that the market or store is becoming a more common source.

When respondents were asked to list food obtained from the milpa, their answers varied in and across villages. One Laguna family reported that they get most of their food from the milpa, so this response was difficult to quantify. Three families in Laguna reported not getting any food from the milpa. “Farming is for old people,” was one response, and another family simply said, “Oh, we buy all of our food.” Removing the

one unquantifiable response, the average number of foods listed in Laguna was three items, with a high of eight, and four respondents only reporting one item, in all cases corn. It should be noted, however, that the milpa can remain a source of a large variety of food products, as the household that reported obtaining all their food from the milpa consumed all 58 foods on the FFQ. Indian Creek had five households that reported not using the milpa as a source of food. One household reported eight items, the highest number reported, and the average for the village was 2.95 items.

Each village reported about the same number of varieties growing in the milpa (Laguna = 19, Indian Creek = 20); however, there were differences in species reported (see Table 4.9). In Laguna, three items were reported by more than five households: corn (14), plantains (5), and yams (5); while this was the case for five items in Indian Creek: corn (13), beans, chaya, jippy jappa, and mushrooms (5). Between the two villages, 33 unique items were reported as being sourced from the milpa.

When asked what foods were obtained from the bush, the differences between the two communities became greater. Laguna reported ten items sourced from the bush compared to 16 in Indian Creek (See Table 4.9). In Laguna, two households reported that they did not use the bush as a source of food, while in Indian Creek, there were three households reporting the same. Jippy jappa was the top food reported in each village (Laguna = 18, Indian Creek = 11), and considering five additional households in Indian Creek have jippy jappa on the milpa, this appears to be a very popular food item across villages. The only other bush food reported by more than five households in Laguna was cohune cabbage. In Indian Creek, picaya (edible palm fruits, 8), cohune cabbage (7), and

armadillo (5) were the top items reported. Game meat was mentioned frequently in both villages, a total of ten households.

Table 4.9: Sources of Various Food Items Reported in Each Community

Source	Laguna (# of times reported)	Indian Creek (# of times reported
Milpa	corn (14), plantain (5), yam (5), banana (3), cocoyam (3), pumpkin (3), rice (3), sugar cane (3), cacao (2), okra (2), pineapple (2), sweet potato (1), annatto (1), avocado (1), cassava (1), cohune cabbage (1), mamey (1), string beans (1)	corn (13), beans (5), chaya (5), jippy jappa (5), mushrooms (5), cocoyam (4), cassava (3), callaloo (2), greens (2), ground foods (2), plantains (2), rice (2), cacao (1), cho cho (1), cilantro (1), guava (1), *kulantro* (1), onion (1), yam (1), *yampa* (greens-1)
Bush	jippy jappa (18), cohune cabbage (9), callaloo (2), chaya (2), game meat (2), crab (1), deer (1), fish (1), *yampa* (greens-1)	jippy jappa (11), picaya (8), cohune cabbage (7), armadillo (5), mushrooms (4), chaya (3), *chi k'ai* (3), waree cohune (2), snails (2), gibnut (2), callaloo (1), deer (1), fish (1), plantain (1), pumpkin (1)
Store/Market	flour (13), sugar (11), rice (8), canned foods (6), beans (5), watermelon (4), chicken (3), onions (3), callaloo (2), cilantro (2), fish (2), mango (2), milk (2), oil (2), papaya (2), plums (2), potatoes (2), sweet pepper (2), tomatoes (2), avocado (1), banana (1), beef (1), cabbage (1), cacao (1), chaya (1), coffee (1), greens (1), *kulantro* (1), lunch meats (1), meat (1), okra (1), pineapple (1), pork (1),	flour (18), rice (16), sugar (16), canned foods (13), beans (6), Cabbage (4), chicken (4), coffee (4), duck (4), lard (5), eggs (3), meat (3), tomatoes (3), milk (2), onions (2), pig tail (2), salt (2), bananas (1), callaloo (1), carrots (1), cassava (1), cilantro (1), cocoyam (1), corn (1), cucumber (1), garlic (1), *kulantro* (1), peanuts (1), ramen noodles (1), sweet peppers (1), vegetables (1)

The final question asked participants to list foods obtained from the market or store. Often times, this list proved too lengthy, and respondents would say something along the lines of, "I get most of my food at the market," or "We buy almost everything." When attempts were made, lists were often quite lengthy, and probably incomplete. With that in mind, there were some noticeable trends (see Table 4.9). Flour, sugar, rice, canned foods, and beans made up the top five items purchased at the store or market in both communities. Meats, fruits, and vegetables were often mentioned, but in considerably fewer instances. In total, Laguna respondents mentioned 34 different items, while 32 were mentioned in Indian Creek.

School Gardens

Plenty Belize and School Gardens

Plenty Belize, a Belizean non-governmental organization based in the largest town of the Toledo District, Punta Gorda, was founded in 1997 with the help of its parent organization, the U.S.-based Plenty International. Working with other Toledo-based and international groups and local communities, Plenty has strived to be true to their mission of "promoting the well-being of the people, the communities, and the environment we share in the Toledo District of Belize" (Plenty 2007). Since its founding, the organization has arranged and carried out a number of different projects in the Toledo District, including soy promotion, midwifery training, solar workshops, and micro-grant opportunities. In 2002, after devastating Hurricane Iris wreaked havoc in communities throughout Toledo, Plenty initiated two programs with the dual hope of providing much needed hurricane relief, while also improving child health. A school feeding program and

a school garden program, both in the primary schools in communities throughout the district, were born.

The Plenty school garden project, *Garden-based Agriculture for Toledo's Environment* (GATE), "aims to create a replicable model of local sustainable livelihood and environmental benefit based on organic school gardens" (Plenty 2007). With the support of the Belize Ministry of Health, Plenty has initiated school gardens in 27 villages throughout the Toledo District. Ten of these schools have graduated from the GATE program, and now continue to operate the school garden on their own, and at least four of the 27 schools have started their garden within the past year. Over the course of multiple visits and talks with the director of Plenty, the processes involved in the GATE program were explained.

In order to become part of the GATE program, a community must approach Plenty to request a school garden, and then meet two further requirements. Communities must provide fence posts for the proposed garden (which can be cut logs or large branches), and they must hold a parent-teacher meeting during which the school garden idea is proposed. The school teachers and principal, along with members of the community parent-teacher association (PTA), the *alcalde*, and chairman all must be present, and it must be agreed upon that the program is indeed wanted and will be supported by the members of the community and the school. After both of these requirements are met, Plenty will use the resources of the GATE program to begin the school garden.

The GATE program supplies fencing, garden supplies (shovels, rakes, and hoes), and seeds, and with the help of students, teachers, and community members, prepares and

plants the garden. The involvement of all stake holders is important and stressed from the beginning, as this reportedly ensures the greatest success of the garden in the long run. Plenty extension agents continue to visit schools on a bi-weekly basis until the garden appears to be doing well, and then cuts back visits to once or twice per month. Plenty provides teacher trainings at the initiation of the GATE program to encourage teachers to incorporate the garden into their lesson plans. Trainings are then held periodically throughout the year for any teacher that wants to learn how to more effectively use the garden in school lessons, or for further training in garden practices. Other organizations working throughout Toledo have also assisted with garden trainings and demonstrations in various villages. Once the garden is planted, school principals and teachers organize the work schedule, while the children work in and care for the garden.

According to interviews carried out in both the research sites, harvested food can then have many destinations. The director of Plenty noted: "For those schools with a school feeding program, most of the produce of the garden goes to the school kitchen. Some produce goes directly home with the children, some shared in school, some is also sold in the village" (Miller 2007). School feeding programs provide lunches during school to students whose parents pay a small fee each year. The program uses these funds to purchase food for the lunches, and supplements these purchases with produce from the school garden. It must be noted that not all students participate in the school feeding programs, and thus not all students consume harvested foods from the school garden.

Schools that have successfully gardened for a number of years, and show the capability of continuing on their own, are then graduated from the GATE program. Graduation includes an end of the year community party, with Plenty and other

organizations providing food, entertainment, presentations, and music. As mentioned, Laguna was among the first four schools to graduate from the GATE program.

The director and primary extension agent from Plenty, and members of two other organizations that also work on school gardens in the district were interviewed as part of this research. These interviews sought to establish the basic operating schema of the school garden program (described above), species typically grown, students' role in the gardens, benefits of the school garden for the students and community, and challenges to having the school garden. Research also included visits to five different school gardens throughout the district in order to observe any variety that may exist between communities.

The GATE program reportedly grows a large variety of food plants in the school gardens (see Table 4.10). However, school gardens tend to do better when community input is utilized. A Plenty extension agent related: "We ask the school what they want to plant. They will grow and take care of what they *want* to grow. They should grow what they want, that will bring the best results." Perhaps not surprisingly, a number of local varieties are on the list, including callaloo, pumpkin, chaya, cocoyam, cassava, *kulantro*, and cho cho. Those interviewed felt that the variety of plants currently grown is satisfactory, although they do encourage certain plants: "I believe these items are sufficient, although I continue to encourage schools to focus more on dark greens, legumes, and items the school kitchen would purchase otherwise."

The literature on school gardening seems to stress the varied benefits of school garden programs (Lieberman and Hoody 1998, Morris et.al. 2000, Graham et.al. 2005,

Table 4.10: Food Plants Grown in GATE-supported School Gardens

Food Plants Grown in GATE-supported School Gardens					
burn pepper, Callaloo, carrot, chaya, cherry tomato, cho cho, cilantro,	cohune cabbage, cucumber, cocoyam, cassava, green onion, habanero pepper,	head lettuce, jack beans (canavalia), jalapeno pepper, *kulantro*, leaf lettuce, local tomato,	acuna beans, marigold, okra, papaya, pigeon peas, pineapple, plantain,	pumpkin (winter squash varieties), radish, romaine lettuce, soybeans,	string beans, sweet pepper, sweet potato, tomato, yard beans, watermelon,

Hermann et.al. 2006). Members of Plenty and the other organizations working with the school gardens stressed similar sentiments. Increased nutrition of the students, and a deeper appreciation and understanding of agriculture and the environment were mentioned by each participant. Other perceived benefits of the school gardens reported by those interviewed included: improved food security, the ability of students to take new gardening knowledge home, teaching students patience, and spreading an understanding of organic growing and the importance of such methods in the health of the community and the environment. Because schools were closed for the summer, this research was unable to determine the accuracy of these perceptions. Further research on what foods are used in school lunches, the sources of these foods, and which students actually eat the school lunches would be necessary to determine any nutritional and dietary improvements.

As with any community project, challenges arise. Expressed most clearly in Toledo is the need to garner as much community support as possible. This support tends to ensure the success and even growth of school gardens, and enables schools to graduate the program. Funding was also mentioned as a major challenge, as there is a near

constant need for garden supplies, teacher workshops, and extension agents. Additionally, only 27 of the 50 schools in the district currently operate school gardens, and if Indian Creek is a typical example, school gardens would likely be welcomed in all 50 schools. The data collected through this research, however, indicates that the school garden has little, if any impact, on overall household dietary intake.

Laguna and Their School Garden

As mentioned previously, a main factor in the decision of which villages to conduct this research in was whether a community had a school garden project under the direction of Plenty Belize. This distinction would then allow for a comparison with a

Figure 4.2: Laguna's School Garden Sponsored by Plenty Belize

village without a school garden, and then identify any potential affects of the Plenty program on the community. Laguna was identified as not only having a productive school garden, but also came recommended from Plenty, as one of the program's first graduates, and an excellent example of the success of the project. The Laguna school garden is approximately 20-25 square yards with a number of raised beds, a seed-starting box, and a variety of fruit trees, including banana, plantain, and papaya. The garden was fallow at the time of the research, so further physical documentation of what is grown was not possible. However, research participants reported that the school garden grows okra, tomatoes, yams, cucumber, pineapple, sweet peppers, cassava, *kulantro*, Chinese cabbage, hot peppers, and callalloo.

In Laguna, the school garden operates to supplement the school feeding program which provides lunch to students whose family pays a small fee each year. Not all students participate in this program, yet all students participate in caring for the garden. Exact numbers of students in the school feeding program were unavailable at the time of the research, and the number varies from year to year. Excess harvest from the school garden is reportedly sent home with students, but according to parents, this rarely occurs, and if it does, just once or twice per school year. During the school year, students care for the garden, including planting, weeding, watering, and harvesting. The garden lies fallow during the summer while school is out of session, and community members volunteer time at the end of the summer to prepare the garden for planting for the new school year. Harvested food is used in the school lunches throughout the year, and excess food is occasionally sent home with teachers and students.

Respondents in Laguna were asked to share their thoughts and feelings about the school garden, and what they felt should be grown in the garden. Overall, participants were supportive of the garden project, but there were some mixed feelings as well. Ten participants responded in completely supportive tones. Examples of this full support included: "It's a positive thing to do. Most children in the village don't eat vegetables, and the school garden gives them vegetables and teaches them to eat right." Another felt, "To me, it's good. Children get some nutritional food, and it gives kids a taste of vegetables that they don't eat at home." More simply, one said, "I say it's good. The kids get to eat it." Another common positive result expressed by some respondents was the experience of gardening itself. "I don't see no bad things. It's more experience for the kids. I fully support it. The kids get to do some paper work and some practical work." Everyone in the community who was interviewed generally expressed the above sentiments; however, some people mentioned some potential negatives as well.

While nobody who was interviewed expressed complete dissatisfaction with the school garden, some issues arose. One theme mentioned by three households was that families had to pay for the School Feeding Program, which the school garden helped to supply. All of the students work in the garden, but unless their family pays for the feeding program, not all students get to share in the production of the garden. "I think it's good. But when the children go work the garden, not all the kids get to eat. We have to pay to be in the feeding program, so some parents don't like their kids to work in the garden and not eat the food of their work. That's where the trouble starts." Some expressed concern with what actually happens to the harvested food. "Sometimes it's good. The teachers

take the food, and the kids only work in there. Only the cabbage goes into the school feeding program."

When asked what types of foods they felt should be grown in the school garden, respondents in Laguna varied in their responses. Tomatoes (6), okra (4), watermelon (4), yams (3), and cassava (3) were the only items mentioned multiple times. However, nine of the 20 respondents expressed the idea that the items grown should vary: "They should grow more of a variety, more vegetables and fruits, and they should grow it to sell it." Some simply listed a number of different food plants, basically expressing the same sentiment that a variety of food should be grown. Ten respondents named three fruits and vegetables or less in what could be described as unconfident tones. Three respondents admitted that they had no idea what should be planted in the school garden. Perhaps the most interesting response was a list of six fruits and vegetables, finished by adding sorrel at the end: "They should grow sorrel to make wine."

In Laguna, food from the school garden remains largely in the school (for school lunches), and rarely, if ever, makes it to the homes of the students. Further, not all students partake in the school lunch, so not all students are receiving the supposed increased nutrients provided by the food from the garden. There are indications that the school garden may be influencing homegardening techniques, as more households in Laguna are utilizing fencing and creating what has been described above as a more formal homegarden.

Perceptions of School Gardens in Indian Creek

In contrast with Laguna, Indian Creek was chosen for this research project largely because it did not have a school garden or a relationship with Plenty Belize. Respondents were asked if they would like a school garden in their community, and why or why not. They were also asked what types of food plants they think would be best to grow in their school garden if they had one. Every respondent in Indian Creek thought the school garden would be a good idea for their community. Only one respondent worried about people who might steal food from the garden, and nearly everyone provided a short list of foods they thought would be good to grow.

Respondents in Indian Creek named on average over six fruits or vegetables that they thought should be grown in the school garden. Cabbage (19), tomatoes (15), sweet peppers (10), carrots (9), callaloo (5), and cucumbers (5) were the most popular recommendations. Interestingly, 14 households expressed the need to grow local foods in the school garden. “They should be sure to grow local foods,” and “They should grow things that the community eats.” This desire to grow local varieties stood out, as not one respondent in Laguna mentioned local foods when talking of the school garden. Variety was stressed in Indian Creek as well: “They should grow vegetables and fruits, and cacao especially.” In the end, all households liked the idea of having a school garden in the community, and respondents frequently asked if one could be brought to their primary school.

Summary and Discussion

Maya in the Toledo District have long been considered undernourished and impoverished, and reports of stunted growth have been released for a number of years (PAHO 2007, Crooks 1994). In many villages in the district, the destruction caused by Hurricane Iris in 2001 complicated the situation, as crops, trees, and houses were lost in many villages, including Laguna and Indian Creek. Plenty Belize initiated the GATE program in direct response to this devastation, and since starting in early 2002 at four schools in the district, the program has grown to 27 schools, and anticipates continued growth to the remaining schools in the district. Plenty has recently received national attention, and is in negotiations to start the GATE program nationwide (Miller 2007: personal communication).

The GATE program has grown since its inception, and now has operated in Maya communities throughout the district. During this period of growth, the NGOs working on the GATE-sponsored school gardens have suggested that the Maya do not grow gardens. In fact, the Maya have a long tradition of homegardens in the district and throughout Maya territory in Belize and beyond (Caballero 1992, Steinberg 1998, Levasseur and Olivier 2000, Zarger 2002b). This study shows that homegardening continues to be widely practiced among the two Q'eqchi' communities that were a part of the research. My research was designed to begin an examination of the affects of the GATE program in these Maya communities, with hopes of identifying particular areas of need in the average diet. Dietary intake and garden content were examined in two district villages, one of which had a long-operating school garden, and the other of which had little to no contact with the organization, Plenty Belize.

While this must be considered a purely exploratory study, the data points to a relatively healthy dietary intake. When compared to the USDA Food Guide Pyramid, dietary intake of the Meat, Vegetable, and Fruit Groups appear to meet or exceed recommended daily servings. Average daily intake of the Fats, Oils, and Sweets Group does not appear to be at excessive levels. The only food group that does not meet daily recommendations is the Milk Group, of which only six households report any dairy intake at all. This should be of concern, as the "intake of milk products is especially important to bone health during childhood and adolescence" (USDHHS & USDA 2005:26), and could be the source of stunting reported by PAHO (2007) and Crooks (1994b). However, while milk products are important sources of calcium and vitamin D, there are alternative sources to these important nutrients. Callaloo, chaya, and yampa, all leafy greens, could represent important parts of the diet in this respect. Also of note, is that these are three local varieties that are a part of the traditional diet, and thus could play an important and acceptable role in addressing this apparent deficiency.

While this research confirms the continued existence of homegardens, the data reported here appears to show a decline in species diversity and number of plants therein. Previous studies in the district have exhibited greater species diversity, and higher average number of plants (Steinberg 1998, Levasseur and Olivier 2000, Zarger 2002b). This contrast would seemingly correlate with the observation that the largest and most diverse homegardens were cultivated by older members of each community, although this could be a reflection of the small sample size of this study. The high incidence of fruit intake in the Q'eqchi' diet was apparent from the food frequency lists and garden inventories, and all families had one or two fruit trees around the home at minimum. The

high incidence of fruit production and consumption is not often noted in nutritional analyses or reports. While only 11 of 40 households had a formal, fenced garden, all households had some sort of food producing plants around the house that were cultivated by a member of the household. The regularity of this cultivation suggests that NGOs working in the region can reassess their knowledge about the significance of fruits and vegetables in the cultural practices of the communities in which they work.

This issue of how plants grown around the house are perceived goes beyond just the NGOs. Households that had fairly extensive homegardens were interested in having a more formal garden. This interest was likely for very practical purposes, as a formal garden would offer protection of plants from local pigs, turkeys, and chickens, while more traditional homegardens do not. Meanwhile, regardless of whether the food-producing plants around each house in either community are considered a formal garden or homegarden by community members and NGOs, there is a clear desire exhibited by all research participants to grow more food plants and crops than they currently do. Not only was there near unanimous interest in having a formal garden, but most people also supported the idea of the school garden. With jobs scarce in the region, the desire for formal gardens is understandable, as more formal gardens in the community would lead to more food being available for everyone. In Indian Creek, a potential school garden was seen as benefiting the children of the community by giving them more vegetables, and further, as providing income for the school through the sale of garden produce. Whether this was explicitly stated, improving food security in both communities is of high importance.

The GATE program was initiated with the improvement of food security as one of its goals. There is the general belief among those at Plenty and other NGOs working with school gardens that students bring home their newly learned gardening techniques and start gardens for their families. This research seems to support this perception, as eight households in Laguna had formal (fenced) gardens similar to the school garden. This similarity in garden-type can be contrasted with Indian Creek, which had only three demarcated gardens, all dissimilar to those in Laguna and the school garden. Further, when asked what plants they would like to grow in either the school garden or a homegarden, respondents in Laguna tended to list imported food crops like tomatoes, okra, Chinese cabbage, and watermelon. In contrast, Indian Creek expressed a greater emphasis on local foods, with 14 respondents mentioning some form of local plant for the school gardens. This may indicate that prestige may be associated with the introduction of a western-style fenced or formal garden, and thus also with the more recently imported foods grown in that type of garden. These contrasts point to the potential influence of the GATE program beyond the dietary improvements of school children.

The possible introduction of prestige associated with garden type could represent a drawback of the GATE program. If growing imported crops becomes more prestigious, there is the potential that this could prove detrimental to the household diet. For instance, the three dark leafy green vegetables (chaya, callalloo, and champa), which are local varieties that may help make up potential deficiencies of the Milk group in the diet, could be seen as less prestigious, and thus disinterest in growing them could have a negative health impact on the community. Developments like these could change the focus of what food plants are desirable to more imported plants, thus potentially deteriorating the

traditional knowledge surrounding local food plants. Here further research on other communities with school gardens would have to be carried out to see if this trend is common.

Some people in Laguna viewed the school garden with skepticism. There was an unconfirmed belief that teachers were the main benefactors of the school garden produce by taking home the best of the harvest. Others that could not or did not pay for the school feeding program felt it was unfair that their children had to work in the school garden anyway. These are issues that respondents in Indian Creek did not perceive due to the lack of experience with such a program.

The GATE program may be attempting to fix a problem that may not exist—at least at the time of this study (it may have been more significant just after the severe hurricane struck in 2001). While reports of undernutrition in the district continue, propagated by reports from PAHO and other organizations, this research appears to indicate that the diet is meeting most nutritional needs in the communities researched. Apparent deficiencies of the Milk Group in the diet should be further explored, and perhaps brought to the fore in terms of what species are grown in the school gardens of the GATE program. It remains unclear what affect the introduction of new gardening techniques has on participating communities, although preliminary evidence appears to show the possible introduction of perceived desirability to garden type and content.

Chapter 5: Discussion & Recommendations

Discussion and Summary of Findings

The health of individuals and communities is intricately tied to diet and nutrition. Poor and otherwise marginalized communities around the world often have poor health outcomes due to dietary deficiencies. The connections between low income and poor health have been shown through studies among the Maya in Toledo (Crooks 1994a, Crooks 1994b). The question remains, however, of where the diet of the Maya fits into this picture. Sydney Mintz notes, "Nutritionists can construct diets for the species based on the best scientific information available, but there is no infallible guide to what is naturally the best food for human beings" (1985:8). By looking at obesity rates and dietary-based health problems in the U.S., it should be clear that a move to a more western or globalized diet is not necessarily healthier. Yet as regions like the Toledo district continue their integration with global economies, this shift toward a globally based diet seems inevitable. This research, conducted among two Q'eqchi' Maya communities in southern Belize, gives a snapshot of an aspect of this transition.

The communities are in a region that was devastated by Hurricane Iris in 2001, which caused considerable damage to crops, homes, and gardens. In the period since the hurricane, a number of non-governmental agencies (NGO's) have made attempts to assist the communities throughout the region. At the same time, tourism has steadily increased, as the main Southern Highway, mostly paved in the late 1990s, facilitated connections to

the rest of Belize and beyond. This assistance has been much needed, as there are few jobs in the region, and many households live not much above subsistence levels that the *milpa*, bush, and homegardens supply. The Plenty school garden program (GATE) represents an example of such assistance, as the goals of GATE have been to improve nutrition of children and families, and improve food security. What seems to have been overlooked, however, is the relative adequacy of the Q'eqchi' diet that has been in place for generations. In short, while reports of undernutrition in the region are widespread, there has not been a complete dietary analysis conducted in the region.

Belize/Toledo

In an effort to determine the effects of the Plenty GATE program, this research was carried out in two Q'eqchi' Maya villages in the Toledo district, one with an established school garden, and one without. Dietary intake between the two villages remained very similar, and in fact, appears to meet most of the recommendations of the USDA Food Guide Pyramid. Homegardens in each village were nearly universally maintained, with some minor differences in outward appearance between the two villages. Despite the near universality of homegardens, species diversity and actual number of cultivated plants appear to be lower than in prior studies (Zarger 2002b, Levasseur and Olivier 2000). Reasons for this remain unclear, however, it may be the proximity to the Southern Highway and the related job opportunities are leading more community members to seek wage labor, and thus placing less emphasis on traditional cultivation practices like homegardening. Further study in villages farther removed from the Southern Highway would help to confirm or reject this hypothesis. Regardless of

these differences in homegardens there remains a widespread interest in growing food around the house in both communities.

The Q'eqchi' Diet

Previous studies in the region point to chronic undernutrition among communities in the Toledo district (PAHO 2007, FAO 2007), indicating a diet that is deficient in essential nutrients. Results from this exploratory project indicate that, among the Q'eqchi' communities surveyed, the diet continues to be procured largely from the surrounding environment using traditional methods of *milpa* agriculture, gathering in the bush, and homegardening. The diet is comprised mostly of plant and animal species native to the region, and supplemented with some introduced products, some of which is grown (like rice), and some of which is purchased (like flour and canned meats). Analysis of the Food Frequency Questionnaire shows that when compared with the USDA Food Guide Pyramid, these methods of food production and procurement satisfy nearly all of the nutritional needs of the communities in question.

The one significant food group in the Q'eqchi' diet that does meet the USDA recommended daily intake is the Milk Group. The USDA dietary guidelines suggest the following: "Milk product consumption has been associated with overall diet quality and adequacy of intake of many nutrients. The consumption of milk products is especially important for children and adolescents who are building their peak bone mass" (USDHHS & USDA 2005:24). However, the Milk group is one area of the Food Guide Pyramid that has been questioned. Critics "specifically criticized the pyramid's overemphasis of dairy product consumption (3 cups daily, regardless of sex, age, or

physical activity) (Mitka 2005:2851).” The Plenty GATE program is not specifically focused on this area of the diet (the Milk group), although there may be ways to increase nutritional intake of this group through consumption of various vegetables. Calcium, potassium, and Vitamin A are three important nutrients obtained through the intake of dairy products that may be low or deficient in the Q’eqchi’ diet. However, there is the likelihood that some of the foods in their diet can and even do address these needs. In particular, the greens, like callaloo, chaya and yampa, are all sources of Vitamin A, potassium and some calcium. Orange vegetables, like pumpkin and yams, are high in Vitamin A, and okra is a source of dietary calcium (USDHHS & USDA 2005). All of these foods are already a part of the diet in each community surveyed. Further understanding of the nutritional composition of many of the foods in the Q’eqchi’ diet is needed in order to accurately determine the dietary needs in these communities.

This research did not differentiate between child, male, or female portion sizes, and these should be researched to identify any nutritional or dietary deficiencies due to gender, age, or other factors. Smaller serving sizes for children, which is likely, may be the reason for reported undernutrition in the district. Still, USDA daily recommendations for children are also lower, so there is the possibility that actual and recommended serving sizes may correlate in much the same way as the results discussed here.

Q’eqchi’ Homegardens

Homegardens have been a part of Maya households for generations. The species growing around the house form a type of traditional or indigenous knowledge that is integral to the health and well being of households. In the communities surveyed,

homegarden composition was primarily fruiting trees, which allow for an almost year-round harvest of fruit just outside the door of peoples' homes. This knowledge is held across communities and age-groups, and could be described as one of multiple threads woven together that make up Maya life in Toledo. As the district continues to develop and otherwise feel the pressures of globalization, it appears that at the same time fewer species are being planted or grown in homegardens.

While this aspect of the study is based on a small sample, and will need to be confirmed through future research, it appears that older members of the community may have more species diversity in their homegardens. This difference in garden diversity between age groups points to a diminished utilization of local environmental knowledge, and thus the local diet will likely continue to change. As diet is one of the fundamental aspects of human life, the erosion of this particular traditional knowledge, surrounding food plants in the environment, could represent a significant loss to the Maya and others. This apparent loss was evident during the research, as some participants named a few foods or plants in Q'eqchi' that were not known in Q'eqchi' or English by some of my younger contacts.

Contribution to the Literature: Globalization and Ecological Nutrition

This research contributes to the literature on Maya in Belize, their diet, and their homegardening practices and knowledge. This report places the Maya at a unique point in the ever-evolving juxtaposition of global and local forces. As noted earlier, the research also contributes to the ecological nutrition model, which proposes that there are a number of factors that affect the diet of individuals and communities: the social and physical

environments, social organization, culture and ideological systems, and technology. The individual is also able to reflect and negotiate to a certain degree how those factors are integrated into daily life at a certain time or place. For instance a mother may decide to obtain seeds of a new food species from the school garden - or she may not. All of these factors have been shown to have an effect on the diet of the Q'eqchi' in the communities studied. While social structures, such as the *alcalde* system and *milpa* agriculture, continue to shape many aspects of social life, including the diet, increased interaction with global forces, such as tourists, wage labor, and new food choices, are causing the nutritional ecology to change. While this should be further investigated, it appears there are signs that the most influential factors may be shifting as Toledo becomes more tightly linked to global markets and consumer products.

Q'eqchi' Maya live in villages that value and practice community leadership and organization, and communal work around the village and in the *milpa* remain a primary focus of village life. The natural environment dictates what is able to grow, and what types of animals are available for the hunt, and their successful management of these resources has sustained communities for generations. Success of these traditional methods and systems can likely be attributed to acceptance of change and ability to adapt to new environments. These forces have been present for centuries at minimum, and include environmental calamity, national and international governments and business interests, and even local innovation and change. As the world population grows, and localities become more linked and crowded, these influences increase in number and frequency. This is so much so that it would prove difficult to capture all of the forces that are in action or at play at any given moment. Influences relevant to this research are

many, including: entrance into the work force, new methods of growing food (through the school garden program for instance), and, through increased contact with U.S. (and other countries') consumer goods, and the availability of a plethora of new foods.

The ecological nutrition approach allows for an examination of each aspect of the surrounding environment that contributes to dietary intake. This research illustrates many aspects of the social, technological, and environmental environment in Toledo that influence the Q'eqchi' diet that are going through an exceptional period of change. It has been shown that these changes are in turn affecting the diet in the communities studied. These processes are clear in the Toledo district. For example, most people in the communities around the district who are about 40 years of age or younger now speak English, which they have been taught in school. This development has allowed for increasing numbers of Maya to enter the national work force. While this does not necessarily mean the abandonment of all traditions, it certainly brings new experience and products into the daily lives of community members.

While change is inherent in any culture, it could be argued that these changes specifically are leading to an accelerated change in what it is that makes a Maya community unique. It does appear that there is less utilization of traditional knowledge among younger families – at least where homegardening is concerned. Further, the products from the western or global economy that are being introduced are typically less than healthy. These food products are inexpensive, and of low quality, and include items like ice cream, soft drinks and soda, and canned meats. Programs like the GATE program may be able to counteract some of the deleterious effects that may result from some of these changes; however, at this point in the life of the program, the school gardens may

be contributing to both negative and positive changes in the communities in which they operate.

School Gardens and Plenty

The school garden project offered by Plenty Belize (GATE) to the communities in Toledo is clearly very popular. Since villages must approach Plenty and satisfy a number of initial requirements, the fact that 27 communities in the district have now participated in the program speaks to this popularity. In communities in Toledo, where jobs are scarce, and access to resources is low, a program that aims to supply food to children and families in a sustainable manner is a valuable resource. The GATE program is such a resource, and it does help issues of food insecurity through the creation of a garden in communities. The gardens also supplement the diet of children, and to a lesser extent families, through the production and consumption of the garden products. In a region with reported endemic undernutrition, this aspect of the GATE program cannot be overlooked. Another important aspect to the GATE program is that organic gardening methods are taught to students, who can then bring these methods home to share with their families. Organic methods, because they do not require purchased chemicals, are a valuable and low-cost set of growing methods for families with little or no income. While homegardens are typically grown organically, many farmers use chemicals on the *milpa*, where organic methods could be beneficial. Added to these contributions are other possible benefits that have been documented in other school garden projects (although they remain undocumented in the GATE program). These potential benefits include increased appreciation for the environment in students, an improved learning

environment, and higher test scores (Morris etal 2000, Graham and Zidenberg-Cherr 2005, Graham etal 2005, Hermann 2006).

While the GATE program is clearly making an impact in the villages in which it operates, it could become even more effective by considering some of the findings of this research. It appears that the diet of the communities in question may not actually need their diet supplemented by the foods currently being produced in many of the school gardens. Further, if there are in fact nutritional deficiencies in the diet of the Q'eqchi', it appears to be in the Milk group and its noted nutrient base: calcium, potassium, and Vitamin A. Identifying plant sources that could address these deficiencies could enhance the effectiveness of the GATE program greatly. For instance, leafy dark green vegetables are typically high in Vitamin A. Chaya and callaloo both fit this description, and are well known species throughout Toledo. Increasing production of these vegetables in the school garden could be a good way to improve nutritional intake that may be lacking due to the scarcity of dairy products in the region.

Taking this a step further, Plenty could perform some basic research in each community with a school garden. Distributing a food frequency questionnaire could help in determining the nutritional needs of each individual community, therefore enabling the school garden to be focused on plants that could best satisfy these needs. Explaining to the community why these plants are important, combined with growing other food plants that the community wants to grow, could make an even greater success out of the GATE program. Again, because chaya and callaloo are both local species, community members may be more amenable to increasing their consumption of these plants.

Another potential finding of this research is that it appears that in the community with the school garden, household interest in growing non-native vegetable varieties was greater than in the village without the GATE program. This difference may point to these non-native foods as having higher perceived value, which could be due to a number of factors. Regardless of the higher status, these foods will prove to do little to address issues of food security, as community members will have to rely on outside sources for seeds of these plants. Preliminary results suggest that many plants in the traditional Q'eqchi' diet could address some, if not all, of the nutrient needs of the communities.

Including these native plants in the GATE program could have a number of benefits. Most of these plants are probably already used in households throughout the community; thus, there is a familiarity with the plants and preparation methods. By placing a focus on native varieties and explaining their importance in the diet, a deeper understanding of, and respect for, these plants may result. Through the inclusion of traditionally used species in the school garden, student (youth) interest in TEK may increase with the realization that this type of knowledge is relevant and valuable. While elders may already know how to grow these plants, teaching the youth how to do so – and do so organically – may serve to strengthen community bonds between the generations and help in the continued transmission of a body of knowledge that has been developed over the course of many generations.

Applied Aspects

Applied anthropology continues to be a growing and influential sub-discipline of anthropology. Taking an applied approach allows research to be conducted with the

approval and participation of the community, while at the same time, offering something back to the community. Much of this project used traditional methods of anthropology, and more specifically, nutritional anthropological methods: food frequency questionnaires, interviews, and participant observation were each integral to the success of the project. While the methods employed were somewhat expected given the nature of the research questions, the applied aspects of this project took on some rather unusual forms.

One of my main contacts in all of Toledo happened to be the PTA chairman in the school of one of the villages where I was conducting research. He asked if I could start a pen-pal program with his school and one in the U.S., and I agreed that it was a good idea, and possible. I took this idea to the other village, which has six computers and an Internet connection, and asked if they would be interested in this arrangement. Both groups were enthusiastic about the idea, and I located a school in Pennsylvania that agreed to have their students write those in Belize. One village received a package of hand-written letters, and the other began communicating through an online pen-pal service. While the pen-pal programs were not directly related to the research, they offered a way in which I, the researcher, could offer something back to the community. Pen-pals offered a structured means in which to familiarize young Q'eqchi' students with students from the U.S. and its vastly different culture, and vice-versa.

As a further offer of thanks, and in efforts to make the research relevant to the participating communities, I plan to send a summarized version of my findings, which will offer some potential ways to address changing diet and cultivation practices. I will also provide Plenty Belize with this summary report, along with recommendations on

how to apply the research findings. Each group agreed that this would be an appropriate way for me to return the favor of allowing me to work with their communities. The research findings described here could help to focus the efforts being made to address reports of undernutrion in the Toledo district. In particular, organizations working in the Toledo district, like Plenty Belize, can confirm household diet and food preferences and address more specific needs in the communities in which they work.

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Appendices

Appendix I: List of food Plants from this Study

English Name	Q'eqchi' Name	Scientific Name
annatto (colorant)	Xiyow	*Bixa orellana L.*
apple (not grown, store bought, imported)	Masan	*?*
Avocado	o’	*Persea americana*
Banana	Tul	*Musa x paradisiaca*
beans (grown and bought)	Kenq	*?*
Blackberry	?	*?*
Breadfruit	Masapan	*Artocarpus altilis (Parkinson) Fosberg*
Breadnut	Kastayn	*Brosimum alicastrum*
bri bri	cho' choc	*3 varieties*
Cabbage	Repoy	*Brassica aleracea L. var capitata*
Cacao	Cacao	*Theobroma cacao L.*
Callaloo	Callaloo	*Amaranthus or Phytolacca icosandra*
Carrot	Carrot	*Daucus carota*
Cashew	marallon	*Anacardium occidentale*
Cassava	tzin (tsin)	*Manihot esculenta*
Cauliflower	Cauliflower	*Brassica aleracea L. var botrytis*
celery	Celery	*Coriandrum sativum*
chaya	Ichaj	*Cnidoscolus chayamansa*
cherry	?	*Flacourtia cataphracta*
cherry plum	?	*?*
chinese cabbage	chinese cabbage	*Brassica rapa L. subsp. pekinensis*
cilantro	sumat (samat)	*Erngium foetidum*
chayote	cho cho	*Sechium edule*
coconut	Cooc	*Cocos nucifera*
coco plum	Rum	*cf. Spondias mombin L.*
cocoyam	Ox	*cf. Alocasia macrorrhizos (L.) Schott*
coffee	Kape	*Coffea arabica*
cohune cabbage (heart of cohune)	Mokoch	*Orbigyna cohune, syn Attalea cohune*
corn	Ixim	*Zea mays L. subsp Mays.*
cowsop (cowsap)	Matuacuy	*Annona purpurea*
craboo	chi’	*Byrsonima crassifolia*

cucumber	cuke or cucumber	*Cucumis sativus*
custard apple	Pak	*Annona reticulata*
deer fruit	tu kej	*?*
fever grass	k'is k'im	*Simbapogon citratus (D.C.) Stapf.*
garlic	Anx	*Allium sativum*
golden plum	rum pook	*cf. Spondias purpea L.*
gooseberry	?	*?*
grape	Grape	*?*
grapefruit	Toronj	*Citrus x paradisi*
guava	pata'	*Psidium guajava*
? (guaya)	k'in ip (kinep)	*Talisia oliviformis*
ik (local pepper/wild pepper)	kok ik	*Capsicum annuum L. var glabriusculum*
jippy jappa	kala' (ka-laah/ka-l ah)	*Carludovica palmate*
juan glan	jon holing	*?*
kulantro	Kulant	*?*
lettuce	Lettuce	*Lactuca sativa*
lime	Lamux	*Citrus limonia Osbeck*
locust (fruit)	Paq	*Hymenaea courbaril*
'long' pepper	rniki ik	*?*
malay (molly) apple	masan arroz	*Syzygium malaccense*
mamey (mamey apple)	saltul (saltule)	*Pouteria sapota*
mango	Mank	*Mangifera indica*
monkey cap	holob'ub'	*Couepia polyandra*
mushrooms (found on burned wood at milpa)	Esem	*?*
okra	Okr	*Abelmoschus esculentus*
onion	Ceboy	*Allium cepa*
orange	Chiin	*Citrus sinensis*
oregano	che' oreg	*Lantana involucrate*
pacaya (young flower)	saki k'ib	*Chamaedorea tepejilote Liebm.*
papaya	Papay	*Carica papaya*
passion flower	k'un batz (umbatz)	*cf. Passiflora*
peanut	Peanut	*Arachis hypogaea*
pineapple	ch'op	*Ananas comosus*
plantain	Sakatul	*Musa x paradisiacal*
plum	Rum	*Spondias purpurea*
potato	Is	*Solanum tuberosum*
pricklish pacaya	och kib	*?*

pumpkin	k'um	*?*
rice	Arroz	*Oryza sativa*
rose apple	Masan	*?*
sapadilla (fruit) (similar to mamey)	Muy	*Manilkara zapota*
small plum	kok rum	*?*
sorrel (for wine)	?	*Hibiscus sabdariffa*
soursop (guanabana)	anaab'	*Annona muricata L.*
star apple	kia mit	*Licania platypus*
star fruit	?	*?*
string beans	q'ehem kenq	*?*
sugar cane	Utzaj	*Saccharum officinarum*
suppa palm	Map	*Acrocomia aculeate*
sweet lime (lemon)	Liim	*Citrus aurantifolia*
sweet pepper	ki'il ik	*?*
sweet potato	ki'il is (Mopan Maya Name)	*Ipomoea batatsas*
sweek yam	Yamachin	*?*
tamarind	Tamarind	*Tamarindus indica*
tangerine	kok chiin	*?*
thyme	?	*?*
tomato	Pixp	*Lycopersicon esculentum*
?	poc-eno-boy (poknoboy)	*Bactris major*
warrie cohune	(ki'sh-kib) och'kib	*Astrocaryum mexicanum Liebm. Ex Mart.*
watermelon	Sendi	*Citrullus lanatus*
wild cacao	b'aalam	*Theobroma bicolor*
wild coco plum	chi que, chi-ke	*Chrysophyllum mexicanum*
wild pepper (hot)	ik (ic)	*Capsicum annuum*
wild star apple	posh (pox)	*?*
wild yam	(ya ya chi)	*Dioscorea bartlettii*
yam	Piak	*cf. Dioscorea*
? (a type of yam/ground food)	yampa (yam pai, yam pay)	*?*
yellow ginger (turmeric)	ginger or yellow ginger	*Curcuma longa*

Food Frequency Questionnaire

How often do you consume the following foods?

Q'eqchi' Name (English Name)	More than once per day	once per day	2-3 times per week	seldom	never
chiin (orange)					
cooc (coconut)					
kenq (beans)					
mank (mango)					
chilan (chicken)					
tul (banana)					
kape (coffee)					
wa (corn tortilla)					
cacao (cocoa)					
arroz (rice)					
harin (flour tortilla)					
kuy (pork)					
rum (plum)					
o' (avocado)					
pata' (guava)					
ik (chile)					
ch'op (pineapple)					
papay (papaya)					
kala' (jippy jappa)					
chi' (craboo)					
kar (fish)					
koolaid (koolaid)					
lamux (lime)					
piak (yam)					
patz (duck)					
senti (watermelon)					
molb' (egg)					
yampa (greens)					
callaloo (Callaloo)					

Food Frequency Questionnaire

How often do you consume the following foods?

Q'eqchi' Name (English Name)	More than once per day	once per day	2-3 times per week	seldom	never
ox (cocoyam)					
saltul (mamey)					
ideal (icepop)					
liim (sweet lime)					
utzaj (sugar cane)					
pixp (tomato)					
wakax (beef)					
okr (okra)					
mokoch (cohume)					
coke (coke)					
matuacuy (cowsop)					
anaab' (soursop)					
jalau (gibnut)					
pan (bread)					
tzin (cassava)					
map (suppa palm)					
poch (corn dumpling)					
wech (armadillo)					
ichaj (chaya/greens)					
aaq (peccary)					
sausage (sausage)					
tap (crab)					
kulant (cilantro)					
is (potato)					
kej (deer)					
repoy (cabbage)					
ceboy (onion)					
ki' il ik (sweet pepper)					
sakatul (plantain)					

Appendix III: Interview Guides

Primary Caregiver/Homegarden Interview Guide (with school garden)

Age_____ Gender_____ # in hshld_____ # children_____

1) Are there any foods that are a part of your child's diet that are not on the questionnaire? List.

2) Does your child obtain food from other places outside the home? Where? When and how often?

3) What is your role in the household regarding food provision and preparation?

4) What do you think about the school garden project? What positive things result from the school garden?

5) Do you know what types of plants are grown in the school garden? What are they?

6) Should any additional plants be grown in the school garden?

7) Do you have plants around the house that you eat or use in meals? List.

8) Do you cultivate any of these plants, or are they wild/natural?

9) Would you like to have a garden at the house? Why or why not.

10) What other plants would you like to have growing around the house?

11) Can you tell me the foods that come from the milpa? the bush? the store?

Primary Caregiver/Homegarden Interview Guide (without school garden)

Age_____ Gender_____ # in hshld_____ # children_____

1) Are there any foods that are a part of your or your child's diet that are not on the questionnaire? List.

2) Do you or your child obtain food from other places outside the home? Where? When and how often?

3) What is your role in the household regarding food provision and preparation?

4) What do you think about having a school garden project? What positive things result from the school garden?

5) What types of plants do you think should be grown in the school garden?

6) Do you have plants around the house that you eat or use in meals? List.

7) Do you cultivate any of these plants, or are they wild/natural?

8) Would you like to have a garden at the house? Why or why not?

9) What other plants would you like to have growing around the house?

10) Can you tell me the foods that come from the milpa? the bush? the store?

NGO school garden Interview Guide

1) Can you tell me what your role is in the school garden projects?

2) How long have you participated in this role?

3) Can you give me a list of species or plants grown in the school gardens?

4) Is there anything else that you feel should be grown in the school gardens?

5) How are these garden products used?

6) Do students participate in the school gardens in any way?

7) Do you think there are benefits from the school garden? If so, what are they?

8) Can you tell me a little bit about how the school garden program operates?

9) How is the school garden thought of in the community?

10) Is there anything else you would like to add about the school garden project?