FROM WOODS TO WEEDS:

CULTURAL AND ECOLOGICAL TRANSFORMATIONS IN ALTA VERAPAZ,

GUATEMALA

A DISSERTATION

SUBMITTED ON THE TWENTY-SEVENTH DAY OF APRIL 2001

TO THE DEPARTMENT OF ANTHROPOLOGY

OF THE GRADUATE SCHOOL OF

TULANE UNIVERSITY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

BY

Darron Asher Collins

APPROVED:

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FROM WOODS TO WEEDS:

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From Woods to Weeds

Landscapes are created and transformed by human beings as they engage in a dialogue with their biotic and abiotic environment. The Q'eqchi' — the fourth largest group of the Maya language family with speakers numbering over 700,000 — are the primary transformers of the lowland forested landscapes of northern Alta Verapaz. However, families actively involved in this transformation are new arrivals to the area and hail from a botanical environment wholly different from the lowland tropical forests of their new home. This dissertation is based on 17 months of ethnographic and ethnobotanical research in two Q'eqchi' communities — one in the highlands, the other in the lowlands — and unravels the cultural process of behavioral and linguistic adaptation to an unfamiliar botanical environment.

Using the Mesoamerican *aldea* as the unit of analysis, the methods of this controlled comparison are both qualitative and quantitative. Participant observation and a long-term, personal commitment to the communities and the Q'eqchi' language provided an intimate understanding of ethnobotany as applied to the cultural domains of house construction, home gardens, agriculture, harvesting of forest resources, local and regional markets, and plant related lexical patterns. Community surveys, home garden inventories, and a plant trail experiment provided a large, quantitative data set that helped determine patterns in the cultural matrix. Basic descriptive statistics, multilinear regression, multi-dimensional scaling, cluster analysis, agreement matrices, and consensus analysis were all employed to help determine the patterns of cultural adaptation within the two communities.

The cultural data show that, although the lowlands are indeed largely unfamiliar to the migrants, distant and recent histories have played a role in *preadapting* the Q'eqchi' to the

lowlands. Through these historical and contemporary channels, knowledge of plants and other characteristics of the lowland forests have reached the highlands, essentially helping to homogenize plant knowledge and behavior across any artificial altitudinal categories. Nevertheless, the lowlands are drastically new and the needs and stressors of the new ecological and cultural environment seem to elicit numerous instances of behavioral and lexical modification.

The "worldy" Q'eqchi' — an ethnographic enigma when compared to other Mayan groups — have been stigmatized in the conservation and anthropological literature as the "invaders" of a "pristine" ecological haven in northern Guatemala. Until this community and the Guatemalan government understand and address the pressing problems in the highlands, the lowlands will remain a social and ecological sponge, destined to become uninhabitable.

Acknowledgments

There are many individuals and groups to be thanked in helping complete this dissertation, but none more than my wife Karen, who managed to get a year off from work to accompany me during the highland segment of this research. Her support was endless. Having her with me was not only beneficial for my sanity, it was beneficial for my research. Next to her, I must thank the communities of Chajaneb and Sa Mox for warmly accepting us and participating in my research. I must especially acknowledge the family of Domingo Cuc in Chajaneb and the family of Domingo Tzub in Sa Mox for their help and friendship.

Writing a dissertation is a long process, this one starting several years ago as a kernel of an idea tossed around with many faculty at the Department of Anthropology, Tulane University. Eventually a committee was formed, with the three members of that committee seeing me through the entire process. To them — Bill Balée, Robert Hill II, and Judie Maxwell — I extend my warmest thanks. Bill Nañez as an individual and as the point man for the Howard Tilton Memorial Library helped pave the institutional and academic road to the dissertation research. Anne Bradburn at the Koch Herbarium at Tulane was an enormous help with plant identifications. And to Steve Darwin, who spent countless hours looking over my shoulder or directly into the dissecting scope, I will forever be indebted. He helped me become a novice botanist and inspired me to pursue the discipline further. Both John Liukkonen of the Tulane Math department and Norbert Ross of Northwestern University's Program in Cognitive Studies of the Environment were invaluable in the development of my statistical ideas.

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Then there were the many groups and individuals, not necessarily affiliated with institutions, that helped get this tome written. They formed a unique cultural climate of ex-patriots in Cobán. Seth Hempstead and the entire Hempstead/Fairhurst clan, Sal and Libby Brizuela, Joni and the late Bob Ford, Don Tino, Pastor Marc and family, Ashley and the entire crew at Hostál D'acuña, the wild man Oscar, and all the rest helped ease the homesickness and were great friends to Karen and me. Don Jerónimo Roberto Bob Jerry Makransky and Dany Bouchard are two of the most inspired individuals I know, both of whom helped me tackle this dissertation. I'm not sure if mentioning Makransky in this dissertation will help or hinder his name, although Karen and I are both glad to be mentioned in *Thought Forms* (Makransky 2000). Don Juicho and his Chamelco family helped me in my initial set-up in Chajaneb and I owe many thanks to them.

This dissertation was also made possible by a grant from the Wenner Gren Foundation for Anthropological Research, grant #6433. The Garden club of Allegheny County's Botany in Action Program, later administered through the Phipps Botanical Conservatory, provided both funding and moral, technical, and emotional support. The women in that group, especially Paula Sculley, Susan Clancy, Mary Brown, Liza Nevin, Sally Ketchum, and Mary Burdett, are trend setters whose dedication will have a profound impact on botanical conservation. I owe them many, many thanks.

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Darron Collins
New Orleans, LA

Foreword

On March 15, 2000 a small motorcade left Cobán in the highlands of Alta Verapaz for a small, rural village in the northern lowlands named **chi tokan** ("place of the raspberry"). A judge and a lawyer were among those in the motorcade. Their mission was to settle a land dispute between a wealthy landlord and a group of Q'eqchi'-Maya Indians whose village was in the process of being cut off from the main road. The Indians grow cardamom, a spice used chiefly in the Middle-East. Without access to the main road, the cardamom growers would be forced to sell their harvest to just one merchant: the wealthy landlord. The judge and lawyer were vocally opposed to the possibility of a monopsony.

As the motorcade skirted off the main road onto the overgrown path that led to **chi tokan**, a group of armed men jumped from the surrounding hills and opened fire, killing the lawyer and the judge. Such local terrorism continues to be a common occurrence in Guatemala, despite the peace treaty ending the civil war signed in December 1996. This region of Guatemala in the north of Alta Verapaz — called "*la franja transversal del norte*" — has had and continues to have an infamous reputation for violence.

The recent surge in violence, like the occurrence at **chi tokan**, is partly the consequence of internal migration — largely the movement of Q'eqchi' farmers from the highlands near Cobán toward the lowlands between Cubil and Playa Grande. Another consequence of this migration which receives as much if not more media attention is deforestation. Satellite imaging dramatically underscores the fingers of deforestation as the

Q'eqchi' push northward into and through the department of the Petén (Atran 1999). This northern third of Guatemala was once a vast wilderness, the "fifth lung" of the world (Schwartz 1994). During the past three decades it has become a vast human ecological sponge soaking up the troubles of highland Guatemala. Despite the creation of the Maya Biosphere Reserve in 1989, the cultural and ecological outlook of the region is bleak.

This dissertation concerns these cultural and ecological transformations.

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A Note on Q'eqchi' Orthography and Treatment of Plant Names

A quick scan through the literature will reveal a confusing array of orthographic treatments for the Q'eqchi' language, so much so that even the word "Q'eqchi'" is variously spelled "Kekchi," K'ekchi'," "Keqchi," or "Kekche." Throughout this text I use the unified orthography developed by the *Academia de la Lenguas Mayas de Guatemala* (ALMG) which assigns 33 letters to Q'eqchi': a, aa, b', ch, ch', e, ee, h, i, ii, j, k, k', l, m, n, o, oo, p, q, q', r, s, t, t', tz, tz', u, uu, w, x, y, and glottal stop. Double vowels represent long vowels and apostrophes (') represent glottalized consonants. All letters approximate their English phonetic equivalents, save "x" which is pronounced as "sh-" in English, and "j" which is pronounced as "h-' in English. All Q'eqchi' words are stressed on the last syllable. Language and ethnicity names also use the ALMG orthography.

Place names have not been converted to this orthography, but remain in the most common Spanish approximation. I have retained the English "s" as a pluralizer, instead of using the Q'eqchi' suffix "eb'."

Obviously, plants are an important part of this dissertation. When a plant is mentioned in the text, it will appear in Q'eqchi' in bold and will be followed by its scientific name encapsulated with parentheses and in italics. Any Spanish terms that appear in the body of the text will also be italicized. Where appropriate, English glosses will be given in plain text between quotation marks. For information on plant families, voucher specimens, and scientific names, see Appendix 1.

A Note on Measurements

The Q'eqchi' of Chajaneb and Sa Mox use a bewildering array of measurements derived from English, Spanish, and Q'eqchi' units. Many of them are quite subjective or objectively variable. The following is a list of the most common measurements used by the Q'eqchi' and, when applicable, their metric and American equivalents.

b'aar — Sp./Q — distance — a yard, or arm's length
b'aral — Q'eqchi' — quantity — skein
b'as — Q'eqchi' — area — half of a *cuerda*
b'uuy — Q'eqchi' — quantity — a lot
ch'ut — Q'eqchi' — quantity — a bunch; group
cuerda/tarea/k'am — Sp., Sp., Q'eqchi' — area — variable, usually 441 m^2
hil — Q'eqchi' — distance — distance between two spots for resting, as when carrying corn
job'ol — Q'eqchi' — quantity — handful
kaajachal — Q'eqchi' — fraction — a fourth
kawayeriiy — Sp./Q — area — 400 *cuerdas*
k'amal — Q'eqchi' — time — English equivalent, "A bit"
k'ojol — Q'eqchi' — volume — the amount of seed that can fill a Coke bottle cap]
k'utub' — Q'eqchi' — length — a handspan
manoj — Sp./Q. — quantity — a firewood bunch, about 60 cm in diameter
mansan — Sp./Q. — area — 16 *cuerdas*
min — Q'eqchi' — distance — the width of your four fingers
moqox — Q'eqchi' — distance — armspan
muuq — Q'eqchi' — stature — head-high
peex — Q'eqchi' — weight — pound
Quetzal — Spanish — money — averaged .133 USD during 1999
quintal — Spanish — weight — formally 100 kilograms, colloquially, 100 lbs.
quintal — Spanish — volume — amount held in a *quintal* bag
jun tuxtun — Q'eqchi' — quantity — 50, usually pertaining to 50 *centavos*
rok — Q'eqchi' — distance — most common board length, approximately 2.2 meters

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Part I

Chapter One: Introduction

> *The anthropogenic impact on the Maya Biosphere Reserve's landscape is negative due to the feeble ecological conscience of its inhabitants as a consequence of the fact that the majority of them have migrated to the area and have a tendency to reproduce their original customs where the conditions of the landscape are different* (Soza 1996:99).

The movement of landless peasants into lowland rainforest environments is often enumerated first on the list of *causes* of deforestation (e.g., Myers 1980; 1984). Without paying much mind to *why* these so-called peasants are invading the tropical forests, environmental planners face the daunting problem of how to stop the flow of people, and, more challenging still, determining what to do with the masses that have already arrived.

The following chapters are not, however, a strategic plan or environmental policy report for saving the forests of lowland Mesoamerica. Instead, they are an attempt to exemplify the process of cultural adaptation — *the process by which human groups and individuals actively manipulate human needs and human ecological conditions in the face of changing human needs and human ecological conditions*. The Q'eqchi'-Maya, the most numerous migrants into the lowland forests of northern Guatemala (Grünberg 2000:1), are the study population. Two Q'eqchi' communities — the highland *aldea* of Chajaneb and the lowland *comunidad* of Sa Mox — are the units of analysis. Through 17 months of ethnographic fieldwork in these two communities I examine how people from a highland tradition have adapted to their new home in the lowlands.

In order to restrict the field of inquiry, the use and categorization of plants are the focus of this study. Despite massive changes that have ultimately made plants *less* important in the lives of these Mayans, they continue to be integral to the Q'eqchi' as a people. The dissertation, then, falls under the anthropological rubric of ethnobotany.

Unfortunately, my research was not timed so as to follow a Q'eqchi' community of highland origin into the lowland rainforests. Such communities that migrate *en masse* are quite rare. Instead, the dissertation attempts to reveal the process of cultural adaptation to a new botanical environment through what amounts to before and after time frames. By spending a year in the highland community of Santa Catalina Chajaneb I describe the baseline situation for the Q'eqchi'. And by working in San Luís Sa Mox, a patchwork community of recent arrivals from various towns in the highlands, I can provide a post-migration snapshot of a lowland Q'eqchi' community. Comparing the two communities allows one to assess the degrees and kinds of changes associated with this movement. These changes I call cultural adaptation.

There are a number of rather obvious theoretical, conceptual, and methodological problems with this strategy. All these problems will be addressed in Chapters One and Two. Nevertheless, the long-term fieldwork and commitment to learning the Q'eqchi' language generated results that address the question of cultural adaptation. Thankfully, history has cooperated by creating a laboratory for understanding social change in Alta Verapaz, allowing for what Bernard calls a "naturalistic experiment" (1994:58).[1]

As adaptation is the crucial theoretical term that the dissertation hinges on, first I lay out the place of cultural adaptation in anthropology and throughout the social sciences. These pages yield a definition of this important concept: *adaptation, when considering cultural and not biological evolution, is the process by which human groups actively manipulate human needs and human ecological conditions in the face of changing human needs and human ecological conditions.* It is a dynamic dialogue where reflecting on the biological use of the term is a valuable heuristic device for understanding the cultural use of the term. The present chapter will then introduce the reader to the history and prehistory that forms the matrix of this naturalistic experiment, first describing the waves of Q'eqchi' migration to the lowlands. The position of the Q'eqchi' as intermediate players between the highland and lowland Maya has been considered by archaeologists, though the region is severely understudied (Arnauld 1986). The chapter then presents a short history of the ethnographic work on the Q'eqchi'.

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[1]History has been kind enough to create many opportunities for these "naturalistic experiments." Take, for example, the blessing of the eight Dutch cities — Amsterdam, Haarlem, Utrecht, Delft, The Hague, Leiden, Dordrecht, and Rotterdam — for the concept of the "ring city" in architectural discourse (Koolhaas 1995:1027).

The Anthropological Meanings behind Adaptation and Innovation

Adaptation is a term used widely and in different contexts throughout the social and natural sciences. It is the goal of this sub-section to clarify its sundry meanings, impose order on the vast terminology, and organize the goals of the dissertation with respect to this newly found order.

It is in the biological sciences, most specifically evolutionary biology, that the term adaptation finds its most historic and most stable sympathizers. Although the concept of evolution certainly preceded Darwinism, it is within the context of Darwinian natural selection that the biological definition of adaptation emerged. Natural selection, the causal mechanism of biological evolution, proposes that with variation, inheritance, and selection at the individual level, certain traits become common throughout a population. In this biological context, adaptation can be defined as *any inherited characteristic that emerged as a feature of a species that directly or indirectly facilitates reproduction during and following the period of its evolution* (Tooby and Cosmides 1992). The function of a specific adaptation is to solve a "problem" or "feature" presented by the individual's ecological niche and, ultimately, facilitate reproduction (Buss et al. 1998:535). In contrast, biologists and physical anthropologists examining adaptation to short-term changes and stressors in their environment — for example, cold, heat, altitude, vapor pressure, availability of nutrients — actually focus on *acclimatization* rather than adaptation (Molnar 1992:214). Like adaptation, acclimatization examines physical and behavioral changes associated with a fluctuating environment, although in this case the response is physiological and the time frame is brief.

Natural scientists limit themselves to understanding biological responses to change by individuals in order to avoid the misuse of concepts within genetics. Of course psychology and social interaction can also have an impact on survival and reproduction, but the key connection for natural scientists is that evolution, and hence adaptation, *operates on a genetic level.* In examining human behavior that is adaptive, sociobiologists and neo-Darwinian anthropologists attempt to identify the genetic basis of behavior that has reproduction-maximizing consequences (Symons 1992:138).

Such a search for the genetic components of behavior is theoretically appealing because of the simplicity of a model that could ultimately unite the social and natural sciences. Methodologically, though, we face an impasse. Until genetic research defines more precisely the role of genes in human behavior, social scientists must broaden or abandon the model.

The one characteristic of adaptation that currently unifies the social sciences and natural sciences is the presence and causal link between stimulus/stressors and responses. All environments — natural and cultural, individual and social, behavioral and cognitive — are dynamic and such dynamism invariably places a certain degree of stress on its individual occupants. For physical anthropologists interested in acclimatization the stress may be heat (e.g., Newman 1961); for cognitive scientists the stress may be changes in visual or auditory stimuli (e.g., Sugita 1994, Anstis and Saida 1985, respectively); for linguists it could be changes in orthography (e.g., Beech 1992); or for social psychologists it could be temporary changes in social setting (e.g., Wooden and Ballan 1996). Across disciplines there is agreement that a change in the level of a certain stimulus provokes a crisis that necessitates a response. Among the social sciences and between the social and natural sciences, differences emerge in explaining the adaptive process of crisis and response. These differences primarily concern: a) whether or not adaptation fuels a goal-driven evolution toward equilibrium; b) the possibilities of optimization; c) the historical origins of an adaptation; d) the levels of analysis appropriate for understanding adaptation; e) the extent to which consciousness becomes involved in the adaptation process; and f) the relationship between an "actor" and an "actor's niche."

Before social science fractured into the various disciplines, it embraced the concept of adaptation if not the term. Theories of geographical causation, born in the seventh century B.C. and revitalized in the Enlightenment, fit the basic mold of adaptation studies. Eighteenth century authors like John Arbuthnot and Montesquieu understood "culture" as a response or a direct reaction to a niche in the widest sense of the term — a geographical region (Harris 1968:41-42). Such geographic or environmental determinism would surface again in the anthropological materialism of the mid-20th century known as cultural ecology. Embodied in the abundant writings of Julian Steward, "cultural ecology is the study of the processes by which a society adapts to its environment" (Steward 1977:43).

This analysis falls directly into the trap of considering adaptation and evolution as a "goal driven" processes that tend toward a state of equilibrium. This view is most apparent in the work of the "new ecologists" Carneiro (1968), Rappaport (1971), and Goldschmidt (1965), and can be described as explaining culture to be something existing between man and environment, where societies are normally in a state of equilibrium until they are disturbed by external factors. When disturbed, adaptive responses follow and homeostasis is reestablished (Bargatsky 1984:401). This point of view ends in teleology: the function of ecological systems is to maintain themselves. If this is the case, "where" or "at what stage" do they maintain themselves? What is the optimal state? With no universally accepted "optimum" condition, applying homoeostatic principles to culture is problematic. Embracing an "optimizing" model has also led to an environmental discourse that proposes one and only one model of "correct" or "optimum" ecological behavior where alternative perspectives are simply unimaginable (Escobar 1995:45).

There are other constraints on the "adaptation toward optimal design" theory that must be recognized at least from an evolutionary perspective. First, evolution is a slow process, so slow that there is often a time lag between a new adaptive problem and the evolution of a design to fix it. Second, there are frequently costs involved in the construction of adaptation that must be weighed. For example, testosterone in males is elevated at the onset of puberty which in turn triggers necessary physiological changes. Elevated testosterone also has costs: namely, it compromises the immune system (Folstad and Karter 1992). Third, optimization is always compromised because of the necessity to coordinate with other mechanisms: women have widened hips to facilitate childbirth which ultimately compromises their ability to run with great speed (Buss et al. 1998:538-539).

Paralleling these factors that inhibit optimization, evolutionary biologists have also rebelled against the idea that one can equate the historical origins of a mechanism or structure with its current utility. Steven J. Gould (1991) invented vocabulary to deal with this problem:

"exaptation" and "spandrels." Exaptation is "a feature, now useful to an organism, that did not arise as an adaptation for its present role, but was subsequently co-opted for its current function" (Gould 1991:43). Birds may have developed feathers as an adaptation for thermoregulation and the adaptation was then co-opted for flight — flight is the exaptation (Buss et al. 1998:539). Spandrels are "presently useful characteristics (that) did not arise as adaptations, but owe their origin to the side consequences of other features" (Gould 1991: 53). The space between the pillars of a bridge — literally, their spandrels — are often used by the homeless as shelter, even though they certainly were not designed with that use in mind (Buss et al. 1998:539). These concepts have recently been put to use in evolutionary psychology. I believe there is also use for them in anthropological investigations of adaptation and innovation.

Modern social scientists — other than neo-Darwinian scholars, new ecologists or cultural ecologists — use the adaptation concept in myriad ways to assess the long and short term impact the environment has on individuals, social groups, and even nation-states. Clinical and applied psychologists follow the same general model of stimulus/crisis and adaptive response, but prefer the terminology "coping strategy," "coping mechanism," or "transient niches," the last borrowed from the natural sciences. Interestingly, and having parallels in anthropology, these disciplines toggle back and forth between adaptation as a conscious or largely unconscious mechanism. Thomas and Paulin (1995:133), for example, advocate consciously "adapting one's behavior to one closely approximating that of another's culture (in order to) improve institutional business relations" (also see Jones and Strand 1986; Heyink 1998). In contrast to this conscious attempt at adaptation, Watson and Hubbard (1996) paint adaptation as a passive, ineffective, and unalterable coping mechanism that is key to understanding neurotic behavior. Sociologists, preferring to focus on larger social conglomerates, prefer the term "socialization" and apply it in a way similar to the anthropologist's use of "acculturation." For example, Wooden and Ballan (1996:780) examine the coping strategies of once free men to a middle class prison. These studies are not wholly unlike the way some anthropologists have approached Mesoamerican Indian adoption of syncretic religious beliefs in the face of colonial oppression.

Perhaps the clearest way to see the parallels between anthropology and its sister disciplines is to equate cultural adaptationism with unconscious manifestations exhibited by cultural groups, and innovation and invention as the conscious efforts of individuals. Innovation and invention have received widespread coverage in both the natural and social sciences. Historians of the natural sciences would associate the two terms with practical, applied fields like mechanical engineering. In such fields, "invention" is equated with scientific discovery: the vague, often arbitrary act of insight that results in a new combination of pre-existing knowledge (Herbig 1994:5). The "innovation," in contrast, is the first practical, commercial demonstration of the invention. In other words, if no market exists — if no *need* or *stimulus* is present — innovation will not occur (Herbig 1994:6; Petroski 1996).

There is an easy interdisciplinary exchange between the inventors or innovators of products and the concomitant development of business and industry's demand for innovation policy and law. However, there is a less direct relationship between inventors and innovators in arenas of society outside business and industry. The pioneer of the innovation concept in the social sciences is Barnett who saw innovation as "any thought, behavior, or thing that is new because it is qualitatively different from existing forms" (Barnett 1953). In Barnett's 1953 classic and his *American Anthropologist* articles prior to the book's release, innovation occurs, not unlike genetic mutation, at the level of the individual. Those on a culture's fringe tend to advocate innovation and promote ideas of reorganization rather than quantitative variation. There then follows a process by which advocates of the innovation become interested and the innovation is ultimately accepted or rejected by the other participants of the local culture (Hodgen 1945; 1952).

These culture change and innovation studies in anthropology, which began in the late 1930s and reached their apex in the 1950s, eventually were taken up under the term "acculturation." But with acculturation studies, no longer was the emphasis on the individual, but rather on the cultural group as a whole. Perhaps the most relevant study, at least in terms of geographical proximity, was Manning Nash's work in the K'iche' community of Cantel where he observed the process of peasant exposure to a new textile mill (Nash 1958). Not conforming to the typical conservatism of the peasant (see Chapter Three, this study), the Canteleños had the uncanny ability to accommodate new forms and exhibited control over new circumstances (Nash 1958:112). It is interesting to note that this was not the case in Nash's earlier studies in Southeast Asia where industrialization brought massive social disruption and cultural disintegration (Nash 1955).

Recently, acculturation studies have waned. But new interpretations of the culture change/innovation process have appeared, largely in the rubric of international development.

The development of the Ecological Psychology Program at the University of Michigan and the publication of the ten titles within the "Linking Levels of Analysis Series" (University of Michigan Press), edited by Emilio Moran, have helped to bring the concept of innovation back to anthropology.

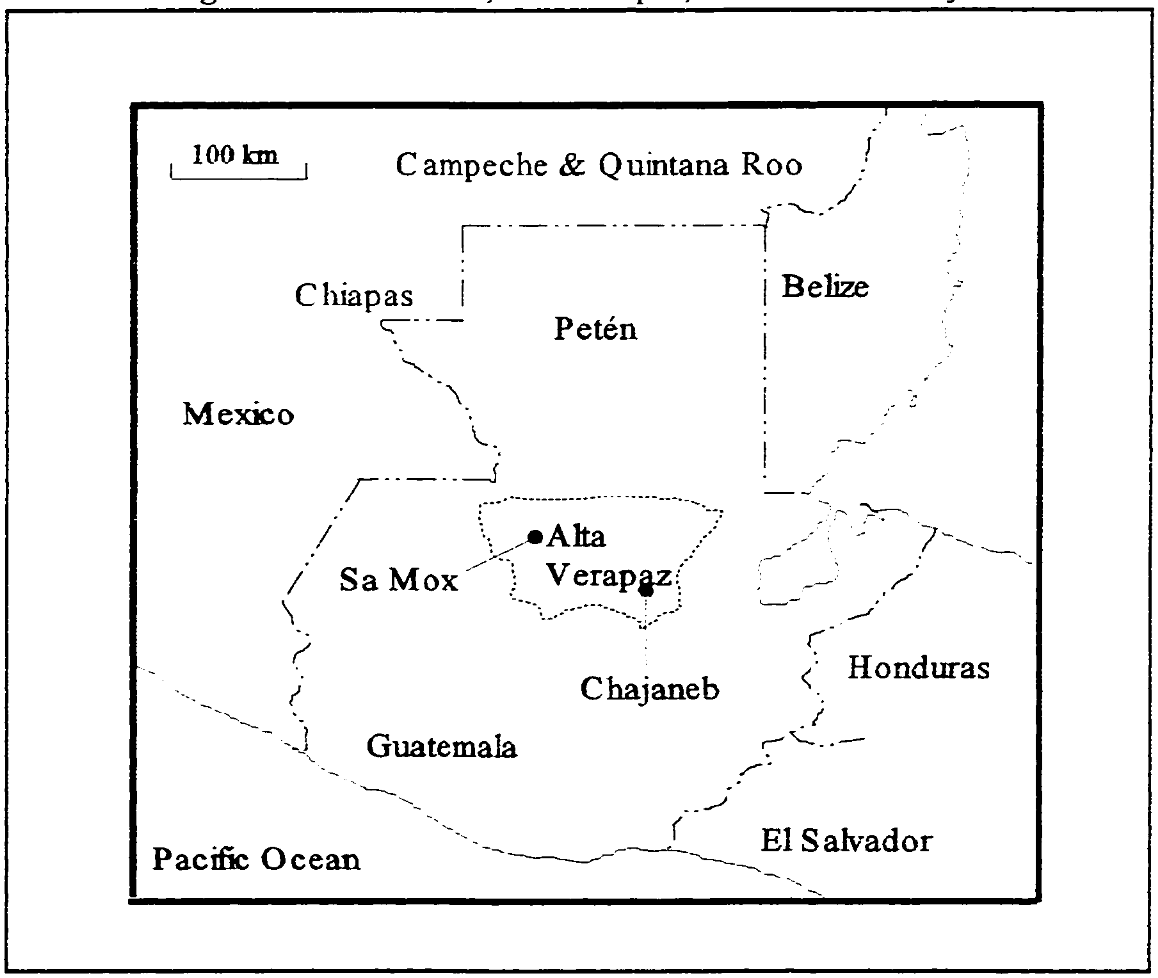
Perhaps the most intriguing problem that often permeates social and natural scientists' perception of adaptation and/or innovation is that there is no way of "subdividing the world into niches pre-dating organisms," because organisms themselves are active in creating their niches (Bargatsky 1984:400). *Niches are not unchanging entities set for organisms to be adapted to, but, rather, co-evolve with their actors.* The hummingbird and tubular corolla of the trumpet vine, the beaver and its pond, and the farmer and his or her field are in constant, creative dialogue — sometimes physically, sometimes behaviorally, oftentimes both physically and behaviorally. Worded very precisely by the pen of an engineer, "The world of our everyday experience is shaped by the practice of engineering and technology, and the world shapes these activities in turn" (Petroski 1996:1). Humans have had such an incredible impact on their "niche" that we ultimately face the erasure of the cultural/natural boundary espoused by essentialist nature philosophy. These essentialists, who continue to be the majority of the industrialized world, espouse the belief in an external, prediscursive nature (Escobar 1995:2). Although the essentialist dichotomy between natural and cultural is largely a creation of modernism, in the post-modern world the two halves are collapsed. From the human manipulation of stem cells and all that is microscopic, to the measurable effect of Amazonians on Amazonian forests (e.g., Balée 1994), humans appear to have completely and permanently altered what was once considered "natural." The elimination of the nature/culture dichotomy is distressing to the environmental movement which seeks to preserve nature in the face of advancing culture. But the theoretical collapse of the binomial pair is part of a long awaited maturing process that will hopefully unite the social sciences, natural sciences, and humanities.

Stemming from these five points of controversy in the literature, I approach Q'eqchi' adaptation to the lowlands with the understanding that: a) cultural adaptation is goal-driven only in an immediate, short-sighted sense; b) adaptation need not be an optimizing agent; c) focusing on adaptation cannot tell us much concerning the historical origins of form; d) the level of analysis can be on the individual and the larger social group; e) cultural adaptation, as defined above, is both a conscious and unconscious process; and f) the best way to understand adaptation as a process is from an anti-essentialist perspective, where the boundary between nature and culture is blurred if not completely eliminated.

The Maya Lowlands as Frontier

The tropical forest of the Maya lowlands is a modern frontier. The region stretches from the states of Campeche and Quintana Roo in the north, to the central highlands of Alta Verapaz in the south, and from the Sierra del Lacandón in the west, to the Belizean coast in the east (Figure 1.1). From the fall of the Itzá empire in 1697 until the 1970s, the region was

Figure 1.1: Guatemala, Alta Verapaz, and the Two Study Sites



essentially an unoccupied wilderness (Schwartz 1990). Like many frontiers, in the historical sense of the term, the region has been a refuge for runaway slaves, Indian uprisings, and religious revitalizations (Bricker 1981). The frontier in Guatemala has also been a safe haven — safe especially from bureaucratic regulating institutions — for large absentee landlords to raise cattle and other agricultural products (Kaimowitz 1995). Recognizing that a frontier has both cognitive and material referents that pertain to boundaries of space, social interaction, time, and cultural knowledge, the Mayan frontier was and continues to be a region of physical and ideological respite (Jones 1989:6).

The frontier's southern boundary has been crossed for permanent occupation in several waves during the past two centuries. The underpinnings of this dissertation rest on these historical occurrences. Before continuing with the theoretical background, methodology, and study site description that comprises the bulk of Part I, I will first sketch the archaeological and historical backdrop that precedes the modern waves of migration into the northern lowlands. I will then summarize the historical colonizations of the region and summarize the ethnographic and historical literature that describe the lives of the study population and most important colonizers: the Q'eqchi' (Schwartz 1990:8). This sketch provides a measure of historical depth for a better understanding of the region as a whole and the study sites in particular.

Q'eqchi' is one of 27 to 31 Mayan languages spoken in Mesoamerica, depending on the scope of the term "language" (Coe 1993:27; J. Maxwell, pers. comm., April 1998; Stewart 1980:8). Colloquially, "Q'eqchi'" refers to the language and the people who speak it. With speakers numbering over 700,000, it is the fourth most widely spoken indigenous language in Guatemala, after K'iche', Mam, and Kaqchikel (Schwartz 1995). Unlike the first three languages, however, Q'eqchi' is spoken over a very large geographic area, encompassing the Guatemalan departments of Alta Verapaz, Baja Verapaz, Izabál, Quiché, and Petén, the lowlands of neighboring Belize, and as far north as the border with the Mexican states of Campeche and Quintana Roo (Adams 1969; Ardito Vega 1997; Carter 1969; Wilson 1972). Recent, unconfirmed oral reports note a Q'eqchi' village off the north coast of Colombia and a small community comprised mostly of Q'eqchi' in Dallas, Texas (B. Cordova, pers. comm., January 2000.)

Alta Verapaz Prehistory and History

Before the Spanish "conquest" of Guatemala in the early 16th century, the transition zone between the Maya highlands and the lowlands of the Petén was sparsely inhabited (Carot 1989). This apparent low population density may, however, be due to sparse archaeological interest in the region. The work that has been done has focused primarily on the extensive cave systems in northern Alta Verapaz and the salt production zone near the four corners area[2] (Butler 1940; Carot 1989; Dillon 1977; Pope and Sibberense 1981). Through ceramic analysis, archaeological research has linked together the pre-Classic, Classic, and terminal Classic Maya of the four corners region to the north, specifically the Petexbatún and Uaxactún regions; significant ties to the highlands in the south have not yet been firmly established (Butler

[2]The four corners area refers to the junction of the three departmental boundaries of Quiché, Alta Verapaz, and Petén with the Mexican state of Chiapas.

1940; Carot 1989). Perhaps the most important site in this transition zone is Chamá, very near the Alta Verapaz/Petén/Chiapas border, on the banks of the Chixoy river. The first discussions of this site were by the amateur archaeologist/entrepreneur Erwin P. Dieseldorff (Dieseldorff n.d., 1936, 1994) and Robert Burkitt (1916) of the University of Pennsylvania who were interested primarily in the beautiful burial urns from the Late Classic Period (Sharer 1994:691). Plans for the mapping and excavation of the site are in the preparatory stages (E. Danien, pers. comm., May 1999).

Just across the Chixoy river is the Late/Terminal Classic site of Camelá Lagoon, described by Dillon (1981). Based on ethnoarchaeological evidence and scant remains at the site, Dillon suggests that Camelá Lagoon was a fish-farming site that provided an important form of protein for the occupants to the neighboring Salinas de los Nueve Cerros[3], itself an important salt production site (Dillon 1981:80). Most interesting in terms of ethnoarchaeology is the discussion of the Candelaria cave system in northernmost Alta Verapaz, where ceramic analysis reveals that, like in some modern Q'eqchi' communities, the caves were most likely used as ceremonial offering sites in the Early Classic and Classic Periods (Pope and Sibberensen 1981:53). Robert Sharer and David Sedat (1987), updating the previous work of A. Ledyard Smith (1955), have also produced a useful archaeological survey of the Verapaces[4] that outlined the sites nearest to the towns pertinent to my fieldwork: Sakajut and Chichén. Through these site analyses, they interpret the region as a north - south trail system

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[3]"Salt flats of the nine hills"

[4]Alta Verapaz and Baja Verapaz are two Guatemalan departments. Historically they were united and referred to as "Los Verapaces."

important for the movement of obsidian, jade, quetzal feathers, and ceramics (Sharer and Sedat 1987:252). Most recently, the work of the Vanderbilt team, headed by Arthur Demarest, has completed an initial mapping and assessment of Cancuen, just north of the Petén/Alta Verapaz border (A. Demarest, pers.comm., January 1999). The archaeological literature of the northern Alta Verapaz region, although sparse, provides at least a tenuous link between the behavioral and demographic patterns of the past with what can be documented ethnographically in the present. It, however mildly, suggests that the occupants of the region — probably Q'eqchi' speakers — played some role in the movement of goods between the highlands and lowlands.

At the time of Pedro de Alvarado's arrival in Guatemala, the Q'eqchi' occupied a relatively small geographic area among the mountains and valleys of what are today the municipalities of Cobán, San Juan Chamelco, San Pedro Carchá, Lanquín, and Cahabón (King 1974; Schackt 1986; Weeks 1997:6; Wilson 1995). Certainly the movement of language groups is not an uncommon occurrence in Mesoamerica, but the scale of the Q'eqchi' migrations that followed the "conquest" — in terms of numbers and distance traveled — is unprecedented in post-contact Maya history.

Before the arrival of the Dominican Fray Bartolomé de las Casas, the Verapaces, or "true peace," was known infamously as Tezulutlán: The Land of Wars (Sapper 1985:3). After Pedro de Alvarado failed miserably on three separate occasions in the military conquest of the Verapaces, it was the work of Friar de las Casas that successfully *reduced* the Q'eqchi' and other language groups in the region (Dieseldorff 1903).[5] For nearly three centuries, until the independence of the Republic of Guatemala in 1821, all secular Spanish and Creoles were prohibited from meddling in the land of true peace, and as a result, the Q'eqchi' were temporarily spared some of the drastic and violent changes common to other indigenous groups in Guatemala (Sapper 1985:5). Our understanding of Q'eqchi' speakers during these centuries is paltry, limited to isolated documents such as calendars (Thompson 1932), *relaciones* (Relación Verapaz 1955, orig. 1574), and wills with annotated land claims (Weeks 1997; Dieseldorff 1932). From reports based on the *Archivo General de las Indias* we do know that the indigenous population of Alta Verapaz in 1750 was just 15,250, with a population density of only 3.5 people/km^2 (Francisco de Solano 1974:144,162). The ethnohistory of the actual town of Cobán is well documented by Arden King (1974), though his work centers on the 19th century relationships between Germans and the Q'eqchi'.

The Q'eqchi' Waves of Migration and their Associated Linguistic and Ethnographic Study

Although there is evidence that the Q'eqchi' may have been migrating into the southeastern Petén even before the arrival of the Spanish (Schwartz 1990:34), I take the well-documented 19th century as a starting point for reviewing the modern "waves" of migration. In response to the increased European presence during the 19th century, several Q'eqchi' communities near the town of San Pedro Carchá revolted in 1864 (Schwartz 1990:81). The

[5]Although Q'eqchi' was the primary language spoken in the region in the time of de las Casas, there were also numerous speakers of Poqomchi', Ch'orti, and Manche (Bricker 1981:37).

uprising was a milestone year for the Q'eqchi' movement to the north as revolutionaries fled into the lowlands. Interestingly, it was roughly during the same time period that Yucatecan rebels fled south into the forests of Quintana Roo during the Caste Wars.[6] This trend intensified in the latter half of the 19th century when the institutional reforms of the economically liberal government further encouraged European investment in Guatemala (Nañez 1970:13). As a result, highland settlements were abandoned for the relative tranquility and open tracts of land in the tropical forests to the north. Although some folders of the Dieseldorff Collection at the Tulane University library make reference to the specific details, the specific numbers and dates of this population movement are opaque.

The same colonists that would force the indigenous population to flee north or work the newly established coffee plantations in the region were also, paradoxically, the source of the first detailed ethnographic documentation on Q'eqchi' speakers. In Guatemala, where North Americans tended to specialize economically in the development of railroads and the banana industry, Germans focused on coffee production (Náñez 1970:17). Fortunately, some of the German coffee barons became interested in the Q'eqchi' way of life — much more so than their *Ladino* counterparts — and it is through their efforts that we get our first firsthand ethnographic glimpse of the Q'eqchi'.

The name Dieseldorff will figure prominently in any discussion of 19th and early 20th

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[6]The conflict known as the Caste Wars lasted from 1847 through 1901, although the majority of the violence and resistance took place in the 1860s. The conflict had many catalysts, but the acquisition of land in the southeast of the Yucatan Peninsula by the Spanish invaders is usually attributed as being the primary motivation for revolt (Bricker 1981:88). For details of the causes and consequences of the war, see Carrillo Gil and Magaña M. (1956) or Reed (1964).

century ethnography in the Alta Verapaz. One of the primary "conquistadores" in what has come to be known as the second colonization of Guatemala, Erwin Paul Dieseldorff spent four years in the forests of northern Alta Verapaz recording the ethnomedical knowledge of the Q'eqchi' (Náñez 1970.:42). These efforts resulted in numerous pamphlets and notes on Q'eqchi' ethnobotany — all held at the Tulane University Latin American Library — and the eventual publication of *Las Plantas Medicinales de la Alta Verapaz* (Dieseldorff 1940).

A close friend and traveling companion of Dieseldorff, the geographer Karl Sapper, has also contributed significantly to our knowledge of the Q'eqchi' during the time of their first modern migrations north. Sapper, like Dieseldorff, was truly a Renaissance man, but perhaps his most important contribution to our understanding of the Q'eqchi' is his pioneering Q'eqchi' grammar (Sapper 1906). The late 19th century work of Otto Stoll (1886, 1938), who was interested more in general ethnographic description than in pottery sequences, language, or ethnobotany, completes what could be called the Germanic, entrepreneurial, ethnographic trilogy.

A second very important component of the Q'eqchi' migrations around the turn of the 19th century was the development of infrastructure. The road system of Guatemala, which today totals just 1,913 paved miles and 6,801 gravel miles, is at least partially responsible for the movement of people toward the department of Petén and into the lowlands of the Polochíc river valley (Dennis et al. 1988). The beginning of infrastructure development in the late 19th century was contemporary with the explosion of the coffee industry, and, in search of a point of exportation, work was initiated on the Cobán to Panzós coffee track. This 90 km path was only finished in 1881 and was nothing more than a "narrow strip of crudely leveled ground without permanent surfacing" (Náñez 1970:250). It did, however, make coffee transport much more efficient and, more importantly, the road was built primarily by the hands of Q'eqchi' under a corvée law that forced indigenous peoples to pay off coffee *finca* debts and unpayable road taxes with labor (Náñez 1970:254). More than one elderly Q'eqchi' man, born just after the turn of the century, can tell stories about building that road and settling down in the lowlands after his labor debts had been terminated. The same process of road construction and resettlement also occurred on the Highway #5 road project which attempted to link the Petén with the rest of the nation. This road project, and others during that era of Guatemalan history, is the subject of the interesting piece of political propaganda published in 1940 by the *Partido Liberal Progresista* entitled *7 Mil Kilómetros de Carretera en 8 Años*. Despite these massive gains in infrastructure under these regimes, the first all-weather, dirt road did not reach the central Petén until 1970 (Schwartz 1995:104-105). The importance of infrastructure development as a catalyst for tropical forest colonization has received significant attention in the literature (e.g., Moran 1983) and has shown that 90 percent of deforestation in the Neotropics occurs within two kilometers of roads (Sader et al. 1994: 325).

This second significant wave of population movement following infrastructure improvements occurred at approximately the same time that the first, more-professional ethnographic work on the Q'eqchi' was conducted. Goubaud Carrera (1949) produced a short yet informative description in Spanish while studying under Sol Tax at the University of Chicago. Although based on just three months of field work with an informant who was known throughout San Juan Chamelco as a thief and a liar (Wilson 1972:23), the piece is useful in some respects, especially in its description of the Q'eqchi' agricultural cycle (Goubaud Carrera 1940).

Guillermo Sedat, an affiliate of the Wycliff Bible Translators/Summer Institute of Linguistics, had worked for nearly two decades on the Q'eqchi' language before publishing the now famous *Nuevo Diccionario de las Lenguas K'ekchi' y Española* in 1955, which is still in print under the direction of Cobán's Baptist ministry (Sedat 1997, orig. 1955). The text was an improvement on the earlier German works, especially in its clarification of Q'eqchi' phonology. Sedat was also one of the first Protestant missionaries in the region and is, therefore, partially responsible for the waves of evangelism that are quickly transforming the Q'eqchi' cultural landscape (F. Eachus, pers. comm., February 1999). The evangelical missions of the Alta Verapaz approached the process of evangelizing through a commitment to understanding the religious background of the peoples they were trying to mold, and this process of understanding resulted in some significant contributions to Q'eqchi' ethnography and linguistics (e.g., Carlson and Eachus 1971; the long term ethnographic work of Francis Eachus and Ruth Carlson that would eventually lead to the publication of *Aprendamos Kekchi,* 1980). It is important to note that during mid-century, while so much quality ethnographic work was coming out of other regions in Guatemala (e.g., Bunzel 1959; Tax 1953), the anthropological work from Alta Verapaz was limited to these scant publications. Possibly because of the region's isolation and perhaps because of the relatively simple Q'eqchi' costume, anthropological interest in the

Q'eqchi' would not proliferate until the 1970s.[7]

While the first modern ethnographies and dictionaries were coming to fruition in the 1950s, the indigenous population in the highlands was growing rapidly and the open wilderness to the north was beginning to disappear in the face of migration (Adams 1965). But it was not just the Q'eqchi' who sought land in the north. During the 1960s and 1970s the Guatemalan economy was spurred on by rapidly increasing production of cotton and beef, the expansion of plantations and ranches, and a desire for land in the open north (Schwartz 1995:106). This terrain, including the entire Department of the Petén and the region known as *La Franja Transversal del Norte* (FTN)[8], was also a region heavily colonized by the Guatemalan military. Military salaries were particularly low at the time and as the ownership of land was seen as a characteristic of prestige and land in the highlands was largely unavailable, the cheap acreage of the Petén and the FTN was highly sought after. The combination of enormous 900-square hectare estates, armed military personnel, and landless peasants was destined to become problematic (CEAR 1993).

The beginning of government efforts to promote small-farm settlement in northern Alta Verapaz, through the government agency known as INTA (*Instituto Nacional de*

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[7]A notable exception to this lack of ethnographic work during the early decades of the 20th century is the fantastic manuscript of M. S. Lope (1931) entitled *Secretos de la Raza* which was published as a second edition in the 1960s.

[8]La Franja Transversal del Norte, or the northern transverse fringe, refers to the northern portions of the departments of Alta Verapaz, Izabal, Quiché, and Huehuetenango. The area was defined in 1970 under Law 60-70 which declared the agricultural development of the FTN to be of public interest and national urgency (Araujo and Uribe 1982; Kaimowitz 1995:1)

Transformación Agraria), began with the 1960 Agrarian Transformation Law and lasted until the early 1980s when increased military conflict in the area brought the process to a halt (Kaimowitz 1995:21). As will be described in more detail in Chapter Three, for the migrants of the Sa Mox area in northern Alta Verapaz the violence over the 20 year period — from the establishment of the 1960 law through the Rios-Montt regime — was enough to *de*populate the area: the Q'eqchi' *finca* workers abandoned the valley for the Petén and the Polochíc Valley. They would return as early as 1983 to the region as squatters on either national *baldío* or private land (CEAR 1993).

Ethnographic coverage of the Q'eqchi' during this time period increased slightly. Most important among these publications was Carter's *New Lands and Old Traditions* (1969) that examined highlanders' practice of agriculture in the lowlands. Carter's work on lowland agriculture in the Polochíc Valley demonstrated that complexity in agriculture was strongly linked to the complexity of soils (Carter 1969). The 1970s saw a revitalization of Q'eqchi' language studies, most notable through the work of Ray Freeze (1970, 1976), Sandra Pinkerton (1976), and Stephen Stewart (1980). Equally important was the linguistic brainchild of Father Haeserijn: a 1974 Q'eqchi' dictionary, which offered more complete and consistent coverage of vocabulary than the earlier work of Sedat (orig. 1955). Also important were the two Guatemalan publications of Q'eqchi' history and ethnography *El Mundo Kekchi de la Verapaz* (Estrada Monroy 1979) and *La Cosmovisión K'ekchi' en Proceso de Cambio* (Cabarrús 1979). These publications were instrumental in highlighting the Q'eqchi' religious practice of cave ceremonies dedicated to the worship of the 13, local mountain deities — the

tzultaq'a. Finally, the most complete, most relevant ethnographic work for the purposes of this dissertation, was Michael Wilson's 1972 dissertation at the Department of Geography at the University of Oregon. Wilson's human ecological description of a highland Q'eqchi' community is incredibly detailed and contains a very helpful appendix on Q'eqchi' plant names that are a valuable tool for cross-checking botanical terms in this study. His treatise also offers a very detailed account of Q'eqchi' plant technologies. However, his adherence to cultural ecology's determinism leaves the reader with a somewhat superficial understanding of the relationship between plants and people.

The last two decades of Q'eqchi' history have seen a continuance of the historical processes of the past centuries. Infrastructure development has continued. Populations have increased. Even since the 1996 peace treaty ending the civil war, violence has slowed but still lingers. Within this state of flux many Q'eqchi' families continue to make the decision to abandon their highland home for the prospect of abundant land in the north. As a result, the Q'eqchi' comprise the largest ethnic group of migrants throughout the FTN and the Department of the Petén (Atran 1999).

The ethnographic texts produced during the last 20 years are three. First, the 1986 publication of Jon Schackt's *One God — Two Temples* which was an ethnographic summary of the Belizean-Q'eqchi' village of Crique Sarco. The work is especially relevant to this dissertation, as it is particularly revealing of the lasting connection between the highland Cobán area and lowland Belize. Schackt (1986) demonstrated that the Q'eqchi' belief in the 13 mountain **tzultaq'a** deities can be replicated, or is adaptable, in the lowlands of Belize even where there are no tangible mountains. The data must be viewed with some skepticism, though, as all data were collected in English or through translators (J. Schackt, pers. comm., June 1999). Second was the work of Richard Wilk, also an ethnography of a Belizean Q'eqchi' group (1991). The text serves limited purposes here because it is an analysis of the term "household" more than it is a work on Q'eqchi' ethnography. Finally came the publication of *Maya Resurgence in Guatemala: Q'eqchi' Experiences* (1995) by Richard Wilson. This text, although based on long-term ethnographic work in the Q'eqchi' language and by a very competent ethnographer who obviously made serious inroads into understanding the Q'eqchi' people, has, in my opinion, some critical flaws and draws serious over-generalizations. These problems will be discussed further as Wilson's particular conclusions become relevant with each chapter.

Thus is the history of the Q'eqchi' and the social scientists who have studied them. Although the Q'eqchi' have been violently and disrespectfully tossed by the ebb and flow of *ladino* rule, for the purposes of social science, this history is telling. For, by the marginally predictable forces of history, we have a laboratory for understanding social change and cultural adaptation: migrants in a new environment with wide-ranging time depths of exposure to a new stimulus.

Preview of Chapters

This dissertation is broken into three thematically related parts. Part I serves as the introduction and is comprised of three chapters. Chapter One has posed the question: how have recent Q'eqchi' migrants "adapted" to the new botanical environment they have encountered in the lowland forests of northernmost Alta Verapaz. It has also set the historical and theoretical stage from which the data will be analyzed.

Chapter Two addresses the methodology and methods of the data gathering process. It tackles some slippery questions in the process, for example: the role of science in the methodology and methods of the data collection, and the problems encountered in selecting an appropriate unit of analysis. The second chapter also describes in detail both the qualitative and quantitative methods — that is, what was actually done "on the ground" — used during the gathering of data.

Chapter Three introduces the two study sites that will be used to make the highland/lowland comparison: Santa Catalina Chajaneb and San Luís Sa Mox. The chapter elucidates these sites in relation to the overall geography and infrastructure of Alta Verapaz. It also describes the demographic, geological, climatological, and ecological substrate of the two communities. Most importantly, it quantitatively establishes the difference in vegetation between the highlands and lowlands.

Part II, composed of Chapters Four through Eight, presents the data. In general, the five chapters of Part II begin by presenting the data gathered in the highlands and follow with the data from the lowlands. Sometimes, however, it was necessary to toggle between the two communities. In Chapters Four through Eight, I attempt a strategy to avoid the cumbersome pitfall of producing an ethnobotanical list. I do this by approaching the data beginning with the individual and extending through the widest community. Chapter Four, therefore, discusses plant use specific to the construction of the "closest" social space — the house. Moving into the next largest social arena, Chapter Five moves one step further to examine the structure and composition of Q'eqchi' household gardens. Chapters Six and Seven — the forests and agricultural fields, respectively — discuss the place where all plant production and consumption begins. Chapter Eight examines the plants of the widest possible social group, those that enter and circulate in the local, national, and international markets.

Part III completely shifts gears by first focusing on plant lexicon instead of plant-related behavior. Chapter Nine presents and analyzes the data derived from the two plant trail experiments to develop a Q'eqchi' botanical lexicon, questions the relevance of a folk botanical taxonomy, and discusses the process of plant name acquisition. Chapter 10 provides the middle-range theory between the data discussed in Part II and the ultimate goals defined in Part I. Can the processes that go on when the Q'eqchi' move into the lowland be called "adaptation," and, if not, what is happening following the movement north?

Chapter Two: Methodology and Methods

The theoretical introduction to the concept "adaptation" highlighted in the previous chapter has set the stage for a discussion of: a) methodology, the system of principles I used as applied to my particular problem; and b) methods, the procedures and techniques that stem from this system of principles. The first section of this chapter reviews the methodological problems inherent to anthropology as a science, and focuses specific attention on the definition of the proper *unit of analysis*. The second section introduces the methodological concepts that were applied to these analytical units, namely, ethnobotany and ethnoscience. The chapter concludes with a discussion of the procedures and techniques that were used to generate the data discussed in Part II of this dissertation.

Anthropology and the Science of Anthropology

Anthropology in North America, at least since the inception of the American Anthropological Association, is said to be the "science of humanity." The journal *Current Anthropology* once carried the subtitle "A World Journal of the Sciences of Man," only to have it dropped under the editorial directorship of Adam Kuper in 1986. Like that editorial board must have done, I spent a significant amount of time during my 17 months of field work questioning whether or not what I was doing was "Science." I shaped many opinions on the degree of science in anthropology during those 17 months and mulling over those questions was crucial to the formation of the goals and methods of this dissertation.

Science is a self-consciously objective means of coming to understand the world. It generally attempts to come to grips with the material world by formulating overarching models that have explanatory and predictive power. For the social sciences as a whole, the systematic search for these nomethetic principles began as early as the Enlightenment (Harris 1968:9). Anthropologists began searching for the laws that govern the behavior and thought processes of humans from the time of Tylor's *Primitive Culture* (1871). Since that time the discipline has oscillated back and forth between searching for laws and, where "there are no laws ... similar to the laws of physico-chemical science" (Kroeber 1915:288), historicity. In their quest for laws, anthropologists began emphasizing the need for a stricter methodology. Such a methodology would have to standardize the voluminous jargon into a workable terminology (Moles 1977). But more important than standardization, a science of humanity would need to measure cultural variables and measure them quantitatively so as to be able to model and predict human behavior (Banton 1965; Goodenough 1965; Honigmann and Honigmann 1955). This emphasis on standardization, quantitative measuring, and modeling became especially important during the Second World War when Science and men in white lab coats were seen as effectively toppling the Axis powers (Trigger 1995:289). Despite this trend, the scientific approach to anthropology began to wane as early as 1960.

It is the term *objective* in the definition of science as used above that caused the greatest concern for the new school. And, although the likes of Aristotle, Hegel, Dilthey, and Wittgenstein all noted that science is an interpretive rather than an objective undertaking, it was

Thomas Kuhn's *The Structure of Scientific Revolutions* (1962) that seemed to get the attention of anthropology. Kuhn forcefully demonstrated how scientific questions and answers depended on *human-constructed* networks of practices and assumptions — paradigms — and that science progressed from paradigm to paradigm (Jones 1998:35). Science, then, was anything but objective. From this idea was born the post-modern, or "interpretive" trend in anthropology.

Interpretive anthropologists would argue that those efforts that searched for nomothetic laws have been entirely futile (Jones 1998:34). What is worse, anthropologists, while proposing objectivity, have practiced a "morally bankrupt attempt to control nature and human beings" through a vast network of subjective biases (Jones 1998:35). But what the interpretive anthropologists have proposed in place of objectivity has done very little to increase our understanding of culture, perhaps with the exception of the work of Clifford Geertz (summation in Geertz 1973). Fortunately, it seems that anthropology and its practitioners are reaching a compromise. Modeling and quantitative description continue to be embraced in many modern camps (e.g., Aunger 1995; Romney et al. 1986), but physics and the other natural sciences are no longer held to be the *only* ideal models for the social sciences, largely because research in those fields rarely confines itself to objective truth searching (Carrithers 1990).

So, when approaching the problem of Q'eqchi' cultural adaptation to new environments, I proceeded with the tools and perspective of a less-than-purely-objective science. The truths that I searched for were not truths in the ultimate sense, but patterns and relationships, and the way I proceeded was mostly through pattern recognition and description.

In this dissertation I attempt a controlled comparison, where, by holding all but one variable constant, the changes in the isolated variable can be measured. This controlled comparison calls for more than science; it calls for an *experimental* science. An experimental science requires the implementation of a "scientific-method" of problem, hypothesis, experiment, results, and analysis, in that order. Because this method requires a control group in order to assess the impact of a particular variable, the only two possible routes for an experimental anthropology are: a) where, against a control group that is held at a "cultural equilibrium," a cultural element is introduced and, all other cultural elements being equal, the impact of that isolated variable is measured and b) where, by chance, history has led to a situation where a subset of the population is isolated from another subset forming a control, and the isolate is exposed to the same variables save one. Comparing differences between the subsets, one has the opportunity to measure the impact of that stray variable. The first possibility, not to mention the long list of theoretical flaws revolving around the control group, the statistical population, and the relationship between the individual and his/her "culture," is morally problematic. Approaching humans as analogous to lab rats is ethically problematic according to the code of ethics established by the American Anthropological Association. The second possibility, lacking the ethical problems, cannot escape some critical theoretical complications unique to the study of human populations. As this second possibility best fits the way my research proceeded, I address these theoretical complications in the latter half of this chapter.

Many have argued that, because anthropology can never hope to control all the variables in what amounts to an incredibly complex equation, it can never be considered "experimental" (Pelto and Pelto 1996:21). The only way I could have possibly controlled all the variables in the case of the Q'eqchi' "experiment" would be to systematically and simultaneously move an entire community out of the highland forest and into the lowlands and measure the cultural response. This response would be the adaptation to the changing variable — environment. This naively assumes that a) culture is a super-organic entity that exists apart from its human "carriers" (e.g., Kroeber 1915:285); b) that the changes are the result of the new environment and not of autochthonous origins; and c) that whatever changes may take place are measurable. Moreover, there are the constant concerns of linking the observed measurement with the proposed goals of measurement (validity) and the replicability of observation (reliability) (Pelto and Pelto 1996:33).

The Q'eqchi' of Sa Mox, as will be discussed in the following chapter on the study areas, are a heterogeneous cultural group with heterogeneous origins. Far from the idealized model of uniform community movement, the families of various places-of-origin that comprise the community also have varying time depths in their new, lowland home. These factors alone make measuring a community's response to change problematic. But what confounds the study further and has ultimately confused many anthropological queries, especially those focused on Mesoamerica, is what I call the unit of analysis problem.

The Q'eqchi' as Marginal Peasants

At the close of the 19th century anthropologists had as their idealized unit of analysis the small and seemingly self-contained human group known as the "tribe" or "horde." These supposedly homogeneous units were subjected to analysis by observing and interviewing a native informant, who was seen as a perfectly representative sample of the population as a whole. This approach to anthropology has been immortalized and mythologized by two treatises appearing in the year 1922: B. Malinowski's *Argonauts of the Western Pacific* and A. R. Radcliffe-Brown's *The Andaman Islanders.* But it was not too long after these publications that American anthropologists became interested in, or were forced to become interested in, the *peasant society.* Because this concept was largely borne of works specific to Latin America, and because understanding the Q'eqchi' in light of the concept sheds some initial light on the "unit of analysis problem," some discussion of this evasive anthropological concept is requisite.

In American and European anthropology the shift toward the study of peasants was not the typical methodological loan from a neighboring discipline, but an autochthonous development resulting from the inadequacies of the "tribal group" model in ethnography. The inadequacies were first recognized in case studies of Mesoamerica by ethnographers like Manuel Gamio (1916), Robert Redfield (1930), and Elsie Parsons (1936), and the concept of the peasant village replaced or at least augmented the isolated tribe. What was exactly meant by this term, *peasantry*? Although the term "postpeasant" has been applied to migrant urban laborers (Coon 1958:11), the defining characteristic of the peasantry is its rural character. The peasant can be distinguished by the tendency toward self-sufficiency in terms of agricultural production. Agriculture is seen as a livelihood, not a business enterprise (Wolf 1957:3), with individuals demonstrating a "... love of the land, of each man for his own piece of ground, (where land) is at the root of family life and social structure" (Bunzel 1952:18). It must be pointed out that this does not necessarily imply that the peasant does not produce a crop for sale in the market, for another general characteristic of a peasantry is its relationship to a market center (Kroeber 1948:284; Wolf 1955:453). Nor does it necessarily mean that peasant families are not land owners, for they typically do maintain effective control of the land they till (Wolf 1957:8). Yet whatever cash income accrues throughout the agricultural cycle tends to be spent on what has come to be called a "cultural tax," and the net income of peasant families therefore tends toward zero (Wolf 1955:459).

Although it has also been proposed that peasants also display particular cultural elements like a dispersed settlement scheme rather than village (Gamst 1969:22), the presence of a politico-religious hierarchy (Murdock 1949:62), and bilateral partible inheritance (Goldschmidt and Kunkel 1971:1062), there seem to be just as many examples of proposed peasant groups with atypical residence patterns, politico-religious structure, and descent. The key, then, to understanding the concept of a peasantry lies not with a list of cultural elements, but rather with the description of a structural relationship: the peasantry cannot be understood in its own terms, but must be understood as a *part* society, linked inextricably to an urban, market center (Gramsky 1974:3; Redfield 1953:31; Wolf 1955:454). It was this structural relationship between the illiterate, folk, rural "little community" and the educated, capitalistic, urbanites of the "great tradition" that captured the attention of Robert Redfield (1956, 1955, 1941, 1930). Because of the dominant, oppressive nature of this structural relationship, the cultural elements of the little community emerge as a syncretic hodgepodge of "ancestral" or "traditional" characteristics dressed in the borrowed clothes of the great tradition.

Beyond the non-capitalistic agrarian lifestyle and the structural relationship with this great tradition, a generalized peasant can be further characterized by two other less tangible qualities. One, the peasant individual, family, and community tend to be extremely conservative (Wolf 1957:4). This conservatism frequently results in a marked short-sightedness in terms of economic affairs. In 19th century Russia:

> The peasant family could survive the long, frigid winters of Russia only with great toil and careful management ... What it revered above all was fertility, which meant life and the continuation of the family. The individual Russian peasant sought immortality through the survival of offspring (Matossian 1968:39)

and in 20th century Guatemala:

> (the *milpa*) organizes resources in a very particular way. ... it works to ensure nutritive security, even, ironically, if that means ensuring material poverty. And, because of its fundamentally anti-entrepreneurial character, it reinforces the egalitarian character of the village ... (Annis 1987:38).

Finally, and perhaps partially because of this conservative character, the peasant society often appears docile, passively accepting its role as the class exploited by an elite class

(Redfield 1956:19). This accepting, docile, conservative character of the peasantry, in addition to their illiteracy and tendency toward widely dispersed settlement, is what led Marx to reject the peasantry as a compelling source for social change (Marx 1970:737). However, work among the villagers of Sedaka on Peninsular Malaysia by James Scott (1985) has forcefully demonstrated that behind this veil of compliance lies an effective form of resistance Scott calls the "weapons of the weak." "There are no riots, no demonstrations, no arson, no organized social banditry, no open violence. The resistance I have discovered is not linked to any larger outside political movements, ideologies, or revolutionary cadres..." (Scott 1985:273). Instead, peasant resistance is largely individualistic and takes the form of doing the least work for the most gain, petty theft, vandalism, and adherence to the "cult of poverty" to ensure at least a superficial egalitarianism. Far from painting a picture of an illiterate, dominated class of buffoons, Scott shows through ethnographic and economic analysis how peasant groups intelligently manipulate their subservient position in order to maximize their economic, political, and social gains. And although some Maya groups have organized, have rioted, and have demonstrated, they also commonly employ the tactics Scott discusses for Malaysia.

Do the Q'eqchi', then, fit the mold of a peasantry with rural character, non-capitalistic agriculture, a structural relationship dependent on an urban elite, conservatism, and an undercurrent of resistance against their structurally enforced overlords? And if they do, can we consider the Q'eqchi" a generalized peasantry and the preferred unit of analysis any of the various communities serving as perfect representative samples of the Q'eqchi' whole? These questions are important only because attempting to answer them exposes some of the problems inherent in cultural categorization.

First, despite my definition outlined above, anthropologists are uncomfortable with the idea of calling any cultural conglomeration a generalized "peasantry." Instead, as often is the case, anthropologists have created various and sundry peasant typologies (e.g., Dalton 1972:399) in order to adequately "fill in" the space between tribal group and modern, industrialized society. Unfortunately, "all stages of the process of transformation of tribal folk into a peasantry culturally homogeneous with their urban elite are to be observed in Latin America" (Redfield 1953:42). This continuum also characterizes the more than 700,000 Maya Indians who speak Q'eqchi'. Certainly the vast majority of Q'eqchi' live in rural areas, but what of those in the town centers of Cobán, Carchá, and Chamelco, or Guatemala City, or Dallas, Texas? And where most of these rural folk are subsistence farmers, many of them are middlemen or owners of small coffee and/or cardamom parcels. The term "conservative" hardly characterizes the Q'eqchi' farmers in the process of re-colonizing the wilderness of northern Guatemala. And one cannot classify the Q'eqchi' as a group dependent on an urban elite when in some cases the Q'eqchi' *are* the urban elite. The term peasantry may be useful for understanding 13th century France or 19th century Russia, but, for the Q'eqchi' and anthropology as a whole, it is just barely heuristic. Peasantry has become a "historical" concept much in the same way that, for the majority of the human population, the term "tribe," "horde," or "band" is no longer suitable analytically. Although it may be useful to consider the Q'eqchi' as marginal peasants if only to classify them separately from "tribal" groups, the term is not analytically useful and does not help determine the proper unit of analysis for this study.

The Unit of Analysis Question

Leaving the question of a peasantry behind but continuing along this line of thought, the question then becomes, of what significance is the term "Q'eqchi'" and how does one deal with the incredible variety of cultural types under the rubric "Q'eqchi'"? These questions are fundamentally questions concerning the proper unit of analysis. Despite other contemporary and historical trends in Mesoamerican ethnography and ethnology, I have chosen the *aldea* as the most theoretically appropriate, most efficient unit of analysis for understanding the process of Q'eqchi' cultural adaptation to new botanical environments.

Recently, Richard Wilson (1995) has attempted to portray the Q'eqchi' as a group in the process of forming a pan-Q'eqchi' ethnic identity. The "resurgence" that he describes among the Q'eqchi' is, however, largely limited to a group of intellectuals who, at least at present, have had little influence on most of the rural folk. The isolation of the rural folk of Alta Verapaz from one another and from the rest of the country, and their relative lack of political solidarity, have not helped in creating much of a pan-Q'eqchi' cultural identity. Despite the fact that Q'eqchi' is the most homogeneous linguistic group of the 23 Mayan languages spoken in Guatemala, and despite the fact that approximately 80 percent of the Q'eqchi' are monolingual (Atran 1999:209), the generalizations do not go very far beyond language. Before the arrival of the Summer Institute of Linguistics among the Q'eqchi' in the early 20th century (Annis 1987:78), it may have been possible to include the worship of the 13 **tzultaq'a** mountain deities as a shared, unifying cultural trait. But, by that time, there were second generation Q'eqchi' in the lowland landscapes of southern Belize with a distorted memory of highland deities (Schackt 1986). Probably, all individuals who learned to speak Q'eqchi' before any other language should be classified as "Q'eqchi' no matter what other cultural characteristics they may acquire in later life.

The more traditional approach to Mesoamerican ethnography has been to move toward a smaller scale, and focus on the municipalities or *municipios* as cultural units. This approach was espoused by Sol Tax beginning in 1937 and continues to be used to this day. Open any of the "classic" texts of Mesoamerican ethnography and, with few exceptions, the introductory chapter will underline the *municipio* as the most important social unit.

Tax emphasized that:

> From the point of view of the Indians themselves, the people of each *municipio* constitute a unique group, united by blood and tradition and differing from all others in history, language, and culture. They are, moreover, conscious of their unity and their uniqueness: they disapprove of marriage outside the *municipio*; when they travel they consider themselves strangers on foreign shores and think of a person from the home *municipio* as a "countryman," and if a colony is established in another *municipio* the people of the colony keep up their home customs and mix only so far as necessary with the local Indians (Tax 1937:433).

Tax (1937:435-440) goes on to describe the *municipio* as a cultural unit, where individuals share uniformity in dress, in dialect, in economic specialization, and in the reverence for a particular Catholic saint. After reifying the *municipio*, Tax created the dichotomy of "vacant-town" versus "town-nucleus" *municipios*, where the vacant-town type has "practically no permanent Indian residents" and the town-nucleus type "in which all of the people," Indian and *ladino*, live in the town center (Tax 1937:427-431). Although the distinction may be useful in a heuristic sense, especially for those towns around Lake Atitlán where Tax conducted most of his work, for San Juan Chamelco, Carchá, and Cobán, the dichotomy is not very telling. Nevertheless, given the large number of rural, Indian inhabitants scattered throughout the *aldeas* surrounding the town centers, for the Q'eqchi', we are dealing with approximations of Tax's vacant-towns.

Tax's ideas had an enormous impact on ethnographers from the United States and saw their development in the work of Eric Wolf's "closed-corporate" communities. For Wolf, the longevity and distinctiveness of the *municipio* is maintained by the active closure of borders, both physical and social. The land within the *municipio* is not a complete commodity in that it is not for sale to individuals outside the *municipio*; goods are grown and consumed locally; *municipio* endogamy is the rule; and the politico-religious *cofradía* system creates solidarity for the *municipio* as a whole (Wolf 1955:454-457). If, then, there is uniformity throughout the *municipio*, one could proceed with research in any *caserío*, *aldea*, or *pueblo* within the municipality and assume that sample to be representative of the *municipio* as a whole.

The past 50 years in Mesoamerica have perhaps witnessed more change than at any time period since the Spanish occupation of the New World. Anthropology in the past 30 years has in many cases abandoned its attempt to find cultural isolates — tribes or municipalities. Taking these two points into consideration, I find very few reasons for treating the municipalities I worked in as social or cultural units. Where Tax's municipalities around

Lake Atitlán were relatively homogeneous, served that author well as units of analyses, and also advanced Mesoamerican ethnography significantly in terms of casting aside a "tribal" approach, the use of the municipality as a principal unit for this discussion would be faulty.

The power and influence of the *cofradía* system has waned substantially since the initial conclusions of Tax and has effectively decreased the importance of the municipality (Annis 1987:62-63). The influx of evangelical missionaries and the influence of Catholic Action, although actually narrowing the behavioral difference between Catholics and Evangelicals, has certainly split any municipality-wide solidarity at least once. Although the Catholics of San Juan Chamelco gather in the *cabecera municipal* annually to venerate Saint John, this does little to unite the people "by blood and tradition." In terms of religion, more emphasis is placed on the local *aldea ermitas* and the veneration of saints associated with these small hamlets. Catholics united in ceremony for the worship of Santa Catalina Chajaneb at the *aldea ermita* during the November festival, rather than emphasizing San Juan.

Although once a year several teenage Chamelqueño girls dress in the traditional "uniform" during the parade of San Juan, the importance of this uniform has lost much of its symbolic and practical appeal for the municipality. Perhaps most importantly, specialization in economic production simply does not occur at the level of municipality in Alta Verapaz. If anything, there seems to be more specialization at the level of *aldea*. The market center in San Juan should also theoretically serve as a force increasing municipality-wide solidarity, but the proximity of the three major towns in the region means the significant use of any and all of these markets. Also, it is sometimes emphasized that marriageables are sought within the municipality, resulting in a *municipio* endogamy. Although partners tended to be from the *municipio* of Chamelco, this never surfaced as a marriage rule. It was more the case that partners were found based on proximity, that is, marriageables were generally selected from neighboring *aldeas*. Perhaps the only trend uniting the municipality of Chamelco is dialect, but I can hardly support using the municipality as a social unit based on dialect alone. It is true, when a man from the aldea of Chajaneb, San Juan Chamelco visits Cobán, he will identify himself as a *Chamelqueño*; find him in the San Juan market and ask him where he is from and he will most likely say "Chajaneb" or one of the other several dozen *aldeas* or *caseríos*.

That the Alta Verapaz is not especially prototypical of the municipality-centered approach was recognized early on by Reina and Hill (1978:119). These authors attribute the unique place of the municipality as a reflection of the region's history, where the will of Bartolomé de las Casas discouraged Spanish settlements in the region. Small, scattered Indian settlements met the agricultural and labor needs of German colonizers in the late 19^{th} and early 20^{th} century and this accentuated, or at least perpetuated, this settlement pattern (Reina and Hill 1978:119). This pattern has consequences for the anthropologist choosing to study pottery production, like Reina and Hill (1978), or plant use and cultural adaptation.

Reina (1960; 1966) emphatically emphasized the cultural homogeneity throughout the municipality of Chinautla, just outside the political boundaries of Guatemala City. Where he espouses a kind of "community culture" common to the municipality center and surrounding *aldeas*, he also recognizes the variability between these hamlets:

> The last two (*aldeas* Jocotales and El Chan), near Guatemala City, are composed mainly of Spanish-speaking Ladinos. The inhabitants of Sacojito, El Durazno, and part of Tres Sabanas are Pokomam-speaking people like those of Chinautla, while the inhabitants of San Antonio de las Flores and part of San Rafael speak Cakchiquel (*sic*). Spanish is therefore a second language, used across settlements. Each hamlet is a distinctive unit, willing to cooperate with the officials in Chinautla, because they are *autoridad*. Hostility is the true sentiment of the hamlets, however, although it is seldomly expressed publically (Reina 1966:8-9).

Reina's observations underscore the distinctiveness of *aldeas* and the cultural cleft extant between the *aldeas* and the municipality town center. These trends are even more obvious in Alta Verapaz. The economic specialization of municipalities inherent in the work of Tax is instead focused on the *aldeas* in Alta Verapaz. For example, the hamlet of Cojila is the recognized expert in the production of lime; Chajaneb, although less obviously specialized than Cojila, is the producer of fine pine boards; *aldea* Saqw'il specializes in maguey products; the people of *aldea* Chicacnab in the highest peaks of the Xucaneb range are basket makers. Perhaps because of the whims of history, perhaps because of the specific segregation of resources, the *aldea*s of San Juan are, *a la* Reina, "distinctive units."

It may seem from the arguments above that I advocate the use of the *aldea* as the social/cultural unit for Mesoamerican ethnography. In fact, I do advocate the *aldea* as a unit of analysis for Alta Verapaz[1] , and advocate the idea most strongly by using it throughout the

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[1]Note, however, that Sa Mox *is not* officially an *aldea*, but, rather, a community, hence its name *comunidad* Sa Mox. Eventually, the community will attain official *aldea* status and is, therefore, analogous.

dissertation. But I can no more pretend to find a "tribe" in *aldea* Chajaneb any more than I find a "tribe" in the *municipio* of San Juan Chamelco. Diversity is the term that best characterizes the *municipio* in landscape, in climate, in demography, in culture. Diversity, perhaps unfortunately for the needs of social scientists, also characterizes the *aldea*. It is only because the *aldea* is small in terms of space and population that it has become my unit of analysis. Knowing the two *aldeas* I worked in allows me to generalize about the Q'eqchi' only with extreme caution.

Ethnobotany as Perspective and Method

Because of the question of ethics, the problems inherent within the conditions of this comparison, and the vagueness of the units of comparison, I have chosen the term "semi-science" to classify the goals and methods of this study. The goals of this comparative analysis are made more attainable by limiting the subject area to a largely material corner of culture: plants. Unlike the various cultures and sub-cultures of the United States, Europe, and the rest of the industrialized world where the relationship between people and plants is superficial at best, the Q'eqchi' of Alta Verapaz generally maintain a much more intimate, profound relationship. There can be no doubt that this depth is becoming increasingly shallow. Nevertheless, adopting a focus on the relationship between people and plants — the ethnobotanical focus — serves as a sensible tool penetrating into all corners of Q'eqchi' culture. And, although plants continuously poke themselves into almost every aspect of what we may call Q'eqchi' culture, limiting the scope to house construction, home gardens, agriculture, forest products, markets, and plant lexicon allows for a more tightly controlled comparison between the highland and lowland cultural environments than a general discussion of all cultural domains.

John W. Harshberger, a floristic and taxonomic botanist at the University of Pennsylvania, first coined the term *ethnobotany* in 1895, but the first written investigation into the use of plants by humans comes from the A.D. 77 *De Materia Medica* of the Greek surgeon Dioscorides (Davis 1995:41). Botanical scholars of the German Renaissance revived the works of the Greek masters; French and British explorers of the New World penned about the curious use of plants by Amerindians in the 19th century; and in 1874, 21 years before the coinage of Harshburger, Stephen Powers proposed the study of aboriginal botany — "the study of all forms of the vegetable world which the aborigines used for medicine, food, textile fabrics, ornaments, etc." (Powers 1976:33, orig. 1874). The first 1900 years of ethnobotany, then, was concerned with one thing: the cataloguing of plants used by humans of exotic cultural and geographic origins. To this day, the "natural history approach" to ethnobotany continues to be an important element of ethnobotanical research. Researchers enter "the field," collect plants, discuss their uses with native informants, and later identify their specimens in the herbarium — this serves, hopefully, as a *baseline* for a better understanding of the role of plants in local society.

Around the turn of the 20th century, scholars attempted to catalogue the use of the total floral assemblage of particular ethnic groups, rather than scattered anecdotal referencing to various, often bizarre, uses of plants (Davis 1995:43; Ford 1978:35). This shift in approach began with the first post-Boasian cohort of scholars (e.g., Stevenson 1915) and has continued through the most recent decades (e.g., Alcorn 1984). These studies have generally focused on small, somewhat isolated groups of limited numbers and have resulted in publications with names like *The Ethnobotany of the ... Indians*. More recent works have proposed general ethnobotanical surveys for groups that do not fit neatly into the rubric "tribal," most important among these being the seminal 1974 publication of *Principles of Tzeltal Plant Classification* (Berlin et al. 1974). Given the discussion earlier on in this chapter, proposing an *Ethnobotany of the Q'eqchi'* would be difficult given the extreme variation of cultural types within the rubric "Q'eqchi'."

The middle decades of the past century, American anthropology began to embrace the scientific paradigm that had won the Second World War and ushered in a new form of energy that would forever power the industrial world. Investigators sought objectivity, hailed quantitative methods, and flaunted nomothetic principles. The scientific tradition in anthropology divided the ethnobotanical camp into two general groups: those attempting to construct a model of how cultural groups classified their botanical world, and those that began looking at plant use by humans from the perspective of conservation, forest management, and ethnopharmacology.

The first group was essentially started with the 1954 doctoral dissertation by Harold Conklin entitled *The Relation of Hanunóo Culture to the Plant World* and continued in a tradition that would later come to be known as ethnoecology. Conklin's "ethnoecological approach" inspired investigators to document and analyze the "folk" classification of plants, animals, soils, firewood, disease, and water from an insider or emic perspective (Nazarea 1999:2). Researchers then began postulating a series of cultural universals in the way that humans organize the apparent biological cacophony (e.g., Berlin et al. 1973, 1974; Brown 1975), or, instead, chose to focus on how varying utility influences classification (e.g., Hunn 1982, 1992). Whichever the perspective, most ethnoecologists championed their ideas through relatively formal models based on quantification, language, and cognitive psychology. A few, like Roy Ellen, diverged from this tradition:

> (My perspective on ethnoecology) ... militated against an approach which seemed to me to reduce "mundane" classifications to narrow intellectual conundrums to be solved through the application of formal mathematical, logical, and linguistic procedures. Without denying the importance of these matters, my main theoretical concern has been with classifications as situationally adapted and dynamic devices... (Ellen and D. Reason 1979:3)

About a decade after Conklin's treatise, the tradition of cultural ecology in anthropology began to pay serious attention to the relationship between plants and people. About a decade following Conklin, researchers like Roy Rappaport introduced a systems approach to human ecology that integrated plants, non-human animals, abiotic factors, *and* humans into a web of relationships where human cultural features served as regulatory mechanisms in the equilibration of the entire ecosystem (Rappaport 1984). One of the unfortunate outcomes of this model was a shallow determinism which ultimately saw human cultural groups as agents of their ecological/botanical environment (e.g., Meggers 1954, 1971). Fortunately, with time an "historical ecology" approach that viewed the relationship between humans and plants as dialectical came to fruition (Balée 1994, 1998; Crumley 1994). This broadening and deepening of perspective helped redefine ethnobotany as *the study of how plants influence the lives of human cultural groups and how human cultures shape the diversity and structure of plant communities* (Collins 1996).

Most recently, the trends of classification and human ecology have merged and focused on the role of indigenous peoples in the management of ecological resources. These studies are what I consider to be the apex of the ethnobotanical approach and are what I have used as models for my work among the Q'eqchi' (e.g., Balée 1998; Nabhan 1985, 1989; Nazarea 1999; Rea 1997). In this study I describe and analyze the cognitive modeling of the botanical environment by the Q'eqchi', yet never fail to underline the importance of participant observation for thick description of the human *use* of plants. I frequently employ quantitative techniques to flesh out the cognitive and behavioral aspects of plant/human interactions, but lean toward the beliefs of Ellen (1986) in not trying to fit the round peg of Q'eqchi' plant classification into the square hole of any universal classification system. Finally, my interest in Q'eqchi' cultural adaptation to the lowland forests is ultimately based on the need to explore conservation strategies for the management of forest ecosystems in northern Guatemala.

Methods: The Anthropologist in the Field

It is from this semi-scientific, ethnobotanical, conservation-minded perspective that I approach the question: how have members of the Q'eqchi' language group adapted to life in the lowland tropical rainforest? From here, I leave the vagueness of methodology behind and present the concrete procedures and techniques used during the 17 months of fieldwork among the two communities. It is at this critical juncture that the theoretical and methodological orientation of the anthropologist begins to interact with the objects of observation. To emphasize the ultimately individualistic nature of this interaction, I will momentarily cast aside the ethnographic present in favor of the first-person, past tense.

Field Conditions

Following two months of exploratory research in 1998, I arrived in Chajaneb for the first segment of full-fledged anthropological field work on the 13th of January, 1999. My wife, Karen Collins, would soon follow and from that point onward we were always considered by the local people as a familial unit. We set up our "highland field headquarters" — Pelto and Pelto's combination household-research center (1996:180) — in a cabin situated on 2.5 *manzanas* of land[2]. The cabin and property were owned by a non-resident landowner and were atypical in construction and design. The non-Indian character of the structure and its inhabitants, and the

[2]See page iii for American and European equivalents.

fact that the local soccer field was *on* our rented land, meant that we were in the center of things as far as the community was concerned.

The disadvantages of not living with a Q'eqchi' family were outweighed by the advantages of being a family unit integrated with other families in the community. In my highland months with the Q'eqchi', I did not always have the "insider" perspective, replete with all the possibilities of increased cultural and linguistic interaction with a family. However, as a married, separate unit, I was not a "lone male" — my living situation, despite the lack of offspring, made sense in the eyes of the community. With the exception of two lone, divorced, *ladino* males in the lowlands of Sa Mox, the middle-aged bachelor was emically unheard of and elder widowers were generally absorbed into consanguinially related households. As a unit that emically made sense, I believe I was offered a view of Q'eqchi' family life that may have been unavailable to me had I been alone. Furthermore, living independently avoided a situation where the outsider appeared to "play favorites" with a host family, causing unnecessary envy that can be destructive to the goals of the research. The space and privacy of a separate home helped relieve some of the stresses associated with living in a rural, indigenous community abroad, and ultimately made my work in Chajaneb more efficient. Luckily, I was also able to experience the family living style of ethnographic research in the community of Sa Mox.

Despite the fact that my family unit made a degree of sense to the people of Chajaneb, it would never make complete sense. We did not have children. Although an embarrassing experimental garden was home to a few stalks of corn, we did not grow corn. I was constantly volunteering to work with other families, yet often paid people for work that seemed voluntary. I frequently refused to speak Spanish and was constantly preoccupied with the names of plants. I asked far too many questions. One thing seemed to help smooth over all these peculiarities: my interest in and dedication to learning the Q'eqchi' language.

During my two pre-fieldwork trips and for the first two weeks in Chajaneb, I took formal Q'eqchi' lessons with two instructors in Cobán. My daily travels to and from the city also must have seemed strange, but those trips were instrumental in delineating my interaction sphere and gave me the necessary grammatical tools for trying to understand the language. Fortunately, several Spanish/Q'eqchi' dictionaries (e.g., Haeserijn 1979, Proyecto Lingüístico Francisco Marroquín 1999; Sedat 1997) and two excellent reviews of grammar (Stewart 1980; Eachus and Carlson 1980) made the process of language acquisition much easier. The importance of speaking the native language has been made over and over again, and need not be recounted here. Suffice it to say, it was my ultimate path to understanding the relationship between people and plants. Perhaps Bernard (1994:145) summarizes the importance of language most succinctly: "The most important thing you can do to stop being a freak is to speak the language of the people you're studying — and speak it well."

Language learning is a continuous, long-term process, though, and it would be next to impossible for a fieldworker to say, "OK, now I know the language, now I can start my *real* work." For the first six months of fieldwork, I avoided having to use the language for the purposes of collecting repetitive, quantitative data, and concentrated instead on using language as only a tool for conversation. In turn, I fostered the need for conversation by participating in the daily activities of community members — I practiced participant observation. Far from the lofty, nebulous meanings often attached to it, participant observation is only a procedure or technique. It has been the cornerstone, the defining criteria of the practice of anthropology, at least since Malinowski:

> In observing ceremonies or other tribal events it is necessary to record carefully and precisely, one after the other, the actions of the actors and spectators. Again, in this type of work, it is good for the ethnographer sometimes to put aside camera, notebook, and pencil, and to join in himself in what is going on (Malinowski 1922:21).

Whether or not Malinowski ever "left the beach" to participate in the Kula ring is immaterial here, for his treatise and his mythic personality inspired the field with his new twist of method (Van Maanen 1988:36).

Agriculture was the most obvious starting point for participant observation among the Q'eqchi' of Chajaneb. Above all over things, Q'eqchi' males were agriculturalists, and, just as I had arrived, fields were being prepared for the April corn planting season and beans were being tended for harvest in March. As daring individuals made their way to my front porch to see what was going on, I quickly invited them to a cup of coffee and offered to work their fields. After stipulating that I need not be paid for my services, they agreed to my idea, snickered a bit, and gave me a time and place, never thinking that the deal would actually come to fruition. Snickering turned to widespread laughter when I actually showed up for the task. After a moment of disbelief, the man I had made the deal with approached me, showed me my task, and went on his way. Eventually, the staring and laughing abated. This scenario was repeated over and over until it was second nature for a tall, balding white man to be in the corn fields trying to wield a hoe. This method was then repeated for constructing houses, gathering firewood, collecting medicinal plants, and in any other realm that involved plant use.

I always carried a microcassette for making notes. Returning from a day's work, I would recount the activities and actors, with the help of the microcassette, on a mechanical typewriter. These became my field notes. I spent approximately 389 days in my highland field site and 85 days in the lowlands, excluding days spent in Guatemala City or elsewhere.

Field notes — the conceptual link between participant observation and ethnography — have recently received much attention in the anthropological literature (e.g., Sanjek 1990). Field notes involve a "turning away from dialogue and observation toward a separate place of writing, a place of reflection, analysis, and interpretation" (Clifford 1990:52). Ideally, field notes would be divided between a daily log, an observational log, and a personal journal, but my field notes tended to encompass the three in one. Cataloging, then, was extremely important. The notes were first catalogued by the above three "genre" categories, then were tabulated according to the Cultural Context Checklist of the UCLA Time Allocation Project (Johnson and Johnson 1990:180-184). These annotated notes evolved into the corpus of unrefined material that would eventually become the *qualitative* data incorporated into Part II of the dissertation.

Before moving to the purely quantitative methods employed in this study, I will briefly describe the practice of collecting ethnobotanical voucher specimens. Voucher specimens allow the ethnobotanist to confidently say that a particular variety of plant used or recognized by an informant is represented by a botanical equivalent in the Linnean system of taxonomy. By collecting voucher specimens, I not only was ensuring I would be able to make confident comparisons between relevant studies, but could also assess the uniformity of Q'eqchi' responses to particular botanical species.

Whenever and wherever I traveled, I would constantly be on the lookout for flowering or fruiting plant specimens. Flowers and fruits ensure adequate specimen material to make positive identifications in the herbarium; sterile specimens — those composed of leaf, twig, root, and/or bark material — often can only be identified to the genus or plant family. Cuttings were made and pressed according to the long-standing traditions of plant collection (e.g., Cotton 1997:113-119; Martin 1995:27-59; and many others). In addition, diameter-at-breast-height (dbh) recordings were made, and notes were taken on the plant habit, height, location and date. In most cases, I collected with the help of a Q'eqchi' friend from the area, so common names, uses, and general opinions on the plants collected could be reported. Weekly or bi-weekly, I made trips into the town of Cobán in order to put the collected material into a dryer where the plants would be exposed to the heat of three 75 watt electric bulbs for three to four days. In April 2000, the dried collections were then brought to the Tulane University herbarium where they were identified, mounted, and preserved for long term storage. When enough plant material was available and when other cultural conditions were right, I collected three duplicates of each specimen; however, actual duplicates number from one to five per specimen. Every collected and preserved specimen was given a voucher identification number; these numbers are catalogued in Appendix 1. Nearly 1500 specimens were collected, representing a total of 251 botanical species, of 172 genera, in 83 plant families.

Quantities and Qualities of the Ethnobotanical Fieldwork

To say something valuable concerning the process of cultural adaptation I felt it was necessary to balance "thick description" based on long-term fieldwork with quantitative methods. I have previously argued that anthropology cannot be a full-fledged experimental science, yet the historical conditions of the Q'eqchi'-Maya, as described in Chapter One, presented a *close approximation* for a cultural "experiment." This is akin to what Bernard (1994:58) calls a naturalistic experiment: "In a naturalistic experiment, you contrive to collect experimental data under natural conditions. You make the data happen, out in the natural world (not in the lab), and you evaluate the results." In order to take advantage of such historical conditions and mold the conclusions into a framework of semi-science, it was necessary to develop a concrete set of quantitative methods in the highlands that could be replicated in the lowland field site.

It was first necessary to demonstrate that forests in the highlands were quantitatively different from their lowland counterparts. To make this comparison, I borrowed the concept of parcel sampling from the methods of field biology. In order to assess the species composition of a given area, field biologists delimit selected areas of forests called quadrats. These are of various shapes and sizes, are sub-divided into smaller parcels, and the biological components of the randomly-sampled sub-parcels are inventoried. Such work gives biologists an indication of the species diversity of the region and these indications are often important in the selection criteria of protected-area programs (e.g., Dallmeier 1992).

Anthropologists, ethnobotanists in particular, have made use of quadrat sampling, especially gearing their methods toward understanding the patterns of distribution of economically important tree species (e.g., Boom 1989; Prance 1991; Salick 1992). Other anthropologists have used quadrat inventories for describing the long-term effect of human populations on forest environments, by comparing high and secondary forest quadrats (e.g., Balée 1993, 1994). Most recently, anthropologists and ethnoecologists have been using plots to help measure individual informants' ethnobotanical knowledge of forests (e.g., Bernstein et al. 1997). Because I used other methods to assess informant knowledge, and because the long-term effects of human forest use were addressed qualitatively rather than quantitatively, I confined my parcel studies to those resembling the first type.

Ideally, a forest parcel of one hectare — 100X100 m, 20X500 m, or 10X1000 m — would have been selected in both the highland and lowland field sites, as this is the most common parcel size used for quantifying tree species (Balée 1994; Martin 1995:155). However, the population density of the Chajaneb region is so high and the forests so fragmented, that using a one hectare parcel was not feasible; although population density and the expanse of forest in the lowlands would have allowed for a one hectare parcel, time made selecting a smaller parcel size more necessary.

In the highlands, a total of 20 10X10 m parcels were selected for a stratified random sample in order to ensure adequate coverage of pine, oak, and mixed hardwood forests. When a site of adequate size was identified and permission to work within the parcel was obtained, I did the following to sample as randomly and efficiently as possible: a) a Q'eqchi' informant would toss a roll of orange flagging tape into the center of the forested area; b) the spot where the tape landed would be marked as corner #1; c) with the aid of a measuring tape and compass, 10 m would be marked off to the north of corner #1; d) the quadrat would be completed by following the northerly pass in the directions of east, south, west, and finally, north, bringing the tape back to corner #1; e) the tape itself would be pegged at each corner and serve as the parcel boundary.

Normally, forest parcels are inventoried by measuring every tree over 10 cm dbh with a tree diameter tape (Martin 1995:161). Because of the nature and composition of the Chajaneb forests and the small size of the parcels in both study areas, I measured everything at or over three cm dbh. Informant selection (or even presence) is not vital as long as two precepts are held: 1) extensive collections are made within each parcel to ensure Q'eqchi' common names are applied uniformly to the same botanical species and 2) the interest is in the botanical composition of the forest and not the cultural importance of various species.

As the goal of these quadrats was to assess the botanical makeup of highland versus lowland forests, the selection of an informant was not critical; but, as I was ultimately interested in the human use and knowledge of forest species, I made some qualitative assessments of the ethnobotanical knowledge of informants before bringing a Q'eqchi' informant into the parcel. Information on common names, uses, and general attitudes toward the trees of the forest parcel were also collected, as were extensive voucher specimens to be confident of a Q'eqchi'-Linnean correlation. General notes were also taken on: a) the height of the canopy; b) the presence/height of any sub-canopies; c) the composition of the forest undergrowth; d) the presence/absence of domesticated or semi-domesticated species; and e) the depth and color of the forest soils.

Forest soils were collected at a depth of 20 cm. Soils in grasslands or in agricultural fields were collected at 10-15 cm. All soil samples — which numbered 20 in the highlands and 20 in the lowlands — were dried in the sun for at least 12 hours. All organic material was removed from the samples and, where soils had compressed into clumps, samples were tamped with a sterile test tube to ensure relatively uniform particle size. All the samples were then labeled and presented to Q'eqchi' informants in order to better understand the ethnoecological classification of soil types.

The quantitative cataloguing of plants continued with a focus on the household garden. Given the obvious importance of the plants within the household garden, and the precedence of garden inventory studies (e.g., Rico-Gray et al. 1990), counting and comparing the Q'eqchi' gardens seemed like a logical goal to pursue. Over the 12 months in *aldea* Chajaneb and four months in the community of Sa Mox, I conducted a total of 24 and 21 garden inventories, respectively. In 88.9 percent of the cases (n=40) I inventoried gardens with the help of the eldest woman of the household. As most of my inventories were carried out during the day, men were frequently unavailable for the task. But my choice of females as informants was partly by plan: women are more or less in charge of the floral composition of the gardens and qualitatively appeared to play the most active role in garden maintenance.

Informants led me through their gardens which they would call **awimk re li rochoch** (glossed "domesticated plants of the household"). It is important to point out that the boundaries of these gardens were quite fluid and the composition of the gardens also frequently included unmanaged, opportunistic weeds, shrubs, and even trees. Informants proceeded from plant to plant, conversing matter of factly — always in Q'eqchi' — about the plants that interested them most or were the highlights of their garden. At each station I asked what the plants were used for, what part of the plant was used, and whether or not the plant was actually physically planted in its location. Data were recorded on microcassette and transcribed later in the evening. Inevitably, informants only gave a partial inventory. After one time around the house, I proceeded to ask about all the remaining plants, down to the most obvious weedy grasses. Following this second perusal of the garden, I was frequently invited in for coffee and food, and I made use of this time to clarify plant uses. In many cases, my hosts would send me home with a few specimens, which would become my voucher specimens. I made a point to not ask for voucher specimens from the home gardens simply because I did not want to impinge on their economic resources. However, by the end of the fieldwork, many of the species were successfully collected and, as the plant trail experiments would later show, if there is informant consensus on one group of plants, it is the domesticated and semi-domesticated plants of the **awimk re li rochoch**.

In an effort to compile basic demographic, cultural, and ethnobotanical data — quantitatively — I also prepared a questionnaire. This was possible only after many months of training and practical experience with the language. By the 8th month, I was also close enough with my neighbors that asking questions and writing answers did not result in any discernible discomfort. All questionnaires were administered by me, in Q'eqchi', with the closest approximation of a "head of household." The multi-generational structure of some families sometimes made identifying the head of household difficult, but, more often than not the process was self-selective. The questionnaire took approximately 1.5 hours. Participants were compensated $2USD, which represented about half a day's wage as an agricultural laborer.

The last purely quantitative technique that I employed was the "plant trail experiment." The plant trail experiment was first used by Brian Stross (1973) to assess the acquisition of plant names among Tzeltal-Maya children. It is the ethnobotanical equivalent of showing a group of informants a catalog of stuffed bird specimens for individual identification. In sum, a number of informants are led through a previously defined trail and are exposed to a number of stimuli in the form of previously identified, living plants. The informants are simply asked the name of the stimulus in the native language and then the informant and researcher go on to the next plant. Such a simple technique can yield tremendous and varied data concerning the acquisition of plant names, the correlation between use and recognition, the diversity of common names, the presence and/or depth of a classification scheme, the possibilities and problems of an "omniscient" informant, and a general sense as to the relationship between a human cultural group and their botanical environment. The apparent simplicity of the technique is highly deceiving.

First, there is the problem of trust, in two senses. It would have been, in my specific case, next to impossible to arrive at the field site and solicit participants for a plant trail experiment. This is true in spite of financial rewards, and is especially true in the case of a male soliciting female participants. Strolling through the woods with a conspicuously bizarre "**q'an**

is" (literally, "yellow hair") would not be seen as typical behavior. Second, the researcher needs to trust the participants. There is no way of avoiding prevarication, but a developed sense of trust certainly decreases its influence. In both cases, time is the critical variable. Unfortunately, the best time to do a plant trail experiment, in order to find out who knows what, is early on in the research. In the lowland section of my investigation, with only 4.5 months total research time, I had to do it early and, as a result, I had no female participants. In the highlands, the plant trails were conducted only after I had been in the region for 10 months. In this case I had almost an equal number of male and female participants. I also expect the degree of prevarication to be significantly lower for my highland sample. Chapter Four contains a complete list of the plants and participants of the trail and serves as a baseline for the discussion of plant name acquisition and folk plant taxonomy.

People lie during their plant trail sessions for various reasons. Embarrassment must be the most common reason, especially among men. The woods are generally the domain of men, as will be discussed later, and being a man means knowing the woods. Although I have no way of measuring, men in their teens through their 30s seemed to be lying — perhaps "being creative" is a better term — most frequently. Children lie as well, but mostly through boredom or fatigue. Although neither of the two plant trails was particularly straining, young children quickly lost interest after plant 100. It was fairly easy for me to tell when a child responded with "**pim**" ("weed" or "scrubby secondary growth") simply because they were tired of thinking about plants. In addition to establishing trust, then, keeping the plant trail relatively short was key. The 113-stimuli highland plant trail took about one hour and 30 minutes, the 102-stimuli lowland plant trail took just over one hour. Although one could certainly second guess an obviously lying informant, I did not see how such manipulation would increase the veracity of responses: unless I felt the participant did not hear my question or see the stimulus, I asked just once and recorded their response without re-questioning.

This yields a second hidden problem in the superficially simple plant trail: how to present the stimulus. First there is the question — What is the name of this plant? In Q'eqchi', and in many other languages in the Maya family, there is no "unique beginner" term for plant (Berlin et al. 1973). The question, therefore, becomes, "**arin, karu xkab'a**?" ("here, what is it called?"). In being forced to avoid using a "life form" term like "tree" or "weed" to identify everything, the investigator must abide by the pronoun "it" and use body language to indicate the stimulus. After a few tries, it became obvious that touching the plant was not a good idea, for if you touched, say, the leaf, you would frequently get the response "leaf" or the addition of a "leaf prefix," for example, "**xaq b'on che'**" (leaf of the **b'on che'**). To avoid these types of responses I carried a walking stick during the plant trail, and waved it at and around the entire plant. But what if the plant is at a distance from the observer?

In some situations, especially with epiphytic species, it was not possible for the participant to have "complete access" to the plant. Observing a plant at a distance not only creates difficulty for viewing, but it eliminates the possibility of smelling, tasting, and touching the plant, three common Q'eqchi' methods of plant identification. An attempt was made to avoid limiting the access of participants from the stimulus, but this was not always possible. Many tropical trees, as another example, only have leaves at their crown, 30 m from the ground, and this effectively makes for a less accessible stimulus.

Still another problem inherent in the presentation of the stimulus is variability in form among stimuli and within one stimulus. Plants in flower or fruit are generally recognized by the Western botanist as being easier to identify; and this is apparently true among the Q'eqchi' as well, although a greater degree of emphasis is placed on leaf characteristic. Not all plants flower and fruit at the same time and one cannot complete all the plant trails simultaneously. Photographs or dried plant specimens would yield less reliable and salient data. Even with the impossible wish of unlimited time there will always be variance. Over the course of the two months time during which I conducted the highland plant trail, the stimuli were uprooted, vandalized, harvested, or chopped into firewood, and in these cases I simply had to replace the stimulus and admit that variability was and would always be a concern.

With the theoretical and practical problems associated with this research presented, and with the basic premises of quantitative and qualitative ethnobotany sketched, it is to the precise location, character, ecology, and human ecology of the two study areas that I now turn.

Chapter Three: The Q'eqchi' and the People of Chajaneb and Sa Mox

In Chapter Two I discussed the practical and theoretical problems of using the term "Q'eqchi'" as applied to the more than 700,000 native speakers of that language. These problems were teased out by asking, "Are the Q'eqchi' peasants?" This question yields the beginnings of a tool for understanding cultural characteristics of the Q'eqchi' as a whole, and indicates that extreme cultural variability renders "Q'eqchi'" a largely arbitrary term. Chapter Two also enumerated the reasons for using the *aldea* as the most appropriate unit of analysis. This chapter will therefore leave behind the artificial usage of the general term "Q'eqchi'," which only applies loosely to a language group, and introduce the study areas whose populace provides the data for discussion of human cultural adaptation to new botanical environments.

The chapter will first center the reader geographically by explaining the place of *aldea* Chajaneb in relation to the muncipal center of San Juan Chamelco, and explaining the place of the municipality in relation to the Department of Alta Verapaz as a whole. Chajaneb is somewhat isolated, rural, and distinct, yet the inhabitants are invariably influenced by the "connected," urban, and somewhat globalized traditions of the departmental capital of Cobán and the more modestly "global" town of Chamelco. Although a detailed history of Cobán and Chamelco are far beyond the scope of this dissertation, I comment briefly on the history of Chamelco and the Cubil-Chamelco byway to better place the folk of Chajaneb in context. I then detail the geological, climatic, and pedological characteristics of the region, because the nature of the vegetative communities emerge from these characteristics. This pattern of discussion is then repeated for the community of Sa Mox and establishes the lowlands as emphatically different from the highlands.

Chajaneb and the Q'eqchi' Triangle

Cobán is the geographical center of gravity for the department of Alta Verapaz. Covering 868,000 hectares, Alta Verapaz is the third largest Guatemalan department (Simmons, Tarano, and Pinto 1959:489). With 540,997 people, Alta Verapaz represents just 5.2 percent of the national population, with an average of 95 people per km^2, of whom 83.2 percent live in rural areas (Programa Las Verapaces 1996:33). Cobán is connected to Guatemala City by 215 km of winding, undulating asphalt that takes a bus approximately four and one half hours to cover. Even with this modern connection, Cobán and the entire Verapaz region remain somewhat of a sleepy backwater. Middle-aged *Cobaneros* easily recall a time when that asphalt connection was nothing more than a mule track and can recount in detail their four-day-long rides through the mountains to reach the capital city. Cobán's isolation from the other regions of the country has continually plagued its economic progress and integration into the world market. At the beginning of the 20th century German coffee entrepreneurs were so distressed at the area's isolation that they chose to focus their energies on directing infrastructure development toward the town of Panzós in the Polochíc River valley, which would ultimately allow them access to the Gulf of Amatique and the markets of Europe (Náñez 1970:250-251).

Two other prominent towns are tied to Cobán by asphalt: San Pedro Carchá and San Juan Chamelco. Like Cobán, these town centers serve as the *cabecera*, or principal town, of the politico-geographic region called the *municipio*. As is common throughout the country, the entire municipality in known by the name of its town centers. Travel between these three towns is cheap and easy. Buses and independently-operated three-ton trucks connect them as do literally thousands of miles of footpath. The proximity, importance, and high percentage of indigenous peoples in the three municipalities make for an interesting socio-demographic complex. It is truly an Alta Verapaz or Q'eqchi' triangle, like the more famous and infamous triangle in the Ixil region which was so devastated by the civil war during the 1970s and 1980s (Stoll 1993).

A one-way trip from Cobán to Chamelco costs 18 cents and takes about half an hour. The paved road crosses the Cahabón river at Puente Chiu and then continues in an easterly direction until it ends eight km away at the central cathedral in Chamelco. In the early 1940s this simple stretch of road was also a tricky and tiresome journey as discussed in the ethnographic work of Goubaud Carrera (Goubaud Carrera 1949). The broad footpath was paved in the early 1980s with the philanthropic support of the then President of Guatemala General Lucas García, himself a *Chamelqueño*. A road of similar length and proportion connects Cobán to Carchá. Chamelco and Carchá are connected by a reasonably well-maintained, unsurfaced road that facilitates easy and regular interchange between the two lesser towns of the triangle.

Although efforts are currently underway for paving a northern road that spans the 66 km between Cobán and Chisec, progress on the road is plodding. The same inhospitable climate and jagged, karstic geology that made progress of the colonial Spanish *Camino Real* effort slow also hinders the modern road worker.[1] Beyond the smatterings of a new road, the capital road, and the Carchá and Chamelco links, all of the other roadways in Alta Verapaz are unimproved dirt and gravel. One of these fingers it way through 45 km of karst, coffee, and cardamom to the two eastern Q'eqchi' towns of Lanquín and Cahabón. Traffic on this road can be quite heavy due to local market exchanges between towns and the pulse of tourism as foreigners go to visit the caves at Lanquín and the turquoise pools of Semuc Champey.

The *municipio* of Chamelco and its town center are geographically and demographically small compared with their cousin municipalities and towns of Cobán and Carchá. Founded on the 24th of June, 1543, it is just 80 km^2 in area, yet boasts a population of 36,288 (Lanza 1984:16). The populace is divided among the town center, with a population of just under 5,000, 18 officially recognized *aldeas*, 86 *caseríos*, and 10 *fincas*. The *caserío* is a small cluster of families that is administratively linked to a nearby *aldea*, whose local officials — the *alcaldes auxiliares* — report to the *aldea* rather than directly to the municipal seat. For example, the *caserío* of Santo Tomás loosely belongs to

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[1]The *Camino Real* was an ultimately unsuccessful attempt by the colonial Spanish authorities to connect the northern Yucatecan town of Mérida with Santiago de Guatemala.

(*pertenece a*) the larger, adjoining *aldea* of Chajaneb. The 10 *fincas* of Chamelco are large tracts of privately owned land, mostly coffee plantations, that frequently support a population of laborers. The general trend in Chamelco, and for Alta Verapaz as a whole, is the transformation of these fincas into *aldeas* or *caseríos* (*Información General del Municipio de San Juan Chamelco* 1999).

From an outsider's perspective, the town and *municipio* of Chamelco has a significantly more rural flavor than the two larger towns of the triangle. Chamelco is also known for its "Indian-ness," since over 92 percent of the population is Q'eqchi'.[2] This fact, the lack of a national league soccer team, and some aura that pervades the people and the place, have given Chamelco and its residents a backward, provincial reputation. Cobán is clearly the big city, and Carchá somehow feels to many visitors like a hustle-bustle conglomeration of hungry penny and nickel capitalists. Chamelco, in contrast, is quaint and old fashioned.

Like most colonial towns in Guatemala, the landscape of the Chamelco town center is dominated by two structures and their related institutions: the cathedral and the marketplace. The enormous mustard-colored cathedral was built in 1564 and sits under the shade of a monstrous, 350 year-old ceiba tree (*Ceiba pentandra*) whose canopy nearly reaches the tallest church spire. The market, in a state of flux during 1999, flanks the

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[2]The percentage, though, is really not that revealing a figure, as the department as a whole was recently 98 percent indigenous (Lanza 1984:55) and is currently 90.9 percent indigenous (*Programa Las Verapaces* 1996:33). The "Indian-ness" must therefore be attributed to some other, less tangible variable.

cathedral and is composed of temporary wooden stalls and simple open spaces for smaller-scale vending. By February 2000 a two-storied, concrete market was finished, giving shelter to the small-scale merchants and more stability to the merchants of the wooden stalls. Like most Guatemalan markets, the streets surrounding the structure itself still serve as a selling area for merchants from the surrounding rural areas, and, during market times, the city block becomes a ramshackle knot of people and produce.

Despite the looming presence of the Catholic cathedral, the smaller *calvario* on a hilltop just south of town, and the four *ermitas* that traditionally served the *bárrios*, or neighborhoods, of Santo Domingo, San Juan, San Luís, and Santa Catarina, the Chamelco town center is a focal point of evangelism (Samandú 1987). Although the first Protestant missions arrived in Guatemala as early as 1882, it wasn't until the 1950s that the Nazarenes and Baptists made serious inroads in the Chamelco area (Annis 1987:76). Led by the Bible translators headed by Eduard Seler, evangelism was spread throughout the countryside by Nazarenes whose *capillas* pepper the entire *municipio* and by two large Nazarene churches rivaling the immensity of the cathedral in the town center (F. Euchus, pers. comm., March 1999). Along with provincialism, protestantism is another defining characteristic of the Chamelco region.

Historically speaking, the town center of San Juan Chamelco is relatively well documented, beginning as a *reducción* in the mid-16th century (Estrado Munroy 1979; Lanza 1984). Chamelco, and to a greater extent Cobán, has also received significant ethnohistorical attention for the 17th through 19th centuries in the works of Karl Sapper

(1985), André Saint-Lu (1968), and Arden King (1974). Two principal archaeological tomes document the prehistoric occupation of the Chamleco region and describe two relatively large centers at Chichén and Sakajut (Sharer and Sedat 1987; Arnauld 1986). Despite the relative lack of archaeological attention paid to the Chamelco countryside, the vegetation, abundant surface artifacts, toponyms, and scant historical citations all point to a region populated by Q'eqchi' speakers and populated for a significant swath of time.

Four, five-meter-wide, unimproved dirt roads connect Chamelco with other population centers in the region. One of these unimproved roads links the town center of Chamelco with the important but isolated town of Chamil. Despite the wretched condition of this road, local people were quick to point out that, before the end of the 1970s, the road was just a one-meter-wide path. Although conditions on the Chamelco to Chamil road improved briefly in the late 1970s, and by 1980 a well established tract reached the juncture at Seobis about 10 km from Chamelco, the dramatic spurt of violence at this time meant abandoning the road's maintenance. Only in the early 1990s with the financial support of the German Government did the condition of the road improve enough to allow for non-four-wheel drive passage (J. Makransky, pers. comm., March 2000). Today this Q'eqchi' byway is a main artery connecting many of the more distant *aldeas* to the Chamelco town center. The road deteriorates rapidly with the onset of the rainy season in June and reaches a yearly worst case in December. The *Fondo Vial*, or federal road works project, does a remarkable job bringing the December road back to a more manageable state by January or February.

Buses, three-ton pickups, small personal pickups, cars, motorcycles, horses, and pedestrians all frequent the Chamil-Chamelco byway. Three morning and three afternoon buses make the 21 km commute in about two hours, and they are generally packed full with people and various produce destined for the home or market. At about km six, four km after the electricity ends, the bus makes a near regular stop at the Roi-Max junction. At this point all the folks of Roi-Max, Santa Cecilia, Chiquic, Santo Tomás, and Chajaneb will leave the bus and take to the trail.

As has been mentioned previously, literally tens of thousands of km of footpath connect *aldea* to *caserío*, unimproved road to household, and household to household. After some exposure to these paths, one gets the sense that you could walk the entire length and/or perimeter of Alta Verapaz on these footpaths and never have to pass through a town center or on a road open to vehicular traffic. The footpaths range from well-defined two-m-wide causeways, to straight single-tracks, to almost indistinguishable impressions on the forest floor. The majority of these footpaths are worn to a red clay substrate that becomes pitted with mud during the rains and plagued by a layer of fine dust in the brief dry season.

The residents of Chajaneb, Santa Cecilia, and Santo Tomás reach their homes by this trail system that links with the Chamelco-Chamil byway at over a dozen points. *Aldea* Chajaneb and its *caserío*, St. Tomás are bordered on the west by *aldea* Sotzil, on the east by *aldea* Santa Cecília, on the north by a small *caserío* named Chiqic, and on the south by the Sotzil river and an appendage of *aldea* Santa Cecilia. At one point *aldea* Chajaneb included seven *caseríos*: Raxonil, Sotzil, Santa Cecilia, Roi-max, Culuquim, Chexna, and

Saxjajou, but many of these *caseríos* have obtained *aldea* status over the past 20 years (Lanza 1984:21). Borders and the plants that mark them will be discussed in Chapter Six, but here, suffice it to say that the common resident possesses a sketchy idea of political boundaries at best. Fortunately, several informants were cognizant of a host of natural and anthropogenic trenches, cement corner markers, and other landmarks to help delineate the local political boundaries, but these landmarks in the landscape are known by just a handful of elders.

Although the river is officially recognized on national maps as the Sotzil, river names tend to be quite plastic, assuming the name of the political division they flow through. Thus, in Chajaneb is referred to as the Río Chajaneb, and upon crossing into Sotzil, the Río Sotzil. The Sotzil and its main local tributary, the Sa Ha' river, wind through the *aldea* in a westerly direction, sumping through approximately one km of cave in *aldea* Sotzil before re-emerging and eventually spilling into the much more significant Cahabón river. The Sotzil, only about 10 m at its widest breadth, can flood quite dramatically during the rains of November and December, sometimes breaching its bank and engulfing the three bridges that cross it, making travel to the town center of Chamelco impossible. Most of the year, however, it is a clear, calm stream running at approximately 20 m^3 per second, and is used by the community more as a play spot than for anything economical like fishing or washing clothes.

Water is abundant, seeping through the karstic geology at hundreds of points on the surface within the borders of the *aldea*. The *aldea* and the region in general are something of a continental divide for Guatemala, separating the waters of the Polochíc river drainage to the southeast, from that of the Chixoy drainage to the northwest. In the middle of the last decade, CARE, an Austrian-based non-governmental organization, sponsored a water program that pumped water from a nearby cave on the road to *aldea* Paapa to many of the families in *aldea* Chajaneb and the *caserío* St. Tomás. So it is from the *chorros* — outdoor spickets — that most families have access to water, although the gravity-based system is far from perfect and subject to frequent failure when rains clog the lines with sediment. When this happens, and for those families without access to a *chorro*, the river and the omnipresent springs provide the necessary water.

Electricity was not available to the residents of Chajaneb in 1999. Electricity is — and is seen as — something of a luxury for those of the *pueblo* and something that further dichotomizes the distinction between the rural *aldeas* and the "urban" town center. Interestingly, by the end of the year rumors turned to truth and work began on electrifying the Chamelco to Chamil byway. Sponsored by a Spanish non-government organization, the electrification would only reach families living on the road or the few that could afford the expense of the labor and equipment necessary to bring the line perpendicular to the axis of the road. By March 2000, the line had reached *aldea* Santa Cecilia. Land value for plots abutting the road skyrocketed (jumping from an average of about $200 USD per *cuerda* to $670 USD per *cuerda*)[3] as families tried desperately to reach the road. The

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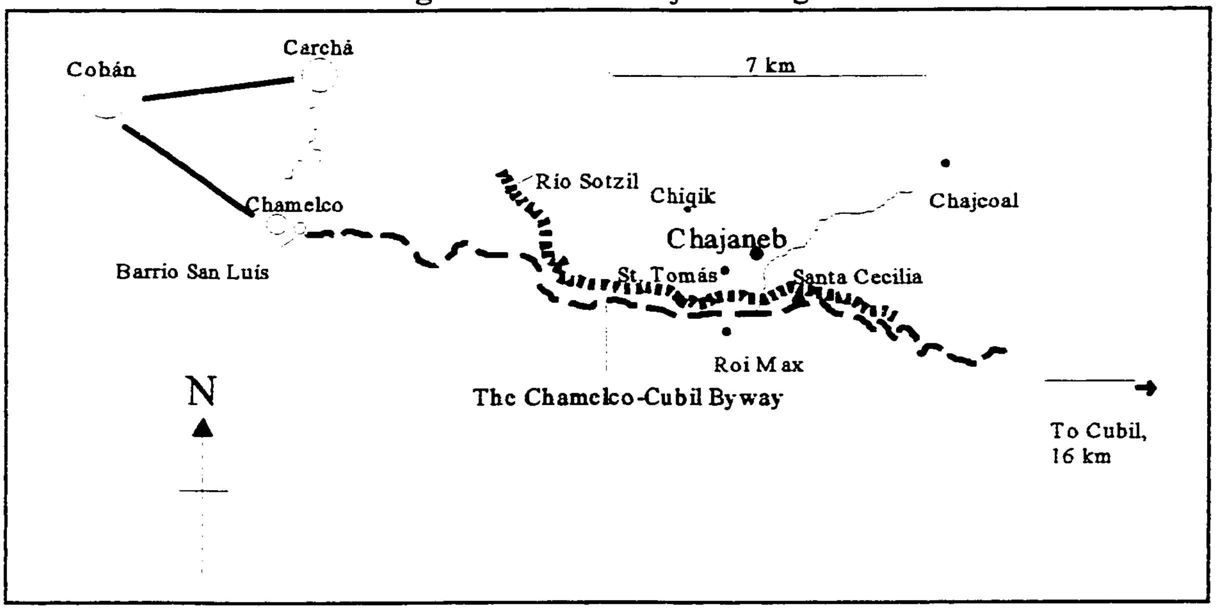
[3]For a complete list of the Q'eqchi' and Guatemalan weights and measures, see page vii.

electrification of that road segment transformed the landscape, with small bungalows springing up every 250 m, equipped with a wood post and meter to measure consumption, and ready to be brought one step closer to modernism.

A Demographic and Ecological Sketch of Chajaneb

As discussed in the previous chapter on methods, delineating a study population has its theoretical and practical pitfalls, especially where the highlands are concerned. In the highlands, my *interaction sphere* involved three different local political entities: *aldea* Chajaneb, *aldea* Santa Cecilia, and *caserío* Santo Tomás. Santo Tomás is represented in the municipality as an entity belonging to (*pertenece a...*) the *aldea* of Chajaneb. This confusion should be clarified some by a perusal of the local map (Figure 3.1). For ease in discussion, I shall refer to my highland study population as Chajaneb (15° 25' N, 90° 21' W).

Figure 3.1: The Chajaneb Region



As my highland study population is not perfectly congruent with any single recognized political division, there are no demographic statistics other than the ones I compiled myself. The Chajaneb area has a total population of 367 individuals over 49 households, giving an average household size of 7.5. These families occupy an area of

Table 3.1: Demographic Data of Alta Verapaz, Guatemala

Name	Males	Females	Total	M-F Ratio	Population Density
Cobán	78,514	77,572	156086	1/.988	37
Santa Cruz Verapaz	7,376	7,186	14562	1/.974	154
San Cristobal Vera.	20,125	20,581	40706	1/1.022	105
Tactic	12,385	12,341	24726	1/.996	148
Tamahu	5,623	5,520	11143	1/.982	50
Tucuru	14,657	13,626	28283	1/.930	153
Panzos	39,478	36,895	76373	1/.935	54
Senahu	32,544	30,041	62585	1/.923	97
San Pedro Carchá	81,955	77,619	159574	1/.947	na
San Juan Chamelco	**18,121**	**18,167**	**36288**	**1/1.002**	**227**
Lanquín	7,898	7,458	15356	1/.944	38
Cahabón	21,867	20,845	42712	1/.954	na
Chisec	47,269	43,053	90322	1/.911	32
Chahal	8,373	7,840	16213	1/.936	12
Fray B. de las Casas	20,460	19,011	39471	1/.929	na
Totals	416,645	397,755	**814,400**		

approximately 2.5 km^2 which yields a population density of 146.8 individuals per km^2, significantly less than the municipality average of 227. For a demographic comparison of the 13 municipalities in Cobán, which dramatically emphasizes the density of the Chamelco populace in comparison with other municipalities, see Table 3.1 above.

As discussed in Chapter Two, diversity is a term that certainly applies to the cultural characteristics of the Q'eqchi'. Similarly, climatological, geological, and vegetative characteristics vary quite dramatically through both time and space. Luckily, in the case of climate, a corpus of data exists to assess adequately the variability through time. An enormous, however chaotic, data set became available at the *Instituto de Climatalogía y Volcanología* in Guatemala City (INSIVUME). This data set, which provided information specific to the Cobán and Chisec regions, as well as two independent weather monitoring stations located in highland *aldeas*, begins to shed light on the dramatic climatological differences through space as well. The geology of Guatemala has piqued the interest of scientists from around the world for almost two centuries. The Middle American Trench, an extremely active volcanic range, and the massive complex of limestone in the north, have been the focus of numerous geological studies.[4] An understanding of the Chajaneb region, especially Chajaneb vegetative communities, would never be complete without a basic understanding of the geological formations and processes of karst. Where a discussion of karst can be readily applied to most of Alta Verapaz, a number of soil samples were taken and analyzed throughout the *aldea* to better characterize the specific region. Finally, and most importantly, it is important to generalize about the region's vegetative types. In addition to reviewing published information specific to the region, 26 10X10 m forest plots were analyzed to help describe the vegetative community. Similar, although smaller, data sets for the lowland study community of San Luís Sa Mox follow.

The weather during the 1999 field season was described by the Q'eqchi' of Chajaneb as quite normal, or even, "the way it used to be." In contrast, 1998 was a year of intense heat and drought followed by the devastating effects of Hurricane Mitch in late

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[4]For a complete list of geological texts specific to Guatemala from the years 1966-1983, see Bonis et al. 1990.

October and early November 1998. The week-long soaking of the region during the hurricane made up for most of the precipitation difference in a statistical sense, but the effects of the drought were nearly as intense as the hurricane itself (Table 3.2).

Weather patterns generally come from the east during July through December and from the northeast in January through June. When interested in predicting the afternoon's weather, the people of Chajaneb would invariably look toward the mountains of Paapa to the east. Frequently there is rain in the forecast. Alta Verapaz is commonly referred to as the place of 13 months of continuous rain, although qualitatively there appears to be somewhat of a drying trend over the past generation. February to May is quite dry and can be very hot, and these months are referred to as summer (**saq'ehil**; from "sun," **saq'e**). The winter season (**hab'al q'e**) is frequently overcast, cold, and rainy. The rains, although at times heavy and accompanied by thunder and lightning (**kaaq**), most often fall in a steady mist (**musmushab**').

A total of 2611 mm of rain fell in 1999, a figure resembling the average annual rainfall for 1953-1957: 2,580 mm (INSIVUME Climatic Data Set, 1953-1957). It is important to remember that these data are from the Cobán weather station, and, although less than 15 km away as the crow flies, Chamelco is considered a wetter *municipio*. Although adequate data do not exist to quantify this difference, the weather station of Las Puertas, high aloft in the Xucaneb range of Chamelco, reported almost 1500 mm of rain for the generally dry months of January through June (PEQ Climatic Data Set 1999). Although the number of days of rain were not recorded and are not available in any of the

Table 3.2: Cobán Weather Data, 1997-1999*

1999	Tmp/av	Tmp/mx	Tmp/mn	RH/av	RH/mx	RH/mn	Precip	AP/av	AP/mx	AP/mn	WV/av
Jan	16.7	22.5	10.6	82	93	68	174.9	871	871.8	870.2	1.5
Feb	17	23.5	10.2	79	97	62	201.6	870.8	871.6	870.1	2.3
Mar	18.6	25.4	10.8	75	96	56	112.3	869.1	870.6	868.3	2.6
Apr	21.3	28.5	12.4	71	95	49	132.7	868.9	869.9	868	3
May	21.9	29.2	13	71	94	48	58.5	868.8	870	867.8	2.5
Jun	20.7	28.1	15.5	81	91	65	309	868.6	869.5	867.9	1.5
Jul	20.4	26.6	14.7	74	95	64	213.7	870.3	870.9	869.6	2.1
Aug	20.6	28.1	14.8	81	97	63	229.7	869.2	870	868.4	1.15
Sep	20.6	27.6	15.5	84	97	65	447.7	867.2	868.1	866.4	1.13
Oct	19.2	23.2	14.4	83	96	69	222.7	867.8	868.6	867.7	1.5
Nov	15.8	21.4	11.3	85	97	73	412.5	868.5	870.9	869.7	2
Dec	16.1	22.6	10.3	82	97	66	95.9	870.3	871.3	869.8	3.13
						year=	**2611.2**				
1998											
Jan	17.5	24.4	12.8	83.7	98	36	70.1	869.2	870	868.5	1.2
Feb	20.1	25.5	11.3	78	98	21	2.9	867.8	869	866.8	1.5
Mar	19.4	23.8	13.2	75	na	na	13	869.5	870.5	868.6	na
Apr	22.1	28.8	15.3	70.1	96	48	72.5	869.2	870	867	na
May	20.7	29.7	13.2	78	94	40	151.2	870.1	869.6	868.4	na
Jun	21.9	28.5	16	88	94	60	244.8	869.9	870.7	868.4	na
Jul	20.5	26.7	16.1	83	96	75	230.2	870.6	871.5	869.5	na
Aug	24.5	14.1	11	70	na	na	120.1	870.1	na	na	na
Sep	20.4	29.3	17.3	81.6	na	na	262.3	866.6	na	na	2
Oct	18.4	23.4	16	81.6	na	na	529.6	870.6	na	na	2
Nov	18.6	23.3	15	83	na	na	218	841.4	na	na	14
Dec	17	22.3	12	84	na	na	78.1	872.5	na	na	1.8
						year =	**1992.8**				
1997											
Jan	16.4	23.1	11.2	91	100	33	172.9	na	na	na	0.6
Feb	17.3	22.7	11.8	67	100	43	125.2	na	na	na	na
Mar	16.8	24.8	12.9	86	na	na	23.5	na	na	na	na
Apr	19.8	28.6	14.1	72	98	25	66.5	na	na	na	1.6
May	19.4	26.8	13.8	80	98	53	59.2	869.7	na	na	1.3
Jun	20	27.3	16.1	na	na	na	357.5	868.2	869.1	867.6	2.1
Jul	19.6	26	16	80	98	59	229.3	868.2	869.1	867.6	2.1
Aug	19.3	26.6	15.5	81.6	98	56.1	208.5	871	871.8	870.3	2
Sep	20.6	26.9	16.1	86	na	na	362.4	868.7	870.4	855.3	2
Oct	19.9	25.6	15.5	86.9	98	34	210.5	869.1	870.1	868.1	1.6
Nov	18.9	24.5	13.4	89	98	53	259	869.6	870.6	867	1.3
Dec	18	23.4	12.6	88.2	98	31	78	869.5	870.6	869.2	1.6
						year =	**2152.5**				

*Tmp/av=average monthly temperature; Tmp/mx=average monthly high; Tmp/mn=average monthly low; RH/av=average monthly relative humidity; RH/mx=average monthly relative humidity high; RH/mn=average relative humidity low; Precip=monthly precipitation; AP/av=average monthly atmospheric pressure; AP/mx=average monthly high atmospheric pressure; AP/mn=average monthly low atmospheric pressure; WV/av=average monthly wind velocity; na=no data climatological data banks, Wilson (1972:28) reported 240 days of rain in 1969, also a quite typical year, with 105 of those days with over 10 cm.

The rather truncated period of dryness from February to May is also the period of warm temperatures and lowest levels of relative humidity. This being the case, it is important to point out that temperatures vary less throughout the year than rainfall and humidity levels. Warm temperatures, with highs above 20 degrees Celsius and moderate lows, are not at all uncommon in the months of June, July, and August. Not until November, right around the corn harvesting season, does the cold weather really begin. The apparent mildness of temperatures in the area is deceiving, though, as high humidity and constant rains make for a biting, "wet" cold. Winds — blowing the strongest in November/December and April/May at an average of three km/hour — only exacerbate this circumstance. And where total annual rainfall certainly varies with locality, temperature has even more dramatic swings, mainly as a result of extreme altitudinal differences. Average low temperatures in the Cobán region, which sits at 1350 m above sea level, are at least 1.5 degrees Celsius warmer than their counterparts in Las Puertas and Saccuil, San Juan Chamelco, which is almost 2200 m above sea level (PEQ Climatic Data Set 1999). This corresponds nicely with the mountaineer's rule of thumb that with every 350 m of elevation, temperature drops on average one degree Celsius. According to the Koeppen system for Mexico and Central America, these climatic patterns would put the Verapaz highlands on the cusp between the Tropical Rainy subtypes, *Afw'* and *Amw'* (Vivó Escoto 1964:213). These temperature and climatic regimes are radically different from those found only 65 km north, and these differences are largely responsible for the variation in plant compositions between the highland and lowland study sites.

Local geology is another component that differentiates the two communities, although to a lesser extent than climate. Perhaps no single term of the natural sciences describes the Chajaneb region and Alta Verapaz as a whole better than *karst*. Any discussion of the area's geology must, therefore, expound on the concept of karstic formations. First and foremost it must be pointed out that karstic geology is more of a *process* than a characteristic. Karst is a historical interaction between limestones, soils, and precipitation that frequently results in the creation and enlargement of underground voids. As a definitional criteria, karst landscapes are characterized by the development of small, centripetal drainage basins and closed depressions rather than a system of small streams in valleys that converge into large streams and eventually deposit into a sea or ocean (Jennings 1985:1-5; Ford and Williams 1989:3). Drainage is, therefore, largely underground and through cave systems.

Although several rock varieties can constitute a karst formation, calcareous rocks make up a definite majority. And of the enormous variety of carbonate limestone, two general classes — based on dolomite as a percentage of carbonates — emerge: dolomite and calcite. The limestones of Alta Verapaz, like those of the Petén and the entire Yucatecan ledge, are largely dolomite (Wilson 1972:42; Day 1980). Both classes of limestones are quite porous.[5] This porosity, and the fact that carbonate rocks yield little soluable residue when in reaction with water, contribute to the characteristic drainage

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[5]Rock porosity is measured by the percentage of voids in the substrate. Clays have 50-60 percent voids, sandstone 5-25 percent, and limestone,1-10 percent, which seems counter-intuitive (Jennings 1985:15).

patterns of karst (Jennings 1985:4). Limestones also vary significantly in terms of hardness, measured by the Schmidt Hammer variable *R*. Guatemalan dolomites are quite soft, with *R* values near 39. The hardest limestones, like those of the Mulu area of Sarawak, have *R* values approaching 62 (Jennings 1985:16-17; Day 1980).

The dolomitic ridges in the Chamelco area are known as the lower Cobán formation. This formation, and the upper Cobán formation of the *municipios* of Cobán and Carchá, overlays a series of shales and sandstones of Jurassic or early Cretaceous age. These shales and sandstones are sandwiched between the recent limestone surface rock and a basement complex of Permian limestones known as the Chochal formation (Wilson 1972:41-42).

The complexity below the surface parallels the geological situation above ground. Faulting and folding throughout Alta Verapaz have buckled the limestone into three major east-west ranges (West 1964:68). This rather ordinary folding is complicated by the presence of odd surface features like haystack hills and sinkholes, making mapping difficult and getting turned around in the hills quite easy. The resultant surface complex of steeply-sloped limestone hillocks is complicated by the presence of expansive layers of ash that dot the valleys around Cobán and Tactic. These ash deposits are the result of the continuous activity of the country's volcanic axis and southerly wind patterns (West 1964:68-69). Although speculative, it could be that these local areas of ash deposit were recognized by the Q'eqchi', who, in turn, marked the local area toponymically with the prefix **cha-** (**cha**, "ash"). Dozens of local place names in the Chamelco region bear this prefix. It is also quite possible, though, that the prefix is somehow derived from the preposition **chi-**, meaning loosely, "place of."

Although one may expect this neighboring volcanic activity to have created fertile soils — and perhaps comparative data would indeed demonstrate this — the soils of the Chajaneb region, based on published sources and personal testing, are quite poor. Interestingly, modern soil science in Middle America owes its origin to the German geographer Karl Sapper, who also produced some of the earliest ethnographic data on the Q'eqchi' (Stevens 1964:265). Most of the soils in the highlands of Alta Verapaz are characterized as red and yellow podzolic-lateritic with patches of lithosols and alluvial material (Stevens 1964:306). These soil types have been continuously exposed to high rainfall and concomitant leaching. As a result, macro-nutrients are all but absent, especially phosphorous (Wilson 1972:38; also, see Table 3.3). It is interesting to note that Wilson's (1972) soil tests revealed uniformly abundant potassium — almost all of the 40 soil specimens measured in the 1999 field season yielded low potassium levels (see Table 3.3, Table 3.6). It is important to note also that the famous botanist Wilson Popenoe's warning for the Polochíc valley — these "lands ... are now saturated and further increasing population pressures will probably result in impoverishment of soil fertility ..." (Popenoe 1960:139 in Stevens 1964:306.) — applies to the Chajaneb and Sa Mox regions as well.

Indigenous peoples frequently develop complex descriptive terminology for soils (e.g., Balée 1994:143; Bellon 1996; Ollier et al. 1971;). Carter (1969) describes in some detail the Q'eqchi' classification scheme for soils. Many of Carter's terms, however, are

Table 3.3:
Soil Sample Results from the Highlands of Chajaneb and Vicinity

Sample # & Location	Description	pH[6]	Nitrogen[7]	Phosphorous	Potassium
1. River depression	dark soil; milpa field;	5.5	20	10	<100
2. Experimental Garden	dark soil; treated w/15-15[8] and organics	6.5	40	10	110
3. Secondary growth	dark soil; no corn past five years	6.5	10	10	180
4. Sotzil river bank	alluvial soil	7.5	10	75	140
5. Lowlying grass-land	seasonally inundated; red clay	6.0	10	25	180
6. Deciduos wood-land	dark soil; 6" deep	5.5	<10	<10	100
7. Milpa field	top of ridge; just before harvest	6.0	20	10	<100
8. Milpa field	neighboring *aldea*[9], just before harvest	6.0	15	10	180
9. Oak forest I	neighboring *aldea*, no recent corn growth	5.0	10	10	<100
10. Oak forest II	neighboring *aldea*, no Recent corn growth	5.0	10	10	<100
11. Garden plot	dark soils; >12" deep	6.5	<10	<10	<100

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[6]pH measured on a 1-14 scale, 7 being neutral.

[7]Nitrogen, phosphorous, and potassium are all measured in pounds per acre.

[8]15-15 or *quince quince* is the most common fertlizer type, numbers referring to amounts of nitrogen and potassium in inorganic source.

Table 3.3 Continued:
Soil Sample Results from the Highlands of Chajaneb and Vicinity

Sample # & Location	Description	pH	Nitrogen	Phosphorous	Potassium
12. Chicacnab[10]	cloud forest; 2300masl[11]; steep slope; shallow soil	6.0	60	10	<100
13. Chicacnab forest	cloud forest; ridgeline	6.0	60	<10	<100
14. Chicacnab forest	cloud forest; bottom of local depression	6.0	40	<10	<100
15. Chicacnab forest	cloud forest; steep slope with shallow soil	6.0	30	<10	<100
16. Chicacnab forest	on forest edge; high disturbance	6.0	20	<10	<100
17. Chicacnab milpa	one year of rest following harvest	6.0	10	10	<220
18. Chicacnab milpa	two years of rest following harvest	6.0	20	10	<170
19. Coban coffee Plantation	heavy organic treatment	6.5	150	25	>400
20. Chajaneb forest	dark soils; 12" deep	6.0	10	10	<100

[10]Chicacnab is a highland community of San Juan Chamelco, approximately 20 km from Chajaneb, that still has significant cover of cloud forest.

[11]Meters above sea level.

not single morphemic units, (e.g., **mero kak li ch'och'**; literally "truest" — a loan from Spanish — "red the earth") and therefore are likely to vary between informants and have less cultural saliency. Either because of culture change across three decades, overzealous ethnographic questioning by Carter, or miscalculated informant choice during my 1999 field season, the Q'eqchi' of Chajaneb did not have nearly as detailed a terminology for local soils. The most basic breakdown of soil types, documented by Carter (1969) and Wilson (1972), holds true for Chajaneb: **kaw ru** ("hard face/surface") versus **q'un ru** ("soft face/surface"). But beyond this distinction between hard and soft, where **q'un ru** soils are obviously sought after for agriculture, only five soil types (with a pair of synonyms) were commonly used in Chajaneb. **Q'eqi ch'och'** ("black earth") was the highest quality, most desirable soil. Although generally lacking in nutrients, its texture is highly friable. These black soils were quite common in Chajaneb, were often as deep as 28-35 cm, and were represented under conditions of forest cover and agricultural field. Although these dark soils are often of excellent texture, they frequently lack the macro-nutrients — nitrates, potash, and phosphorous. Macro-nutrient levels and pH values were tested in a corpus of 20 soil samples and are detailed in Table 3.3 above.

Kaqi ch'och' ("red earth") or **seb'** was by no means uncommon. This red clay commonly forms a substrate beneath black earth deposits, is frequently exposed by agricultural activity, and is the most common component of the trail systems that weave through the region. Also widely distributed is **saklum**. This attractive white clay is far less common than the red variety and is sometimes exposed by the wearing of footpaths or road construction. It was with this clay, informants reported, that old timers preferred to build their waddle and daub houses.

Samahi' was the term used for sand, usually of alluvial deposits. **Saab' ru** (literally, "swamp face") rarely if ever can be found in the highlands, as it refers to inundated soils used mainly for rice agriculture, as in the Polochíc River valley.

It is with this background on soils, geography, and weather that I now turn to vegetation. The vegetation of Mesoamerica has been thoroughly discussed by natural and social scientists who have been concerned especially with the impact of the large indigenous population during the Maya Classic period (e.g., Culbert 1988; Fedick 1996; Rico-Gray and García 1991). Although untested, the omnipresence of surface artifacts, the current population density, and the long-term human occupation of the Maya area in general, and Chajaneb specifically, point to a largely anthropogenic forest complex. In Chajaneb, forest patches are small — rarely reaching one hectare — and are composed largely of pine (*Pinus pseudostrobus; Pinus oocarpa*) and sweetgum (*Liquidambar styraciflua*). Oak (*Quercus guatemalensis*) and gallery forests composed largely of hornbeams (*Carpinus carolineana*) are also quite common. This forest type is somewhere on the cusp between Mirand's (1952;1953) types "*selva alta subdecídua*" and "*selva de cajpoquí*", and is characterized by Wagner (1964:237) as belonging to the lower montane rain forest formation, also typical of the oak/pine forests in highland Chiapas. As discussed in the chapter on methods, a total of 20 10X10 m inventories were made in the highlands to better characterize the species composition of these forests. A summary of these results is shown in Table 3.4 and the results from these inventories appear in Appendix 2.

Forests of pure stands of pine are quite rare and occur most frequently on the crests of the numerous haystack hills that dot the *aldea*. These stands of pine have canopies that often exceed

Table 3.4: Summary of Twenty Highland Plots, Taken as One Contiguous Area

Common Name	Scientific name	No.	Relative Density	Basal Area	Rel. Dom.	Fre-quency	Rel. Fre-quency	S.I.V.
			*	**	***	****	*****	******
chaj	*Pinus oocarpa*	39	7.7	3.95	33.1	<7> 35	4.58	45.38
okob'	*Liquidambar styraciflua*	70	13.7	1.503	12.6	<12> 60	7.84	34.14
ka' q'ut	*Clethra suaveolens*	43	8.5	0.7896	6.6	<14>70	9.15	24.25
ha che'	*Rubiaceae*	55	10.7	1.0572	8.9	<etc>25	3.27	22.87
ji	*Quercus guatemalensis*	23	4.5	1.353	11.3	40	5.23	21.03
onk	*Hedyosmum mexicanum*	54	10.7	0.2692	2.3	45	5.88	18.88
mes che'	*Carpinus carolineana*	34	6.7	1.251	10.5	10	1.31	18.51
am che'	*Rhus striata*	23	4.5	0.3293	2.8	70	9.15	16.45
tzunu che'	*Viburnum blandum*	34	6.7	0.3658	3.1	50	6.54	16.34
rax wak	*Palicourea gaeottiana*	34	6.7	0.0598	0.5	60	7.84	15.04
kaqi yux	*Daphnopsis tuerckheimiana*	11	2.2	0.0367	0.3	20	2.61	5.11
q'eqi che'	*Swartzia guatemalensis*	11	2.2	0.0518	0.4	15	1.96	4.56
kaqi xo'ot	*Saurauia kegeliana*	5	1	0.0916	0.8	20	2.61	4.41
saqi yux	*Nectandra* sp.	7	1.4	0.0201	0.2	20	2.61	4.21
o max	*Persea donnell-smithii*	3	0.6	0.1769	1.5	15	1.96	4.06
xub' ti	*Canavalia hirrutissima*	5	1	0.0469	0.4	20	2.61	4.01
jow	*Vebesina lanata*	6	1.2	0.0178	0.15	20	2.61	3.96
saqi che'	*Miconia glabberima*	10	2	0.0423	0.4	10	1.31	3.71
aq'al	*Eugenia* sp.	3	0.6	0.022	0.2	15	1.96	2.76
saqi xo'ot	*Saurauia rubriformis*	3	0.6	0.0107	0.09	15	1.96	2.65
ch'ut	*Alsophila arborea*	3	0.6	0.0178	0.2	10	1.31	2.11
akl	*Eugenia* sp.	4	0.8	0.0638	0.5	5	0.654	1.954
wa'ut	*Myrica cerifera*	2	0.4	0.0095	0.08	10	1.31	1.79
b'ach	*Triumfeta* sp.	1	0.2	0.106	0.9	5	0.654	1.754
sipres	*Cupressus lusitania*	2	0.4	0.0837	0.7	5	0.654	1.754
manzana ros	*Syzygium cuminae*	2	0.4	0.001	0.008	10	1.31	1.718
q'iib'	*Trema micrantha*	1	0.2	0.0907	0.8	5	0.654	1.654
terak	?	3	0.6	0.0085	0.07	5	0.654	1.324
tzoloj chich	?	2	0.4	0.0042	0.04	5	0.654	1.094
tul che'	Rubiaceae, USS[a]	1	0.2	0.0254	0.2	5	0.654	1.054
yax hab'	Rubiaceae, USS	1	0.2	0.026	0.2	5	0.654	1.054
q'ana'ix	*Friera guatemalensis*	1	0.2	0.0152	0.1	5	0.654	0.954
sak atzum	*Lippia myriocephala*	1	0.2	0.0095	0.08	5	0.654	0.934
q'an che'	*Inga* sp.	1	0.2	0.01	0.08	5	0.654	0.934
loolo sam	*Boehmeria sp.*	1	0.2	0.0065	0.05	5	0.654	0.904
chamach o	*Rondeletia amoena*	1	0.2	0.0032	0.03	5	0.654	0.884
b'on che'	*Hoffmania conzittii*	1	0.2	0.0019	0.02	5	0.654	0.874
tza'aj	*Veronia leiocarpa*	1	0.2	0.0013	0.01	5	0.654	0.864
yax che'	*Brunfelsia* sp.	1	0.2	0.0015	0.01	5	0.654	0.864
jom che'	*Crescentia alata*	1	0.2	0.0013	0.01	5	0.654	0.864
chu che'	*Siparuna nicaraguensis*	1	0.2	0.0013	0.01	5	0.654	0.864
chochokl	*Inga* sp.	1	0.2	0.0012	0.01	5	0.654	0.864
koiyo'	*Persea shiedeiana*	1	0.2	0.0007	0.006	5	0.654	0.86
TOTALS	44 SPECIES	507	100	11.9349	100.254	153	99.999999	

*Number Individuals/Total Individuals; **Sum of species basal area at breast height; ***Species basal area/Total basal area; **** Number and percentage of plots over twenty; *****Number of plot appearances/153 (sum total frquency); ******Species Importance Value (Relative Density+Relative

25 m, have very little undergrowth, and — according to informants — have not been cleared for at least 75 years. These pure stands of pine are intensively sought after by woodcutters. It is not surprising that stands of pure pine in easy-to-reach areas are extremely rare. Highland plots number 5, 6, and 14 are representative samples of these pine forests (Appendix 2).

Hardwood clusters dominated by several large oaks (*Quercus guatemalensis*) are also quite rare (see highland plots number 18, 19, and 20, Appendix 2). As revealed in the Chajaneb questionnaire, oaks are universally considered the best firewood variety and thus are in high demand. Like the stands of pure, mature pine, it is quite easy to see how proximity to roadways and households decreases the likelihood of finding stands of oak. Pine stands have individuals of wide girth (often over 150 cm dbh) and are therefore also highly sought after.

Only slightly more common than the oak stands are the gallery forests dominated by the river hornbeam (*Carpinus carolineana*). Although the hornbeam is sometimes found in mixed evergreen/hardwood stands, it is the dominant tree species on both sides of the river. The continuous carving of the river frequently creates havoc for these hornbeam stands, contributing to their collapse, leaning, and twisting. It is not surprising, then, that these woods are infrequently used for structural materials. The riverside gallery forest is best represented by highland plots number three and nine (Appendix 2).

By far the most common forest type is the mixed coniferous/hardwood stand. Such forests rarely have canopies that exceed 20 m. The individuals of pine within these mixed stands are usually of smaller girth (25-85 cm dbh) than the stands of pure pine. These mixed forests are also more heavily used, partially because of their ease of access, and are in various stages of flux. Typical of such forest types, there is a rather distinct zonation of the canopy with the evergreens occupying the highest zone, a series of common hardwoods in the middle zone, and a rather dense zone of underbrush. The most common hardwood types, which appear in the forest plots with high consistency, are *Liquidambar styraciflua*, **jow** (*Verbesina lanata*), **onk** (*Hedyosmum mexicanum*), and the conspicuous and infamously poisonous **am che'** (*Rhus striata*). These forests have a consistent herbaceous floor of the grass *Panicum xalapense* and the common fern **sisb'i ha** (*Adiantum* sp.).

The plot summary table (Table 3.4) is a useful tool for assessing the ecological importance of the most common tree types in the study area. The Species Importance Value (SIV) was computed for all 44 species occurring in the 20 10X10 m plots by considering the individual plots as one contiguous unit. The SIV of a species is a simple, frequently-used index calculated by summing the relative density, relative dominance, and relative frequency of the individual species (Balée 1993:235; Balée 1994:124). Despite the scarcity of large, old stands of pure pine in the Chajaneb region, *Pinus pseudostrobus/Pinus oocarpa* is by far the most ecologically important species (SIV 45.38). Although this species of pine does not have nearly the relative frequency and relative density of the hardwoods, its total basal area and resultant relative dominance is over 2.5 times greater than any of the hardwood species.[12] Following pine is a list of 14

[12]Relative density is calculated by dividing the total number of individuals of a particular species by the total number of all individuals of all species represented in the study plots. Relative frequency is a measure of how often a particular species occurs across subplots. Relative dominance is the total basal area for a particular species divided by the total basal area for all species.

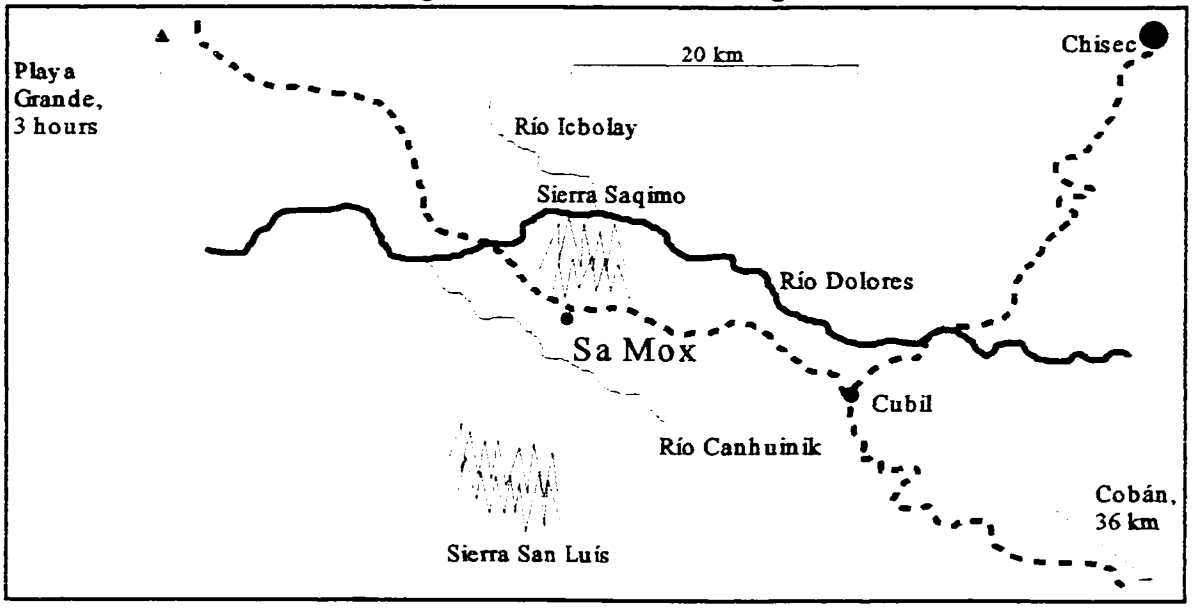
important hardwoods, including *Liquidambar styraciflua* and *Carpinus carolineana*, with SIVs of between 34.14 and 15.04. After these significant tree species, the importance of the remaining hardwoods rapidly drops off in terms of their SIV. For the wood varieties represented in the quadrats, there is a rather strong, although qualitatively-derived, correlation between SIV and species use, with the most ecologically important species being used most commonly. That this correlation does not hold true when considering herbs and other plant life-forms will be discussed in some detail in Chapter 10.

Following this brief discussion of forest types, it is important to point out that forest as a whole is becoming scant with the increase in acreage of maize and beans. The agricultural field — currently planted or in various stages of fallow — is by far the most common vegetative community. The composition and human ecology of these agricultural fields will be treated in Chapter Six.

The Lowlands and The Road to San Luís Sa Mox

Qualitatively, there are enormous distances separating the ecology of the highlands from the lowlands. In just 60 km even the most amateur of botanists would notice the

Figure 3.2: The Sa Mox Region



difference. No line is or can be drawn demarcating where the highlands end and the lowlands begin, although a benchmark of 1000 m above sea level has heuristic value. Perhaps even more important than altitude is the near complete absence of pine in the lowlands — and in terms of the phytogeography of Alta Verapaz one probably could draw a line indicating the last stands of pine. The following section details some of these qualitative changes and also quantitatively demonstrates the radically different vegetation to which humans must ultimately adapt in migrating north.

Almost everything about the community of San Luís Sa Mox (from here on referred to as simply Sa Mox) stands in stark contrast to the highlands around Chajaneb, including access to the region. Sa Mox (15°58'N, 90°41'W) is a community of the road. Thus, the layout of the community is, therefore, largely linear, with 77.5 percent (n=55) of households bordering the road itself. The road figures prominently in the lives of the people in Sa Mox and understanding the history of the community means understanding the road itself. Because the evolution of the Sa Mox to Playa Grande road radically affects the exposure of the Sa Mox community to the merchentile traffic between Cobán and Playa Grande, and because this exposure radically changes the importance of cash crops to the residents of Sa Mox, I describe the history of the road in some detail.

Primera Avenida, Zone One, Cobán is the lifeline of commerce in Alta Verapaz. After a steep descent from the northern end of the cathedral, the road parallels the western boundary of the enormous *Mercado Terminal*, the largest of three markets in Cobán. The market and the road is a congested, dirty vat of people, vehicles, and goods from before dawn until late afternoon. People and products destined for northern communities must begin their journey from the *Primera Avenida*. Three-ton Mazda and Toyota trucks, minivans, old Bluebird school buses from the United States, and all varieties of personal vehicles pass the *Primera Avenida* and exit the city to the north destined for commercial centers like Cubil, Canhuinik, Chisec, and Playa Grande. This is the road, mentioned earlier in the chapter, that probably parallels quite closely the colonial Spanish *Camino Real* and is in the process of being paved.

The three-ton trucks line the road as their drivers and *ayudantes* ("helpers") try to corral prospective passengers. When and only when a sufficient number of passengers has been loaded in the truck bed does the vehicle make its way north. Before leaving the city, the trucks circle the market and town center in order to load merchandise — mostly bread, soft drinks, and construction material — destined for the north. Fully loaded, the truck leaves the city and begins the long, precipitous drop that is the Cobán to Cubil byway.

A typical three-ton truck, loaded with goods and passengers, will cover the 36 km from Cobán to Cubil in approximately 105 minutes. In Cubil the road forks, the northern branch passing Finca Cubilhuitz, Chisec, and eventually Fray Bartolomé de las Casas. Most trucks, however, will take a short break at the Cubil market, allow their passengers to buy food and drink, and take the northwest fork. Twenty km past the Cubil market the road enters a broad valley. The valley floor sits at just 240 m above sea level and is flanked on the northeast and southwest by limestone bluffs that reach over 900 m in altitude. In the heart of this valley lies the rather unassuming community of Sa Mox. Few people disembark in Sa Mox, as most are destined for the economic center of Kantobal/Playa Grande, about two more hours to the northwest (Figure 3.4).

The entire valley and its associated ranges of Saqumo to the northeast and San Luís to the southwest were the possession of a German coffee baron at the close of the 19th century. German settlers, largely uninterested in the lowland, coffee-unfriendly climate, did manage to denounce the northern Alta Verapaz as unoccupied and proceeded to title lands under their own names. These once "unoccupied" lands amounted to over 18,000 hectares of land in the northern Verapaz (Kaimowitz 1995:20). After the majority of Germans were expelled from Guatemala at the onset of World War II, the land was sold to a half-Q'eqchi', half-*ladino* named Sek Tuli Chen who the residents today refer to as **Qawa Sek** (literally, "Mister Cup"). At that time, the Cubil to Playa Grande route did not exist. Instead, *finqueros* reached the area by a German-built road that paralleled the present-day road by about 1.5 km to the southwest and connected Finca Cubilhuitz with the community of Sa Palau (from, "lake," **palau**). Running a course between the present-day and old road is a meandering stream, usually referred to as the Río Canhuinik, which terminates in a permanent depression of standing water about two hectares in area. The town of Canhuinik, just a half hour walk from Sa Mox, is the area's market center and is still an operating cattle *finca* with a sizeable pool of mostly Q'eqchi' laborers.

Qawa Sek maintained his base of operations from Cobán, but, according to informants, played an active role in the management of the *finca's* Q'eqchi' labor pool from the farm house atop the 950 m ridge of San Luís. The stone and cement ruins of that farmhouse still stand on an open grassy knoll in the present-day community of San Luís. In the mid-1960s the entire valley was abandoned because of the guerrilla and military violence of the civil war. The region was known as a hot-spot of violence, and shared a similar reputation for hostility with the *Ixcán* region to the north.[13] Sometime during this violent epoch, ownership of the valley changed hands from **Qawa Sek** to his son, Marco

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[13]For a detailed account of the violence in the *Ixcán*, see R. Falla (1992), Masacres de la Selva: Ixcán, Guatemala (1975-1982) or Commision for Historical Clarification (1999) Guatemala: Memory of Silence. Report of the Commision for Historical Clarification, Conclusions and Recommendations.

Tulio Chen. Mr. Chen still maintains legal possession of the land, but is resident in Cobán. His possessions total 96 *cabealerías* of land and include the four communities of Sa Mox, Sa Palau, San Lucas, and Sa Pox.

Sometime shortly after the Rios-Montt-inspired scorched earth policy in 1982 and 1983, landless migrants from the cold, high country of the *municipio* of San Juan Chamelco rediscovered the broad, flat, well-drained, and unoccupied Canhuinik river basin. They came slowly, as scattered individuals or young families. They constructed makeshift shelters on a horsepath that lead to *finca* Canhuinik — the site of the present day road — and began to plant and harvest *milpa*. The shelters eventually clustered into the present day communities of San Luís, San Luís Sa Mox, and Sa Palau. According to informants, the horsepath was widened to its present width in 1986, but horses continued to be the most important and practical means of transportation. In 1993 the wide horsepath was given a surfacing of crushed stone, dramatically improving access to *finca* Canhuinik and allowing motor vehicles to traverse the valley during the dry and the wet seasons. Only in mid-year 1998 did the municipality finish constructing the bridge at *finca* Canhuinik that crossed the river of the same name. This effectively opened a new route to the commercial center of Playa Grande, shaving over *twelve* hours off the old Cobán to Playa Grande route, and turning Sa Mox into a point — however small — on the map.

All three communities of the valley are technically squatter communities, as the land is still owned by Marco Tulio Chen. Although there is a local *comité* represented by an *alcalde auxiliar* and although there is a sizeable school of concrete that even educates the children from the nearby *finca*, the community is not an *aldea* or *caserío* and the families do not have title to the land they live on or farm. But this fact has not inhibited the original settlers or newcomers from continuing to work and settle the land — neither have they turned away from the tremendous cultural adaptations necessary to successfully accommodate the extreme changes of climate, altitude, and resultant vegetation.

A Demographic Sketch of Sa Mox

Sa Mox is a community with clear boundaries. From south to north, Sa Mox begins and ends where the houses begin and end. From east to west, large, precipitous mountains define the borders. Clear, natural boundaries make for relatively clear political ones — they also make for modestly clear borders of an ethnographic study area. These clear, relatively stable boundaries, combined with active interest in community welfare helped produce a detailed, locally-initiated census in 1996-1997. The following demographic data come from that locally-produced census, to which I was given access for one evening in March 2000.

In 1997 there were 50 nuclear families (father, mother, at least one child) inhabiting Sa Mox. There were 11 "incomplete" families that either lacked children or one spouse. Seven individuals without relatives also made Sa Mox their permanent residence — one of the seven was female. There were 314 individuals dispersed among these 68 households, yielding a figure of 4.62 individuals per household, far less than the figure in the highlands (7.5). Not surprisingly, a quick survey of the community today produced a count of 358 individuals, but only slightly more households — 71. In just over three years, then, the average number of individuals per household has reached 5.04. From these scant figures, it would appear as if migration to the community in the form of newly arrived families has slowed, with the households that have remained growing in the average number of individuals per household.

Where households in Chajaneb have deep time depths in that region, the majority of Sa Mox families have only recently arrived. More importantly, Sa Mox families have origins that extend throughout the Department of Alta Verapaz and neighboring departments. This creates somewhat of a methodological flaw, as has been previously discussed, in terms of the comparison. Unfortunately, there is no situation where an entire community has picked up simultaneously from the highlands and transplanted itself to the lowlands. Movement is haphazard, temporally and spatially.

Domingo Tzub, one of my primary informants in Sa Mox, was a pioneer in the most recent colonization of the community. He arrived just as the Rios-Montt-inspired scorched earth policies were coming to a close seventeen years ago. At 18, alone, and after a stint as a *chiclero* in the Petén, Domingo erected a small, temporary shelter of plastic and began farming the unoccupied valley. While traveling in the Senahu region just north of the Polochíc Valley, he met his wife, Juana, whom he somehow convinced to make the move to Sa Mox. Now the Tzub family numbers seven, has a tract of cardamom of 25 *cuerdas* and of maize of 50 *cuerdas*, and a cattle herd numbering 35 head. Two other families arrived in the region soon afterwards — this group of three households forms a patriarchal unit of pioneers, whose heads of household maintain a certain degree of respect and authority. Domingo Tzub fits the pioneer stereotype well. He is sharp, witty, and willing to take a chance. Many of the families seem to share these characteristics which are all but required in such a frontier zone.

One segment of my orally administered questionnaire attempted to answer *how* and *why* these families left their places of origin for a life in the lowlands. Other authors have examined this question for northern Alta Verapaz and the Petén as a whole. Morrison (1993:817) demonstrated that political violence is a determining factor in the displacement of people within Guatemala; Adams, writing before the onset of the height of the civil war (1965), emphasizes land shortage. Clearly, political violence was an issue for the *depopulation* of the Sa Mox valley during the period 1965-1983, but respondents almost unanimously (n=19; 90.5 percent) cited the availability of land and the possibility of two corn harvests per year as the greatest advantages drawing them to the region. Asking *how* families arrived provoked a more varied response. Most often — in 61.9 percent (n=13) of the cases — individuals or families worked for several years on a lowland *finca*, became frustrated by *finca* work, and, already in the region, happened to run across the developing community of Sa Mox. Participants in the questionnaire were rarely more explicit than that. In a few cases — 14.3 percent (n=3) — individuals or families were encouraged to move to the region by families or friends. In fewer cases still — 9.5 percent (n=2) — did participants cite political violence or general social unrest as reasons for leaving their place of origin, and the vast majority of these cases came from the Panzós region, infamous for the slaughter of over 100 Q'eqchi' men in 1978.[14]

Given these factors "pushing" families from the highlands, we can now turn to the important question of *where* families came from. Understanding places of origin is necessary because it sets the complete stage for painting the "before" picture. Although not everyone comes from the Chamelco region, the largest percentage of Sa Mox families do have their origins in the municipality of San Juan Chamelco — 26.5 percent. Cobán and San Pedro Carchá — the two other legs of the Q'eqchi' triangle — are also well represented with a total of 34 percent. Other Q'eqchi' speakers come from the largely "lowland" municipalities of Lanquín and Panzós (21 percent). There is also a corpus of families originating in Tactic and Puruhla whose members tend to be bilingual in Q'eqchi' and Poqomchi'. Finally, two lone males come from "the *oriente*" in Jutiapa. As Q'eqchi' is the *lingua franca* of the region, these individuals have had to cast their native Spanish aside in favor of Q'eqchi'.

Establishing an Ecological Backdrop of Sa Mox for the Purpose of Comparison

The climate and ecology of the Sa Mox valley are radically different from the highlands of San Juan Chamelco, San Pedro Carchá, Cobán, Tactic or any of the other municipios in the south of the Department. Although some areas in the municipios of

[14]For a complete description of the Panzós massacre and the response of the international media, see IWGIA document Number 33, 1978.

Lanquín and Panzós could be considered lowlands, interviews qualitatively established that there is little overlap in terms of tree species in these areas as well. The remainder of this chapter describes the climate, geology, soils, and vegetation on the Sa Mox region, underlining the most outstanding contrasting elements with the highland data discussed earlier in the chapter.

Unfortunately, there is no specific climatic data for the Sa Mox locale. The nearest weather station, in terms of distance and climatological proximity, is located in the *municipio* of Chisec, over the Saqimo hills to the northeast. The data from the Chisec station is far inferior to that available in the departmental capital of Cobán, as it provides only summary information for the years 1972-1989. The annual pattern of rainfall for the lowlands generally follows the highlands, with the driest months

Table 3.5: Climate Data from San Augustin Chixoy Station, Chisec, Alta Verapaz, 140 m Above Sea Level; Monthly Averages for Years 1972-1989

Month	Temp. Deg.			Total	Relative	Wind Vel.
	Celcius			Precip.	Humidity	kms/hr
	Hi	Low	Average	mm.	%	
January	28.4	17.6	21.9	113.4	87	2.6
February	29.7	18.1	22.8	69.9	85	2.7
March	30.7	18.9	25.1	64.3	78	3.5
April	33.7	20.3	26.5	59.7	75	3.9
May	35	21.7	27.8	155.1	77	4.2
June	33	21.7	26	361.6	83	3.4
July	32.1	21.1	25.8	302.5	85	3.1
August	32.5	21.4	26.2	291.2	85	3.1
September	32.5	21.5	25.9	375.6	86	2.8
October	31	21	24.8	317.9	87	2.7
November	30.2	19.2	23.8	202.2	88	2.5
December	28.5	18.3	22.6	164.1	89	1.7
Totals:				2477.5		

spanning February through May (Table 3.5). Total annual precipitation, however, was 19.4 percent greater than the highlands over these years: 2477.5 mm. However, it is important to remember that a total of 2611 mm of rain fell in the highlands during 1999, a figure resembling the average annual rainfall for 1953-1957: 2,580 mm. Relative humidity and wind speed were slightly lower in the lowlands as compared to the highlands, 84 percent and 3.4 km/hour versus 88 percent and 4.2 km/hour, respectively. By far the most dramatic difference — qualitatively and quantitatively — is temperature. Lowland temperatures are more uniform, and also uniformly higher than their highland counterparts. The average maximum temperature over the 17 years in question was 31.4 degrees Celsius — 28.2 percent higher than for the same period in the highlands. Average minimum and average median temperatures showed similar disparity. These figures do not conform to the mountaineer's rule of thumb — drop one degree Celsius for every 350 m in altitude gain — as was demonstrated for the two highland weather stations: the Chisec station, at just 140 m above sea level, is less than 1000 m below the central Cobán station, yet significantly warmer. According to personal altimeter readings, it should also be noted that the valley floor of Sa Mox sits at approximately 240 m above sea level. According to the Koeppen system for Mexico and Central America, these climatic data would put the lowland Alta Verapaz in the Tropical Rainy subtype *Afw'* (Vivó Escoto 1964:213).

Geologically, the Sa Mox region shares many features with the near-by highlands. Dolomitic limestones dominate. The folded, faulted, east-west-running ridges quickly give way to the east-west anticlinal ridges of the Antillean affinity, characteristic of the region all the way north until Lake Petén-Itzá (West 1964:68,72). The region would sterotypically be labeled karstic, because of the dominant calcareous content; however, one uncharacteristic feature becomes more common: large volume rivers carrying surface run-off to the sea. Many sub-surface water courses exist in the Sa Mox area, but as the folded ridges have given way to broader, more well defined valleys, surface water has become more prominent. The Chixoy River — the Usumacinta in Alta Verapaz — is just one drainage off to the northwest. In the north of the Department, larger tributaries like the Dolores, Icbolay, Chacmaic, and Sa Mox's own Canhuinik have gathered waters from many surface and subsurface streams and become a real focal point in the daily lives of the men and women who live on their banks.

One may assume that larger water courses mean more alluvial soils and concomitant soils with higher macro-nutrient levels. However, because the larger rivers of the north drain limestone ranges rather than volcanic ranges, the alluvium deposited contributes little to the improvement of soil quality. River margins are, therefore, left largely uncultivated because they are more prone to flood. The soils of northern Alta Verapaz and the Petén are of the Sebol series, and are classified with the Reddish Brown Lateritic Group (Stevens 1964:299). These soils, like their counterparts further south are deeply weathered and often devoid of nutrients (Table 3.6). Although pH levels are on the whole more acidic than in the highlands, there appears to be a general trend of higher nitrate and potassium levels in the north, conforming with Wilson's (1972) soil samples that revealed universally high levels of potassium. This may be the consequence of anthropogenic factors. Though many of the lowlands in the Sa Mox valley have been intensively cultivated over the past 10

Table 3.6:
Soil Sample Results from the Lowlands of Sa Mox and Vicinity

Sample # & Location	Description	pH[15]	Nitrogen[16]	Phosphorous	Potassium
1. Milpa Field, "saqi wa"[17]	woods removed 15 years ago	5.0	100	10	150
2. Cardamom field	steep, rocky slope	6.0	20	10	160
3. Milpa Field	seasonally flooded	6.5	60	10	<100
4. Household Garden	center Sa Mox	5.0	150	10	<100
5.Grassland #1treeless	cattle grazed	5.0	20	10	120
6. Milpa Field, "saqi wa"	woods removed 1 year ago	6.5	150	10	100
7. Household Garden plot #2	center Sa Mox	6.5	100	10	220
8. Grassland #2	sporadic tree cover; cattle grazed	6.0	20	10	120
9. Milpa Field	woods removed 1 year ago (#2)	6.5	150	10	200
10. Mixed Cardamom /Milpa Stand	valley floor; thin soil	6.5	20	10	220
11. Forest	flat terrain; unbroken Canopy	6.0	60	10	<100

[15]pH measured on a 1-14 scale, 7 being neutral.

[16]Nitrogen (nitrates), phosphorous, and potassium (potash) are all measured in pounds per acre.

Table 3.6 Continued:
Soil Sample Results from the Lowlands of Sa Mox and Vicinity

Sample # & Location	Description	pH	Nitrogen	Phosphorous	Potassium
12. Milpa Field "saqi wa"	woods removed 15 years ago (#2)	5.0	60	<10	<100
13. Forest	broken canopy w/ significant undergrowth	5.0	40	10	180
14. Forest	broken canopy w/ significant undergrowth (#2)	6.5	125	<10	<100
15. Milpa Field, "saqi wa"	woods removed 4 years ago	6.5	150	<10	<100
16. Rubber Forest	valley floor; monocrop	5	10	<10	<100
17. Milpa Field, "saqi wa"	woods removed 3 years ago	6.5	150	10	<100
18. Household Garden, aldea Sequixpec[18]	high % red clay	6.5	60	10	100
19. Milpa Field, lowland Carcha, AVP	after one year fallow	6.5	20	10	100
20. Forest Floor	unbroken canopy	6.5	50	15	100

[18]Sequixpec is a lowland aldea in the municipality of San Pedro Carchá, on the banks of the Chaqmaic river.

years, much of the region was probably forested for several centuries before that time. In contrast, the highland soils near Chamelco — although exposed to only one corn harvest per year instead of two — has been cultivated intensively for centuries. A summary of the 20 lowland soil samples appears in Table 3.6. The impact of fertilizing fields must also be taken into consideration, but this will be discussed in detail in Chapter Seven. With this ecological backdrop, it is possible to begin a discussion of the local vegetation. The entire Sa Mox valley, between the Saqimo and San Luís ranges, was once blanketed with lowland tropical forest. In just under 20 years the majority of that forest type has been converted to grasslands for cattle grazing and agricultural fields. Some patches of forest still remain. The immediate banks of the Canhuinik river, the shores of a small lake, and the flanks of the two ranges are still largely forested, and it was from these areas that I gathered forest inventory data. Ten 10X10 m forest plots were inventoried using one informant — Qawa Marcos — that I selected based on his performance in the plant trail test. The specifics of each plot are detailed in tables located in Appendix 2 and a summary of these results appears in Table 3.7.

The structure of these lowland forests differs dramatically in comparison with the forests inventoried in the highlands. The maximum canopy height reaches 25 to 30 m, which is on par with the largest of canopies in the highland pine forests. Lowland canopies, as they are rarely composed of members of the same species, tend not to have a uniform structure. The "broken" nature of these canopies is most likely indicative of human disturbance in the past; that is, these are not the classic "primary" forests found farther north in the Department of the Petén. Lowland forests near Sa Mox do tend to have a uniform secondary canopy reaching 10 m. The density of undergrowth varies greatly from parcel to

Table 3.7: Summary of Ten Lowland Plots, Taken as One Contiguous Area

Common Name	Scientific Name	No Ind	Rel.	Basal Area	Rel. Dom.	Fre-quency	Rel. Fre-quency	S.I.V.
q'an xan	*Terminalia amazonia*	7	4	5.719	55	50	5.38	64.38
wachil	*Dialium guianense*	7	4	1.341	12.89	40	4.3	21.19
kaqi chajlal k'im	*Miconia punctata*	17	9.8	0.1007	0.968	40	4.3	15.07
tzol	*Muellera frutescens*	12	6.9	0.322	3.1	30	3.23	13.23
cha'ib'	*Belotia campbelli*	19	11	0.1142	1.1	10	1.08	13.18
wolwol	*Rinorea guatemalensis*	11	6.4	0.0447	0.43	40	4.3	11.13
kub' te'	*Tamarindus* sp.	6	3.5	0.5118	4.92	20	2.15	10.57
san juan che'	*Vochysia hondurensis*	5	2.9	0.1664	1.6	40	4.3	8.8
sak si'	*Nectandra membrenacea*	7	4	0.1399	1.34	30	3.23	8.57
saqi chajlal k'im	*Miconia* sp.	4	2.3	0.2039	1.96	30	3.23	7.49
kik che'	*Castolloa guatemalensis*	2	1.2	0.3972	3.82	20	2.15	7.17
ak te'	*Bactris* sp.	4	2.3	0.0081	0.078	40	4.3	6.68
komum	*Crysophila argentea*	5	2.9	0.0174	0.167	30	3.23	6.3
tul k'iche'	Rubiaceae, USS	4	2.3	0.0674	0.648	30	3.23	6.18
saqi suu chaj	*Parathesis cubana*	2	1.2	0.2715	2.61	20	2.15	5.96
lech	Sapotaceae	2	1.2	0.262	2.52	20	2.15	5.87
sak atz'um	*Lippia myriocephala*	8	4.6	0.0169	0.16	<1>10	1.08	5.84
kojl	?	3	1.7	0.0331	0.318	30	3.23	5.25
ka q'ut	*Clethra suaveolens*	3	1.7	0.0239	0.23	30	3.23	5.16
pata k'iche'	*Terminalia* sp.	2	1.2	0.1749	1.68	20	2.15	5.03
aq'al	*Eugenia* sp.	2	1.2	0.072	0.692	20	2.15	4.04
manzan che'	*Bellucia costaricensis*	3	1.7	0.014	0.135	20	2.15	3.99
chochokl b'itz'	*Inga* sp.	2	1.2	0.0381	0.366	20	2.15	3.72
q'an te'	*Gliricidia sepium*	2	1.2	0.0227	0.218	20	2.15	3.57
palal	*Inga laurina*	2	1.2	0.0029	0.028	20	2.15	3.38
muuy	*Manilkara zapota*	2	1.2	0.0672	0.603	10	1.08	2.88
pong jor	*Cecropia obtusifolia*	3	1.7	0.0048	0.046	10	1.08	2.83
tul che'	Rubiaceae	1	0.6	0.0683	0.657	10	1.08	2.34
chochokl	*Inga* sp.	2	1.2	0.0026	0.025	10	1.08	2.31
kampat	?	1	0.6	0.0327	0.314	10	1.08	1.99
ich te'	*Tibouchina longifolia*	1	0.6	0.0269	0.259	10	1.08	1.94
ch'ut	*Alsophila arborea*	1	0.6	0.0213	0.205	10	1.08	1.89
kape che'	*Posoqueria latiflia*	1	0.6	0.0189	0.182	10	1.08	1.86
anj che'	?	1	0.6	0.0165	0.159	10	1.08	1.84
o che'	Lauraceae	1	0.6	0.0104	0.1	10	1.08	1.78
unknown #3	?	1	0.6	0.0079	0.076	10	1.08	1.76
kajaj	*Bursera simaruba*	1	0.6	0.0063	0.061	10	1.08	1.74
lolo sam	*Boehmeria caudata*	1	0.6	0.005	0.048	10	1.08	1.73
chu che'	*Siparuna nicaraguensis*	1	0.6	0.0038	0.037	10	1.08	1.72
semem	*Veronia echiedeana*	1	0.6	0.0044	0.042	10	1.08	1.72
chochokl k'iche'	*Inga* sp.	1	0.6	0.0026	0.025	10	1.08	1.71
k'ix poy	Fabaceae	1	0.6	0.0027	0.026	10	1.08	1.71
keng' xul	*Acacia angustissima*	1	0.6	0.0025	0.024	10	1.08	1.7
inup	*Ceiba pentandra*	1	0.6	0.0017	0.016	10	1.08	1.7
wab'on	Fabaceae	1	0.6	0.0006	0.005	10	1.08	1.69
sajab'	*Inga* sp.	1	0.6	0.0006	0.005	10	1.08	1.69
pox	*Spondias* sp.	1	0.6	0.0014	0.013	10	1.08	1.69
unknown #1	*Miconia* sp.	1	0.6	0.001	0.01	10	1.08	1.69
unknown #2	*Turpina* sp.	1	0.6	0.0007	0.007	10	1.08	1.69
Totals	50 SPECIES	17	100	10.402	100	93	100	

parcel: where canopies are more broken and light reaches the forest floor, a dense mat of chest-high lianas and woody and herbaceous shrubs forms; where the canopy is more intact, the forest floor is nearly free from undergrowth. It is important to point out that the Sa Mox forests cannot be characterized as pure evergreen stands, as some tree species are deciduous, dropping their leaves most frequently in the short dry season between February and May. The forest floor is often covered with tree litter; however, rapid nutrient cycling and heavy, frequent rains rarely allow these organics to set in forest soils.

I conducted nine of the 10 lowland forest plots in relatively mature forest, Lowland Plot 1 is the exception. In these nine forest plots, one or two individuals tended to dominate the parcel in terms of basal area. More than once, this dominant individual specimen was identified as **q'an xan** (*Terminalia amazonia*, literally "yellow brick"). As a result, **q'an xan** was by far the most ecologically important species with an SIV of 64.38, three times the importance of the second rank species, **wachil** (*Dialium guianense*). This was, as may be expected, purely the result of relative dominance: **q'an xan** was responsible for 55 percent of the basal area of all tree species over the 10 forest plots. This characteristic was not apparent in the highlands, where in one parcel a particular species tended to dominate. This characteristic is also expressed quantitatively by noting the average number of individuals per plot: 17.9 in the lowlands versus 25.95 in the highlands. Average basal area per plot, an indicator of biomass productivity, was also much higher in the lowlands (1.04 m^2/plot) than in the highlands (.6034 m^2/plot). Another factor differentiating the two forest types is the obvious importance of palm species in the lowlands. Species of *Chamaedorea* sp. and *Crysophila argentea* ranked 12 and 13, respectively, in terms of Species Importance Value. Palm species do exist in the highlands — most commonly, they are in the form of managed groves of *Chamaedorea* sp. (**k'ib'**) whose inflorescence is sold in the markets, most frequently during holy week. Lowland plots were more diverse than their highland counterparts, with 9.8 species/plot (SD=2.04) as compared to 7.9 species/plot (SD=2.2). A one-tailed student's t-test using 28 degrees of freedom reveals that the mean species/plot is not significantly larger than the lowland mean at the .05 level. A final point of distinction between the highland and lowland plots is the lack of overlap in species: only five tree species appear in both the highland and lowland plots.

This chapter has highlighted the differences in demography and ecology in the two study areas. The differences, especially concerning vegetation cover, are quite dramatic. It is toward the linguistic and behavioral accommodations to these differences that we now turn.

Part II

Chapter Four: Plants in Q'eqchi' House Construction

One of the principal findings to be discussed in Part III of this dissertation is that plant utility plays a powerful role in determining the consistency of plant labels: the more people use a particular plant, the more uniformly they apply a specific label. The goal of Part II is to supply the behavioral background to plant use and describe the numerous ways that the people of Chajaneb and Sa Mox interact with plants.

The data of Part II are derived from three methods: participant observation, an orally-administered interview schedule, and garden inventories. During my 17 months in these two communities I had the opportunity to partake in many activities that involved plants. The data on plant use are largely taken from those experiences, plus any informal questioning that took place before, during, and after the particular activity. It is true that I approached my work as a participant observer with preconceived ideas: I wanted to build a house, plant a field, decorate an altar. By my commitment to speaking and using the Q'eqchi' language and to building relationships, all my needs in this arena were met. However, it must certainly be the case that I did not capture the total variability of ways to build a house, plant a field, or decorate an altar. For example, it is at least possible, that an individual, a group of families, or even the entire community joined in an activity involving plants that I simply did not experience. While admitting these problems, I can say confidently that, in reference to the data available, Part II largely covers the majority of the bell shape, if missing the points along the asymptotes.

In order to avoid creating simple, boring lists of plant uses, I have chosen to present the data on plant use in a way that emphasizes the immediate landscape. I begin with a description of the physical house. I then move to the home garden which surrounds *all* of the homes I had the chance to visit. From there I move to the agricultural fields and forests that do not abut the home garden. Finally, I describe the interaction of plants and people at the local and regional markets, which involve Q'eqchi' speakers completely outside of the communities with which I had experience. This "inside-out" perspective focuses first on Chajaneb and is then repeated for Sa Mox in an attempt to shed light on the comparative question of adaptation in the region.

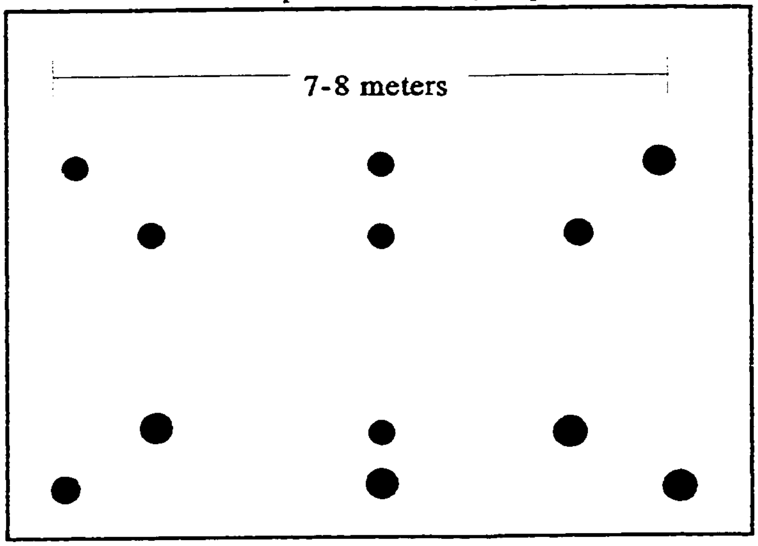
Perhaps the tradition of an ethnobotanical list of plants used in medicine, construction, and so on is more efficient for answering the question, "How do the Q'eqchi' use plants?" Such lists, however, tend to rely on etically-salient categories, often fail to describe the richness of experience that exists between plants and people, and can make for lackluster reading. Nevertheless, Appendix I contains a list of the plants I collected and successfully identified during my 17-month-long field experience.

Chajaneb Houses

The construction of the house involves many plants and by moving to a dramatically different forest environment the highland Q'eqchi', in treating a need that remains essentially static, face a very different set of resources to meet their housing needs. House construction in traditional societies has been approached from several angles: ethnoarchaeological, ethnobotanical/conservationist, and sociological. Ethnographers and ethnoarchaeologists have spent considerable time understanding the construction of modern houses in order to map their decay within archaeological assemblages, and this is especially true where more lasting materials like mud and earth had been incorporated into the house (e.g., Agorash 1985:103-104). Although superficially mundane, several monographs have simply described the construction of a typical, traditional house, as in the work of Milliken and Albert (1997) among the Yanomami, where a remarkable 52 botanical species were recorded as having been used. A section or subsection of a treatise is often dedicated to house construction, whether ethnobotanical in nature or otherwise, but for the Mayan people we are fortunate to have Robert Wauchope's 1938 Carnegie Publication, *Modern Maya Houses*. Although composed primarily with ethnoarchaeological intention, the text is invaluable in terms of its ethnographic, linguistic, and ethnobotanical substance. More recently, ethnobotanists have become concerned with the impact native house construction might have on the surrounding flora (e.g., Flores and Ashton 2000; Gragson 1995) or the valuation of forests in terms of construction species. Finally, others are concerned more with the structure of the house in terms of sociological, gender, or economic partitioning (e.g., Boddy 1982; Wilk 1991), and these frequently avoid botanizing. It is my hope that this section will contribute to all three domains, although the emphasis of the dissertation leans more in the direction of the latter two than the first.

In Chajaneb, four principal motives seem to drive a family to construct a house. First and most commonly, families simply were forced into the activity out of necessity because of wear and tear or irreparable damage on an earlier structure: A river swollen with flood waters carved the foundation from under the family's feet, a cooking fire destroyed a roof, or the house simply rotted away. The year-round moisture and permeability of common building materials like pine make house rot a common occurrence. Second in terms of frequency, the nuclear family ages and a son or daughter normally marries and moves to establish a new household. Commonly, this is done in the close vicinity of either the groom's or bride's parents, suggesting no strict residence rule. The pattern, though, is basically bilocal. Over the long-term, individual houses often become household compounds with clusters of small residential buildings. Third, one of the residential buildings is simply outgrown. When older siblings begin sleeping in the rafters with the foodstuffs, it is often considered time to enlarge that structure. Sometimes this involves simply adding a quadrangular structure off to one side of the kitchen area, but more frequently, new corner posts are dug around the existing corner posts and the new house envelops the old. This is a crafty strategy, as it allows for materials from the old site to be recycled, and, equally as important, to be recycled without transport. It also means the family can continue to live in the old structure while the new structure is erected. This behavior could

Figure 4.1: Schematic Archaeological Representation from an Expanded House, Top View



have explanatory power in terms of ethnoarchaeological analogy where the archaeologist uncovers a corner post plan similar to Figure 4.1. Finally, an outside economic incentive can create the need to construct a new house. This can be the need to relocate closer to a recently acquired plot of land, or, in the case of Chajaneb once I had left the village, the desire of families to move nearer to the road, recently electrified.

Before considering the constraints on the choice of house sites, it must be pointed out that the real or imaginary need to move does not always lead to construction, since some families are not equipped with the resources to build. An elderly, single woman with no male relatives lived for years in a house on the verge of collapse from rot and infested with termites, scorpions, cockroaches, and rats. It was not until her peer group — the Catholic citizenry of Chajaneb — provided the financial, labor, and material resources needed to build that she was able to act on her motives. That house construction project was my first in the Chajaneb community.

With the resources available and the motive for change established, the question of *where* to situate the house arises. As Chajaneb is nestled in an uneven landscape, there is scant level ground that does not already have a house or is occupied by *milpa*, so, although the degree of slope is a constraining factor, families most often are forced to build on land with at least some degree of slope. Also important is the structure's placement relative to a water source. Luckily, as has been discussed in the section on ecology and geology, the karstic terrain of Chajaneb is littered with springs. Uncharacteristic of karstic terrain, a moderately-sized river flows through the *aldea*, although a town-centered *ladino* owns much of the watercourse and can, theoretically if not practically, control access to the river. The ideal, from the perspective of a Chajaneb Q'eqchi', would be to locate at a spot where C.A.R.E. had four years previously established a gravity-fed water system. The system currently has approximately 34 spickets throughout the community. Pending petition to the water committee, an individual could tap the system, but that requires significant resources. The system, being constrained by gravity, is also unfeasible to tap unless you can locate somewhere in the lower elevations. Finally, there is also the less tangible desire to locate "where the action is." Although there is no definable town center in Chajaneb, there are certainly areas more peripheral to others and these peripheries are generally avoided. With population and *ladino* land ownership steadily increasing, and given the constraints of an angularized, karstic topography, prime locations for house construction are severely limited.

A pair of men is the minimal labor team needed to construct a house yet, with just two workers, the process is slow and tedious. Most frequently groups of five to six join to do the job, although in the case of welfare and labor donation, teams of 20 to 25 may work a house so it can be completed in a day. With normal-sized groups, workers are led by either the house owner or a specialist with much experience in construction. In either case, workers are paid a day's wage by the owner (15-25Q) or, when working for close relatives, receive meals and reciprocity expectations for the future. As food is frequently involved, women do indeed contribute to the successful completion of a Chajaneb house, although in five house constructions never did I witness a woman wield a saw or hammer.

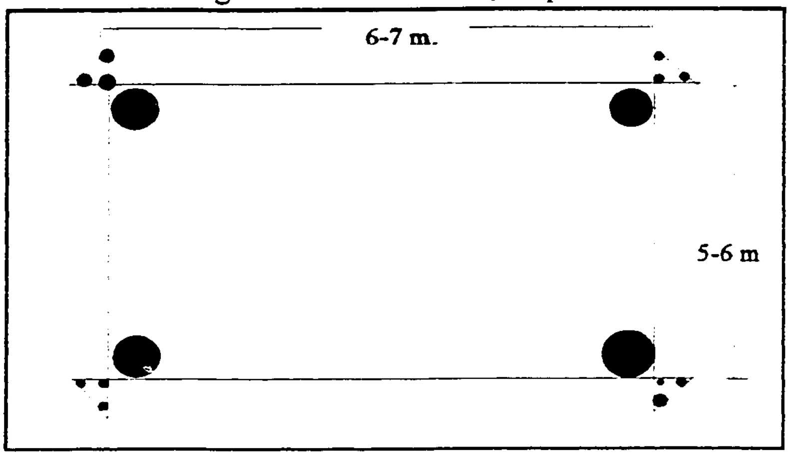
The first task of the labor group is to level ground and clear the masses of debris that frequently accumulate during renovation-type projects. Large bladed (30 - 48cm) hoes (**asaron**) are used to level and clear debris from the construction site, and no measuring or leveling gauge is used other than eyesight. Removing an old roof is never a pleasant task, given that the thatch has accumulated years of carbon from a smoldering fire and thousands of living inhabitants. The thatch — in most cases of corn leaves (*Zea mays*) — is hacked from the roofing foundation with machetes and tossed to the floor where it is swept into the *milpa* that surrounds the house. No more than two men can do the cutting at the same time, as their weight is barely supported on the rotting rafters. The wall boards are then removed and sorted between the reusable and those that will be discarded. In reconstruction projects, corner posts and house components other than the wall boards are rarely reused. It took 40.5 man-hours to demolish a house, sort the wall boards, clear the area, and adjust the level of the hillside during the one case I kept time allocation data.

The largest investment of time, energy, and aesthetic planning is dedicated to the selection, preparation, and placement of the corner posts and other floor-to-ceiling posts (**oqech**). It is worthwhile to note here the probable anatomical referent of the morpheme **oq**-, meaning "foot." This pattern of equating plant parts, landscapes, and human creations with human anatomy appears frequently in the Q'eqchi' language. Correct post location — in addition to determining the size, shape, and ultimate cost of the structure — ensures proper rafter and wall-board positioning and ultimately determines the life-span of a house. In the past there was but a single species considered appropriate for the corner posts of structures, the tree fern *Alsophila arborea* (**ch'ut**). Seven decades ago Wauchope (1938:33) had elicited this information from a Q'eqchi' informant in Cobán. Elders to this day speak of the lasting quality of *Alsophila arborea*. When houses approaching 150 years of age are torn down in the center of Cobán, it is not uncommon to uncover the tree fern with its characteristic "bark" that is actually the patterned scars of fallen leaves (Seth Hempstead, pers. comm., July 1999). A testament to the durability of the tree fern in moist conditions, the well-known *Cobanero* orchid farm continues to use *Alsophila arborea* trunk segments (*monos*, Sp. for "monkeys") to raise and display their orchid collection.

Unfortunately, most of the larger *Alsophila* individuals have been cut in the Chajaneb region. I only encountered the tree fern in one of 20 forest plots, and in that plot I measured but three, small individuals. In order to be used as corner posts, informants were adamant that the ferns must be approximately 24 to 30 cm in diameter, and, as they are particularly slow growing, finding large individuals is even more difficult. During Wilson's fieldwork in the Q'eqchi' highlands 35 years ago, he noted a total of 15 species used as corner posts, including the revered **ch'ut** (Wilson 1972:205). Also listed in Wilson's index was the then-unidentified **tz'aj** (variously, **tz'a'aj**), which I have identified as the composite *Perymenium grande*. Of the 33 interview schedules administered in Chajaneb, **tz'aj** was unanimously reported as the best and most frequently used corner post material. It is important to note, though, that in the cloud forest village of Chicacnab, approximately 32 km NNE of Chajaneb, a species of *Ficus* particular to the cloud forests called **tzolo'ox** was given as the best corner post material. Nevertheless, where the choice of other architectural components of the house is extremely variable, it was strange to hear such precision in regards to the corner post. Like the characteristics of the antiquated **ch'ut**, the wood of **tz'aj** is considered to be extremely long-lasting due largely to its resistance to rot.

It is best to cut the **tz'aj** during the new moon, which reduces the likelihood of unwanted fractures. This custom of harvesting construction materials during the new moon appears frequently in the ethnographic literature of Mesoamerica and could be of Christian rather than of indigenous origin (V. Bricker, pers. comm., November 1996). If time is an issue and the new moon is still weeks away, it is considered appropriate to fell the **tz'aj** as long as the moon is not approaching its full stage. The corner posts are cut at lengths of at least four m and with diameters nowhere smaller than 24 to 30 cm. Frequently the correct number of corner posts cannot be found on the owner's land proper, and must be purchased from a neighbor. Hopefully, that neighbor is relatively close, as the trees are extremely heavy, the lengths requiring two sets of shoulders to carry them any distance. Once the predetermined number of corner posts is harvested and collected at the construction site, these are used immediately, without any time for drying or bark removal.

Figure 4.2: Positioning of String Pins (smaller circles) and String to Ensure Corners, Top View



As the floor is being leveled and the corner posts are being transported, the layout and placement of the corner post holes is begun. Although the leveling of terrain was done with an eyeballing approach, with the placement of corners an exactitude and meticulous approach are used. Corners are justified at right angles with the help of string, a 90-degree ruler, and measuring tape. String and string pins are placed as in Figure 4.2 to ensure the proper positioning.

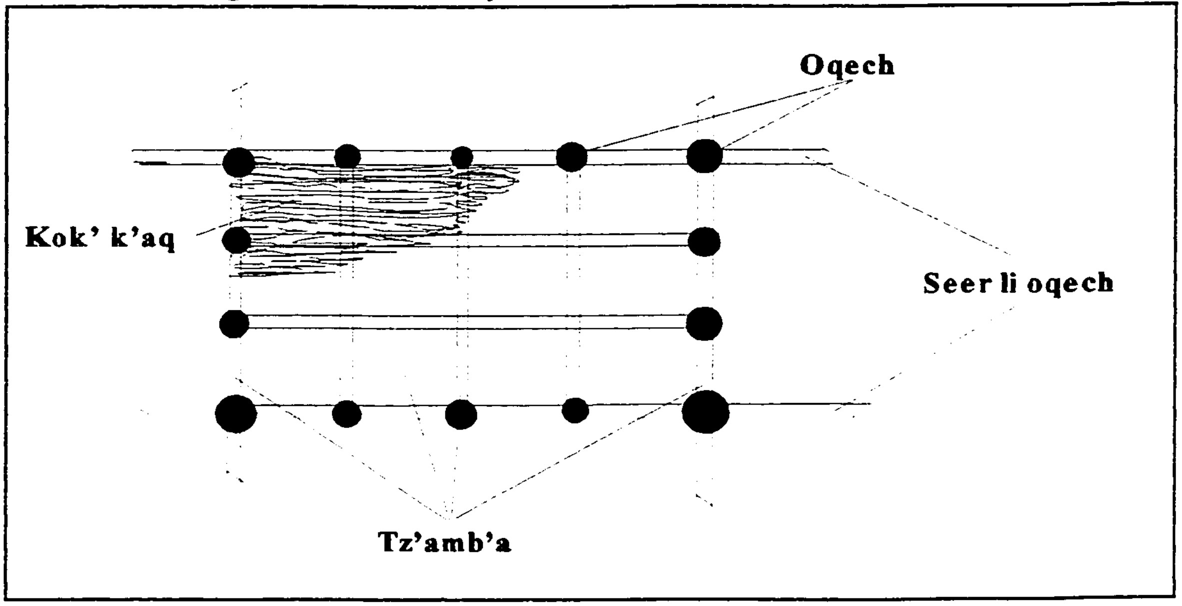
With the angles checked, the long and short lengths are checked with another tape and adjustments are made if either of the pairs do not match up. Houses in Chajaneb were consistently rectangular rather than apsidal or square and averaged approximately seven by five m, although the lengths and widths were highly variable (SD=2.4, 2.1). **Tz'aj** posts of equal diameter are also used for the other main posts that line the lengths and widths of the houses. Wauchope (1938:30) noted that dwellings in Alta Verapaz frequently had many more main posts than was common in Yucatan and other regions of the Maya area. A house in the vicinity of Cobán, for example, had 34! — 11 in each side, four in each end, and the four corner posts. Whatever the ratio of side to end main posts, the only rule is that each side and end be symmetrical.

Before the corner and other main posts are situated, the post holes must be trenched and the posts themselves must be notched. Digging post holes requires much more skill that one might expect. The reddish clay soils that are so common are first broken with a machete blade and then the 16 to 24 cm-wide hole is excavated with the **pat che'**. The **pat che'** (literally, "crust pole") is either tipped with an iron attachment (**makan**), which is preferable, or is simply sharpened by machete at one end. The **pat che'** can be of any hardwood, although the **okob'** (*Liquidambar styraciflua*) is by far the most desired material. The digging stick is driven vertically into the ground with the thrust of one arm, swivelled back and forth, pried to and fro, and retracted from the hole. The sticky mud clings to either the metal appendage or bare wood and is knocked on solid ground to clean the debris. Rarely does hand touch earth, or even boot touch earth. A skilled digger can burrow one m, the average depth of post holes, in approximately 25 minutes. Although it is common to see houses that use a natural tree crotch as a support for the horizontal rafters, it is just as common for builders to hack a 90-degree notch into the upper end of a main post with a machete blade. This notch, which cuts the corner post diameter in half and is approximately 14 cm deep, supports the weight of the horizontal beams and ultimately the weight of the entire roof.

The corner posts and other main posts are then set into their hole, leveled with string and a carpenter's level, and fed. In order to strengthen the posts (**k'e li metz'ew**) and ensure a long lifetime for the house, it is still quite common for Catholic families to "feed" the corner posts a serving of animal gut. This practice is also quite common during bridge construction. For the construction of the local *ermitas*, Sapper (1998) also reported that the Q'eqchi' commonly poured boiled pig's blood on the corner posts and roof supports in order to achieve the same effect — lifelong strength. While the men are working the corner posts, a group of women have been preparing the afternoon meal behind a makeshift structure walled with woven grass mats (**poop**, of *Phregesides communis*). Protecting the men from the fire's smoke as much as the women from the men's staring, the mats are an integral part of the Chajaneb home and will be discussed in greater detail in Chapter Eight.

With the posts leveled and in place, a church elder (**mertoom**) will burn a small

Figure 4.3: The Components of the First Floor, Top View

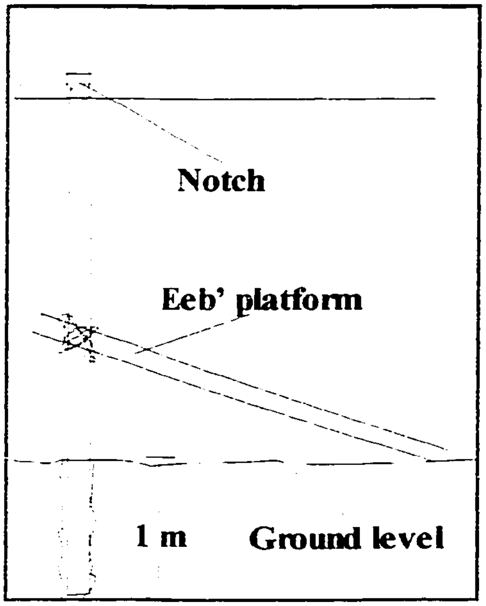


incensario of **pom** (*Protium copal*) before feeding a generous portion of turkey or tripe stew into the esophagus-like hole of each corner post. A prayer is said, the holes are filled and tamped, and the crew is ready to move on to the first floor horizontal beams. The latent function of this magic, then, is to minimize damage to the corner posts by insects and humidity.

This practice shows considerable time depth and is mentioned in the works of Wilson (1972), Goubaud Carrera (1949), and Selis Lope (1931).

Much attention has been given to the bare house skeleton that now stands, but from this point until the placement of thatch, the process moves on rapidly. Much less attention is paid toward the selection of tree species of the horizontal beams, as the characteristics of being straight, of even-diameter, and smooth are the defining qualities of a good beam. Figure 4.3 above shows the anatomy of the first floor and the Q'eqchi' terminology associated with various architectural components.

Figure 4.4: The Eeb' Platform, Side View



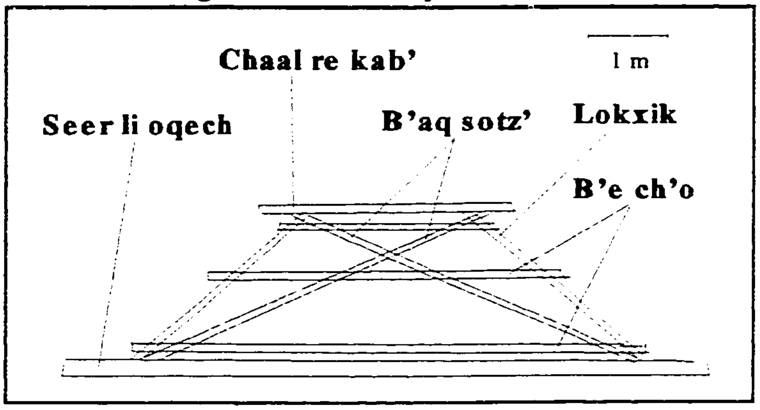
In the arena of attachment, Q'eqchi' construction has gone through major changes in the last 20 years. Although lianas (**k'aam**) are at times used as cordage for attaching the horizontal beams to the corner and main posts, nails or aluminum wire is the preferred material. When using aluminum wire, an anonymous piece of wood about 25 cm long and two cm diameter is collected. The wire is first wrapped tightly around the implement, called a **B'ar** or **Ruk** ("hand"), and this extra "hand" is used to pull the wire taught against the post. Nails (**klaawx**) have greater strength and durability (again, **metz'ew**) than any vine or cordage to be found in the forest. Nails are a valued commodity in Chajaneb, and great lengths are taken to salvage any bent or used nail to be used again in the future. As most men in Chajaneb' are under 1.5 m (5'6") and the horizontal beams sit at about 2.2 m, nailing requires the use of a ladder, unless there happens to be a relatively tall *gringo* in the crew. To gain a bit of elevation, the crew employs a temporary ladder (**eeb'**) that binds to the set corner post (see Figure 4.4). Carpenters invariably carry a nylon cord (**k'aam**) to attach the platform. With the platform secure, workers drill several nails through the horizontal beams and into the notch of the corner posts. The **kok' k'aq** (literally, "little flea"), which will serve as the loft boards where corn and other household materials will be stored, can be of any straight, thin-diameter wood or of roughly sawed planks, and is generally not put in place until the roof is thatched.

The **seer li oqech**, which are the longer of the horizontal beams that form only the front and rear of the house, are put into place and nailed first. The name derives from the fact that many families will hang a nest of stinging wasps (**seer,** generic for "bee") from this pole. The wasps are likely of the genus *Xespidae* and are said to protect the house and its inhabitants from a class of evil spirits known as **awas**. With these beams in place, the remaining long and short beams (**tz'amb'a**) are set and nailed into position and the first floor is ready to accept the rafters and other roof supports. They will also serve as the scaffolding for the crew in order to lift all the components of the roof structure.

The fastening of the principal A-frame (**lokxik**; although Wauchope 1938:43 cites the Spanish-derived **terer** for "scissors") is a critical part in the construction of the house, for it ultimately sets the roof pitch which, in turn, determines the way smoke behaves inside the structure and the way rainfall is drained. Karl Sapper (1905:280) made the logical assumption that areas with high annual rainfall would correlate significantly with steeper roof pitches, but this appears not to be the case (Wauchope 1938:41). Measuring roof pitches throughout the Maya area, Wauchope found the exact opposite: roof pitches in Yucatan were most often very steep in comparison with the much wetter region of Alta Verapaz. In Chajaneb roof pitches varied significantly, but most fell within the general quarter pitch classification, varying from 40-60 degrees. The rise in popularity of metallic (**lamina**) roofs with their much greater resistence to water permeation has decreased the average roof slope, although I have no quantitative data to document this supposition.

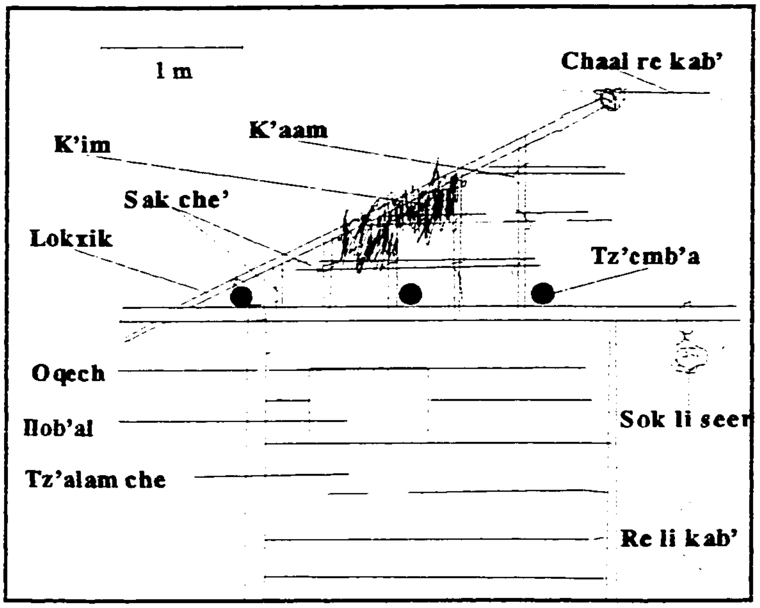
The four poles of the A-frame must then be placed so as to unite the **tz'amb'a** with a ridgepole (**Chaal re kab'**, "body part of the house") which will eventually give the roof its classic hip character. Unlike the horizontal and vertical rafters that are frequently of soft, light woods and will eventually serve as the frame for the roofing material, the four A-frame

Figure 4.5: Primary Roof Beams



poles are often from a strong, heavy hardwood. No great care is taken to select individual species for these A-frame poles, although several varieties were mentioned as preferable: **okob'** (*Liquidambar styraciflua*), **ji** (*Quercus guatemalensis*), **mes che'** (*Carpinus carolineana*). Because at this point the crew is adjoining round to round structures, nails generally give way to a tying implement: either a flexible metallic wire or cordage (both, **k'aam**). Figures 4.5 and 4.6 highlight the principal components of the roof mentioned.

Figure 4.6: Linguistics of the House Components, Side View



Each pair of the A-frame is lifted simultaneously and then fastened with wire or cordage. Once both pairs are in place, the ridgepole (**Chaal re kab'**) can sit nestled firmly in the crotch of the two A-frame poles. The horizontal rafters (**b'e ch'o**, literally, "rat walk") are similar in species but thinner in diameter to those of the **lokxik**. These horizontal roof rafters along with the diagonally oriented rafters (**b'aq sotz'**, "bat bone") will form the substrate upon

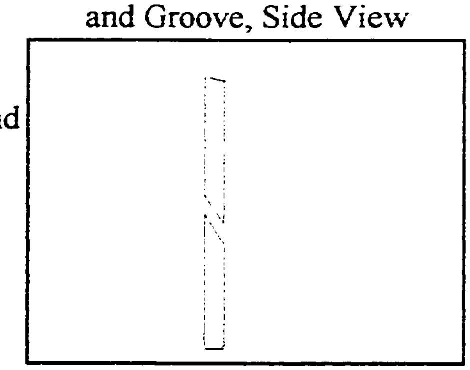
Figure 4.7: Sak che' attachment

which rest the horizontal and vertical roofing rafters. The roofing rafters are termed **sak che'** which can be literally glossed as "white tree," but more likely refers to the light weight of the poles used — poles as fragile as dried corn stalk or sugarcane stem are common. The web of **sak che'** is strengthened by a continuous string of cordage that winds in and out of the horizontal rafters, and around the vertical rafters as in Figure 4.6 and Figure 4.7. With the entire frame complete, only the wall boards (**tz'alam che'**, "jail wood") and thatch (**k'im**, or, alternatively, **aq**) remain.

The style and preparation of wall boards have changed dramatically over the past three decades and have shifted as a direct result of sawing technologies. About a generation ago, most Q'eqchi' men used the saw frame (Sp. *tapesco*) which allowed the relatively fast preparation of somewhat refined boards. The design and use of the saw frame for the production of timbers will be discussed in more detail in the section of products from the surrounding fields and forests. More recently, several families have saved enough capital to purchase or lease chain saws equipped with metal guides that allow for the rapid felling, bucking, and sawing of timbers. Not surprisingly, with most men using the manual saw and frame and some men using chain saws, the rough-trimmed wall boards are by far the most popular wall construction material. The landscape of Chajaneb (possibly, "of the pines," **chaj**=pine; **-eb'**, pluralizer) is blessed with many tall, large-diameter pine trees whose soft, malleable wood succumbs quite easily to either saw. Recently, families have had a much more difficult time procuring pine from their own or their neighbors' land due to widespread deforestation of aged stands of pine.

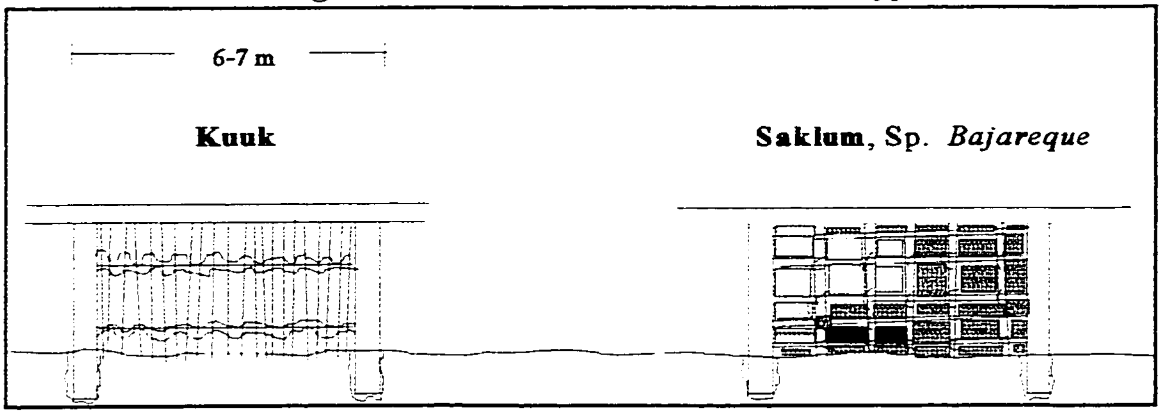
Planks are of varying widths, depending on the diameter of the tree, and are commonly sawed to 2.5 m lengths. Ideally the timbers are cut or purchased at least a month before construction, as it can require a month to find enough warm, sunny days to dry the timber. Wet timbers are set to dry (**chaqik**) against the horizontal roof beam or a random tree and must receive a solid three days of sun to dry adequately and minimize warp. A good carpenter will shave 45 degree angles into the board lengths with a carpenters plane in order to create a type of tongue and groove as in Figure 4.8. With boards sawed and tongued it is not long before the entire structure is walled. The most difficult placement is the plank closest to the ground. That plank is generally saved until last and is secured with a mound of dirt from the inner and outer wall.

Figure 4.8: A Q'eqchi' Tongue and Groove, Side View



Before there were planks at all, from either a hand saw or chain saw, two other wall types were common: **kuuk** and **saklum**. Although **kuuk** walls were rare, and **saklum** walls of

Figure 4.9: Alternative, Traditional Wall Types



the common, white mud impressed in a matrix of thin poles, were completely absent in Chajaneb, I did have occasion to see them in other communities and was told of their frequency in times past. The **kuuk** ("squirrel") variety is a simple conglomeration of vertical, thin-diameter posts that are driven slightly into the ground and held together with natural or metallic cordage known as **b'olok kuuk** ("squirrel's hem") that is woven in and out of each separate vertical slat. Another piece of cord is then threaded through all of the weaving for added support as in Figure 4.9. This is a common type of wall construction throughout Mesoamerica, although it is more frequently used for chicken or hog pens and is frequently glossed with the Spanish term *cerca* for "fence" (Collins 1996:66).

Whenever a road or pathway is cut in the Alta Verapaz, construction inevitably will slice into a vein of beautiful, coarse-textured, greyish clay: **saklum**.[1] Older folks of Chajaneb can remember a time where the majority of houses were constructed out of this grey clay, but

[1]The Spanish term for this construction type is *bajareque*. Houses made in this style were completely destroyed during the 1976 earthquake. This could very possibly be a reason for avoiding such construction in the present day (R. Hill, pers. comm. March 2001), although no one mentioned this during my stay in Chajaneb.

today one is hard pressed to find an extant sample. I was unable to persuade a family to reconstruct a miniature house of **saklum** and so I cannot describe the construction techniques in any detail. What may look from a distance as nicely crafted adobe blocks of **saklum** is actually nothing more than the course intrusion of the grey clay into a fabric of horizontally and vertically placed posts called a **koral** (Sp. *corral*). The collection, transport, and placement of the material, although difficult and time consuming, must have resulted in a wall design effective against the cold and rain that so characterizes the weather in highland Alta Verapaz.

With the house framed and walled, the last step in construction is the placement of the roofing material. In Chajaneb, that material was 65 percent corrugated zinc roofing sheets (**lamina**) and 35 percent grass thatch. The metallic roofing sheets are purchased in Cobán, or more expensively, in Chamelco, and are transported by truck to the Roi Max stop on the Chamelco to Chamil byway. The 1.2 by 2.4 m sheets are simply nailed into place and covered at the roof apex with a drip guard of the same material. **Lamina** houses offer little insulation against heat or cold, do not allow for smoke of the cooking fire to quickly escape, and are extremely loud when it rains, but their durability and ease of installation are making them the preferred roofing material in most regions of Guatemala including Chajaneb.

A grass roof is certainly more aesthetically pleasing to the Western eye searching for Maya authenticity. In Chajaneb, thatch comes from one of three principal sources: **k'al** (*Zea mays*), a large-leafed grass called **aq** (*Muhlenbergia macroura*)[2] or **utz'ajl** (*Saccharum officinarum*). The leaves of sugarcane, although a durable choice, are infrequently selected

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[2]**Aq** seems to refer to a class of large, useful grasses of which *Muhlenbergia macroura* is an important member.

because of the species rather patchy distribution. Nevertheless, casual conversation revealed that bundles of sugarcane are always used to thatch the roof peak.

Aq is a thatch source that tends to dominate annually inundated flood plains and can therefore exist in great stands, but access to these grass fields is not always open to anyone in need of thatch. Despite its abundance, to thatch a house with **aq** can take as many man-days of labor as does the framing and walling of an entire house (Wilson 1972:213). Corn is plentiful and dried corn leaves are especially available following the harvest in November. It is therefore the most common type of thatching material (see Figure 4.10). Thatching a house is a skill most men in Chajaneb have, although one family had a group of males known for their thatching skills. A roof of corn thatch is commonly repaired every year or every other year, but may require several episodes of repair to fend off a hard driving rain. Rethatching a house is by no means a pleasant task, as it involves evicting the thatch's mammalian and insect pests and swimming in large quantities of burned or carbon-caked corn leaf. Despite their appearance, a corn leaf —

Figure 4.10: Roof Thatch of Corn

dry or green — can inflict a gash in even the most calloused of hands. Bundles of dried corn leaf are collected into groups of about 25. Their length of 1 to 1.5 m is then simply doubled around a horizontal roofing beam (**sak che'**), making sure the terminus of the bundle sits atop the lower beam. In this way the majority of the roof is covered in two layers and the majority of waters are shed with little leakage. Thatched homes are warmer and quieter in the rain, but even though it is said a strong, continuous cooking fire will drive out most of the rats and insects, my personal experience does not support this claim. Wilson (1972:208) also reports the use of the imported sedge (**tam**, *Juncus marginatus*) as thatching for families with the most economic resources, although I never documented the use of this species in Chajaneb. Table 4.1 highlights some characteristics of the thatch materials mentioned in this section.

Table 4.1: Chajaneb Thatches, based on Wilson 1972:207

Common Name	**Scientific Name**	**Durability** (in years)	**Cost** (per 100lb, Q circ. 1968)	**Notes**
aq	*Muhlenbergia macroura*	15-20	0.3	common in poorly-drained bottomland
tam	*Juncus marginatus*	12-15	0.5	not used in Chajaneb
utz'ajl	*Saccharum officinarum*	5-10	0.25	used for peaks
k'al	*Zea mays*	1-3	0.15	most common in Chajaneb

Sa Mox Houses

With a few important, very interesting exceptions, the houses of Sa Mox differ little from their counterparts in Chajaneb. The anatomical structure, architectural terminology, labor time and specialization, construction practices, and beliefs regarding the strength of the house are essentially the same as described above. The differences are largely the result of the geological background of the region and the resulting vegetation, the availability and distribution of housing materials, the socioeconomic setting of the village itself, and the origins of the inhabitants.

The community of Sa Mox is wedged between a road and a river. On a larger scale the road follows a broad valley of the Rio Canhuinik between two abrupt ranges. Unlike Chajaneb, there is no want of flat land for the construction of a house. Where the ultimate motives for house construction are the same as in Chajaneb, house placement balances on two variables: proximity to the corn fields, and, much more importantly, proximity to the road. The road, as has been discussed previously, is a recent phenomenon and a driving force behind the social and economic characteristics of the entire community.

Where the community structure of Chajaneb must contend with rising populations through birth, in Sa Mox population rises from birth and immigration. In order to accommodate new arrivals to the area, the community's elected *comité* maintains a rough map and a policy for distributing household compounds. Applicants accepted into the community structure receive a designated plot of two *cuerdas* on which they can construct a house and plant their home garden. Such a policy simply cannot prevail in Chajaneb, where land is completely occupied and must be bought and sold by the will of individuals. The community structure of Sa Mox cannot deal with the rising problem that the best of land parcels — for house construction and *milpa* — have already been parceled out. Those new arrivals must either accept that they will receive less than ideal land resources or simply decide not to settle in Sa Mox.

Once the placement has been decided by the will of the *comité*, the process of construction proceeds as in Chajaneb with the bulk of the initial energy going to the selection and placement of the main posts — **eb' li oqech**. **Tz'aj** (*Perymenium grande*) is quite

Table 4.2: Lowland Construction Choices; Roof: 1=lamina; 2=thatch; Wall: 1=Board; 2="kuuk"

House	Origin	Roof	Wall	WallSp1	WallSp2	RoofSp1	Oqech1	Tz'amb'a1	Tz'amb'a2
LQ1	Pururla	1	1	kub' te'	san juan	lamina	muuy	suu chaj	
LQ2	Chamelco	1	1	kub te'		lamina	muuy	kix poy	
LQ3	Carchá	1	1	san juan		lamina	wachil	suu chaj	
LQ4	Chamelco	1	1	san juan		lamina	muuy	cha'ib'	
LQ5	Tamahu	1	1	san juan		lamina	wachil	suu chaj	
LQ6	Lanquín	1	1	san juan		lamina	ich malau	san juan	
LQ7	Panzos	1	1	san juan		lamina	wachil	san juan	
LQ8	Chamelco	2	2	puj b'ach		komum	wachil	suu chaj	
LQ9	Tucuru	1	2	suu chaj		lamina	wachil	kix poy	
LQ10	Carchá	1	1	suu chaj		lamina	wachil	sahab'	
LQ11	Carchá	1	1	sib'ik te'	san juan	lamina	wachil	suu chaj	
LQ12	Lanquín	1	2	suu chaj		lamina	muuy	q'an xan	
LQ13	Tactic	2	2	pong jor		komum	wachil	manzan che'	
LQ14	Chamelco	2	2	kik che'	kub' te	aq	wachil	suu chaj	
LQ15	Chamelco	1	2	suu chaj		lamina	muuy	leech	
LQ16	Jutiapa	1	1	san juan	kik che'	lamina	muuy	suu chaj	
LQ17	Chamelco	1	2	sahab'	san juan	lamina	muuy	q'an xan	suu chaj
LQ18	Cobán	1	2	sahab'		lamina	wachil	suu chaj	q'an paraway
LQ19	Chamelco	1	2	pong jor	su chaj	lamina	wachil	sak atzum	suu chaj
LQ20	Carchá	1	1	pong jor		lamina	wachil	san juan	suu chaj

common as a roadside weed, but rarely if ever attains the proportions of its counterpart in the highlands; the tree fern *Alsophila arborea* (**ch'ut**) is extremely rare. However, the migrants of Sa Mox are in no way short of rot-resistant hardwoods that would be perfect for main posts. Three tree species were elicited as the most appropriate for posts: **wachil** (*Dialium guianense*), **muuy** (*Manilkara zapota*), and **ich malau** (*Tibouchina longifolia*). This pattern, where Sa Mox residents are faced with and take advantage of a more variable source of construction materials, is repeated in other arenas of architecture. Table 4.2 summarizes some of the variability of lowland construction choices. Extrapolating from the data, **wachil** makes up 60 percent, **muuy** 35 percent, and other species up to 5 percent of the house posts in the community of Sa Mox. But, as these tree species frequently attain dbh's of well over 80 cm at maturity, rarely if at all are the trees used as they are — they must be processed into 4X4s or 2X2s. Anyone who has ever attempted to haul a *Manilkara zapota* 4X4 through the woods will soon tell you that no one would ever consider trying to work that plank with a handsaw. The density of these woods (*Manilkara zapota* has a specific gravity of 1.2 compared with .35 for most pines; Harrar 1958:129; see Figure 4.11) requires a chainsaw for processing and, not surprisingly, many families own or want to own a chainsaw.

Figure 4.11: *Manilkara* posts

The economics of owning and operating a chainsaw will be discussed in the section of woodcutting, but a brief note on technique must appear here as it is specific to the work of house construction in Sa Mox. Where for wall boards the chainsaw operator uses a steel guide to slice planks from the mother log, for main posts (which most frequently measure 12X12 cm as in Figure 4.11) and the roof rafters (whose size's vary) all the work is done "freehand." In other words, a mother log simply sits on the ground and the operator pieces the planks by first scarring the log with the end of the chainsaw blade and then following his mark through the entire diameter. This requires significant practice and, as negative results can be quite expensive or dangerous, woodcutting has developed into quite a specialty in Sa Mox. Beginners will start out with felling trees, progress on to cutting wall boards, and finally obtain the dexterity to cut posts freehand. Expert freehand logsmiths not only have significant economic opportunities in the Sa Mox area, but also tend to accumulate a degree of social capital with their skill.

At this point it is important to point out the "decision" chain that is starting to emerge regarding house construction in the lowlands. It moves in a series of interdigitated characteristics and shapes future decisions, e.g., the density of wood drives woodcutting behavior with a chainsaw which in turn means that most architectural angles will be 90 degrees. This pattern continues when it comes to the attachment of roofing rafters. Construction material cut with a chainsaw produces flat surfaces; flat surfaces are attached much more efficiently with nails than are rounded surfaces. With the flatness of surface, the rather time consuming process of gathering strapping from trees like the abundant *Bauhinia herrerae* becomes much less

Figure 4.12: The Changing Roof Structure

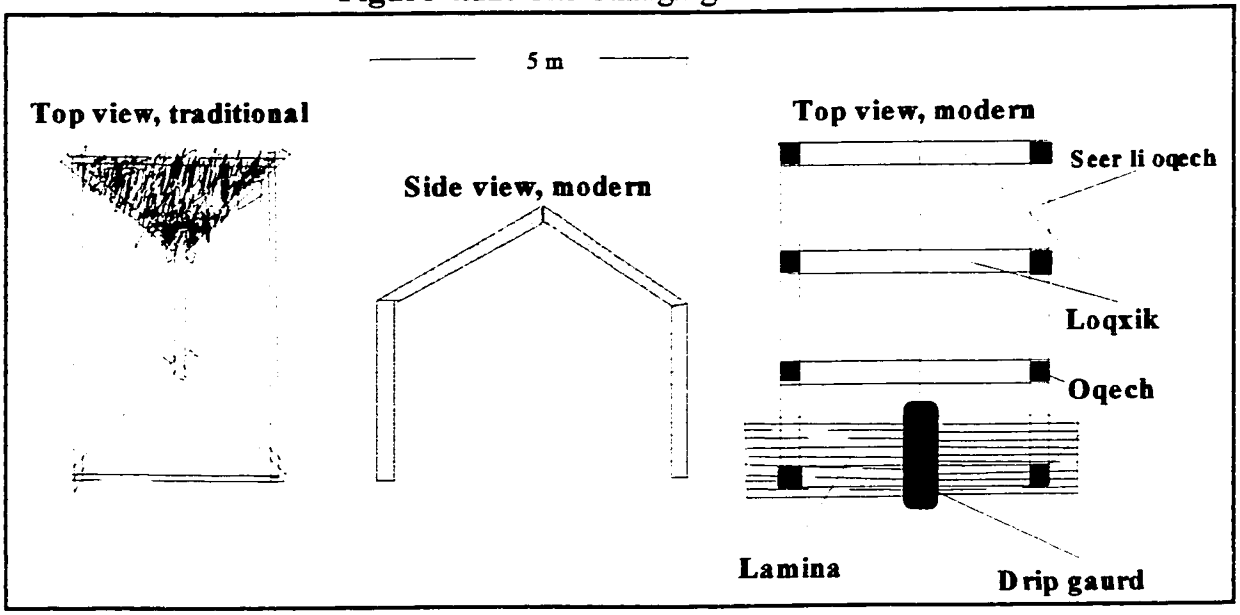
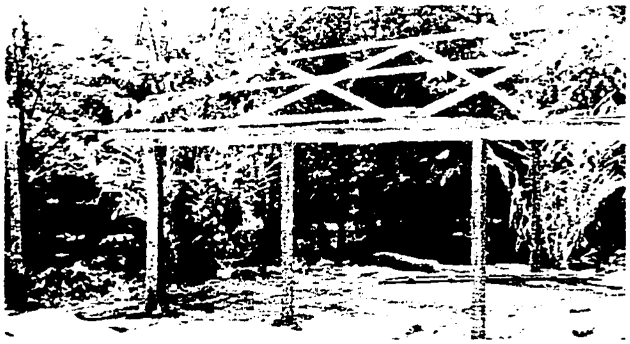


Figure 4.13: The Lowland House Frame



efficient.[3] Also, although men are adept at cutting right angles with a machete blade, the use of a chainsaw allows the production of these and other important angles at a much reduced input. As a result, the architecture of roofing rafters changes. Now, instead of nesting the ridgepole in the crotch of the two pairs of the **loqxik**, angles can be cut into many pairs of **loqxik** as in the Figure 4.12 and 4.13.

The various horizontal and roof rafters can be made from a variety of species. From

[3]*Bauhinia herrerae* is commonly considered the most important strapping and lashing material in the Maya lowlands. The bark of this common, fabaceous tree is stripped and doubled over on its inner surface. This tough, doubled-over bark is then rolled into huge wheels that are stored or sold to market. When the strapping is needed, it is simply rehydrated by soaking in water so that a degree of flexibility is regained (Standley and Steyermark 1958 (V):92). The tree is very rarely found above 300 m and is infrequently used in the highlands.

Table 4.1 **suu chaj** (*Parathesis donnell-smithii*) was the most frequently used species at 40 percent of the sample. **San Juan** (*Vochysia hondurensis*) represented 15 percent of responses, **k'ix poy** (unidentified) and **q'an xan** (*Terminalia amazonia*) at 10 percent, and the other five species used are all light and very common in both disturbed and primary forest. Although these softer, lighter species are better for materials like roofing rafters, many times when a large individual of *Manilkara zapota* or *Dialium guianense* is felled, there is more than enough wood to serve for the entire frame. For example, a large *Manilkara zapota* was cut by the community *comité* in order to fence in the schoolyard: the 146 cm diameter at breast height monster was whittled into 136 13X13 cm, 1.8 m-long posts with wood to spare. When trees like this are available, it is not uncommon to find house frames made of one species or of *one individual* as in Figure 4.13.

The pine (*Pinus pseudostrobus; Pinus oocarpa*) so common to the highlands (above 1000 m above sea level) that it could be considered a "weedy" species, supplies all the necessary, soft, easily-worked wall boards in Chajaneb. No species in the lowlands can match the ideal plank making characteristics of the pine, but two species of low specific gravities are most commonly cut as wall boards: **San Juan** (*Vochysia hondurensis*) and **kub' te'** (unidentified Leguminosae), both of which grow quickly enough to diameters that make plank cutting feasible and efficient.

Interestingly 9 of 20 houses (45 percent) employed the **kuuk** wall type as discussed above. Although planks are definitely the preferred wall material — to the point of being a marker of economic class — the **kuuk** construction makes excellent sense given the availability of materials and the climate. Where wall board species are certainly available in the vicinity, it still takes considerable effort to locate individuals of adequate size and shape. For **kuuk** construction, the builder is faced with a much less daunting task — small diameter trunks and limbs of **pong jor** (*Cecropia obtusifolia*), **kik che'**(*Castilla elastica*), and **puj b'ach** (*Inga spuria*) are much easier to come by. It was also noted that houses with **kuuk** construction allowed for increased ventilation and were considerably cooler than those with typical wall boards.

Finally, the roofing must be completed. As can be seen in Figure 4.12 and Figure 4.13, the decision to frame the roof with hardwood beams squared with a chainsaw necessitates that the traditional four-sloped roof be discarded in favor of the modern two-sloped roof. The very shallow pitches on these two-sloped roofs then require that the roofing material be of *lamina* rather than thatch, as a shallow-pitched thatch roof would be prone to leakage in the hard rains of the lowlands. Eighty-five percent of households surveyed in Sa Mox (n=17/20) have a roof of metal *lamina* with all its advantages and disadvantages as discussed above. Residents of the lowlands also must contend with serious heat for most of the year, and houses of *lamina* roof tops have the added disadvantage of becoming extremely uncomfortable in the summer heat. Apparently, this discomfort is not enough to drive families to utilize thatch roofs.

The decision to thatch is also dependent on economic considerations. Much as planked walls are considered an economic advance over their **kuuk** counterparts, families that thatch often simply do not have the economic resources to buy *lamina* for their roof. In the lowlands, although all of the highland species of grasses and sedges enumerated in Table 4.1

are available for thatching, thatchers are much more confident in the lasting properties of palm leaves. Palm leaves, whether of **komum** (*Cryosphila argentea*) or especially in the case of **mapach** (*Orbignya* sp.), are also less cumbersome to attach to the web of rafters (**sak che'**) than bundles of grass. Approximately 30 large *Orbignya* leaves can be lashed to the rafter web in under two hours and can serve as solid protection from the elements for 10-12 years. I have no time allocation or coverage data for the much smaller fan-palm leaves of *Crysophila argenta* but they apparently approximate the durability of the *Orbignya* palm.

***

Despite the disheveled appearance to the Western observer, the Q'eqchi' house is a complicated amalgam of plant and non-plant materials that requires a degree of technical sophistication. This sophistication has in turn inspired a degree of specialization, but, in general, every man in both of the communities is a house builder and thus familiar with the various and sundry architectural components, choices of material, and building techniques. The movement of people to the lowlands has required a certain strategizing as new materials become available, old materials are lost, and new requirements appear. More than any other segment of plant use, in house construction the change of plant resources initiates a chain of behavioral accommodations: higher density woods increase the need to use a chainsaw; the use of a chainsaw sets the architectural angles; the roof design becomes simplified due to the ability to cut right angles and the classic Maya hip roof is lost; with just two roof sides, *lamina* becomes the more common roofing material. These behavioral accommodations then have secondary effects from the effect on Q'eqchi' household economy — e.g., the need to *purchase* **lamina** — to the effect on flora — e.g., the decreased pressure on palm species in the forest.

Chapter Five: The Home Garden

The Maya home garden, also known variously as house garden, dooryard garden, *solar*, kitchen garden, and *huerto*, has been the subject of many ethnobotanical studies. In many instances these home gardens have been portrayed as masterpieces of botanical tapestry, mimicking the surrounding tropical forests and thus touted as "agroforestry systems" (e.g., Caballero 1992; Gispert et al. 1993; Rico-Gray et al. 1990). Although these gardens were most commonly discussed in the Maya area, others have recognized a distinct human-botanical interface labeled "home garden" in other areas of the world as well (e.g., Agelet et al. 2000 for Catalonia, Rugalema et al. 1995 for Tanzania, Soemarwoto et al. 1985 for Java). Worldwide, the home garden is often sketched as technically sophisticated, forest-mimicking, and demonstrative of human ecological nobility. My experience in and with the home gardens of Alta Verapaz does not completely corroborate this characterization.

Realistically, Q'eqchi' home gardens are workshops of cultivar variability and cultural information and do, therefore, deserve the attention of ethnobotanists. Instead of viewing them as technically complex, forest-mimicking "systems," it is more realistic to view Q'eqchi' gardens — and perhaps other Mayan home gardens — as more or less spontaneous, utilitarian gardens that constitute unique productions of human beings designed to serve the needs of the gardeners, not the ideals of conservationists. The corpus of plants maintained in these gardens is diverse, but in no way mimics the surrounding forest. Plant placement is highly variable and tends to be augmentative, that is, gardeners plant new species based on the placement of previous plantings. Plants serve the economic, health, food, and aesthetic needs of the family in a way that could hardly be described as a logical system, ecosystem, or agroforestry ecosystem (Collins 1999). The gardens are indeed a conglomeration of trees, herbs, and vines, but beyond that, the systemic nature of gardens is tenuous.

Plants accumulated in home gardens are important economically, nutritionally, aesthetically, medicinally and in many other ways, but interestingly the space where these plants are cultivated is not labeled in the same way we use the term "garden" or *ladinos* use "jardín," "huerto,"or "solar." Only after continuous prodding could the phrase **xna'aj li awimk** (literally, "place of the cultivars") or **xna'aj li utz'u'uj** (literally, "place of the flowers") be elicited. Clearly, this area around the house where many varieties of plants are cultivated or encouraged does not have the same psychological saliency as the **k'al** where corn is grown in monoculture or in association with just beans and squash. The linguistic ambiguity of the home gardens makes perfect sense for what can be observed in Chajaneb: where in isolated cases a fence clearly marks the division between the garden and some other vegetation zone, this is not the trend. In the vast majority of cases, a home garden slowly fades into corn field, bean field, or forest. In Sa Mox, where family compounds and houses are more tightly compact, the exact line that defines home gardens is somewhat more recognizable. In either case, this characteristic makes it especially difficult to measure adequately garden sizes. Where I could estimate the area of Chajaneb gardens to be about 30X50 m, and the home gardens of Sa Mox to be slightly smaller, the ambiguous nature of gardens makes it impossible to say much quantitatively about their size. As in previous chapters, I discuss in turn Chajaneb home gardens, Sa Mox home gardens, and then compare them. Comparisons will show that more variation exists in gardens and among gardens in the highlands than the lowlands, and that lowland family place of origin is not a good predictor of garden compositions in their new home.

The Composition and "Structure" of Chajaneb Home Gardens

During my 12-month stay in the community of Chajaneb, I conducted a total of 30 home garden inventories. As these inventories were largely conducted at midday when men were typically working away from the home, the informants that helped me identify the plant names and uses of the garden were largely female. Casual conversation also seemed to indicate that these gardens were more the domain of females and that indeed, where the garden was concerned, women knew more about the various plant types, characteristics, and uses. Women casually led me through their garden and confidently gave me the names of all the plants that they considered as **awimk** which, as noted above, can be glossed "cultivar." These **awimk** are ideologically and cognitively separate from plants that are considered **namok**, or "simply there." Plants that could be considered as volunteers or those plants that are encouraged if not actually planted generally fall into the **awimk** class, although the boundary is hazy. A simple list of Q'eqchi' common names was collected with pad and pen and then this list was brought into the household following the inventory to solicit the various plant uses. In some cases an attempt was made to collect voucher specimens, but as this sometimes was not acceptable to informants, the scientific name was determined based on the Q'eqchi' common name.

Table 5.1: The Chajaneb Garden Inventory

Scientific Name	Plant Family	Common Name	Uses	Frequency %
Zea mays	Poaceae	k'al	S-e; L-th	96
Coffea arabica	Rubiaceae	kape	S-e; L-m	96
Citrus sinensis	Rutaceae	chin	F-e; L-m	92
Sechium edule	Cucurbitaceae	ch'ima	F-e; L-e	92
Persea americana	Lauraceae	o	F-e	86
Hippeastrum solandiflorum	Amaryllidaceae	saqi choop	Fl-d	83
Calathea allouia	Marantaceae	moxl	L-wr	79
Persea shiedeiana	Lauraceae	koyou	F-e	79
Prunus persica	Rosaceae	loraz	F-e	79
Solanum nigrum	Solanaceae	maak'uy	L-e	79
Alocasia macrorhiza	Araceae	saqi oxl	T-e	75
Cucurbita moschata	Cucurbitaceae	k'um	F-e; T-e	71
Ipomoea tiliacea	Convolvulaceae	saqi is	T-e	67
Phaseolus coccineus	Fabaceae	lol kenq'	S-e	67
Tagetes erecta	Asteraceae	q'ani tutz	Fl-d	67
Chamaedora sp.	Arecaceae	k'ib'	I-e; L-d	63
Musa X sapientum	Musaceae	saqi tul	F-e; L-wr; Tr-m	63
Pouteria viridis	Sapotaceae	rax tul	F-e	63
Physalis philadelphica	Solanaceae	mil tomat	F-e	63
Amaranthus caudatus	Amaranthaceae	ses	L-e	58
Cyphomandra betaceae	Solanaceae	che' pix	F-e	58
Phaseolus coccineus	Fabaceae	nun kenq'	S-e	58
Musa X *sapientum*	Musaceae	keneey tul	F-e; L-wr	58
Saccharum officinarum	Poaceae	utz'ajl	Tr-e; L-th	58
Portulacca sp.	Portulaccaceae	gradiyol	Fl-d	58
Dhalia variabilis	Asteraceae	moroy tz'oloj	L-e	54
Colocasia esculenta	Araceae	malang	T-e	50
Ananas comosus	Bromeliaceae	ch'op	F-e	46
Bixa orellana	Bixaceae	xayau	S-e	46
Musa X *sapientum*	Musaceae	tzuul tul	F-e; L-wr	46
Annona cherimolia	Annonaceae	tzurmuy	F-e	46
Hippeastrum solandriflorum	Amaryllidaceae	kaqi choop	Fl-d	42
Hippeastrum puniceum	Amaryllidaceae	asusena	Fl-d	42
Canna indica	Cannaceae	tz'ukl	L-wr; Fl-d; S-msc	42
Furcrea guatemalensis	Agavaceae	ik'e	L-c	42
Mentha citrata	Lamiaceae	kaxlan isk'i'ij	L-e	38
Musa X *sapientum*	Musaceae	kaqi tul	L-wr; Tr-m	38
Psidium guajava	Myrtaceae	kaqi pata	F-e	38
Citrus limonia	Rutaceae	lamuj	F-e; L-m	33
Citrus limetta	Rutaceae	lim	F-e; L-m	33
Eryngium foetidum	Apiaceae	samat	L-e	29

Table 5.1 cont. Scientific Name	Family	Common Name	Uses	Frequency
Hypoanthus verbenaceus	Violaceae	isk'i'ij pur	L-e	29
Manihot esculenta	Euphorbiaceae	tz'in	T-e	29
Musa X *sapientum*	Musaceae	manzan tul	F-e; L-wr	29
Hydrangea macrophylla	Saxifrageaceae	ortenz	Fl-d	25
Rubus adenotrichus	Rosaceae	tokan	F-e	25
Capsicum lanceolatum	Solanaceae	k'um ik	F-e	21
Eriobotyra japonica	Rosaceae	nisp	F-e	21
Inga micheliana	Fabaceae	chochokl	E-sh	21
Pasiflora ligularis	Passifloraceae	granadix	F-e	21
?	Araceae	kartuch	Fl-d	21
Pyrus communis	Rosaceae	per	F-e	17
?	Agavaceae	kanya/mau	L-c	17
Citrus reticulata	Rutaceae	mandarin	F-e; L-m	17
Elettaria cardomomum	Zingiberaceae	tz'i'	S-e	17
Pimienta dioca	Myrtaceae	pens	S-e; L-m	17
Mangifera indica	Anacardiaceae	mank	F-e	17
Catoferia chiapensis	Lamiaceae	chinchinbajlak	L-m	17
Ocimum micranthum	Lamiaceae	albaka	L-m	17
Musa X *sapientum*	Musaceae	saqi keenay	F-e; L-wr	17
Alocasia macrorhiza	Araceae	kaqi oxl	T-e	13
Dioscorea alata	Dioscoreaceae	piyaq	T-e	13
Crinum erubescens	Amaryllidaceae	rey	Fl-d	13
Impatiens balsamina	Balsaminaceae	utz'u'uj	Fl-d	13
Lepidium lasiocarpum	Brassicaceae	isk'i'ij	L-e	13
Capsicum annum	Solanaceae	b'ak ik	F-e	13
Nicotiana tabacum	Solanaceae	may	L-m; L-msc	13
Ruta graveolens	Rutaceae	arud	L-m	13
Cucurbita pepo	Cucurbitaceae	ik'oy	F-e	8
Byrsonima crassifolia	Malpighiaceae	ch'i	F-e	8
Acrocomia mexicana	Arecaceae	map	F-e	8
Bacopa procumbens	Scrophulariaceae	xa'aw tz'i'	L-m	8
Coriandrum sativum	Apiaceae	kulandra	L-e	8
Portulacca oleraceae	Portulaccaceae	paxlak	Fl-d	8
Brassica oleraceae	Brassicaceae	repoy	L-e	8
Musa X *sapientum*	Musaceae	maysena tul	F-e; L-wr	8
?	?	escuela	Fl-d	8
Hippeastrum solandiflorum	Amaryllidaceae	k'oki choop	Fl-d	8
Pimpinella anisum	Apiaceae	anis	L-m; S-e	8
Andropogon achoenanthus	Poaceae	te limon	L-m	8
Tagetes erecta	Asteraceae	kaqi tutz	Fl-d	4
Lycopersicon esculentum	Solanaceae	pix	F-e	4

Table 5.1 Cont. Scientific Name	Family	Common Name	Uses	Frequency
Ipomoea batatas	Convolvulaceae	kaqi is	T-e	4
Ipomoea batatas	Convolvulaceae	q'ani is	T-e	4
Ipomoea batatas	Convolvulaceae	moray is	T-e	4
Solanum tuberosum	Solanaceae	kaxlan is	T-e	4
Dahlia variabilis	Asteraceae	saqi tz'oloj	Fl-d	4
Dahlia variabilis	Asteraceae	q'ani tz'oloj	Fl-d	4
Dahlia variabilis	Asteraceae	kaqi tz'oloj	Fl-d	4
Spondias purpurea	Anacardiaceae	rum	F-e	4
Psidium guajava	Myrtaceae	saqi pata	F-e	4
Capsicum annum	Solanaceae	kot ik	F-e	4
Capsicum annum var. *aviculare*	Solanaceae	chiltep	F-e	4
Capsicum annum	Solanaceae	saqi ik	F-e	4
Spathyphyllum blandum	Araceae	tz'ab'al	Fl-e	4
Malus pumila	Rosaceae	manzana	F-e	4
Brassica oleraceae	Brassicaceae	brok	Fl-e	4
Pouteria mammosa	Sapotaceae	sapot	F-e	4
Balsamina sp.	Balsaminaceae	sosol q'een	L-m	4
Anthurium montanum	Araceae	kartuch	I-d	4
Allium cepa	Liliaceae	seboy	T-e	4
Cucurbita moschata	Cucurbitaceae	huikoy	F-e	4
Matricaria chamomilla	Asteraceae	manzaniy	I-m	4
Hibiscus rosa-sinensis	Malvaceae	klavel	Fl-d	4
Lycaste virginalis	Orchidaceae	saqi hix	I-d	4
Lythrum vulnerarium	Lamiaceae	kolo isk'i'ij	L-e	4
Heliconia latispatha	Strelitziaceae	kerk	L-wr	4
Jasminum multiflorum	Oleaceae	hasmin	I-d	4
Rannunculus pilosus	Rannunculaceae	q'an ru	I-m	4

Use Key

Capital Letters–Plant Part
F=fruit
L=leaf
T=tuber
Fl=flower
S=seed
Tr=trunk
E=entire Plant
I=inflorescence

Lowercase Letters–Use
e=edible
th=thatch
m=medicinal
d=decoration
wr=wrapping
c=cordage
s=shade
msc=miscellaneous

Figure 5.2:

Highland

Presence/																															
Absence	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Totals
Totals	40	36	28	28	40	37	28	32	45	25	23	36	34	28	17	12	29	31	34	53	24	24	32	79	35	36	23	26	29	26	
chin	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	29
k'al	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	29
kape	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	29
ch'ima	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	27
o	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*			*	*	27
moxl	*	*	*	*	*	*	*	*	*	*	*	*					*	*	*	*	*	*	*	*	*	*	*	*	*	*	26
k'um	*	*	*	*	*	*		*	*	*		*	*			*	*		*	*	*	*	*	*	*	*	*	*	*	*	25
loraz	*		*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*			*	*			*	*	*	24
saqi choop	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*		*	*			*	*	*		*	*	*	*		24
koyou		*	*		*	*	*	*	*	*	*	*	*	*			*	*	*	*	*	*		*	*	*		*		*	23
saqi oxl	*	*		*	*	*	*		*	*	*	*	*	*		*	*	*	*				*	*	*	*	*		*	*	23
maak'uy	*	*	*		*	*			*		*	*	*	*		*	*	*	*	*	*	*	*	*		*		*		*	22
lol kenq'		*			*			*	*	*	*	*	*	*	*		*		*	*	*	*	*	*	*	*	*			*	21
nun kenq'	*	*	*	*	*			*	*			*		*		*	*		*	*			*	*	*	*	*	*	*	*	21
rax tul	*	*	*	*	*	*	*	*	*		*			*				*	*	*			*	*	*	*	*	*	*		21
saqi tul	*		*	*	*		*	*	*	*		*	*	*	*	*	*				*	*		*	*			*	*	*	21
utz'ajl	*	*	*	*		*		*	*			*	*				*		*	*	*	*	*	*	*		*	*	*	*	21
che' pix			*	*	*		*	*	*	*	*	*	*				*	*	*	*	*			*	*	*		*	*		20
k'ib'	*	*			*	*	*	*		*			*				*	*	*	*		*	*	*	*	*				*	18
qani tutz	*	*	*	*	*	*			*		*	*	*				*	*		*			*	*	*			*	*		18
saqi is	*		*	*	*	*	*		*	*	*			*			*	*		*	*			*				*	*		17
ch'op	*	*	*		*	*			*					*					*	*			*	*	*	*	*	*		*	16
saqi tz'oloj	*	*		*	*	*		*	*				*		*			*	*	*			*	*			*		*		16
ses	*	*				*		*	*	*	*		*	*	*				*	*	*	*		*						*	16
tzurmuy	*	*	*	*		*	*	*	*			*	*											*	*	*	*		*	*	16
xayau	*	*		*	*	*	*		*				*							*	*			*	*	*	*		*	*	16
ik'e			*	*	*				*		*	*					*			*			*	*	*	*	*	*	*		15
mil tomat	*		*		*		*		*	*		*	*	*			*		*	*			*	*				*			15
gradiyol	*		*		*	*	*		*				*	*					*		*		*	*		*		*			14
malang		*			*			*		*		*	*	*						*	*	*		*	*	*					13
tz'ukl	*		*					*							*		*	*		*		*	*	*			*	*			12

**Presence/
Absence cont.**

tzuul tul			*		*	*	*		*			*			*	*				*		*		*	*						12
asusena					*	*			*		*		*				*	*					*	*	*	*					11
keneey tul					*	*	*	*	*		*	*						*	*					*						*	11
tz'in	*			*	*	*	*		*											*				*	*		*		*		11
samat	*							*	*				*					*		*	*			*		*				*	10
saqi pata										*	*	*	*	*				*		*				*		*				*	10
isk'i'ij pur		*	*					*							*		*			*				*		*		*			9
kaqi choop		*					*	*						*			*	*				*	*						*		9
kaxlan isk'i'ij									*	*		*	*	*						*			*	*		*					9
manzan tul		*				*			*									*	*			*	*	*	*						9
tokan	*	*					*		*			*		*					*	*				*							9
kaqi tul	*	*					*					*	*				*			*				*							8
lamuj				*	*						*	*							*	*				*					*		8
lim				*						*			*	*				*		*					*				*		8
saqi keenay		*					*									*			*					*	*	*	*				8
tz'i'		*	*										*	*				*		*				*				*			8
granadix				*	*										*				*	*				*					*		7
pens			*			*		*				*												*		*		*			7
utz'u'uj	*			*											*					*							*		*	*	7
arud									*				*								*			*	*					*	6
kaqi oxl	*	*							*											*				*	*						6
ortenz		*			*														*			*	*	*							6
xak aceit				*			*	*											*					*					*		6
chochokl						*						*						*	*					*							5
isk'i'ij						*		*												*				*		*					5
nisp						*	*		*									*						*							5
rey	*			*						*										*				*							5
b'ak ik												*		*						*				*							4
chinchinbajlak																				*		*				*			*		4
kanya	*	*																			*			*							4
kaxlan is		*			*				*			*																			4
klaux	*				*																		*	*							4
mandarin	*					*																		*			*				4
mank						*	*											*						*							4

Presence/
Absence cont.

per	*				*														*				*								4
te limon																			*			*	*		*						4
albaka													*				*	*													3
escuela																			*				*			*					3
ik'oy					*									*									*								3
kaqi tutz																			*					*	*						3
klavel					*												*						*								3
kotz ik											*				*								*								3
may									*								*						*								3
moray is	*																						*	*							3
piyaqj	*				*																		*								3
repoy									*			*			*																3
xa'aw tz'i'									*										*				*								3
chiltep		*																					*								2
kaqi pata						*													*												2
kartuch																					*									*	2
k'oki choop		*																				*									2
kulandra									*	*																					2
k'um ik			*						*																						2
map						*																	*								2
maysena tul								*											*												2
minis tul																	*				*										2
moroy tz'oloj																							*	*							2
ook																						*			*						2
paxlak																							*	*							2
pix	*																								*						2
qani is																			*				*								2
rum						*				*																					2
saqi hix								*										*													2
xan xiyra																									*	*					2
anis																						*									1
brok												*																			1
ch'i																							*								1
kaqi is																							*								1

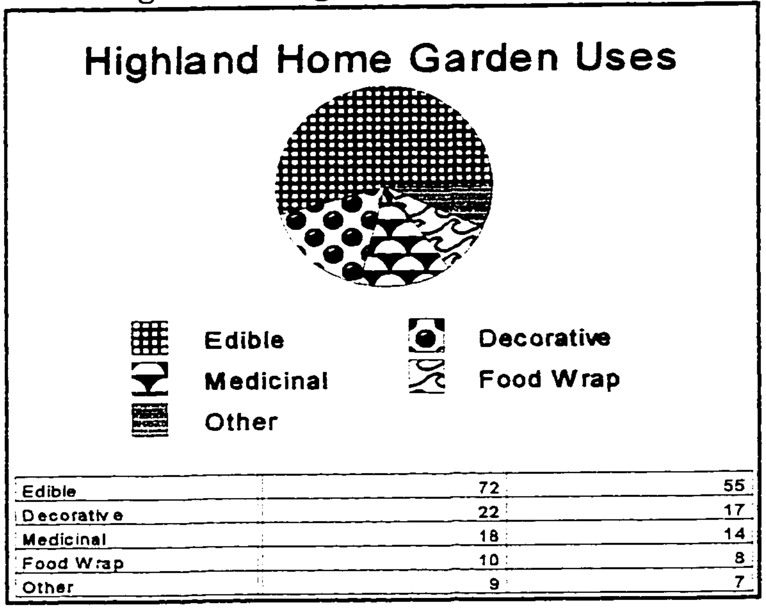
**Presence/
Absence cont.**

kaqi tz'oloj																								*							1
kerk																				*											1
makadam								*																							1
manzana												*																			1
manzaniy															*																1
q'an ru		*																													1
qani tz'oloj																								*							1
sal tul																					*										1
saqi ik																												*			1
seboy													*																		1
sosol q'een																						*									1
tz'ab'al																				*											1
Totals	40	36	28	28	40	37	28	32	45	25	23	36	34	28	17	12	29	31	34	53	24	24	32	79	35	36	23	26	29	26	

Table 5.1 enumerates all of the plants named during the inventories, highlights their uses, and notes their frequency of appearance across the 30 Chajaneb gardens. Table 5.2 lists the solicited plant names and notes their presence and absence in each of the 30 gardens.

One hundred eleven Q'eqchi' plant varieties were solicited in the 30 home gardens interviewed. These 111 varieties were composed of 45 plant families, 74 genera, and 88 botanical species. As 16 percent of the highland garden plants fulfill more than one use, a total of 131 uses were tabulated from the 111 plant varieties. In terms of utility, food plants dominated and comprised 55 percent of use within the 30 gardens. Plant for decorative purposes (17 percent) and medicine (14 percent) followed in a distant second and third, respectively. Figure 5.1 summarizes the use of garden plants in terms of a use category per 131 total uses. Included in the edibles are the near omnipresent corn, beans, and squashes, but a surprising number of fruit trees can be found in these highland home gardens. Four species of the genus *Citrus* are found in the highland gardens. In Chajaneb, all of these species are about at their temperature and altitudinal maximum. More deleterious to the successful cultivation of

Figure 5.1: Highland Home Garden Uses



the *Citrus* species, however, is the ubiquitous moisture and concomitant fungal infections. Families often are not careful in ensuring adequate space between trees, and, with no room for draft and transpiration, leaf and fruit can rot on the tree. Most oranges (*Citrus sinensis*), which were introduced to Guatemala soon after the conquest, are of the seeded, Sevilla variety, but a few are seedless, navel oranges (**ch'up**) (Standley (V):408-410). The Q'eqchi' term for orange — **chin** — is apparently derived from the approximation and abbreviation of the Spanish *naranja china* (E. N. Anderson, pers. comm., October 2000). The lime (*Citrus limonia*) is the second *Citrus* species in terms of importance. But unlike the extremely widespread orange, the lime (**lamuj**, also a Spanish borrowing) can only be found in 33 percent of highland gardens. These fruits are highly sought after in the community, especially by the children who enjoy squeezing them and adding sugar water to make a lemonade.

The genus *Persea* is also an important genus for highland gardens, with *Persea shiedeiana* (**koiyo**) occurring in 79 percent of gardens and *Persea americana* (**o**) in 86 percent. The less common **koiyo** is considered the bastard brother of the more delicious, sought after, and expensive **o**, the American avocado. Interestingly, the avocado tree is one of the only trees where the label is generally preceded with the definite article, perhaps imparting a sense of respect — **li o** (the avocado tree). The avocado has a long and important history in the Alta Verapaz region, for it was here that the famous agricultural explorer Wilson Popenoe made many of his early expeditions in search of a proper variety to import to the United States. In 1917, Popenoe spent 16 months in some of the most remote areas of Alta Verapaz admiring and collecting avocados with the help of many Q'eqchi' and German-American colonists. He became so famous for his interest in avocados that upon entering a town he would frequently hear the remark, "*Ahí viene el gringo aguacatero!*" ("Here comes the American avocado-man") [(Rosengarten 1991:51)]. A salted avocado fruit and a few tortillas are frequent meals in the Verapaz, but the fruits are also commonly used to bait animals during a hunt.

Several other fruits familiar to the temperate palate are also well represented in the highland gardens of Chajaneb. The common peach (*Prunus persica*), a native of China, is common throughout the highlands of Guatemala, most commonly cultivated between 1400-2700 m above sea level. Because humans are in constant competition with birds and small mammals, peaches are never left to ripen on the tree, the small, immature, tart fruits being harvested when they reach two inches in diameter. As is common with most temperate fruits grown in the highland tropics, the winter daytime temperatures never drop enough to standardize the growth and development of the fruits (Standley 1948 (IV):467-469). As a result, these smallish fruits mature randomly throughout the year. These peculiar characteristics are also shared with the pear (*Pyrus communis*), although it is far less common than the peach, occurring in only 17 percent of the inventoried gardens.

The edible, domesticated banana has its phylogenetic roots in two wild species of Indo-Malaysia: *Musa acuminata* and *Musa balbisiana*. Although some have argued that the banana has a pre-Columbian presence, the written record suggests that Friar Thomás de Berlanga brought the banana to the Americas in 1516 from the Canary Islands (Simmonds 1966:313). Seven varieties of banana (*Musa* X *sapientum*) are grown in the 30 inventoried gardens of Chajaneb, with the white variety (**saqi tul**) being the most common, occurring in 63 percent of the home gardens. The white variety has a rather small fruit, averaging about 15 cm in length, but it is quite sweet, easy to grow by vegetative reproduction, and also used medicinally as an antiseptic. Of the other six varieties, only the **ch'ol tul** (literally, "wild man's banana") and **kaqi tul** (red banana) stand apart. The **ch'ol tul** is the large-fruited plantain that is commonly fried in oil, and is much more common in the lowlands of the north and in the Polochic River valley. The town of Panzós commonly boasts of having the largest, most delightful plantains and my personal experience underscores this opinion. The red banana is the only banana variety whose fruit is not consumed. The leaves are used to wrap large quantities of tamales during festival times. A final variety deserves mention for its name alone, **keenay tul**, which highlights the importance of the banana on the West Coast of Africa (Guinea coast).

Although 10 root crops appear amongst the 111 varieties of plants in the highland home gardens, common consumption is limited to just four varieties: *Alocasia macrorhiza* (**saqi oxl**), *Ipomoea tiliacea* (**saqi is**), *Colocasia esculenta* (**malang**), and *Manihot esculenta* (**tz'in**). The two *Alocasia* and *Colocasia* aroids are abundant both inside and outside gardens and are considered to be a delicacy, although the taste is extremely bland and mealy. All four are simply boiled and consumed, most commonly in the oily-frothed *caldo*. Manioc, the most important crop of the Amazon Basin and Equatorial Africa, is only grown in 29 percent of the highland gardens, but forms a more popular staple in the lowlands. It must be assumed that these highland manioc varieties are of the "sweet" variety, as they are not prepared with any prussic acid removing technology necessary for the "bitter" varieties.

Many other garden plants are consumed as spice and flavoring, contributing little to the nutritional component of the Q'eqchi' diet. The exception to this trend is the near omnipresent **maak'uy** (*Solanum nigrum*), grown in 79 percent of inventoried gardens. This common, almost weedy solanaceous herb is used as a flavoring in *caldos* and is known to have an extremely high concentration of iron, which is quite important for a diet based largely on starches. Its country cousin **mil tomat** (*Physalis peruviana*) (borrowed from Nahuatl, meaning "cornfield tomato") also has significant iron content (Standley 1948 (IV): 467-469).

Although the Q'eqchi' diet may appear bland to the Westerner, and perhaps even more monotonous, many Q'eqchi' households maintain a large number of spices to augment their starchy diet. Chile peppers (*Capsicum* sp.) commonly come to mind when thinking of Latin American foodstuffs, yet the four varieties of pepper appear very low on the list in terms of popularity (e.g., *Capsicum lanceolatum*, **k'um ik**, appearing in just 21 percent of highland gardens). The comparative absence of chile varieties in gardens is explained by informants as a function of both the time involved in preparation and the ease with which cheap chiles can be purchased in the market.

Much more common than the chiles are the abundant and diverse mints and mustards known as **isk'i'ij**: **kaxlan isk'i'ij** (*Mentha citrata*, "foreigner's **isk'i'ij**), **isk'i'ij pur** (*Hypoanthus verbenaceus*, snail's **isk'i'ij**), **isk'i'ij** (*Lepidium lasiocarpum*, the focal type, or "true" **isk'i'ij**), and **kolo isk'i'ij** (*Lythrum vulnerarium*). The etymology of **kolo** is problematic, stemming perhaps from "*kolonel*," or "colonel's **isk'i'ij**," or **k'ol**, which refers to male animals excluding birds (PLFM 1999:174). These spices are not centrally located, but scattered throughout the garden, as are the more cosmopolitan borrowings of oregano, *Ocimum* mints, and cilantro. It is not at all an uncommon occurrence to find these typical spices as semi-naturalized at the forest edges.

Second only to food plants in terms of popularity are decorative or ornamental plants. These plant varieties are used to decorate home altars and church altars and are commonly brought to market for sale. **Saqi choop** (*Hippeastrum solandiflorum*) appears in 83 percent of highland gardens, grows profusely in the wet highlands, and floods both the Chamelco and Cobán markets. The most esteemed decorative plant variety, **rey** (*Crinum erubescens*, Sp. for "king") can fetch as much as five Quetzales per individual at market as it is a slower growing, less frequently flowering decorative. The aroid **kartuch** (Q'eqchi' abbreviation of Sp. "cartucho," i.e., "shotgun shell") is such a successful and pioneering domesticated plant that it is not at all uncommon to see cattle fields spotted with white spathes.

For the highland home gardens, medicinal uses make up the third most popular category. Although 18 medicinal uses were recorded for garden plants, this number is somewhat inflated by the fact that 12 of the uses are associated with multi-use plants such as bananas or coffee. Qualitatively, it is safe to say that the majority of Chajaneb families do not use these plants for their medicinal qualities, especially given the community's recent proximity to a health clinic.

Food wrappings make up 10 percent of the 131 plant uses to be found in the highland gardens, although this number is also somewhat inflated, due to the many varieties of banana used in such manner. In reality, **moxl** (*Calathea allouia*) is the only food wrap of any importance. **Moxl** leaves are strong and pliable and the plants regenerate very quickly after harvesting. As many as one thousand tamales can be served at crop planting celebrations, requiring the same number of the ubiquitous **moxl** leaf. Women frequently grow row upon row of **moxl**, harvesting the leaves about once a month and bringing them to market to fetch about one half a Quetzal per bunch of 20. Banana leaves more commonly serve to envelop large quantities of tamales or line the bottoms and sides of plastic baskets. Although the leaves of **kerk** (*Heliconia latispatha*) and **tz'ukl** (*Canna indica*) are said to also be used as food wrappings, I never witnessed that. Most families maintain that these were the food wraps of the elders or those that the wild men of the forest (**ch'ol winq**)[1] use to wrap their tamales. Interestingly, the extremely hard seeds of **tz'ukl** are said to be used as grape shot in the home fabrication of munitions.

Beyond these principal uses, highland garden plants are used in many other diverse settings that must be labeled "miscellaneous." These plants include the popular **ik'e** (*Furcrea guatemalensis*) for the production of cordage as discussed in the previous chapter; sugarcane, **utz'ajl** (*Saccharum officinarum*), the raw material of the fermented beverage **b'oj**; and **chochokl** (various species of *Inga*) for coffee shade. A multitude of uses are embedded in the graphs above. The preparation and specific uses of the most important garden plants will be discussed in further detail in chapters yet to come.

The point has already been made that these highland gardens, although diverse

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[1]Although Westerners would classify the Q'eqchi' belief in the wild, **ch'ol winq** as folklore, most Q'eqchi' that I questioned about the nature of the **ch'ol winq** are adamant that the concept is reality that can be found in some areas of Northern Alta Verapaz and the Sierra de las Minas, south of the Polochíc river. The name refers to the nomadic groups of Chol speakers who were eventually incorporated into Q'eqchi' territory in 16th century *reducciones* (Wilson 1995:83-84).

workshops of cultivars and cultural knowledge, can hardly be thought of as hyper-organized agroforestry systems. Nevertheless, some mention must be made of the general structure of the gardens, no matter how erratic or unorganized. Corn is the most prevalent plant in Chajaneb gardens. As regional populations increase together with the demand for corn products, corn is grown in all corners of the *aldea*. This contributes to the lack of clear distinction between garden, forest, and agricultural field. The entire highland landscape is essentially part garden, part forest, and part field. Many ethnographic works have highlighted the Mesoamerican farmers' use of the corn stalk as garden trestle for climbing legumes — in Chajaneb this is true only of the corn and beans grown in gardens. As a crop in and of itself, the common black bean (*Phaseolus vulgaris*) is grown as a ground crop and not as a climbing legume. The **nun** and **lol** bean varieties, which are very common across the inventoried gardens, contribute only marginally to the overall diet of the Chajaneb Q'eqchi'. Beyond these legumes, the **granadix** (*Passiflora ligularis*, Q'eqchi' abbreviation of the Spanish "granadillo") and the cucurbitaceous tendrils of **chimaj** (*Sechium edule*) are the only other climbers common to the highland gardens. **Granadix**, particular its showy flower, really caught the attention of the 16th century Spanish immigrant. Missionaries used the fruit as an example of the passion of Christ, evidence that the savior had marked the new world. Its reds and purples were the colors of *semana santa*, the floral corona represented the crown of thorns, the stigmas were replicas of the Holy Trinity, and the five anthers signified the five mortal wounds of Christ (Olaya 1991: 28).

Beside corn (*Zea mays*), coffee (*Coffea arabica*) is the only other garden plant that is grown in long, ordered rows. Like the vast majority of coffee in the Alta Verapaz — in both large and small scale plantings — coffee is grown in the shade, most commonly beneath the broken canopy of one of several varieties of *Inga* sp. or the more dense shade of banana leaves. *Inga* sp. is also a popular, fast growing source of fuel wood, although a glance through the above tables would reveal the general *lack* of fuel woods in the highland gardens. I often questioned whether or not the common, weedy pine tree (*Pinus pseudostrobus*; *Pinus oocarpa*) could be considered as part of a garden's **awimk**. Where even-aged stands of nicely spaced trees stood in the garden area, it was obvious that indeed pines had been planted. However, pine was not considered fully under the rubric **awimk** by the majority of interviewed gardeners.

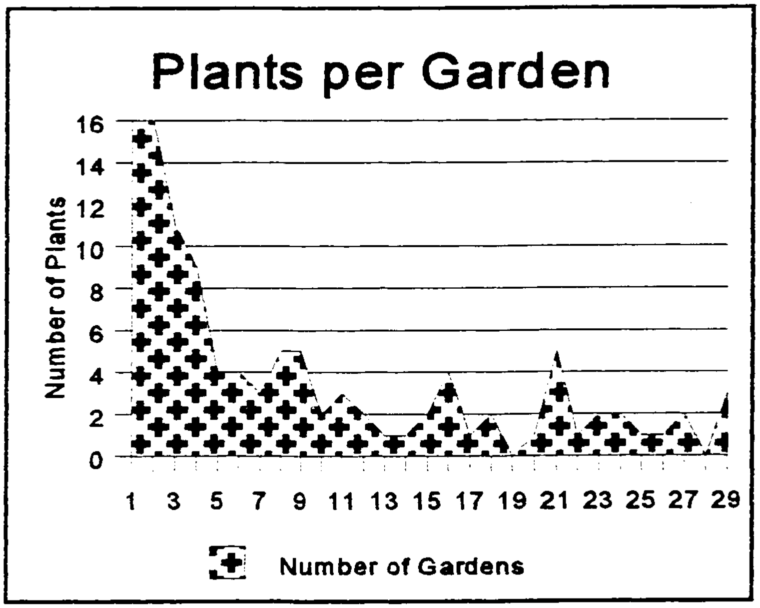
Although gardens tended to blend with less managed vegetative communities, a clean break in the garden was made where gardens abutted the public space of the community foot path, and, in this case, pine trees and other species of plants were used as borders. One of the several varieties of bananas or the ubiquitous *Furcrea* sp. agave were also popular choices for garden borders. These border plants should not be confused with the corner markers that sometimes denoted the corners of property. Despite the obvious importance of humans in their placement, these corner markers, which will be discussed in more detail in the chapter on agricultural fields, also fall outside of the **awimk** category.

Like the general lack of organization associated with the garden structure, the labor involved in garden maintenance is frequently scattered. Unlike the corn and bean fields which are tended at regular intervals and with a degree of organization and festivity, garden maintenance can best be described as opportunistic; that is, when time and manpower present themselves, the garden is weeded. Sheldon Annis' description of the *milpas* of San Antonio Aguas Calientes (1987:37-38) applies especially well to the home gardens of Santa Catalina Chajaneb: "... it (the *milpa*) tidies the environment. In a sense, the *milpa* acts as the horticultural equivalent of a pig — a biological transformer which recycles table scraps into pork — only in this case, the scraps include loose bits of unproductive time and pieces of miscellaneous information, as well as material and human wastes." Like a spoiled child, the corn stalks of the highland gardens receive constant and special attention. They are generally the only plants of the gardens that receive chemical fertilizer. Hoe (**asaron**) weeding, to be discussed in more detail in the chapter on agricultural fields and forests, is centered on cleaning the corn: the other garden plants receive a cleaning from the hoe *only* because there is corn nearby. The only other fertilizer applied to garden plants is from human and animal waste and the yearly or bienniall application of old thatch as houses receive a new roof.

Before moving on to the lowland home gardens, it is worthwhile first to note qualitatively and quantitatively the similarity or dissimilarity *among* these highland gardens. This will also allow for a better comparison between the highland and lowland data sets as wholes. The presence/absence data listed above in Table 5.2 is an asymmetric matrix where the 111 rows are every solicited highland garden plant and the 30 columns are each garden. An asterisk in a particular cell indicates the presence of particular plant in one of the 30 gardens, whereas a blank indicates that plant's absence. Analyzing the data contained in those 3,330 cells and the averages and standard deviations of the row and column totals can say a lot about the nature of the highland Chajaneb home gardens.

The 30 highland home gardens averaged 32.2 plants per garden with a range between 12 and 79 plants, a median number of 31 plants, and the mode, or most frequently occurring plant number, of 28. The standard deviation for this data set of 30 gardens is 11.96, indicating that if one were to inventory another Chajaneb home garden one could predict with 95 percent certainty that that garden would contain between 20 and 44 plant varieties (two standard deviations around the arithmetic mean). Looking across rows, the average plant appears in 8.73 or 29 percent of gardens (SD=8.23) with a range of one to 29 gardens, a median number of just five gardens, and a mode of just one garden. The bulk of this data set of 111 plant varieties occurs in just one garden, as is graphically displayed in Figure 5.2.

Figure 5.2: Distribution of Plant Varieties in Highland Gardens



Several points of interpretation can be made from these basic descriptive statistics. First, with the standard deviations of plants per home garden being so high, it ***does not*** appear that there is one culturally salient "model" for the number of plants that *should* be contained in highland home gardens. And, as the median at five (50 percent of the area beneath the curve in

Figure 5.3: Euclidean Distances of 30 Highland Q'eqchi' Gardens

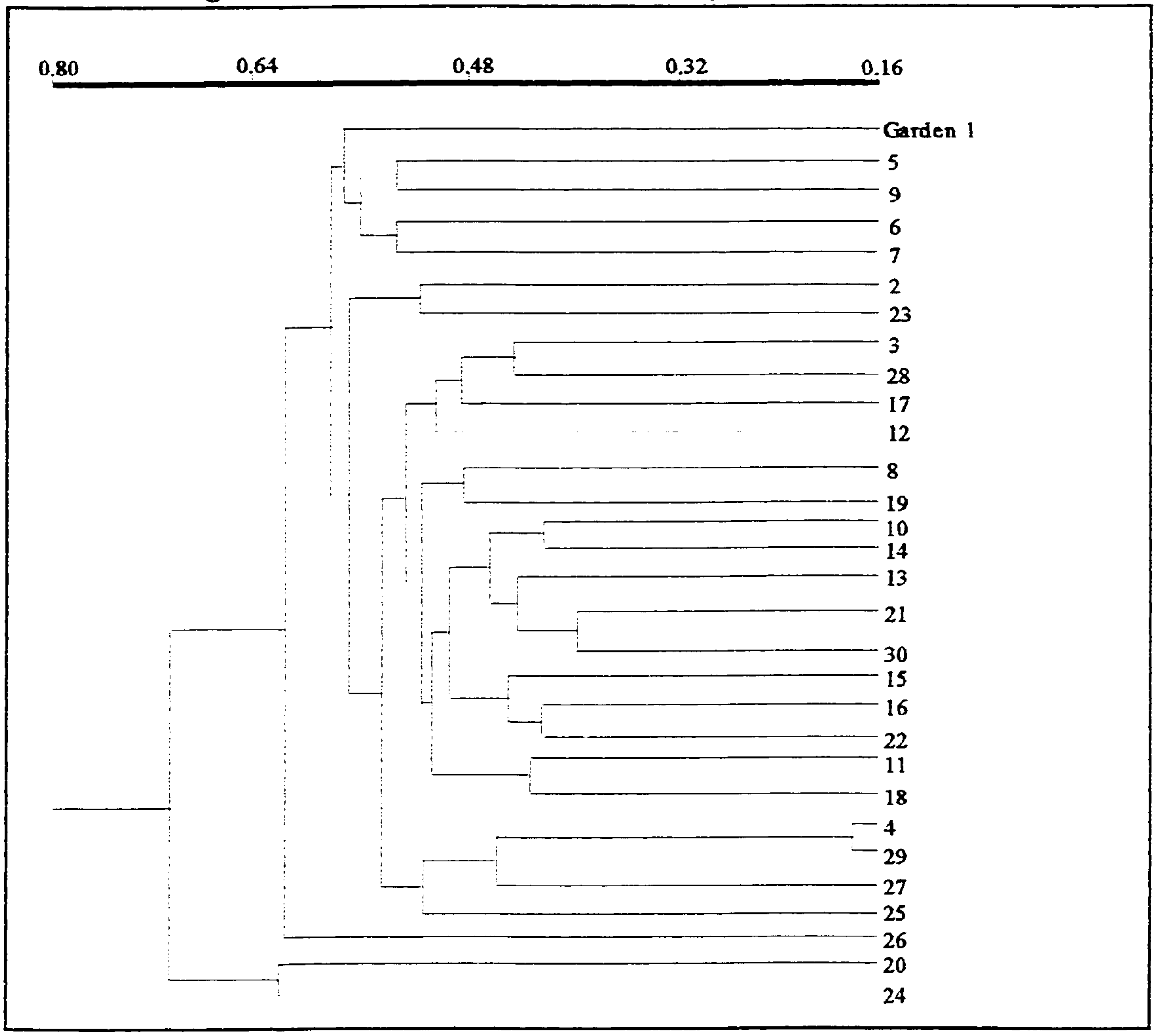


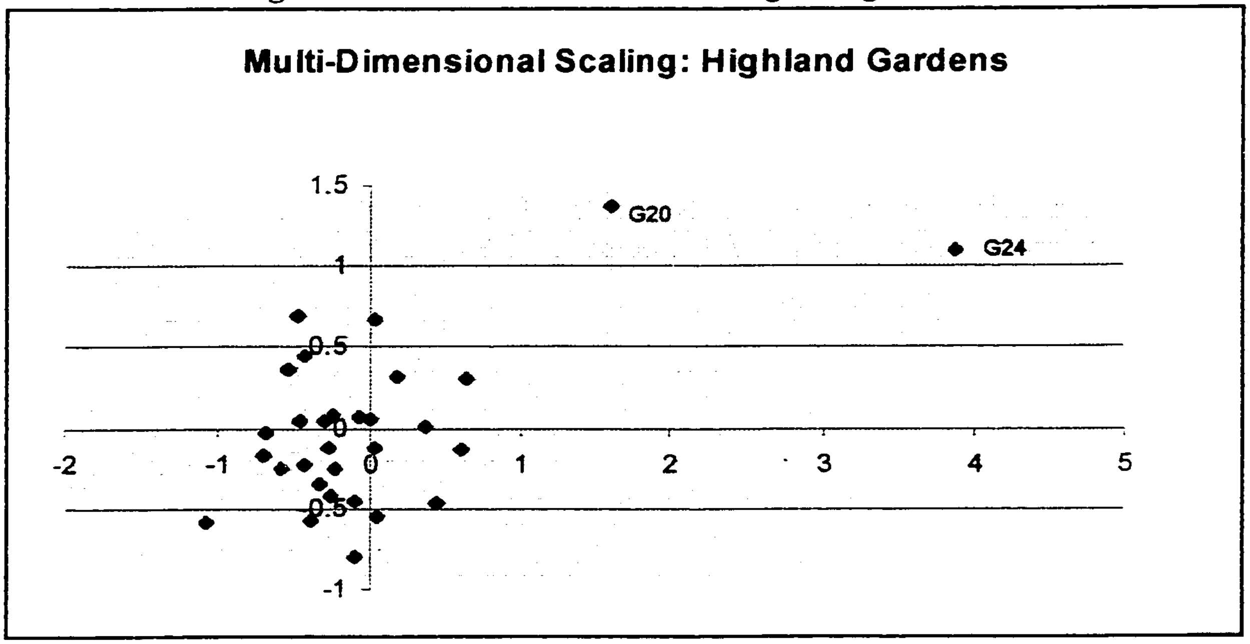
Figure 5.2) indicates that 50 percent of the 111 plant varieties appear in less than five home gardens, it ***does not*** appear that there is a uniform model for what *kinds* of plants should be contained in highland home gardens. Rather, it seems that the large number of plant varieties appearing in only a few home gardens suggests that there is a high degree of experimentation and individual or familial choice involved in garden plantings. This quantitative evidence was confirmed by informants describing their reasons for planting a particular cultivar with phrases

like "I just like that fruit," or "I use that spice a lot." At the same time, as orange trees, corn, and coffee appear in 97 percent of the 30 home gardens sampled, these plant varieties can be seen as defining characteristics for highland gardens.

Finally, in order to begin to describe the reasons for the cultural variability among home gardens, I constructed a dendogram based on average Euclidean distances in a hypothetical 111 dimension space (where each plant type is the equivalent of one variable and one dimension). The 111 variables and 30 cases were analyzed with NTSYS and produced a dendogram (see above, Figure 5.3) for subjective interpretation . Garden numbers 4 and 29 are very similar in terms of both the number and kind of garden plant variety; garden numbers 20 and 24 are also similar, but share fewer characteristics than gardens four and 29. A glance at the overall structure of the above dendogram shows that gardens tend to pair off in terms of similarity: gardens 20 and 24, 4 and 29, 18 and 11, 16 and 22, 30 and 21 for example.

A second way to analyze the relationships between the highland gardens is through multi-dimensional scaling. This method first requires the transformation of the 30-column, 111-row matrix into a symmetrical 30-column, 30-row agreement matrix. By coding plants as present (1) or absent (0) within the 30 highland gardens, a simple calculation can be made to calculate the "agreement" or relatedness of gardens based on 111 variables. The presence/absence data of garden one are compared with garden two, three, four etc; then between garden two and gardens three, four, five, etc., until the full 30X30 matrix is finished. These data were then transferred to ANTHROPAC 3.2 and analyzed with the program's

Figure 5.4: Multi-Dimensional Scaling of Highland Gardens



multi-dimensional scaling tool which gives each data point (a highland garden) a set of X and Y coordinates that can be plotted on a scatterplot. The resultant scatterplot is given in Figure 5.4 above and shows a pattern similar in agreement to the dendogram, with even more emphasis. In the X Y scatterplot, one significant cluster emerges with two obvious outliers: gardens 20 (coordinates 1.58, 1.37) and 24 (coordinates 3.87 and 1.09). The dendogram and multi-dimensional scatterplot both underscore the need to examine these two gardens in order to explain why they deviate so drastically from the "model" highland garden.

Both the gardens and the garden owners of numbers 20 and 24 were exceptional in many senses of the word. Both families were Catholic, involved as caretakers in the local *ermita*, and were significantly better-off than many of the other families interviewed for the garden survey.[2] The high number of total plant varieties (53 and 79, respectively) are indicative of individuals that either enjoy or see the benefit of experimentation in the garden. It is significant that more than one member of each family was particularly well versed with the local medicinal plant repertoire and was a frequent participant as vendor in the Chamelco market. Not surprisingly, the women that could be called the caretakers of these gardens were close friends and had many social and personal opportunities to exchange garden information. Finally, and intuitively, it was with these two women that I spent the most time querying about garden plants and gardens in general. They were — both qualitatively and quantitatively — the experts or "most omniscient" informants as far as highland gardens go and the "outliers" of what could otherwise be described as a generally consistent model for highland gardeners.

The Lowland Gardens of Sa Mox

The home gardens of Sa Mox are much more like a Westerner's idea of what a garden should be: these are square or rectangular spaces and can be readily distinguished from what *are not* gardens. This characteristic, different from the conditions in Chajaneb, is the immediate by-product of having a recently arrived group of colonizers with a strict method of parceling out territory to arrivals. New arrivals to Sa Mox, once accepted into the community through the workings of the *comité,* are given a four *cuerda parcela* (approximately 1000 m^2) that quickly

[2]Generally, families that are more constrained economically simply cannot afford the risks involved in devoting too much time and energy to developing gardens and experimenting with garden varieties. Innovations, in this case of garden cultivars, occur only where there is somewhat of an economic safety net, as in the two highlighted gardens.

becomes their garden and place of residence. The committee structure and the comparatively short term occupation of the landscape has amplified this clear distinction: forest is clearly separate from agricultural field, which is, in turn, separate from home garden. In addition, the people of Sa Mox make use of an horticultural artifact of the abandoned coffee farm. The popular decorative malvaceous **klaux** (*Hibiscus rosa-sinensis*) that were planted as hedgerows by the *finquero* during the 19^{th} century have become the boundaries of many household family compounds. They neatly delineate home gardens as well and play the utilitarian role of drying racks for freshly laundered clothes and bedding.

The methods used for inventorying in the highlands were replicated for a total of 20 lowland gardens. Table 5.3 enumerates all of the plants named during the inventories, highlights their uses, and notes their frequency of appearance across the twenty Sa Mox home gardens. Table 5.4 lists the solicited plant names and notes their presence and absence in each of the twenty home gardens. Seventy-five emically-distinct plant names were elicited over the 20 inventories and interviews that represent 32 botanical families and 53 genera. As 21.3 percent of plants have more than one use, a total of 92 uses were recorded. Figure 5.5 highlights the major use category distribution of the 92 uses of the 75 lowland garden plants. The graphic is very reminiscent of its counterpart for highland gardens with a notable exception. Where the proportions of edible plants to decorative plants to medicinal plants remain essentially the same, the "other" category in the lowlands has expanded significantly. This can largely be explained by the presence and importance of fuelwood trees included as garden variety plants, as

Table 5.3: The Sa Mox Garden Inventory

Scientific Name	Plant Family	Common Name	Uses	Frequency %
Coffea arabica	Rubiaceae	kape	L-m; S-e	100
Bixa orellana	Bixaceae	kaqi xayau	S-e; S-m	85
Byrsonima crassifolia	Malpighiaceae	ch'i	F-e	85
Hibiscus rosa-sinensis	Malvaceae	klavel	Fl-d	80
Citrus sinensis	Rutaceae	chin	Fr-e; L-m	80
Colocasia esculenta	Araceae	malang ox	T-e	65
Elettaria cardomomum	Zingiberaceae	tz'i'	S-msc	65
Musa X sapientum	Musaceae	minis tul	F-e	55
Ananas comosus	Bromeliaceae	ch'op	F-e	55
Psidium guajava	Myrtaceae	pata	F-e	50
Citrus nobilis var. deliciosa	Rutaceae	mandarina	F-e	50
Artocarpus altilis	Moraceae	mazapan	F-e; Tr-f	50
Mangifera indica	Anacardiaceae	mank	F-e	45
	Fabaceae	chelel	F-e	40
Canna indica	Cannaceae	tzukl	L-wr	40
Citrus limetta	Rutaceae	lim	F-e	40
		juanaca	F-e	35
Calathea allouia	Marantaceae	moxl	L-wr	35
Saccharum officinarum	Poaceae	utz'ajl	E-msc	35
Cucurbita moschata	Cucurbitaceae	k'um	F-e	35
Alocasia macrorhiza	Araceae	ox	T-e	35
Pouteria mammosa	Sapotaceae	sal tul	F-e	30
Manihot esculenta	Euphorbiaceae	tz'in	T-e	30
Cocos nucifera	Arecaceae	kook	L-th; S-e	25
Musa X sapientum	Musaceae	banan tul	Tr-m; L-wr; F-e	25
Citrus limonia	Rutaceae	lamuj	F-e	25
Bixa orellana	Bixaceae	saqi xayau	S-e	20
Eryngium foetidum	Apiaceae	samat	E-e	20
Persea shiedeiana	Lauraceae	koiyo	F-e	20
	Fabaceae	che' kenq'	S-e	20
Bixa orellana	Bixaceae	rax xayau	S-e	20
Crescentia alata	Bignoniaceae	joom	F-msc	20
Musa X sapientum	Musaceae	oro tul	F-e; L-th	20
Carica papaya	Anacardiaceae	papaya	F-e; F-m	20
Musa X sapientum	Musaceae	manzan tul	L-wr	15
Luffa cylindrica	Cucurbitaceae	estepa	F-msc	15
Lepidium lasiocarpum	Brassicaceae	isk'i'ij	L-e	15
Theobroma bicolor	Sterculiaceae	b'alam	F-e; S-msc	15
Bernoulia flammea	Bombaceae	q'an te'	E-s; Tr-f	15
Solanum nigrum	Solanaceae	maak'uy	L-e	15
Ocimum micranthum	Lamiaceae	albaka	L-e	15

Table 5.3 cont.	Family	Common Name	Uses	Frequency
Origanum sp.	Lamiaceae	oreg	L-e; L-m	15
Tagetes erecta	Asteraceae	tutz	Fl-d	15
Alpinia speciosa	Zingiberaceae	utzu'uj tz'i'	Fl-d	10
Persea americana	Lauraceae	o	F-e	10
Hymenaea courbaril	Fabaceae	paks	F-e	10
Zea mays	Poaceae	ixim	S-e	10
Sechium edule	Cucurbitaceae	ch'ima	F-e	5
Phaseolus vulgaris	Fabaceae	nun kenq'	S-e	5
Citrullus lanatus	Cucurbitaceae	sandia	F-e	5
Musa X sapientum	Musaceae	kaqi tul	L-wr	5
Capsicum annum var.	Solanaceae	chiltep	F-e	5
Coriandrum sativum	Apiaceae	kulandra	L-e	5
Lycopersicon esculentum	Solanaceae	pix	F-e	5
Solanum tuberosum	Solanaceae	kaxlan is	T-e	5
Citrus maxima	Rutaceae	tronk	F-e	5
Licania platypus	Rosaceae	jolob'ob'	F-e	5
		moche chiclero	R-m	5
Hypoanthus verbenaceus	Violaceae	isk'i'ij pur	L-e	5
Fucreae guatemalensis	Agavaceae	ik'e	L-c	5
Inga micheliana	Fabaceae	chochokl	E-s; Tr-f	5
Catopheria chiapensis	Lamiaceae	b'ajlak che'	L-m	5
Bougainvillea glabra	Nyctaginaceae	bogenviy	Fl-d	5
Cryosphila argentea	Arecaceae	komum	L-th	5
Musa X sapientum	Musaceae	saqi tul	L-th; F-e; Tr-m	5
Citrus limetta	Rutaceae	lima	F-e	5
Crinum erubescens	Amaryllidaceae	rey	Fl-d	5
Musa X sapientum	Musaceae	ch'ol tul	F-e; L-wr	5
	Agavaceae	kanya	L-c	5
Alocasia macrorrhiza	Solanaceae	kaqi ox	T-e	5
Citrus aurantium	Rutaceae	arang	F-e	5
Dialium guianense	Fabaceae	wachil	E-s; Tr-f	5
Allium cepa	Liliaceae	seboy	T-e	5
Theobroma cacao	Sterculiaceae	kakaw	S-msc; F-e	5
Lycaste virginalis	Orchidaceae	hix	Fl-d	5

Use Key

Capital Letters–Plant Part	*Lowercase Letters–Use*
F=fruit	e=edible
L=leaf	th=thatch
T=tuber	m=medicinal
Fl=flower	d=decoration
S=seed	wr=wrapping
Tr=trunk	c=cordage
E=entire plant	msc=miscellaneous
R=resin	f=firewood

Table 5.4: Lowland Gardens and Species Presence/Absence Data

Table 5.4: Lowland Gardens and Species Presence/Absence Data

Lowland																					
Gardens																					
Garden No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
HofH Origin	Ca	Co	Tu	Lq	Co	Ca	Lq	Tc	Co	Co	Ja	Co	Co	Ca	Pz	Co	Ca	Tu	Co	Co	
																					Totals
Totals	14	14	14	13	25	12	23	20	13	17	17	18	22	27	14	23	18	10	25	22	
kape	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	20
kaqi xayau	*	*		*	*		*	*	*	*		*	*	*	*	*	*	*	*	*	17
ch'i	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*		*	*	17
klavel		*	*	*	*	*	*			*	*	*		*	*	*	*	*	*	*	16
chin	*	*	*	*	*			*	*	*	*	*	*	*		*		*	*	*	16
malang ox					*	*	*	*	*	*	*	*		*	*	*			*	*	13
tz'i'	*		*		*		*			*	*		*	*	*	*		*	*	*	13
minis tul	*		*	*		*	*		*			*	*	*	*				*		11
ch'op					*			*	*	*		*		*	*	*		*	*	*	11
pata				*	*	*				*		*	*			*	*		*	*	10
mandarina		*		*	*			*			*	*	*	*	*		*				10
mazapan	*			*	*		*	*					*			*		*	*	*	10
mank							*	*		*		*	*	*			*		*	*	9
chelel					*	*	*			*			*	*			*		*		8
tzuki					*			*	*	*		*			*	*				*	8
lim	*							*			*		*	*	*				*	*	8
juanaca	*	*	*										*		*		*		*		7
moxl			*					*	*	*		*				*				*	7
utz'ajl					*		*					*	*	*					*	*	7
k'um											*		*	*		*	*	*		*	7
ox	*		*		*							*	*	*					*		7
sal tul				*				*		*				*			*		*		6
tz'in								*				*	*			*	*			*	6
kook				*		*					*						*		*		5
banan tul		*			*			*			*					*					5
lamuj	*					*							*	*		*					5
saqi xayau		*	*						*				*								4
samat							*						*	*						*	4
koiyo								*			*						*			*	4
che' kenq'							*		*								*	*			4
rax xayau		*	*														*		*		4
joom							*							*		*			*		4
oro tul			*						*					*		*					4
papaya			*										*			*	*				4
manzan tul	*				*													*			3

Table 5.4
Cont.

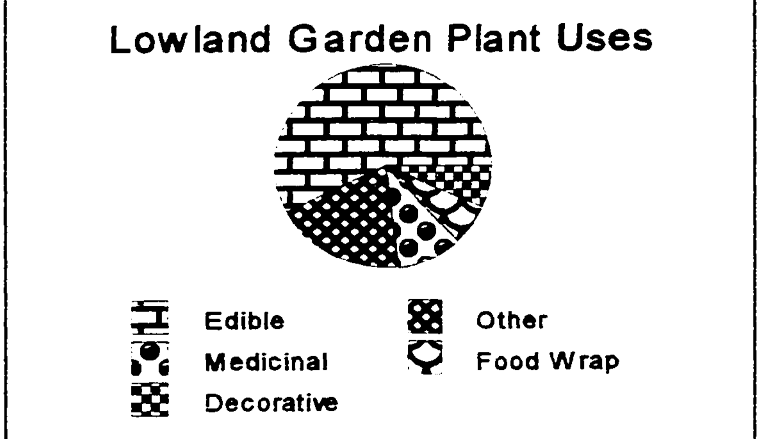
Lowland																					
Gardens																					
Garden No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
HofH Origin	Ca	Co	Tu	Lq	Co	Ca	Lq	Tc	Co	Co	Ja	Co	Co	Ca	Pz	Co	Ca	Tu	Co	Co	
																					Totals
estepa						*	*								*						3
isk'i'ij							*							*						*	3
b'alam		*			*		*														3
q'an te'							*				*			*							3
maak'uy											*						*			*	3
albaca					*						*					*					3
oreg					*		*									*					3
tutz					*														*	*	3
utz'u'uj tz'i'																*			*		2
chikiin		*			*																2
o							*	*													2
paks					*														*		2
ixim										*		*									2
chimaj	*																				1
nun kenq'										*											1
sandia										*											1
kaqi tul																			*		1
chiltep										*											1
kulandro											*										1
pix														*							1
tul xinok														*							1
kaxlan is														*							1
tronk														*							1
jolob'ob'															*						1
moche chiclero											*										1
isk'i'ij pur																*					1
ik'e													*								1
chochokl												*									1
kaqi tul						*															1
b'ajlak che'					*																1
tiqir b'ak							*														1
bogenviy						*															1

Table 5.4 Cont.

Lowland																					
Gardens																					
Garden No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
HofH Origin	Ca	Co	Tu	Lq	Co	Ca	Lq	Tc	Co	Co	Ja	Co	Co	Ca	Pz	Co	Ca	Tu	Co	Co	
																					Totals
Totals	14	14	14	13	25	12	23	20	13	17	17	18	22	27	14	23	18	10	25	22	
komum			*																		1
saqi tul				*																	1
lima				*																	1
rey					*																1
pata	*																				1
ch'ol tul								*													1
kaqi ox									*												1
arang								*													1
wachil							*														1
seboy							*														1
kakaw		*																			1
hix		*																			1

awimk. One distinct advantage of living in a region where vegetation clines are not so dramatic, as in the case of the Chajaneb Q'eqchi', is that families are surrounded by fast-growing, easily-accessible fuelwood. Where a Chajaneb Q'eqchi' man can essentially walk into his backyard and collect high quality pine (*Pinus pseudostrobus; Pinus oocarpa*) or **okob'** fuelwood (*Liquidambar styraciflua*), in Sa Mox families either must grow fuelwood as a garden plant or collect it from great distances. In both cases the fuelwoods come from privately owned (Chajaneb) or privately used (Sa Mox) lands: in general, fire wood is not a resource of communal access. If the community members of Sa Mox are not harvesting fuelwoods from

Figure 5.5: Lowland Garden Plant Uses



Edible	53	57.6
Other	18	19.6
Medicinal	9	9.8
Food Wrap	6	6.5
Decorative	6	6.5

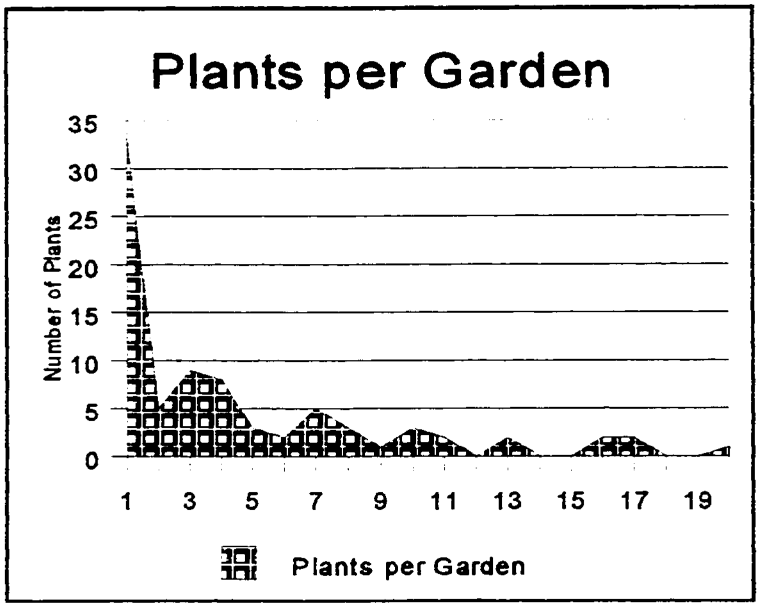
their gardens, they make long treks to their *milpa* fields to harvest downed and charred timbers that were felled for corn planting. Qualitatively speaking — and despite the presence of fuelwoods in gardens — these fuelwood collecting trips produce the vast majority of household fuelwood.

Beyond fuelwoods, the presence of luffa sponges for bathing (*Luffa cylindrica*) and two varieties of cacao (*Theobroma bicolor*, *Theobroma cacao*), whose seeds are occasionally used in divining, also inflate the "other" category of uses. The two *Theobroma* (literally, "food of the gods") are especially significant. It appears as if *Theobroma cacao* was domesticated first by the lowlanders of the Amazon basin, where it was used only for its juicy, sweet pulp (Young 1994:4; Coe and Coe 1996). After diffusing up the Amazon, the Rio Negro, and through the Casiquiare Canal, it is thought the seeds arrived in coastal Ecuador and the Colombian Chocó. After this circuitous route, it eventually appeared in Mesoamerica 3500 years ago (Purseglove 1968). It is Mesoamerica where the use of seeds began. Traditionally, these were mashed into a bitter paste, mixed with water, chile pepper (or *pimento*), vanilla, maize, and *Bixa orellana* to form a drink of the upper classes (Young 1994:28). Today, the process remains largely the same, with sugar frequently substituting for vanilla. The drink is prepared principally in a ritual context, as in the corn harvest meal or *cofradía* celebration.

Of the 57 percent edible uses, the one plant surprisingly low in popularity is corn, which appears in just 10 percent of the inventoried lowland gardens. Where land is not held at such premium as in Chajaneb, corn can be confined to the agricultural fields: it is not worth the effort to try and eke out another 50 m^2 of *milpa* when you have hectares and hectares of secondary growth ready for clearing. The popularity of fruit trees mimics the conditions in the highlands, yet popular highland varieties simply fall out in favor of lowland varieties. The varieties of *Citrus* are still present with the addition of the grapefruit (*Citrus maxima*). Neither the avocado or the **koiyo** (*Persea shiedeiana*) are of much importance, as gardeners claim their fruits are far inferior to those grown in the highlands. Gone too are the peaches and pears of the highlands, replaced by the typical lowland fruits of mango (*Mangifera indica*), breadfruit (*Artocarpus altilis*), and papaya (*Carica papaya*). The banana varieties number seven as in the highlands.

Spice varieties in the lowlands are similar to those of the highlands, with the exception of the increase of importance and variation in annatto (*Bixa orellana*). Considered principally as a lowland, or hotland plant, *Bixa* is split into three varieties — red , white, and green. The seedpods of these important garden varieties are laid to dry in the sun and broken open to reveal their oily seed. These seeds are then grated with *mano* and *metate* into an oily paste that is sold in the nearby Canhuinik market and used as a food additive — a color enhancer if not a flavor enhancer. Although the red **kaqi xayau** is the most common of the *Bixa* varieties

5.6: Distribution of Plant Varieties in Gardens



with the largest, most productive seed pods, the green (**rax xayau**) and white (**saqi xayau**) varieties produce the strongest flavor, which says a lot in the case of *Bixa* which otherwise is essentially tasteless. It is interesting to note the diversity of Q'eqchi' *Bixa* varieties, a genus that, although controversial in phylogenetic circles, is thought to be monospecific (Heywood 1993:106).

Another structural characteristic that differentiates lowland from highland gardens is the use of small enclosures that separate herbaceous spices from the other garden plants. In 55 percent of the lowland gardens inventoried, small, four m^2 enclosures harbored the mints, mustards, and the like. These sub herb gardens were often shoddily constructed with leftover house planks, fence posts, or other building scraps. Where pigs generally replace the highland turkey as the garden animal of choice in the lowlands, it makes perfect sense to attempt to buffer these spices from the marauding nose of a hog.

In terms of the distribution of plants across the 20 sampled lowland home gardens, some patterns in common to the highlands emerge. The twenty home gardens averaged 18.05 plants per garden (SD=4.90) with a range between 10 and 27 plants, a median number of 18 plants, and the mode, or most frequently occurring number of plants, of 14. Looking across rows, the average plant appears in 4.54 or approximately 23 percent of gardens (SD=4.62) with a range of one to 20 gardens, a median number of just three gardens, and a mode of just one garden. The bulk of this data set of 75 plant varieties occurs in just one garden, as is graphically displayed in Figure 5.6 where 50 percent of the plants occur in just three gardens or less. The interpretation of this data remains essentially the same as for highland gardens. Many plants could be considered experimental in nature, contributing little to the overall composition of lowland home gardens. In the case of lowland home gardens, five emically recognized plant varieties could be considered as defining criteria for gardens: coffee (*Coffea arabica*), annatto (*Bixa orellana*), nance (*Byrsonima crassifolia*), the decorative hibiscus (*Hibiscus rosa-sinensis*), and orange (*Citrus sinensis*).

Both dendogram and multi-dimensional scaling analysis were applied to the lowland data using the same principles as discussed for the highlands. The results of these analyses are given in Figures 5.7 and 5.8 below.

The Euclidean distances and resulting dendogram have a qualitatively different structure than their highland counterparts. The general pattern appears to be an outlier (for example, garden seven) separates off from the other sampled gardens; another outlier is separated off from that group, and the pattern is repeated until a closely related pair is left (garden 1 and 18). Based on my experiences with gardens and gardeners in the highlands, I

Figure 5.7: Euclidean Distances of Twenty Lowland Q'eqchi' Gardens, Listed with the *Municipio* of Origin of the Head of Household

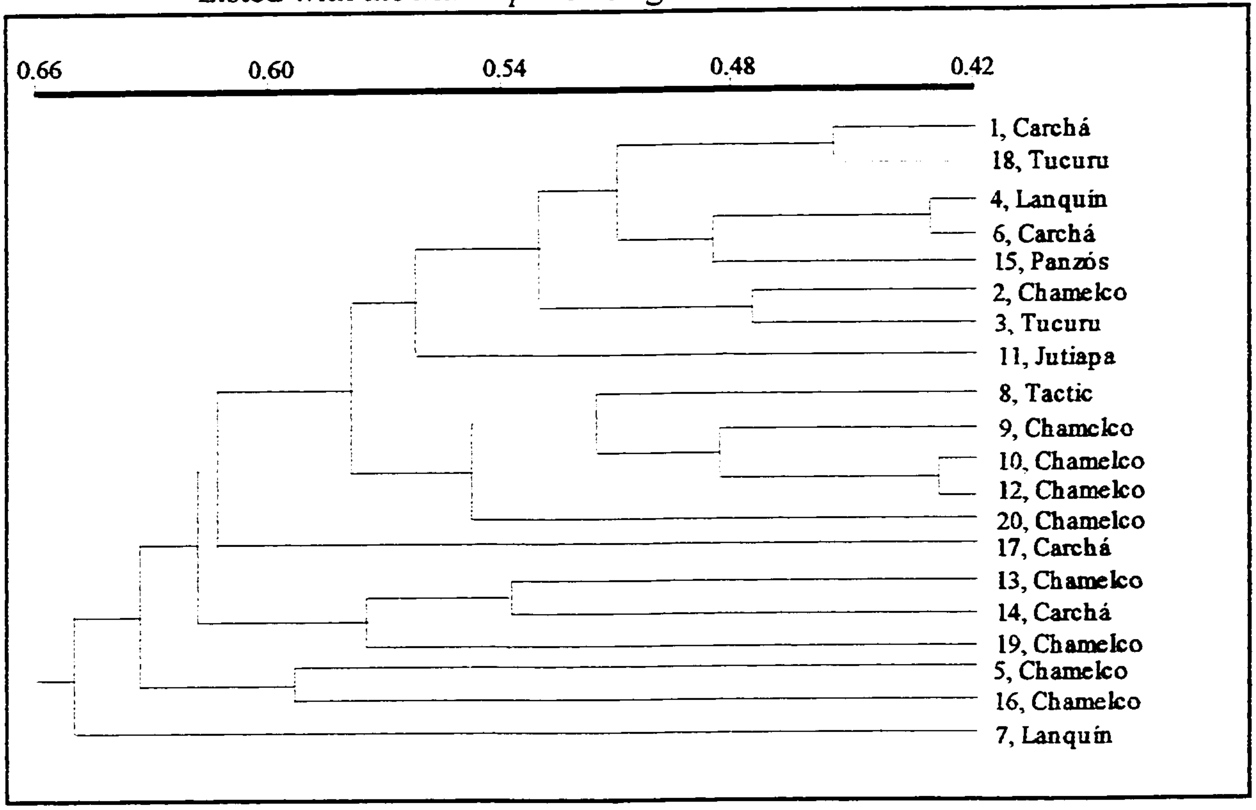
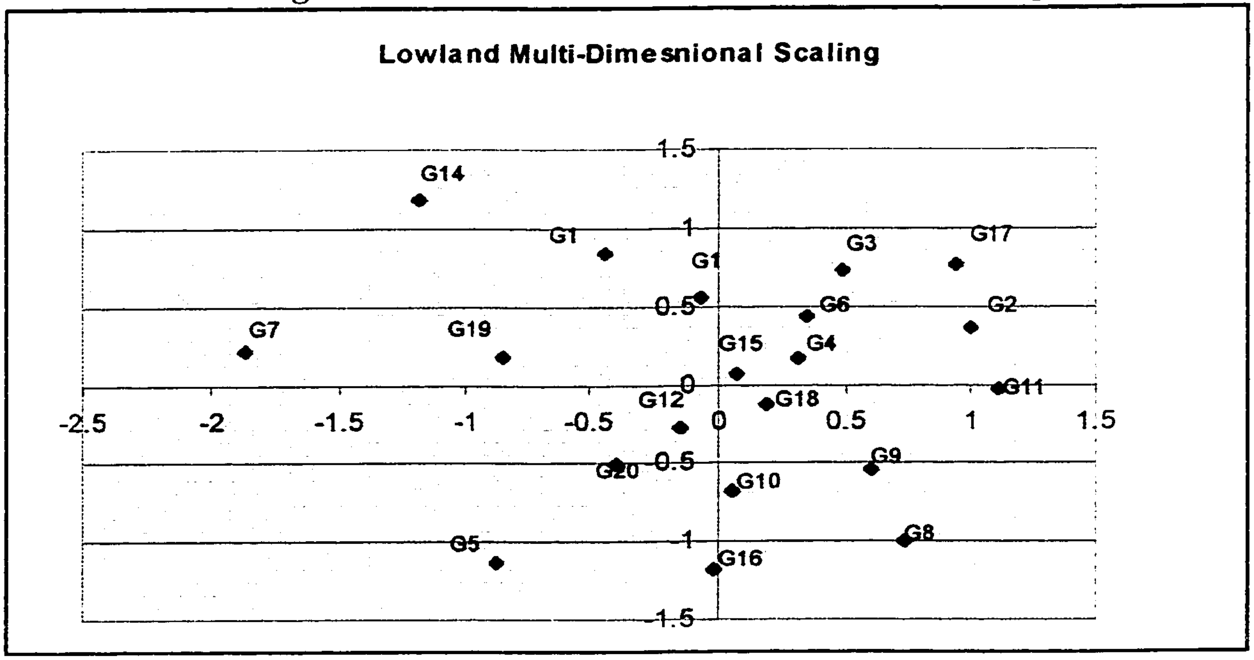


Figure 5.8: Lowland Garden Multi-Dimensional Scaling



hypothesized that a gardener's place of origin should affect the composition of that family's garden. Families of like place of origin should have more common garden compositions than those of families who come from different regions. The Euclidean distance dendogram output seemed to point in this direction with several Chamelco and Carchá households seeming to cluster, but the output from the multi-dimensional scaling did not reconfirm any distinct clustering of Chamelco or Carchá-based gardens.

The MDS output for lowland gardens paints a different picture of garden likeness than for the highlands, where there was a relatively defined cluster that could be termed a "model" plus two obvious outliers that I labeled "experts." The "shotgun"display of the MDS presented in Figure 5.8 above neither highlights a consistent model nor an obvious group of expert outliers. Unfortunately, the MDS results do not qualitatively or quantitatively say much concerning the place of origin hypothesis.

To do this, I filtered the lowland garden data first into a "Q'eqchi' triangle" cluster composed of 13 gardens of people originating from Chamelco, Cobán, and Carchá and an "other" cluster of the remaining seven gardens. These two asymmetrical matrices were then converted into symmetrical 13X13 and 7X7 agreement matrices. Average agreements were calculated across these matrices where a score of one would be the equivalent of two gardens composed of the exact same number and kind of plants, and a score of zero would be two gardens that share no single variety of plant. Total lowland agreement was 76.2 percent and agreement for the "Q'eqchi' triangle" group was 72.6 percent. Agreement for household gardens with heads of household originating only from the municipality of Chamelco was 73.5

percent where agreement between gardens of other municipalities was 74.5 percent. The only statistically significant difference among these average agreements is that between the lowland total and agreement among the "Q'eqchi' triangle" gardens (two-tailed t-test, $t_{0.05}$=2.179, $|t|$= -7.2) indicating that, in fact, the total agreement among lowland gardens is *higher* than the agreement between those garden owners from Chamelco, Carchá, and Cobán. Contrary to the hypothesis, then, place of origin does not appear to contribute to more uniform garden composition.

Summary Comparison between Highland and Lowland Gardens

Table 5.5 summarizes the quantitative descriptions of sampled highland and lowland gardens in Chajaneb and Sa Mox.

Table 5.5: Summary Comparison of Highland and Lowland Gardens

		Mean Plants	SD Plants	Max Plants	Min Plants	Median Plants	Mode Plants
	N	per Garden	per Garden	per Garden	per Garden	per Garden	per Garden
Highlands	30	32.2	11.96	79	12	31	28
Lowlands	20	18.05	5.03	27	10	17.5	14
		Number Uses	Average Uses	Mean, Gardens	SD, Gardens	Median, Grdns.	Mode, grdns.
	N	Reported	per Plant	of Appearance	of Appearance	of Appearance	Appearance
Highlands	30	131	1.18	8.73	8.23	5	1
Lowlands	20	92	1.23	4.54	4.62	3	1
		Average %	Total Number				
	N	Agreement	of Plants				
Highlands	30	72.7	111				
Lowlands	20	76.2	75				

Highland gardens are significantly larger than lowland gardens at the .05 level (one-tailed t-test, $t_{0.10}$=1.699, t=7.06). The maximum number of plants, median plants per garden, and mode of plants per garden are all much greater in the highland community of Chajaneb indicating gardens with greater overall diversity in terms of species represented. It is unlikely that this is the result of fewer possibilities for garden varieties in the lowlands, since, on average, 3.75 new plants were recorded per lowland interview: it is therefore likely that had I inventoried 10 more lowland gardens the figure of 75 total plant varieties encountered would have approached or surpassed the highland figure of 111. If anything, the lowlands might potentially support many more garden variety plants than in the sometimes-frigid highlands.

Most likely, the significantly lower figure of 18.05 plants per garden in the lowlands is related to the importance of lowland cash cropping. In the lowlands, where in most cases corn is grown in such abundance that a portion can be sold at every harvest, and where the cardamom crop can supply the much needed cash for the purchases of other necessary goods, families need not turn to their gardens for either cash or goods. In the highlands, where corn is in shortage vis-à-vis the availability of land, families must rely on gardens both for an extra source of cash and products. With less corn, families must continually search for places to earn cash *in order to buy corn* and the garden is one significant potential source; with less corn, families must also turn to their gardens directly as a dietary supplement. In the lowlands, where there is corn and cardamom, there is cash and food and less need — and, in fact, less time — to work gardens.

In terms of garden likeness, it does not appear that being raised in a particular municipality locks people into a particular garden composition. On average, an individual shares roughly three of four plant varieties with his neighbor (73 or 76 percent), regardless of where they are from and regardless of whether they are highlanders or lowlanders. This similarity in agreement levels is interesting; it presents a loose model. The one important exception distinguishing the highland from lowland models is the presence of "experimenters" in the highlands who fall way outside the model in terms of agreement and number of plant varieties. From my experience, these gardening specialists have a unique insight into the structure and function of household gardens and a stronger relationship with plants in general.

One possible way to interpret the lack of "experimenters" in the lowlands is the recent origin of families to the region. Clearly, the climatic conditions of the Sa Mox region would allow for the same or more plant cultivars in the garden. Second, the question of market distance must be raised. As Sa Mox does not have the proximity of the Cobán and Chamelco markets that Chajaneb enjoys, it may appear that there would be an impetus to be more self-sufficient in fruits, vegetables, and spices. At the same time, greater distance to large markets may also suppress the inspiration to cultivate market-oriented produce because *selling* is not as convenient. This question will be discussed in more detail in Chapter 8. Finally, it will be demonstrated in the following chapter that families spend considerably more time in the cultivation of corn, which dramatically alters their annual time budget. Self sufficiency in corn, or the production of surplus corn, may, therefore, impinge on the needs, desires, and abilities to cultivate large home gardens.

Chapter Six: The Q'eqchi' Agricultural Regime

The diverse ways in which the approximately 700,000 Q'eqchi' speakers make a living has already been commented on in previous chapters. Despite this diversity, the Q'eqchi' are first and foremost agriculturists. And although they grow various crops, corn and the process of growing corn permeate most Q'eqchi' lives to a degree that cannot be matched by any other plant species. Even as turn of the century *finqueros* forced the Q'eqchi' to participate in coffee cultivation, most families continued to be mainly corn harvesters. Despite the fact that numerous environmental, non-government organizations and multiple generations of Peace Corps volunteers have stressed that corn is an ecologically taxing species and that the soils of tropical Guatemala are unsuitable for corn cultivation, the Q'eqchi' have been resistant to trying other primary crops (D. Unger, pers. comm., October 1999). Whereas other Mayan speakers throughout the highlands have made forays into the world of export vegetable agriculture, this economic diversion is rare in the Alta Verapaz, even among families recently converted to Protestantism.[1]

Explanations for this agricultural conservatism will surface in this chapter and most especially in the conclusion of the dissertation, but my primary purpose here is to describe qualitatively and quantitatively the yearly agriculture cycles in order to afford a comparison of

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[1]Annis (1987) has convincingly established that those San Antonio Aguas Calientes families that have converted to evangelism have much more commonly adopted cash crop vegetable agriculture. But cash crop vegetable agriculture, even among more traditional Catholics of half a century ago, has been an appealing alternative to Maya groups outside the Alta Verapaz (e.g., Tax 1953).

the two study communities. As in previous chapters, this comparison will then allow me to address my more general concern of cultural adaptation. Corn threads its way into all the analytical rubrics of this dissertation, yet here I will focus on the rich cultural matrix on the entire agricultural experience. The reader will quickly become aware that corn growing specifically and agriculture in general involve much more than simply guiding the seed to a mature crop.

The Agricultural Experience in Chajaneb

For the highlands of Guatemala as a whole, that is, those regions above 1000 m above sea level, land appropriate for corn-based horticulture is scarce. As such, the definition of land "appropriate for corn-based horticulture" is being stretched even through the eyes of the Q'eqchi'. The smallest plots of the town center of Chamelco are bursting with corn as are the steepest, rock-strewn slopes in the rural countryside. As will be demonstrated quantitatively below, most Q'eqchi' families in Chajaneb (and, I expect, many other highland *aldeas*) simply do not have the acreage to raise their annual corn needs. Families respond to this pressing need through one of two avenues: they grow as much corn as is economically and spatially feasible and enter other gainful employment to supplement the want of corn, or, they migrate to a region where enough corn can be harvested to supply a family with the corn they need. Given the demographic transition taking place in the land-abundant north, it is not surprising that migration is a popular option. But seeking other money-based activities is, for the time being, what the residents of Chajaneb have followed. In both cases, though, the presence *and* the absence of corn drives the behavioral choices of most Chajaneb residents.

In many Maya communities, the success of families — and especially men — oftentimes is gauged by their self-sufficiency in corn. But, among the Q'eqchi', those that simply do not have the land base and must turn toward other economic options are not seen as "second tier" males as in the case of other Mayan communities (e.g., the Kaqchikel of Comalapa; David Carey, pers. comm., May 1998).[2] Nevertheless, those that own significant tracts of land, good corn-growing land, are generally those who are materially better-off and often those who command more authority in the community. Interestingly, and further demonstrating that success is not only measured in corn, those that own the largest tracks also frequently enter other economic sectors, renting parcels to less well-off families. This results in a situation where the wealthiest and the poorest spend far less time in direct contact with corn than the family of average means.

Corn planting techniques, harvesting, the application of fertilizers, ritual, and food storage all vary slightly from family to family, even within the confines of what is theoretically the relatively homogeneous *aldea*. These characteristics vary through diverse channels, from religion to average holdings in hectares, from individual taste, to feelings on the weather. The qualitative discussion of the yearly agricultural cycle is a detailed description of the agricultural activities that I participated in and is often flavored from the informal interviewing that went on during these activities. The quantitative data, then, are a way of making more general statements on the agricultural practices for the *aldea* as a whole. Both techniques will be

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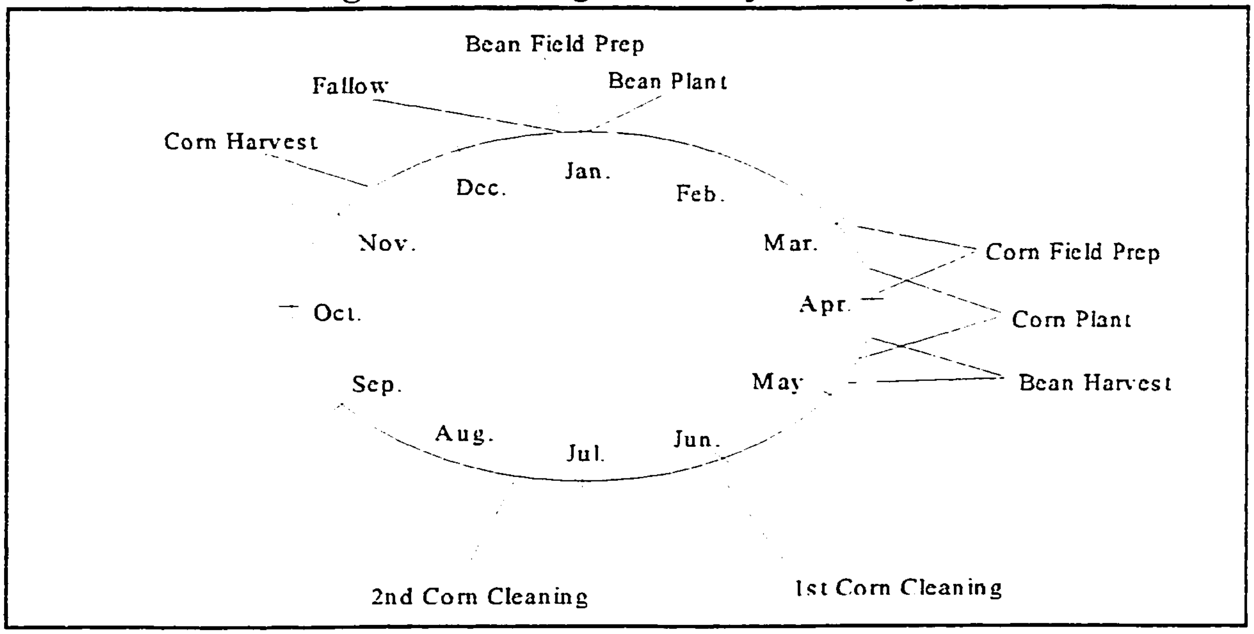
[2]Carey (1999:432-434) outlines a process by which the Kaqchikel of Comalapa, when faced with food shortage, tended to follow temporary labor markets on the south coast.

important for any conclusions that can be drawn regarding human cultural adaptation.

Figure 6.1 below is a schematic diagram highlighting the major, annual agricultural activities of the Chajaneb Q'eqchi'.

It should be noted that Figure 6.1 indicates *ranges*, rather than specific dates, for planting and harvesting. There is not a universally agreed upon date to begin the planting of corn, or beans for that matter. First, corn cycles vary significantly depending on altitude. In communities higher than 2000 m above sea level, corn is planted as early as the first week in March and harvested in November — a dramatic schedule difference given just 500 m of altitudinal difference. Even within one community, for families to begin planting on the same day would be all but impossible, as the necessary labor would simply not exist. Families in

Figure 6.1: The Agricultural Cycle of Chajaneb



Chajaneb maintain a rough, agreed upon schedule to ensure that families plant on staggered days, thereby allowing for labor crews to be formed.

Despite the overwhelming importance of corn for the Chajaneb Q'eqchi', it is the common *Phaseolus* bean that begins the annual cycle. A plethora of *Phaseolus vulgaris* varieties is grown throughout the country and throughout Mesoamerica. Not surprisingly, Latin America as a whole produces over 30 percent of the world's bean production (Duke 1981: 197). In English, we refer to these varieties as the "Mexican black bean" because of the black seed coat on many varieties, the "string bean" because of the significant amount of pod fiber in the young infructescence, or "snap beans" because of the popping sound made when the young fruit is cracked open. Other common English names that reveal the history and botany of the plant are French bean, garden bean, stick bean, haricot bean, bush bean, pole bean, and green bean (Rubatzky and Yamaguchi 1997: 488). The habit of the plant can basically be broken down between the climbing "pole" or "stick" varieties and the low growing "bush" varieties. Although the Q'eqchi' use both types, the low growing "bush" variety is by far the more important and is generally the only type planted over a significant area.

Considerable debate surrounds the center of origin for the genus *Phaseolus*. Despite the controversy, a distinct, two point source explanation has been accepted favorably, with one distinct gene pool originating in the Andes and another in Mesoamerica (Singh et al. 1991). The domesticated bean appears to be derived from the wild *Phaseolus aborigineus* with less pod fiber, reduced pod dehiscence, and an increase in flower number, pod, and seed size as the selected characteristics (Rubatzky and Yamaguchi 1997: 489; Duke 1981: 197). Most *P. vulgaris* are annuals, as are all of the bush varieties grown by the Q'eqchi'.

Beans are most resilient when grown in well-drained, sandy loam, silt loam, or clay loam soils as they tend to be especially susceptible to fungus and flower drop with too much exposure to moisture (Duke 1981: 198). This is particularly important for the near year-round moisture common in the Verapaz. Chajaneb planters are very particular in their choice of a planting date, attempting to predict the very last days of the wet season some time in January. Planted too early, a bean crop will drown in pools of standing water; planted too late, and the young sprouts will bake in the sun. The later is apparently what happened to the crop devastated by *El Niño* in 1998. Moisture is a very serious threat because it brings on many problematic bacteria (e.g., Common blight, *Xanthomonas phaseoli, X. campestris* pv. *phaseoli*), fungi (e.g., Fusarium root rot, *Fusarium solani* f. sp. *phaseoli* or Angular leaf spot, *Isriopsis griseola*), and viruses (e.g., Bean Common Mosaic Virus) (Rubatzky and Yamaguchi 1997: 496). The Q'eqchi' of Chajaneb do not employ fungicides to battle any of these crop pathogens. At the same time, once the seeds have germinated and the plants have reached about five cm in height, sun is their most important resource. For combating natural enemies, primarily fungal infestation, and stimulating growth, shade — that is, any kind of forest whatsoever — is simply not acceptable.

With the fields cleared of debris left from the corn harvest, a process of considerable skill and effort that will be discussed later in the chapter, the bean crop is ready to be planted. Seeds of the bean generally come from last year's harvest, although in more than one case seeds were purchased either from a neighbor or from a seed dealer in Chamelco. The bean variety that is planted in early January is exclusively of the low-growing, bush variety and is called **q'eqi kenq'** ("black bean") or **ch'och' kenq'** ("ground bean"). With the field cleaned, rows of raised soil with interwoven trenches are created with a small-bladed hoe (**asaron**). As bean fields are rarely if ever square, a farmer must decide which way to lay the rows across the sloping terrain. Universally, the rows are laid perpendicularly to the slope, so with rain, large columns are not trenched throughout the field. Before the seed is placed in the five cm-high mounds, chemical fertilizer is generally applied, finances permitting. Two types of chemical fertilizer are common in the area: 15-15-15, with an equal concentration of nitrogen, phosphorous, and potassium; and 20-20, with an equal but higher concentration of nitrogen and phosphorous. In these calcium based soils, 15-15-15 is the preferred variety, with 20-20 appearing more frequently in use on the southern, "boca" coast (J. Makransky, pers. comm., May 1999). Fertilizer is sometimes cast by hand, but cost generally forces farmers to apply fertilizer more carefully. A plastic cup is used as a scoop and as the dispenser. A layer of soil is always then spread over the fertilizer pellets, as, both according to farmer's manuals and the Q'eqchi' themselves, the fertilizer will burn the seed (**li iyaj xkamk chi rix li ab'on... jwal tiq!** "The seed will die because of the fertilizer; it's very hot!"). Children are usually put in charge of covering the fertilizer. They do so by furiously scratching a small twig down the rows, a chore they seem thoroughly to enjoy. A 45-kg bag of 15-15-15 costs approximately 70 Q, and one bag will cover approximately three *cuerdas* of land. With a nimble grab from within the shoulder-hung seed bag, a quick stoop and a pry of the index finger, a farmer will then insert one seed about every 12 cm and quickly cover the seeds with a wave of the palm. In approximately one week, the seeds will germinate.

The bean seeds enter the soil with significantly less cultural fanfare than corn.

Figure 6.2: Beans in the Drying Process

Generally, large working teams are not assembled to plant the bean crop, although teams may be assembled to clear the corn debris from the November corn harvest. Commonly, three generations of consanguineally related males will do the planting. A meal of chicken or turkey may be offered to the males returning from the planting, but large, multi-family extravaganzas are not the rule. Beans compete significantly with weeds, and careful hoe cleaning of the bean rows happens sporadically throughout the 12-week growing season. Cleanings general occur twice at four-week intervals in February and March. Again, this technique will be described in detail during the discussion on the corn cycle. Following the blossom of pink to purple flowers, the bean will quickly produce its long, green legumes. By this time, mid-March, the sun is generally very direct and will quickly turn the entire field of bean plants yellow. Farmers like to let the beans dry as much as possible on the plants themselves, but the longer they remain, the more exposed they are to insects, rabbits (*Lepus* sp. **imul**), squirrels (*Sciurus griseioflavus* and *Sciurus chiapensis*, **kuuk**), mice (*Sygmodon hispidus*, *Rattus norvegicus*, and *Peromyscus guatemalensis*, **ch'o**) or the ever present and incredibly destructive groundhog (*Orthogeomys* sp., **b'a**). In late March, hordes of women and children gather the bean pods. These are collected into plasticized burlap bags (**kostal**) and spread out on an old metal roofing sheet (**lamina**) to accelerate the drying process (see Figure 6.2).

Women and children, usually girls, will then spend hours on end shelling the seeds.

Most seeds are black, but fantastic purples and reds are commonly represented. The seeds are then stored in a large plastic pail (**palangan**), hopefully safe from pests that continuously invade the household. The bean chaff is frequently used as a marginally-effective weed suppressant for the upcoming corn planting.

Bush beans were planted in all but one of the households I interviewed. On average, families planted 3.75 *cuerdas* of the low-growing bush means (N=28, SD=2.38) which represented an average of just 23.7 percent of the total land owned by these families. Although Sapper (1998:13) reports that the entire bean growing process can occur twice in the Alta Verapaz, I was witness only to one bean crop rotation, meaning the production associated with these 3.75 *cuerdas* (which should last a family of six approximately six months) must be augmented with beans purchased from other families or from local and regional markets. It always seemed curious that, given the importance of beans in their diet, Q'eqchi' farmers would not plant *all* of their fields with beans. Apparently, it is the price of 15-15-15 (70Q/3 *cuerdas*) that is the most serious limiting factor. Wilson (1972:144), who conducted extensive harvest measurements, determined that an average yield at middle elevations (approximately 1300 m above sea level) equaled 28.9 kg/*cuerda*. But even if the Chajaneb Q'eqchi' are not self-sufficient in bean production, beans are *always* part of their daily diet and are integral in their provision of whole proteins.

At the other extreme, this ever popular bush bean does not grow at all at elevations higher than 1900 m above sea level. Q'eqchi' living in the highest peaks of the Xucaneb' range must depend entirely on the "pole" variety known as **lol kenq'** which is the large shell bean variety of *Phaseolus coccineus*. It is in these extreme altitudes where one finds the situation of corn stalks as bean supports. In the town of Chicacnab, elevation 2100 m above sea level, Q'eqchi' farmers will plant **lol** in the very same hole as corn. The Q'eqchi' of Chajaneb also grow the **lol** variety, but only in household gardens, never as a monocrop. This is not to say that corn and beans never exist in the same plot for, in many corn planting situations, I was faced with the daunting task of trying to plant corn amongst a health crop of **ch'och' kenq'** without trudging over the beans or uprooting them with my digging stick.

The occasional overlap of the corn and bean crop was curious, and instantly aroused questions of nitrogen fixation and crop rotations. Much has been made about the ability of many legumes to "fix" nitrogen in the soil and subsequently improve soil's nitrogen levels without the addition of nitrogenous fertilizers. Indeed, *P. vulgaris* is a species known to fix nitrogen levels in the soil when proper levels of *Rhizobium* bacteria are present in the soils. When soil conditions are right, and there are adequate levels of iron and molybdenum in the soil, *P. vulgaris* roots will develop obvious nodules that are used by the plant in growth and can enrich the soil after plant death (Rubatszky and Yamaguchi 1997: 476). The Q'eqchi' of Chajaneb are quite aware of the soil-enhancing capabilities of their bush beans, but, upon many close inspections, I never saw roots with particularly well developed nodules. Despite the fact that their beans no longer appear to be in the presence of *Rhizobium* bacteria, a loose system of crop rotation is generally in place, whereby farmers rotate their approximately 3.75 *cuerdas* among three different parcels.

Corn in Chajaneb

Although as many as five *cuerdas* of ground may have been prepared for the planting of bean, there remains a significant amount of soil to be worked and weeds to be removed for the coming corn planting season. This process is known as **k'alek**[3] and is significantly different from the process of weeding the fields once the corn has been planted — **aq'ink**. **K'alek** can also refer to the cleaning of high grasses and weeds, as those that commonly grow up around churches, on soccer fields, or around important fruit trees. This type of cleaning is done with machete (**ch'iich'**) and a small branch with a sharp-angled fork at the end, called a **xok**. The **xok** is wielded in the left hand and is used to stand the matted weeds up to be more efficiently severed with the machete. The typical Q'eqchi' farmer spends an enormous amount of time attempting to hold back the rapidly growing weeds — **pim** through the **k'alek** and **aq'ink**.

Since the corn has been harvested, a significant tangle of weeds has grown up around the old corn stalks (**rok wa**). The most common weeds encountered are **aq** (*Muhlenbergia macroura*), **axl** (*Polymnia caxacana*), and **xub'ay** (*Bidens triplinervis*). Both the old stalks and weeds must now be completed dislodged and piled up in long rows so that the corn can be planted in early April. This is done by informally gathered labor teams and with little ceremony. Poorer men and adolescent boys frequently hire themselves out for the day as workers for 15Q daily. In contrast to the **aq'ink**, there is little skill employed in the process. Large, broad-bladed **asarons** are used for the cleaning. They must be swung high overhead and with great

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[3]Wilson (1972:90) calls this behavior **chapok k'al** (literally, "grab corn,") but I never heard it referred to in that way.

force in order to dislodge the entrenched weeds. As most corn in the *aldea* is planted on some kind of slope, workers proceed across the hillside, standing below the point where the hoe will hit the soil. Large mounds of debris — **mul**, literally "trash" — pile up at the worker's feet, and after a day of hoeing, a hillside will take on the appearance of corduroy, with row after row of drying, weedy debris.

There is significant debate about what should be done with these parallel lines of debris. Travelers to Alta Verapaz often are disappointed to find the skyline clouded with smoke and ash as many farmers choose to burn the debris, claiming that rats and other annoyances are attracted to the mounds. Another camp claims that these mounds serve as good **ab'on**, that is, supplying nutrients to the soil and, more importantly, suppressing weeds and erosion. I saw both techniques employed in Chajaneb, although the latter appeared to be more common. With the weeds cleared, or at least uprooted, it is only a few weeks before corn planting, perhaps the most festive time in the Q'eqchi' agricultural year.

A selection taken directly from my field notes dated April 22, 1999 reads:

> *Today was a day of corn planting with Qawa Pablo and his cohorts. The day starts at about six thirty in the morning with the arrival of Qawa Mingo at the front door with a short series of "Wan b'i, wan b'i, wan b'i..." really in rapid succession. I interpret this to mean "ok, it's pretty important that you get up at this very moment..." and not the usual, "I'm here hanging around your house waiting for you to get up so that I can tell you how good your beans are looking."*
>
> *I have said it before, corn season is a time for ethnic renewal, when people revitalize what may have been traditional Q'eqchi' behavior.*

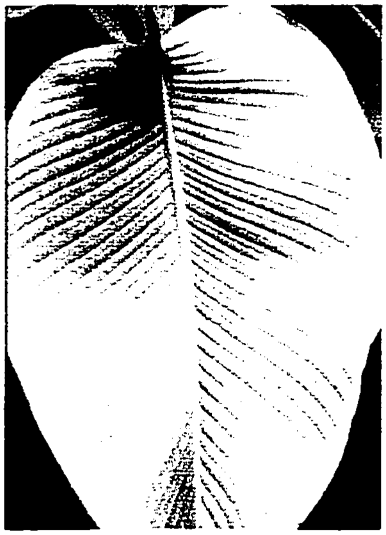
A morning of corn planting starts at about six thirty and, unlike the **k'alek** of a few weeks prior, it starts with festivity. Much attention has been drawn to the **yo'lek**, or vigil for

Figure 6.3: Corn is Everywhere in Chajaneb

the maize seeds by Richard Wilson (1995:94). Michael Wilson (1972:90) notes that veneration, involving pilgrimages to caves, begins at the very beginning of the clearing. Elders told me that this was indeed the case, but today these pilgrimages are rarely made. Blessings are certainly given in ceremonies at the local *ermita* and small shrines are still erected in small rock shelters of the *milpa*, but the main ceremonies (**loq'oniink ru**) tend to commence at the planting. A group of workers and their wives and children arrive at the ceremony and, immediately, a strict sexual division of labor and other behavior follows. Women immediately file into the back room in order to help the hostess, who has been up since at least four a.m. preparing the bean filled *tamales* (**xep**) that will be the main course for the morning. Men and any boys that have been invited to plant enter the altar room where a large table has been set up for the ceremonial breakfast and nod to the chorus of welcoming "**Qawa Marcos, xatkuluunk**..." (Mr. Mark — for example —, you made it!). They approach the altar, kneel, cross themselves and whisper a prayer just under their breath. The altar, a permanent fixture of any proper Catholic Q'eqchi' house, is extravagantly decorated for the corn planting season. A large arch made of **okob'** (*Liquidambar styraciflua*) sprigs surrounds an image of Mary, Jesus, and other Saints. White and yellow candles burn at the four corners of the altar table. The ever important **pom** (*Protium copal*) resin smolders in a small ceramic *incensario* and the pungent smoke drifts through the entire house. Cacao seeds (*Theobroma cacao*) may pepper the table as well.

When the men kneel, they do so in front of the altar and in front of a large pile of seed — **iyaj**. This is the blessed seed that will soon be imparted into the soil. It shares the spotlight with the blessed Virgin and is offered both thanks and a meal of chicken or beef to ensure it will be planted with potency, with **metzeu**. This practice shows a strong analogy to the practice of "feeding" the corner posts of a house that are also, in a sense, "planted." After a prayer, men remove their small cotton seed bags (**bols**), toss them on the pile of seed, and take a place at the table. Although the planting group is largely Catholic (and largely related by consanguinity or affinity), *evangélicos* are present, welcome, and simply forgo the crossing and kneeling in front of the altar. Unlike the image of fierce rivalry that is frequently painted of the relationship between Catholic and Protestant, the two eat, pray, and plant side by side with no apparent strain or stress. In fact, I once attended a corn harvesting session directed by a Catholic family, where the eldest and most senior male of the group asked an *evangélico* participant to say the prayer — he was a preacher, after all.

Figure 6.4: A Leaf of **Moxl**



Once the male constituency has all been seated, the master of ceremonies — the eldest relative and/or resident of the planting household — says a blessing to the corn, to the food to come, and to the participants. During this prayer, the **pom** is lit, and smolders while the *incensario* is waved in all corners of the house and around the outside perimeter of the house. The leader will then rush to the kitchen and call for food to be served. He then returns to his seat and begins a long string of acknowledgments to all the participants, each of the planters responding with a **b'antiox awe** ("No, thank *you* fine sir."). The morning meal consists entirely of **xep** and coffee. The women emerge from the back with large plastic pails filled with the bean *tamale*s. The back room is sweltering from the flame of the **xam** (fire), forcing the women to cool off by wearing their *huipiles* over their head so that the neck hole rests at the small of their back. The *tamales* are filled with a bean called **kok' kenq'**, a pole variety of *Phaseolus vulgaris*, and are wrapped in a leaf of **moxl** (*Calathea allouia*), the covering in which they were steamed (see Figure 6.4). The hot, wet, bland dough satiates the men's appetites, the watery, sweet coffee their thirst. The leaf wrappings are thrown to the floor and quickly make a mat of *Calathea allouia* and pine needles (*Pinus oocarpa; Pinus pseudostrobus.*), which were ceremonially strewn to cover the dirt floor the night before.

When the leader of the day's planting session is convinced that his crew has been well fed, he gets up from his seat and goes to the pile of corn seed. He plucks his bag from a mound of seed bags, a store bought variety that look almost identical, and fills the bag will seed, nearly to the brim. All the men at the table follow suit and gather outside the altar room.

Outside the altar room, lying against the house, are dozens of two meter high poles called **auleb'** or simply, **che'** (tree) that will serve as the digging sticks for the workers. Although almost any stout pole sharpened to a point with a machete at one end will do fine, every man certainly has *his* pole, the sweat of years of planting wearing a "handle" smooth and polished strait through the bark. Armed with poles and seed bags, the men take off for the hills, knowing exactly what the plan is — e.g., which parcel of land will be planted first.

There is never any question concerning parcel ownership, nor parcel boundaries. This comes more obviously from year after year of planting, but less obviously from the use of plants as boundary markers. Many types of plants could be emically recognized as marking the border between two parcels of land, but three species make up the overwhelming bulk. By far the most important is **k'uuk'iil** (*Yucca elephantipes*). This plant, with its odd habit and striking appearance, is an obvious choice for a marker, although it is used much more frequently as a corner marker than a line marker. That job is the domain of **kaqi q'een** ("red leaf," *Liliaceae*, see Figure 6.5). Finally there is the rather eloquent **tz'in te'** ("manioc tree" *Erythrina berteroana*) with its gnarled trunk and striking, red inflorescence. **Tz'in te'** is used more commonly for boundary markers between *aldeas* with some old trees of over 50 cm diameter-at-breast-height (dbh) marking some rather ancient boundaries.[4]

Figure 6.5: A line of **kaqi q'een** delineating a corn field

Every family plants *milpa* in the immediate area surrounding their house, that is, throughout what I earlier called the home garden. The largest fields, however, are often located over an hour's walk from the house, sometimes farther. As workers arrive at the site, the owner of the parcel spreads people

[4]**Tz'in te'** is a fast growing tree that can be easily planted vegetatively. It would be especially interesting to map the distribution of the **tz'in te'**s of Chajaneb and, if possible, date them by tree ring core dating. Theoretically, one could produce a historical reconstruction of boundary markers.

approximately two m apart, from the top of a slope to the bottom. Planters then proceed across the slope. There is a definite technique to corn planting, called "**awk**." Planters first spit in their right hand and furiously rub the saliva to a paste, grab their digging stick, and walk. At about one meter intervals, the pointed stick is driven with full force into the loamy soil, twisted counter clockwise, then clockwise, and then pried away from the body, then toward the body. Planters dig into their seed bags and attempt to pull the agreed upon number of seeds. In my experience, five kernels are planted per hole, although some seed varieties, I was told, do better if planted in groups of four. Men glance at their hand, scan and count seeds, place their thumb on the number of seeds over five, and — almost without bending — drop the seeds into the hole. The tip of the digging stick is then quickly passed over the hole's surface to spread a thin layer soil onto the naked seed.

The men move incredibly fast across the field and maintain near perfect distances between holes, despite the steep angle, the sometimes rocky soil, and the presence of the mounds of weeds, pine, and an occasional fruit tree. Rarely is there even a pause to contemplate the placement of the next thrust. The trick, it was explained, is to think in squares, for as each man is in charge of about two rows down the face of the hill, you need to create a square with your uphill neighbor, between your own rows, and with your downhill neighbor. I will never forget being watched by the group of men, long finished with their rows, watching as I fumbled with seed, wrung my sore hands, and pondered endlessly over the placement of my next move. The **awk** is a technique with a shallow learning curve.

Planting is anything but a solemn, religious ritual. Although my skills may certainly have been reason for more than average laughter, corn planting was an easy-going, joyous time for fun. The corn itself is taken quite seriously; any dropped kernel is either returned to the seed bag or placed in the correct hole, but the process is light-hearted. A break will bring the work-gang under the shade of a pine tree or banana grove for a hearty drink of piping hot coffee from a plastic container. A team of 12 men can cover a field of eight *cuerdas* in three hours — one *cuerda* in 4.5 man/hours.

The lunchtime meal is the grandest of the corn planting day. It is one of the few meals of the year where a large audience is treated to large quantities of beef and turkey. Men returning from the morning's planting session are greeted at the house with cups full of steaming cacao broth. This broth is served in halves of the near sacred **seer** gourd (*Catalpa* sp.) which are painted in reds, blacks, and yellows. The cacao (*Theobroma cacao*) is always bought at the local market, as it is of lowland origin. It is prepared by first boiling, then grating the reddish oblong seeds into a mealy, granular powder, and then beating this into hot water with annatto (*Bixa orellana*), vanilla, and sugar. The watery result is consumed in large gulps, with the server standing at the drinker's feet until the entire gourd-full is finished. Second and third servings arrive in rapid succession.

After the host is satisfied that all workers have received enough to drink, they are invited to take a seat at the table in the altar room. The host then continues with a short and soft prayer of thanks, welcoming his guests from his fields and to his house. Immediately, tubs full of *tamales* wrapped in **moxl** leaves are poured all over the table and endless piles of *tortillas* are stacked; then, each man is served a large bowl of beef and turkey **ya'al** (i.e., "stew") — **ya'al** — in a loose order of seniority. Butchers in the market of Chamelco must see enormous profit from the meat they sell during the planting months. This **ya'al** is amply seasoned with rock salt and **ik** — the watery blend of braised *Capsicum annum* peppers — turning the soup into a bowl of oil, fire, and salt that leaves a lasting impression on the lips of a novitiate. The capstone of any corn planting session was traditionally a vat of **b'oj** — fermented sugar cane juice. Although planters always joked about getting me intoxicated on their strong **b'oj**, the practice has become far less common with the rise of evangelical missions and renewed Catholic conservatism.

Interestingly, the men will almost *never* eat any of the beef or chicken in the *caldo*, preferring to wrap the delicacy in a large banana-leaf **xel**. The **xel** construction marks the end of the meal. The host hands a banana leaf and a short cord of **ik'e** (of *Furcrea guatemalensis*) to each of the guests. Every individual then combines the chunks of meat with several pinches of salt and wraps the combination into a package that will be taken home and shared with the family following the afternoon planting session. Amid a chorus of **b'antiox**, every man finds a nail on the wall where his **xel** can be hung, thanks the host for a fine meal, leaves the altar room in search of his planting stick, and departs for the next segment of field. The planting process is repeated in the afternoon, with men returning to the host's house at around 5:00 p.m. for another round of cacao broth, and then return home to share the meats brought home in the men's **xel** and large bundles of *tamales* and *tortillas* that the women have collected as leftovers from the day's festivity. The whole planting process will repeat itself over and over again for the next several weeks, with a series of different hosts. It is a regular, festive, revitalizing force in the community that continually reaffirms that the culture and ecology of corn are paramount.

The weeding of the corn fields — the **aq'ink** — is most commonly done twice a year, in June and July, and is not the scene of nearly as much ceremony. The work is more frequently done by smaller labor groups, consisting of a group of three to four closely related males. Children partake intermittently, before the school day begins, or perhaps in the late afternoon for a few hours before the dinner meal. With the corn planted about six or seven weeks ago, weeds have reached a height of not more than three or four inches, about equaling the height of the emergent corn stalk. Young weeds grow in close around the corn stalk, many varieties not completely by chance having deep green, acaulescent, long-nerved leaves, closely approximating those of corn. The process of removing those weeds with a large-bladed hoe is a beautiful action to watch, as recorded in my notes, "... it is more than just scraping away weeds."

A batter's grip is used on the **asaron**, with the hands at about 45 cm apart. The wood of the handles is almost universally from **okop** (*Liquidambar styraciflua*) and is polished by spit-soaked hands. A full, shoulder-high swing is used, but the method is by no means violent. The blade of the hoe is brought within centimeters of the stalk, removing an extremely thin mat of weeds, with as little attached soil as possible. The crux of the move comes on the half upswing, where a gentle twist of the blade sends the mat of weeds tumbling top down next to the base of the stalk. A quick shove by the hoe blade nests this mat of overturned weeds solidly against the stalk, supporting the young root systems. A good *milpero* will weed by hand any remaining grasses that might be just too close to the corn stalk to remove with a hoe, but, other than this, little bending is done through the entire day. The entire process will repeat itself in about four to six weeks. After this time, the corn has grown to about knee height and is tall enough to shade out any emerging weeds.

By mid-September the corn stalks are full-grown, have flowered, and have long green ears that the Q'eqchi' call **k'ux**. As if they cannot wait to eat some fresh corn, many Q'eqchi' families send their sons into the *milpa* to gather several dozen **k'ux** that will be placed on the hot coals of a fire, wrapped in only their husks (**humal**). A dinner meal of only salted **k'ux** is not at all uncommon and is a special treat for children. The corn of the highlands, I was told, produces the sweetest **k'ux**; its lowland counterpart is almost objectionable.

By mid-October the corn has reached maturity and is ready for harvest — the **k'olok**. There is much festivity surrounding the corn's harvest, in a style and format much like the corn planting. Therefore, here I will only detail the technique of harvesting and the sorting of ears following the day's work. A work group of about the same size and composition as the planting group clusters on one side of the host's field. The host then selects a marker, called the **retalil li tuub'** (literally, "sign of the mountain of corn"), which will serve as the marker toward which individuals will throw the ears of corn. A man bends a stalk and eventually breaks the stalk at about waist height, allowing him to get hold of the one to several ears that would otherwise be out of reach. Tied to his belt with a piece of nylon cord is a nail or small, pointed stick called a **laaw** (literally, "key," probably from Sp. *clavo*) that will serve to break open the hardest, outermost husk of the corn stalk. Without the **laaw**, even the roughest, most calloused of hands will quickly become torn by the sharp, minutely serrated edges of the corn husk. If the exposed cob is small, deformed, or badly rotted, the entire husk will be snapped from the base of the cob. This low-quality corn is labeled **k'oq b'il** and is tossed overhand toward the **retalil li tuub'**. The larger, better cobs are removed of most of their husks, with only half a dozen strong husk blades left attached that will later serve to tie the cobs to the lower house rafters. These cobs are classed as **k'uluk** (also the term for a small, black *Lepidoptera* caterpillar) and launched underhand toward the **retalil** from their remaining husks.[5] Soon the group is pitching corn from distances of over 15 m, with stalks missing their targets. At this point, the host will call for the group to split up, select another area of the field, and have individuals choose new **retalil li tuub'**s.

The harvesting, like the planting, is an especially joyous occasion, even though a host may complain bitterly that his harvest is full of **k'oq b'il** corn. This is especially the case on a warm, sunny day, although by mid-October these days are hard to come by in Alta Verapaz. Nevertheless, the harvest proceeds rain or shine, primarily because farmers fear that their crops may be rotting (**q'aak**) with each passing day. When a parcel has been completed, the workers gather their **kostal** (large sack) and **taab'** (tump and tump line) and disperse to the various **tuub'**s of the host's field. Every carrier brings only **k'oq b'il** or **k'uluk** at a time, as they will be sorted as such in the home. The **k'oq b'il** are simply piled into the **kostal** until the **kostal** is full, leaving not even one decaying cob nor one spare square inch of empty space to

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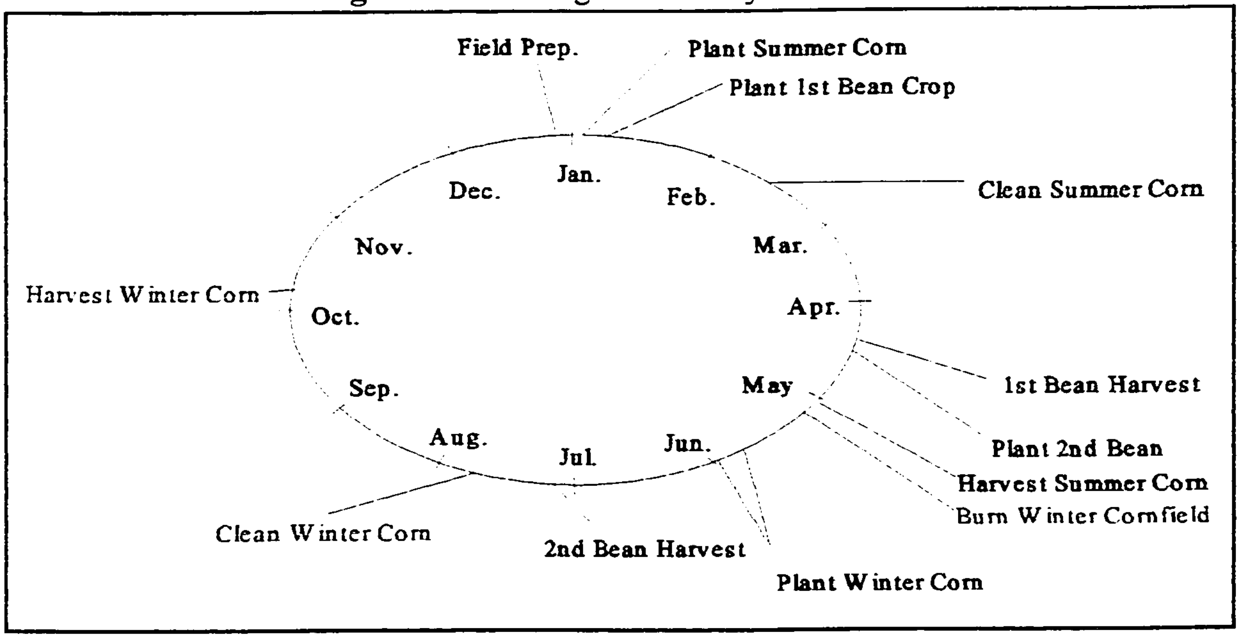
[5]Wilson (1972:102) gives five categories of corn: **tulux, muruk, k'oq b'il, k'ulum** (my **k'uluk**), and **niimqi hal**, in increasing order of quality. Although farmers agreed that these names were used, the third and fourth degrees were used most commonly.

spare. Using the pitch of the field to help hoist the man's burden onto his head, a carrier immediately assumes the familiar pose and behavior of the Q'eqchi' corn harvester: with body bent forward against over 60 kg of corn, and with hands fastened to the tumplines at about ear level, he will trot — not running, not walking — with incredible dexterity and endurance to the host's home. The **k'uluk** requires a bit more technique in order to fill the **kostal** to maximum capacity. Cobs are stacked with tying stalks toward the opening of the **kostal**, so that the lowest level of cobs stretches the large sack to its limit. Successive rows are then piled in a similar manner until the entire **kostal** is full. Workers then take any remaining cobs and force them into any open spaces of the uppermost row, securing the entire cargo.

When the workers bearing corn arrive at the door of the host, it is generally the women that assume the leadership role, directing where the two classes of corn will be stored. The smaller pieces are generally mounded in a great pile in the loft of the house but, before anything can be done with the **k'uluk**, they must be prepared properly for hanging. This process is known as **pixok hal** and it takes considerable time, energy, and skill; it is also used as a time for relaxing and talking after the long harvest day is over. The largest, straightest, and most uniform of cobs will become the next year's seed corn and will be tied into units of six; the remaining "food" corn will be clustered according to color and will be tied into units of five. The knots of corn stalk are exemplars of ingenuity and will hang close to the fire, ensuring that their seed is adequately dried and thus ready for consumption.

Agriculture in Sa Mox

Figure 6.6: The Agricultural Cycle of Sa Mox



If anything, corn plays a *more* important economic role in the migrant community of Sa Mox. It also consumes much more of the daily and yearly agricultural input. This is largely due to the fact that, below about 1000 m above sea level, two crops of corn are planted and harvested a year instead of one. This results in a rather different agricultural cycle than in the highlands of Chajaneb (Figure 6.6).

The process of bean cultivation in Sa Mox differs little from that described above. The only truly significant differences are two: location and productivity. The community of Sa Mox is on a plain 200 m above sea level between two ranges rising 900 m above sea level. Agriculture occurs either on the flat plain, preferably, or on the slopes of the ranges that border the plain. For beans, planting occurs entirely on the flat, semi-alluvial plain, where beans are exposed to the sun's direct rays for all the long, daylight hours. As in Chajaneb, the beans that cover large areas of the flatlands are all of the "bush" variety, with only one variety of "pole" being grown in the gardens: **nun kenq'** (*Phaseolus coccineus*). Second, and more importantly, although people grow approximately the same number of *cuerdas*, they receive a higher net quantity in Sa Mox. This is due to the fact that, like their corn cycle, they can also plant two cycles of beans per year instead of one. Although it was impossible to measure the bean harvest, as it took place after I had left the community, I estimated that residents of Sa Mox are self-sufficient in beans for approximately 5.5 months of the year, as compared to just three in Chajaneb. Sa Mox farmers planted an average of 3.9 *cuerdas* of beans (SD=6.31[6]), a close approximation to the Chajaneb figure of 3.75. As in Chajaneb, I was persistent with the question, "There is so much land not planted in beans, why not plant more and be self-sufficient the entire year?" I thought this to be a more relevant question here in Sa Mox, as chemical fertilizers were not applied to the soil, significantly decreasing the capital input. "Beans are fickle," I was told. All the work that goes into a bean crop can be lost quickly to bad weather — too much or too little rain. Why risk it when there are plenty of beans for sale in the Canhuinik market for good prices?

First and foremost, the agriculturists of Sa Mox harvest corn. More interestingly, they are *farmers* in the capitalist sense of the term — they grow corn not only for food, but for sale. Fifty percent of the farmers interviewed in Sa Mox grew a corn surplus, these 10 farmers selling

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[6]The standard deviation of this figure is so inflated because one individual of my survey planted 30 *cuerdas* of beans. He could feed his family of 10 children for the entire year on the crop.

on average 9.4 *quintales* each. Given the wholesale price of corn during the months of my stay in Guatemala (approximately 45Q/*quintal*), a family could expect 423Q/year from the sale of surplus corn. This figure may seem small (approximately 53 USD), but given a typical day laborers pay, this figure represents 28 days of labor.

The first corn cycle, grown from January to May, yields by far the best harvest. During these months the flat plain of the valley is clear of standing water, yet recently hydrated from the swelling of the Río Canhuinik. Despite the fact that the major soil nutrients of the valley soil (nitrogen, potassium, phosphorous) are not well represented in soil samples (see Chapter 3), the corn is large, plentiful, and almost all white. The name of this harvest is the **saqi wa** (white food or white corn). The winter harvest — called **k'at k'al** (burned *milpa*) — must be confined to the steep slopes of the ranges, as water floods most of the valley making corn planting impossible. The soils on these slopes are even poorer than on the valley floor, erosion can be a serious problem, and the harvest is, therefore, less.

The name of this second corn harvest reveals an interesting pattern that further distinguishes the corn harvest, and separates the lowland corn harvesting methods further from their highland counterparts. In 1982, when the first recent wave of migrants came to Sa Mox, the valley was almost entirely forested. As corn simply can not tolerate shade, this forest had to be removed in order to harvest corn successfully. The first *milperos*, like Don Domingo of Chapter 3, had the luxury — in their mind, the daunting task — of planting crop after crop on land cleared of forest by their own hands. In order to do so, large hardwood trees were felled with an axe, underbrush was cut with a machete, and the resultant debris was burned. This yearly tradition of removing forest, burning, planting and harvesting corn, which lasted only until 1988, fit perfectly with the "slash-and-burn" or "shifting cultivation" cycle of corn harvesting so familiar in the anthropological, ecological, and conservation biology literature:

> Clearance of the forest for agriculture has from ancient times been the main consumer of primary forest, the main creator of extensive stands of secondary forest, and the main cause of the creation of grasslands in place of either forest or farming. It continues so today, notwithstanding the depredations produced by the timber industry. ... cultivators open the way to the invasion of grasses that are not shaded out by the recovering forest because new fires — often escaping from the fires lit intentionally to clear adjacent gardens — destroy the young trees before they can be established. Thus the shifting cultivators are, it is said, the principal destroyers of the forest in many regions, doing far more damage than the timber industry (Brookfield 1988:215, 218)[7].

It does not take expertise in conservation biology to determine that, given a limited area and an increasing population, this type of corn cultivation will lead to problems. In 1988, realizing this very fact, the now swelling community of Sa Mox formed a committee to deal with the problem. The committee effectively changed what was ultimately common property into a series of privately worked and managed parcels, and forced farmers to plant yearly on the same parcel of land. The strategy calls quickly to mind Hardin's "Tragedy of the Commons" (Hardin 1968). This will be discussed further in the conclusions of Chapter 10, but it is

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[7]As the reader may have gleaned from the phrase in the last sentence "it is said", Harold Brookfield was writing under the subheading "In Defense of the Shifting Cultivator." He later goes on to say "The recovery of a complex forest in these areas (of shifting cultivation), despite continued but much lighter interference, is an important reminder that destruction need not be permanent and that the shifting cultivation system, lightly practiced, can coexist with a recovering and merchantable forest" (Brookfield 1988:218).

important here to at least note that the good of the group was advanced over the will of a few aggressive individuals.

Saqi wa fields were originally given in parcels of 20 *cuerdas*, with individuals receiving more land the longer they remained in Sa Mox. At the time of my arrival, families maintained an average of 22.25 *cuerdas* of land under **saqi wa** (SD=10.17) based on the responses of 20 heads of household to my lowland questionnaire. On average, this land produced approximately 45 kg of corn kernel per *cuerda*, giving a total yield of 1001.25 kilograms of corn from **saqi wa** (see Figure 6.7). This average, which gives a yield of .102 kg of corn per square meter, is based not on actual measurement, but on reported data.[8]

Figure 6.7: A Healthy Harvest of **Saqi Wa**

Several other important factors distinguish the behavior associated with **saqi wa** corn production from the **k'at k'al** and the production in the highlands. For one, large tree stumps, burned as long as 18 years ago, are scattered throughout the corn fields and are a source of firewood for many families. Unlike the corn growing around these stumps, fallen, burned timber can be harvested by any other family, although

[8]In 1974, amidst the green revolution in agriculture and considering the impact of fertilizer, herbicides, insecticides, machinery, and better hybrids, the national average yield of corn for the United states was approximately 90 bushels per acre which is the equivalent of .56 kg/m^2, over five times the average reported yields in Sa Mox (Aldrich, Scott, and Leng 1978:366). It is also remember that the *cuerda* measurement is somewhat fluid, for these calculations I used a figure of 441 m^2.

farmers generally take fuel wood from their own fields simply because they spend so much time there. Second, the cleaning or **aq'ink** is done almost exclusively with herbicides and a backpack pump called a *bomba*. A *bomba* is a 450Q investment that is worn like a backpack that uses air pressure, generated by pumping a lever to spray liquid from a tube. The preferred herbicide is *Gramisón*, which is purchased in the markets of Cobán, Cubil, or Canhuinik for seventy Quetzales a liter, which is enough to kill the weeds in about 16 *cuerdas* of land. Parcels of land, I was told, are just too large to clean efficiently with a hoe, and the labor that an individual would be required to hire would be significantly more than the cost of the *bomba* and *Gramisón*. Interestingly, the use of chemical fertilizers is insignificant in the community of Sa Mox. Families prefer instead to use large quantities of a legume called **ab'on kenq'** (*Mucuna pruriens*) that is purchased up the road at Cubil for half the cost of a chemical substitute (15-15 or 20-20-20). Third, in terms of significant differences, involves the storage of corn. Because corn fields are so large, and because they are frequently at great distances from "downtown" Sa Mox, most Q'eqchi' families maintain a small corn house (**k'uuleb'aal hal**) on each parcel of land (Figure 6.8). These storage houses employ the **k'uk** construction method as discussed in Chapter 4, all have corrugated tin roofs (*lámina*), and measure about three by three by two meters.

Figure 6.8: A **k'uuleb'aal hal**

A fifth critical difference between highland and lowland corn harvesting involves labor. Both planting and harvesting the large fields of **saqi wa** requires labor inputs that frequently go beyond the circle of extended family and friends and, most often, families will hire two to three young men from outside the community to help. These laborers will receive room and board in addition to a daily wage of approximately 15Q. Interestingly, and perhaps related to this new living situation, ritual is much less prevalent for lowland corn farmers, generally taking place only on the day of planting. The corn planting rituals are almost identical to those described above and need not be retold here.

Finally, and perhaps most importantly, the presence of a second cycle of corn , called **k'at k'al**, distinguishes lowland from highland corn agriculture. This winter harvest is less productive than the summer harvest (reported about half as productive), so much so that one family simply abandoned the process altogether. Corn is planted in areas about as large as the **saqi wa** on the steep hillsides of the San Luís range to the northwest of the community center. The **k'at k'al** is perceived as a kind of emergency surplus, filling the gaps left open by the **saqi wa** harvest or supplying a few *quintales* of corn that can been sold at market. A review of the most dramatic differences in agricultural techniques as applied to corn appears in Table 6.1 below.

Table 6.1:

Dichotomous Key of Distinguishing Features between Corn and Production in Chajaneb and Sa Mox

Chajaneb	*Sa Mox*
1 corn harvest/year	2 corn harvests/year
little use of hired labor for corn production	significant use of hired labor for corn production
festivity at planting and harvesting	festivity only at planting
manual weeding with hoe	manual weeding with *bomba* and *Gramisón*
corn stored in household	most corn stored in *k'uuleb'aal hal* in the fields
absence of downed wood in fields	presence of downed wood in fields
harvest sustains family for 6.25 months	harvest sustains family for most or all of year
no corn surplus	average of 5.4 *quintales* of corn surplus/year
average of 13.6 *cuerdas* corn planted	average of 48.18 *cuerdas* of corn planted[9]
little use of fire for weed control	significant use of fire for weed control
fields clearly marked with flagging plants	fields rarely marked with flagging plants
significant use of chemical fertilizers	significant use of natural fertilizers

***

The process of corn cultivation in the highlands and lowlands is linked both culturally and economically. Culturally, despite significant changes that I call cultural adaptations, the lowland method of corn production still retains many key elements ultimately traceable to the highlands. Economically, there is also a very important connection: the corn that the highlanders are forced to purchase because of an inadequate land base actually is grown in the lowlands in and around Sa Mox. Migrants to the region, then, transform themselves from consumers to producers. During this transformation from corn-purchaser to corn-vendor, the process of corn cultivation is stripped of many cultural associations present in the highlands. Nevertheless, the people are ultimately consumed by corn

[9]This figure represents combined areas of summer corn (averaging 22.25 *cuerdas*) and winter corn (averaging 25.93 *cuerdas*).

culture, economically speaking. Moving from one corn cycle to two requires a complete reorganization of the yearly family economic cycle, a reorganization that has implications in many other cultural arenas involving plants. In terms of this reorganization, the two most important changes are 1) the ways in which the Q'eqchi', mostly males, work in the forest and 2) the importance of crops that are integrated in the network of local and regional markets, the subject of the next two chapters.

Chapter Seven: Harvesting Forest Resources

In Chapter Three data were presented on the structure and composition of forests in the *aldea* of Chajaneb and in the community of Sa Mox. All the forest plots from both communities were orally labeled as **k'iche'** by my Q'eqchi' peers — glossed in English as "forest" — yet the differences between these forest types, especially when comparing community forests as a whole, are dramatic. This chapter explores and compares the ways in which the Q'eqchi' exploit forest resources in the two communities. It will be shown that the differences in forest exploitation vary, not only in term of forest species exploited, but also in terms of the ways in which community members conceptualize forests in relation to other landscapes within the community. This differential exposure to forest landscapes, in turn, shapes the degree and kind of knowledge of plants in those forested landscapes which is then reflected in differential plant lexicon. Where this chapter describes the process of adaptation to lowland forests, Chapter Nine's discussion of lexicon follows the differential acquisition of plant names between communities and between males and females.

The Forests of Chajaneb

In the discussion of home gardens presented in Chapter Five the point was made that, in contrast to the ways in which many North Americans may envision a home garden, the Q'eqchi' gardens of Chajaneb have relatively plastic boundaries, with the transition between garden and *milpa* occurring over broad spaces. In Chajaneb the same point essentially holds true with the transitions and boundaries between forests and gardens, and between forests and *milpa*. The forests of Chajaneb could best be described as patchy. At the same time, the population density of the Chamelco region is very high compared to other municipalities in the Department (at approximately 227 persons/km^2). High population density and scattered, patchy forest environments create a situation where humans are never very far from forest landscapes. This proximity is often convenient for the exploitation of forest resources, but it also dramatically impacts the ways human beings *perceive* the forest and their relationship to it.

The forests of Chajaneb, and most forests of the Guatemalan highlands, are a far cry from the deep, dank jungles so stereotyped for the tropics as a whole. Although men are the principal exploiters of forest resources, the forest itself is not considered a particularly dangerous place for women. Paths frequently criss-cross through small forest stands, and passing through these forests becomes a matter of necessity for everyone in the *aldea*. This situation, it will be shown, stands in stark contrast to the relationship between people and forests, especially women and forests, in the community of Sa Mox and impinges on the acquisition of plant names.

The structure of Chajaneb forest landscapes is so bound to the past and present behaviors of human beings that they are entirely and profoundly anthropogenic. The oldest trees in the *aldea* are a stand of enormous pines (*Pinus oocarpa*; *Pinus pseudostrobus*), yet these are just over 70 years old. It would not be an exaggeration to say that almost every m^2 of forest in Chajaneb was, at some point in the past five centuries, composed entirely of *milpa*.

The small size of forest parcels, because of a large perimeter-to-area ratio, means that they are always under the influence of the edge effect: the process by which an edge of forest exposed to the different microclimatic conditions outside the forest affects the ecology of the woods as a whole. The Chajaneb forests are, in essence, more edge than closed-canopy forest. High population densities and individual ownership of forest parcels result in a situation where even relatively large parcels, with distant edges, are continuously exploited for household fuel, structural timbers, and other wood products — all of which leave a lasting impression on the structure of the forest.

Following the plot surveys described in Chapter One, the small, anthropogenic, edge-influenced forests in and around Chajaneb can loosely be classified into three types. First, forests of pure stands of pine (*Pinus oocarpa*; *Pinus pseudostrobus*) are quite rare and occur most frequently on the crests of the numerous haystack hills that dot the *aldea*. These stands of pine exhibit canopies above 25 m in height and have very little undergrowth. These pure pine stands have individual trees of very wide girth (often over 150 cm diameter at breast height) and are, therefore, intensively sought after by woodcutters. These forests are composed largely of *Pinus oocarpa* and *Pinus pseudostrobus* and are reminiscent of the pine forests of northern Appalachia. An obvious distinguishing feature of these montane tropical forests can be found high up in the canopy: continuously high moisture levels create a perfect environment for a tangle of epiphytes and mosses, much more reminiscent of lowland tropical forests. Second, there are the stands of mixed hardwood/coniferous forests, composed largely of pine (*Pinus* *pseudostrobus; Pinus oocarpa*)[1] and sweetgum (*Liquidambar styraciflua*). Thirdly, there are the oak (*Quercus guatemalensis*) and gallery forests composed largely of hornbeams (*Carpinus carolineana*) which are also quite common. These forest types are somewhere on the cusp between Mirand's (1952;1953) "*selva alta subdecídua*" and "*selva de cajpoquí*", and are characterized as belonging to the lower montane rain forest formation, also typical of the oak/pine forests of highland Chiapas.

First and foremost, these three forest types are seen as sources of fuelwood. Most families maintain a parcel of forest, equaling approximately nine percent of their total land, specifically for the purpose of cutting fuelwood. This fuel will eventually warm the house on a cold night, kill or drive off many insect pests, and, most importantly, heat the circular, iron, flat *comal* (**k'il**) that will cook the corn *tortillas* (**wa**) that make up the majority of the family's caloric intake. The responsibility of gathering firewood from the forest rests largely on the shoulders of the eldest male in the household; rarely if ever will more distant kinsmen assist in a labor drive specifically for gathering fuel. Women and children also play a role in transforming a tree into the extremely valuable commodity that is firewood, but rarely cut living trees.

Men generally keep a close watch on the progression of the timbers that populate their private forest plots. When a man and his male children awake on a day they have designated as firewood cutting day, they do not simply wander through their plots looking for a specimen; rather, they make a bee-line for the tree that is deemed ready to be processed. The felling,

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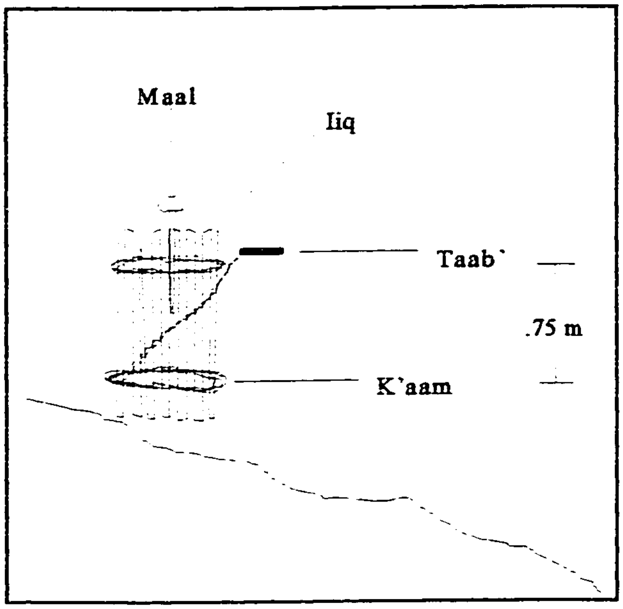
[1]A third species of pine, *Pinus tecumumani*, was proposed as existing in the region by Dr. Fritz Schwertfeger, although Standley and Steyermark do not recognize it as taxonomically valid. The three species as a group appear to be quite variable in form and are, therefore, frequently confused (Standley and Steyermark 1958(1):53).

cutting, and retrieving of firewood requires at least one morning of work and must be repeated approximately every three to four days to supply the necessary fuel for the hearth. Once a path has been cleared to the chosen tree's trunk, the lay of the land is analyzed and the cutting proceeds so that the tree will fall downhill, hopefully toward terrain that allows for easy segmenting. A single bladed axe — called **mal** — with a handle made from **okop** (*Liquidambar styraciflua*) is used to fell the tree. The tree is notched on the downhill side, resulting in a fragment of wood called **k'aj che'**, and then finished off with a few strokes to the uphill side. In general, the Q'eqchi' males of Chajaneb are superbly skilled woodsmen and are highly skilled in tree cutting (**kurek**); rarely do trees fall out of the intended design.

Trees felled for firewood are commonly in the 16 to 25 cm dbh range, as they section and split into a size that best fits the need of the family fire. Branches of trees these sizes are rarely over 10 cm dbh, and can be removed with a few swipes of a machete (the action, called **b'esexink**). With the tree felled and cleaned of lateral branches, the segmenting (**kuruxink**) begins at the trunk and proceeds to the apex in divisions of approximately one m. This measurement, called a **b'aar**, is based roughly on the length of a grown man's arm or that of an axe handle, and this length is accommodated to the size and shape of the hearth.

As the felled tree is usually green, and, since wet wood weighs significantly more than dry wood, a Q'eqchi' woodsman prefers to leave his felled and segmented timbers in the forest, yet this is rarely done as theft of firewood is a common occurrence. Therefore, the segments must be gathered, stacked, secured, and carried with tumpline across sometimes treacherous terrain in order to be processed further around the household. To do this, a

Figure 7.1: The Woodcutters Burden (**iiq**) and Accoutrements



woodcutter piles the firewood segments atop two pieces of nylon cordage (or of maguey, **ik'e**, *Furcrea guatemalensis*) which lay parallel with the slope of a hill and approximately .75 m apart. Once the wood burden (**iiq**) is gathered, these two cords are wrapped and tied, usually with single and double half-hitches. Frequently, the axe is carried by forcing the handle among the segments of fuelwood. The tumpline, again of nylon or **ik'e** is fastened to the lower, backside of the burden and attached to the headpiece of the tumpline (**taab'**) made with leather or nylon sack material (**kostal**). Then the carrier places an empty sack over his shoulders to line his back and protect it during the return home. Finally, the porter nestles against the downhill-side of the now upright burden, grasps the tumpline at about temple level, and then slowly shifts his weight forward, using gravity to force the burden off the ground and onto his back. This same method of portage is used in carrying harvested corn from the field to the home, and it is a technique that requires amazing leg, back, and neck strength, superb agility and balance, and — above all — endurance (see Figure 7.1). An adult male commonly will carry more than 77 kg of firewood at a time; a young adolescent may carry as much as 50 kg. Wood burdens are set down outside the home and are generally split with an axe (**jachok che'**) in order to facilitate the drying process. This is done by laying two halved pieces parallel at approximately .75 m apart, then superimposing a round log perpendicular to the two halves. An steel axe is used for splitting. This laborious process is most commonly the work of men and adolescent boys, but I witnessed more than one woman splitting logs with nearly equal efficiency. These halved, m-long pieces are then stacked by leaning them up against the house and are dried for a period of five days. Interestingly, some trees, such as the common *Liquidambar styraciflua*, can be cut, split, and burned on the same day. However, most require at least several days for drying.

This raises the issue of tree species selection for firewood, one that I included in my questionnaire in order to describe the selection process quantitatively. In reality, almost anything that can be burned is burned. Even the infamous **am che'** (*Rhus striata*), which causes horrible rashes when the skin comes into contact with any part of the tree, is occasionally burned, although most people reasonably fear that the inhaled smoke of burning **am che'** cannot be healthy. Some families also feel that by burning the omnipresent **oonk** (*Hedyosmum mexicanum*), malevolent spirits (**awas**) are released and will cause infections in children. Table 7.1 below demonstrates the variety of trees chosen as firewood.

These data were gathered through the use of the free listing method as part of the general questionnaire administered to the families of Chajaneb and Sa Mox by Alvaro, a student of a summer class entitled "*Los Métodos de la Etnobotánica*" that I taught during June at the Chajaneb field site, conducted a second free-listing experiment. In both Alvaro's and my own questioning, participants were simply asked "Name the best types of wood for fuelwood" (**Karu xkab'a li si' jwal chab'il arin sa k'aleb'al?**).

Table 7.1: Wilson's (1972) and Collins' and Alvaro's (1999) Firewood Free Lists

Wilson's Free List	Collins' and Alvaro's Free List	Scientific names
Principal varieties	*Principal varieties*	*Principal varieties*
ji	ji	*Quercus guatemalensis*
oqob'	okob'	*Liquidambar styraciflua*
chaj	chaj	*Pinus oocarpa*
Minor varieties	*Minor varieties*	*Minor varieties*
pata	pata	*Psidium guajava*
sepres	sepres	*Cupressus lusitanica*
kik'el ji		Unidentified
chamach o	chamach o	*Rondeletia amoena*
ixim che'		*Cleyera theaeoides*
sak atzum	sak atzum	?
semem	semem	*Vernonia* sp.
chochokl	chochokl	*Inga* sp.
chunak te'		Unidentified
ch'alib'	cha'ib'	*Callandra confusa*
ismira'		*Ocotea* sp. or *Mectandra* sp.
tz'unuj che'	tz'unuj che	*Vibernum blandum*
q'am paraway	q'an paraway	*Vismia* sp.
k'ap k'u		*Oreopanax eschenops*
k'ox		Unidentified
xo'ot	xo'ot	*Saurauia* sp.
sub'	sub'	*Rhamnus discolor*
q'ol che'	q'ol che'	*Lippia subestrigosa*
o	o	*Persea americana*
may te'		*Solanum umbellatum*
q'anaix	q'anaix	*Freiera guatemalensis*
oonk che'	oonk che'	*Hedyosmum mexicanum*
	waut	*Myrica cerifera*
	baq che'	*Eupatorium ligustrinum*
	jow	*Verbesina* sp.
	xub'u ti'	*Rapanea myricoides*
	tz'aj	*Perymenium grande*

The fact that 25 total varieties were listed in 1972 and 23 were listed in 1999 is, more than likely, a matter of chance. That the top three varieties listed are identical, however, is by design. **Ji** (*Quercus corrugata*) was unanimously chosen as the best firewood type available to the Q'eqchi' of Chajaneb (N=33). Although the burning temperatures and smoke qualities were not quantitatively measured, oak is sought for its high burning temperature and relatively low smoke levels. Oak is, unfortunately, now largely logged-out exactly because of those qualities, and families wanting to burn oak generally have to purchase it in the local market. The quality of oak as a firewood is recognized by the market — perhaps because of its quality and its scarcity — since it fetches the highest price.

Pine, in contrast, is abundant, fast-growing, comparatively cheap, but not a very efficient burner. The heart of pine, called *ocote* in Spanish, is full of quick-burning resin and is frequently gathered from the largest-girthed trees without felling the tree itself. Pine, oak, and *Liquidambar styraciflua* are also the species that are most commonly harvested and sold in the market as a trade. Several individuals in Chajaneb make firewood gathering and selling their profession, and for those who can afford to own their own transportation (just one head of household in the entire *aldea*), the business can be quite profitable. Firewood is sold in one of two sizes: **kok' manoj** and **nim manoj**. The more common **kok'** — small — variety consists of approximately 12 **b'aar**-long segments that are wrapped with untreated maguey fibers (*Furcrea guatemalensis*) and amount to a very manageable bundle of approximately 60 cm in diameter. The **nim** — glossed as "large" — bundles are about twice that size.

A successful wood-merchant, with his or her own transportation, will generally not cut and process the firewood from his or her own land. Rather, they spend the day traveling to the more distant *aldeas*, buying the wood, and then selling it in the town centers of Cobán, Carchá, or Chamelco. Pine and *Liquidambar styraciflua* are the most common species traded, and both can be purchased for 1.5Q/**kok' manoj** and resold for 3.5Q/**kok' manoj**. Any of the various species of oak (**ji**, *Quercus* sp.) can be purchased for 2.5Q/**kok' manoj** and sold for twice that price. Although gasoline and maintenance costs are high, long-term savings are apparent: a trip into Cobán with 100 small bundles of firewood can cost a middleman firewood dealer 50-60 Quetzales. Where each trip could net between 250 and 350Q, this represents an expenditure of 14.2 to 24 percent.

Given the ubiquity of pine in the Chajaneb region[2], the rapidity with which it grows, and the ease with which it is worked, it is not surprising that wood cutting for boards — most frequently, pine boards — occupies a significant amount of almost every male's time and is a principal occupation of some. The pines of Chajaneb either arise via natural seed dispersion, are encouraged through weeding, or are even planted. Some men related how frequently they will gather low-hanging or recently-dropped cones, spread the cones out on a nylon tarp to dry in the sun for three or four days, and then plant the small, white seeds. Its importance and uniqueness as a plant variety are also attested by its evasion of classification, being not entirely within the rubric

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[2]Remember that although toponyms are often difficult to pin down in terms of accurate glosses, Chajaneb could be glossed as "Place of the Pines" with some confidence. Spaniards generally gave phonetic interpretation to indigenous names, with languages varying on the region. "Chaj-" appears in many toponyms throughout the municipality and beyond. Frequently, place names may have indigenous, Maya names, Spanish names, and even Nahuatl place names. Jorge Luis Arriola (1973) has attempted to translate many of Guatemala's toponyms in *El Libro de las Geonimias de Guatemala*.

of **awimk** ("planted") or **namok** ("exists on its own"). Two methods are employed to fell, section, and cut the majestic pines: the modern chainsaw and the more traditional, two-man Swede saw.

The chainsaw is increasingly becoming a more common tool in the Chamelco region. Especially over the past decade, chainsaws are seen as a reasonable expenditure that can bring in significant funds during the many months between harvesting and planting. And, as was discussed in the previous chapter, more and more families are searching for ways to accrue money in order to purchase corn for up to nine months of the year. Because wood cutting is important to many community members and is an activity that brings men into the forest, it exposes men to many plant varieties that are not found in other vegetative communities. This exposure, in turn, helps facilitates the development of a plant lexicon. In a sense, as most of the large animals have been hunted out of the region, wood cutting is the modern equivalent of hunting — a primary economic activity that helps define male and female labor roles and continuously exposes males to forest plant communities. The differential timber species in the two communities also require different methods of board preparation, therefore, I examine the various processes in some detail.

It is rare for a Q'eqchi' logger to own the timbers he will cut; much more commonly he will assess the value of an individual pine, approach the owner of the parcel, and make a deal. A tree of 57 tree rings and a diameter at breast height of just over 100 cm will cost a prospecting lumberman as much as 200 Q. This payment buys the right to enter the owner's land (*permiso*), the right to work the tree on the land, and the right to damage smaller timbers during the felling process. It will take a lumberman and a helper as much as a week to cut and section the tree, saw the timbers, and remove them from the owner's land.

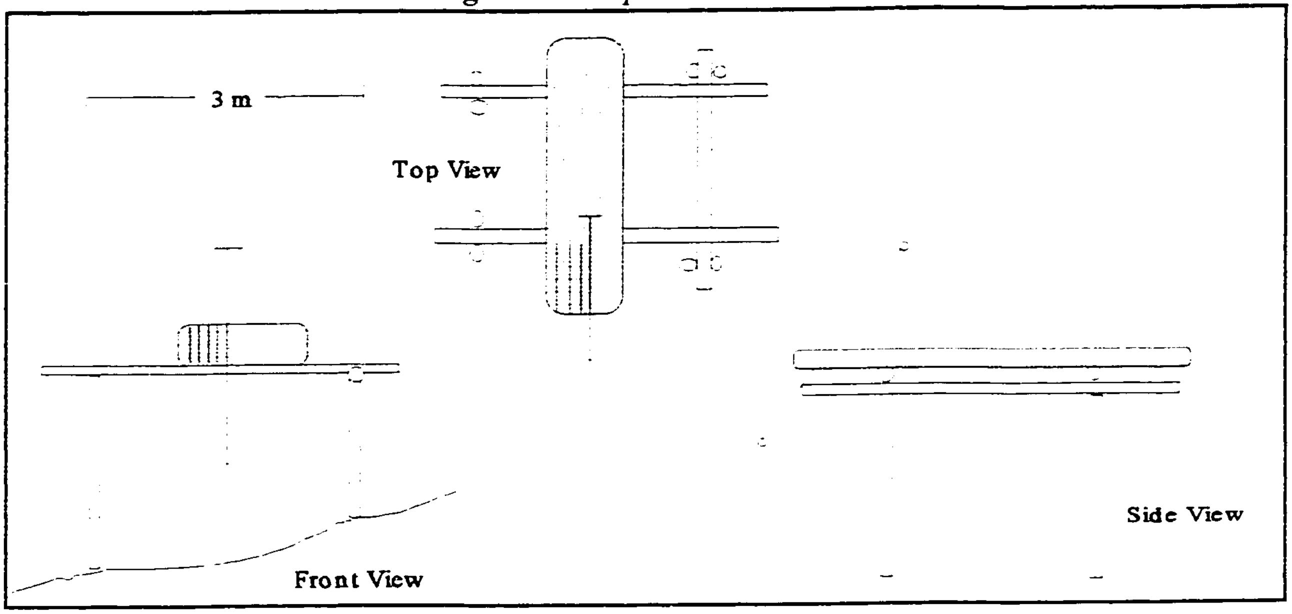
Table 7.2: Cost/Benefit Ratio of a Typical Logging Case Study

Case by Case Expenses for 100 cm dbh Pine Tree	
Stihl DL Chainsaw Payment	56.25 (10,800Q/12 months/4 weeks; includes metal guide)
One Gallon of Gasoline	12.5
One Liter, 2 Cycle Oil	11
New Chain (1/4 use)	45 (180Q/4)
Helper Wages, One Week	75
Round File	8
Cutting Rights	200
Transport to Cobán	60
Total Case Expenditure	467.75 Quetzales
Gross Worth	
Approximate value of timbers	650
Approximate value of firewood from secondary branches	140 (40 **manoj**)
Net Case Worth	**322.25 Quetzales**

A cost-benefit expenditure of a hypothetical 100 dbh pine tree is provided in Table 7.2 and shows that a tree of such diameter can mean a net profit of 322Q. Dividing this figure over the approximately five days that a lumberman must spend in such a process yields a daily wage of 64.4Q, a 430 percent increase above the typical agricultural wage. Given this comparatively good wage, why doesn't every man in the *aldea* take up wood cutting as a profession? At least three constraints are involved: 1) procuring a down payment for the chainsaw; 2) having the necessary skill to produce timbers; and 3) having the proper relationships within the region to secure enough trees and enough *ayudante* (**aj tenqanel**; "apprentice") labor. Procuring a down payment of approximately 1000Q for a 8000Q chainsaw is no easy task in Chajaneb and often involves selling a parcel of land — therefore, it is a huge commitment and risk, both because of the monetary expenditure as well as the loss of possible *milpa* lands. Wood cutting with a chainsaw is a skill that takes a serious time commitment to learn. One of the men with whom I frequently worked timber spent three years apprenticing in order to gain the necessary skill to process a tree efficiently. In terms of the constraints, and perhaps most importantly, being a wood cutter does also demand a certain degree of respect from both potential landowners and potential employees.

Assuming that these conditions are met and a contract has been made to fell, section, and make timbers from a tree, the lumberman sets out early in the morning to begin his task. The 20 kg chainsaw is carried by the blade, with the engine handing over the back of the shoulder. The helper — **aj tenqanel** — carries the **aro** (the steel guide for cutting boards) and the other necessary equipment of the day: a spare chain, gas, oil, round file, flat file, **kostals**, string, tumpline, machete, old batteries, and a wedge. Once they reach the pre-selected tree, they cut it in essentially the same way as was described above for firewood. The bole (**toon**) is then sectioned into either 2.2- or 3-m sections, depending on the length of log the cutter desires. With the tree sectioned, the helper takes a sharpened machete to one side of the tree. He takes several longitudinal swipes at the thick bark (**rix**), then places the blade into the cut and, using two hands on the machete handle, furiously shaves the bark to create a reasonably smooth surface (**mich'ok li rix**). The steel **aro** is then fitted onto the chainsaw and the slicing of the first board (**tz'alam che'**) begins. The chainsaw is worked by the wood cutter, the opposite end of the **aro** by the helper. The two men then guide the roaring blade for the first two slices that will yield scrap pieces called **kostej**, which are used for making hen houses or outhouses. This process gives a nice flat

Figure 7.2:*Tapesco* Saw Frame



surface approximately 60 cm wide, which then must be turned face up, and this is done with two random, pointed poles (**eb' li che'**) that are used to roll the log section.

With the working surface face up, as much of the remaining bark is removed as possible, using the same method as described above. The helper then must dye a piece of string that will serve as a snap-line to ensure a perfectly straight cut. To do this, he smashes the casings off old batteries and soaks the white nylon cord in the contents. The cord is then held at both ends of the sectioned log and snapped to create a straight line, which will serve as a cutting guide (the **aro** generally maintains a straight cut, but some slight deviations can occur). The **aro** can be adjusted to vary the board width; usually it remains set at about three cm which will yield a 3/4 inch-thick board, a standard width for construction. Then, like a butcher shaving thick slices of ham, the workers pass the saw and **aro** over the downed trunk time and time again until the tree becomes too small to work; this last cutting becomes a **kostej** like the first. The entire process is then repeated on the remaining sections. The cut boards are then carried vertically with tumpline to the home of the lumberman where they will be set to dry for four to five days before they make the trip to an individual client or larger buyer in Chamelco. These methods of board preparation work fine with pine, but must be worked and molded to adapt to the demands of processing the hardwoods so prevalent in Sa Mox.

Although chainsaws are quickly becoming rather popular pieces of machinery, the more traditional two man Swede saws are still common sights throughout the *aldea* of Chajaneb. The use of these two man saws requires the lumberman to build a sawing frame called a *tapesco*, a practice which has considerable time depth in the region. The saw blades are generally of German fabrication and can last a man a lifetime (Wilson 1972:228). The typical *tapesco* has four vertical poles that support horizontal beams in "y" shaped crotches; these horizontal beams support the timber segment. An elevated timber allows one person to saw while standing on the actual timber, and a second worker to saw beneath the timber (See Figure 7.2). When the team reaches approximately 30 cm into the board, they will drive a wooden wedge to ensure that the saw does not stick and continue until the saw almost touches the horizontal beam. This type of cut will be made for the width of the log and then the frame will be reconstructed so that these cuts can continue the length of the timber. The process is extremely strenuous and is yet another testament to the incredible endurance of the people. One pass through a three-m board can take over half an hour, the processing of just one segment an entire day.

Time allocation studies were not performed to demonstrate that these two activities — firewood harvesting and logging — consume most of the time men spend in forests, however, I am quite confident that this is indeed the case. Although the techniques of fiber production, basketry, or mat-making that will be discussed in Chapter Eight may require gathering supplies from the forest, almost all of the time spent on these activities happens in and around the home. Medicinal plants are used and gathered only infrequently, and, as the most common medicinals are not forest dwelling, this requires little time in the forests. Because of the paucity of mammals of any size, what hunting that does take place occurs infrequently and in other regions. The descriptions of wood harvesting, then, efficiently portray the palpable interaction between humans and the forest landscapes of Chajaneb.

The sustainability of these wood gathering practices, in an ecological sense, has been a contested topic in Guatemala as a whole and for the Q'eqchi' of Chajaneb specifically. National forestry laws require that tree cutters apply for licenses and permits to cut trees of significant diameter within the municipality; however, this is rarely enforced, especially in the more distant *aldeas*. A recent threat to clamp down on these forestry laws incited a large riot in the town center of Chamelco, with hundreds of Q'eqchi' storming the *municipalidad* office and holding the mayor (*alcalde*) for ransom. Situations like these underscore how important the remaining pine forests of Alta Verapaz are in the local Q'eqchi' economy. Efforts to make the practice more sustainable by encouraging afforestation through federal taxation incentive programs were initiated in 1999, but it remains to be seen whether this will affect the rural Q'eqchi' or not. Threats on resource acquisition such as this, in communities close to the regional representatives of the federal government are yet another "push" factor that must be considered when analyzing the question of migration to more distant, isolated communities.

The Forests of Sa Mox

Walking toward the northeast from an imaginary center of Sa Mox, one would first leave the residential area composed of homes and their surrounding gardens, pass over the Rio Canhuinik on a series of high, unstable foot bridges, enter a long, flat plain dominated by corn, bean, and cardamom fields, and finally arrive at the foot of Sierra San Luís. At that point, the forest begins. Walking toward the southwest, one would cross the road and almost immediately be confronted with an enormous limestone outcrop. Climbing over that outcrop the traveler would pass through a series of cardamom fields and then hit another outcrop of limestone. At that point also, the forest begins. In Sa Mox, forests are very well demarcated from other vegetative landscapes.

Although most of the significant tracts of forest in the valley have been converted to agriculture over the past 18 years, the forests that remain on the slopes of the valley boundaries are large and have canopies that are largely intact. Many of these forests would call to mind the more stereotypical picture of a tropical forest, complete with masses of vines, epiphytes, numerous armed palms, hardwoods with large buttresses, and the like. These forests are also large enough to harbor game animals like tapir (**tixl**, *Tapirus bairdii*), brocket deer (**yuk**, *Mazama americana cerasina*), collared peccary (**k'iche' aaq**, *Pecari tajacu nelsoni*), and paca (**halaw**, *Agouti paca nelsoni*). Men also claim to have seen the elusive jaguar (**hix**, *Felis onca*) and have occasionally come across the awesome and deadly *fer-de-lance* (**ikb'olay**, *Bothrops atrox*). The forests of Sa Mox are both a very real and imagined source of danger. The reality of this fear is compounded by the fact that these forested areas were at one time the refuge of both factions of the guerilla war, whose downed planes and munitions are still scattered throughout the woods. The women of Sa Mox rarely enter the forests for reasons related both to their labor requirements, which tend to restrict them to the vicinity of the household compound, and to this fear.

Table 7.3: Sa Mox Firewood Rankings

Common Name	Scientific Name	Appearance Percentage[1]	Rank Points[2]	Rank Index[3]
wachil	*Dialium guianense*	0.9	39	35.1
suu chaj	*Parathesis donnell-smithii*	0.45	13	5.85
q'an paraway	*Vismia camparaguey*	0.25	6	1.5
chochokl	*Inga micheliana*	0.2	6	1.2
q'an xan	*Terminalia amazonia*	0.1	6	0.6
sak atzum	*Lippia myriocephala*	0.1	2	0.2
tzol	*Muellera frutescens*	0.05	3	0.15
ich te'	*Tibouchina longifolia*	0.05	1	0.05
manazan	*Bellucia costaricensis*	0.05	1	0.05
muuy	*Manilkara zapota*	0.05	1	0.05

[1]Number of appearances in free list divided by number of questionnaires (20).

[2]Points for each tree/respondent, e.g., "wachil, suu chaj" of a list, "wachil" receives two rank points, "suu chaj" receives 1 rank point; "wachil, suu chaj, tzol" of a list, "wachil" receives three rank point, "suu chaj" receives two, and "tzol" receives one.

[3]Appearance Percentage multiplied by Rank Points.

In addition to the impropriety of walking through the forest with a *gringo*, the fact that no women wanted to participate in my lowland plant trail was due to this fear. Men, therefore, are the only ones accustomed to spending much time in the forests of Sa Mox.

Not unlike the situation in the highlands of Chajaneb, firewood gathering and lumbering are the primary reasons for men to spend time in the forest. Although consistently warmer temperatures than in the highlands may decrease the need for firewood as a source of heat, the food economy remains essentially the same: one would be hard pressed to find a home without a fire burning. The method of gathering firewood is substantially altered, primarily because of the relatively recent arrival of agriculturalists to the region. As was discussed in the Chapter Six, large trees needed to be felled in order to create fields suitable for corn agriculture, and these felled trees still litter many of the corn fields. It is from these burned trunks that most of the firewood is harvested. Although identifying burned, leafless, sterile trees was next to impossible for me, the Q'eqchi' men I interviewed had no problem with it and quickly named their favorite sources of firewood (See Table 7.3). That just 10 tree species were given when 20 individuals were asked "what are the best types of wood to burn as firewood?," is a strong sign in itself that there is a relatively uniform conceptual model when it comes to firewood. The strong correlation between appearance percentages and rank ratings (Correlation Coefficient=.94329) is an indicator that the distribution of tree species across questionnaires is a reliable indicator of the importance of those species when it comes to firewood. Accordingly, no tree species can compare to the fabaceous hardwood **wachil** (*Dialium guianense*) in terms of importance, occurring in ninety percent of the questionnaires. This species is analogous in some ways to the varieties of oak (*Quercus* sp.) available in the highlands, given its high specific gravity[3], its extremely hot burn, low smoke output, and importance as a firewood. Several heads of household also drew this analogy. Luckily for the families of Sa Mox, **wachil** can still be found quite readily. It remains to be seen whether or not the fate of *Dialium guianense* will approximate that of the oaks in the highlands.

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[3]The specific gravity of *Dialium guianense* is .81-.93 overdry weight/green volume, air dry density of 63-73 pounds per cubic foot. This is extremely high and, combined with a high silica content (1.83 percent), makes the wood very difficult to work (Chudnoff 1984). Oaks, also considered a very hard wood, have a specific gravity of .57-.82 overdry weight/green volume and an air dry density of 44-62 pcf.

If I were to have "pushed" the persons participating in the free listing exercise of firewood, I could have elicited as many or more secondary firewood species as in the highlands. In the highlands there was an exceedingly clear model for firewood use. The oaks were highly praised but rare, pines and *Liquidambar styraciflua* were adequate and plentiful, and a long list of woods were considered marginal. For the lowlands this pattern was essentially repeated: **wachil** was the overwhelming favorite and still plentiful, a set of three or so species (arbitrarily, those with rank indices above one) were adequate and plentiful, followed by a list of marginal firewoods.

Firewood also serves an industrial purpose for a small minority of people in the lowlands: as a fuel source for the drying of cardamom. The entire process of cardamom harvesting and processing will be described in the following chapter; here it is sufficient to know that a major point in this process is the drying of cardamom fruits in enormous, wood-burning vats. It is interesting to note that the importance of a cash crop has a highland analogy with coffee cultivation and preparation. The principal difference, however, is that many owners of the cardamom driers are local, Q'eqchi', small-scale capitalists whereas in the highlands, a few, foreign owners controlled (and control) the vast majority of coffee plantations. When asked what kind of wood was littered about the cardamom drying shack, the owner proudly replied "**wachil ka'aj wi**," — "it's all **wachil**."

In the forests of Sa Mox there is no tree species that can compare to the two highland species of pines when it comes to workability. As a result, there is no local lumbering industry as in the highlands of Chajaneb. Nevertheless, the families of Sa Mox frequently use local timbers for a variety of needs, rather than make the long trip to Cobán to purchase timber products. Most obviously, this holds true for house construction, as was discussed in some detail on page 112-118 of Chapter Four. Other important uses of local timbers include fencing materials and bridge-making materials.

The most common fencing operation, conducted by the majority of Sa Mox residents, is for the containment of domesticated animals. If there is one animal that defines the domestic environment in the lowlands of Alta Verapaz it is the common barnyard pig: **aaq**, *Sus scrofa domesticus*. Of course one could find a hoard of chickens (**kaxlan**, *Gallus gallus*) in almost any rural home in Central America, but pigs rule in the lowlands. Pigs are occasionally found in the highlands, but the sub-dominant domesticated animal in the highlands is, universally, the domesticated turkey (**ak'ach**, *Meleagris gallopavo*) — the lowland equivalent of this bird is, then, the pig. And, unlike turkeys that are usually allowed free range of home and gardens, pigs must be controlled and contained or else they tend to ravage anything remotely edible. The most common way of maintaining control of pigs is to construct a one-m-high cross pole fence in the yard where a close eye can be kept on the animals. Although pigs do have a remarkable ability to escape or break fences, not a lot of thought is put into the construction of these fences and even less thought is put into the type of wood.

The principal reason why little attention is paid to the wood type of these fences is that they are "above ground" fences, that is, no post holes need be dug and woods are not so immediately threatened with decomposition. The cow (**wakax**, *Bos* spp.), however, must be contained by a more durable fence, and barbed-wire fences, which do require post holes, are the design of choice. Chainsaws are required for the cutting of the 12X12 cm posts. As was described in Chapter Four, any posts that are embedded in the ground, like the house corner posts, must be of extremely rot-resistant wood, and these generally are derived from **muuy** (*Manilkara zapota*) or **wachil** (*Dialium guianense*). The enormous diameter and extreme density of these woods makes chainsaws the only rational choice. In fact, during my months in the lowlands I never saw neither a two-man Swede saw nor sawing frame, as there are simply not enough soft woods available to make hand sawing efficient.

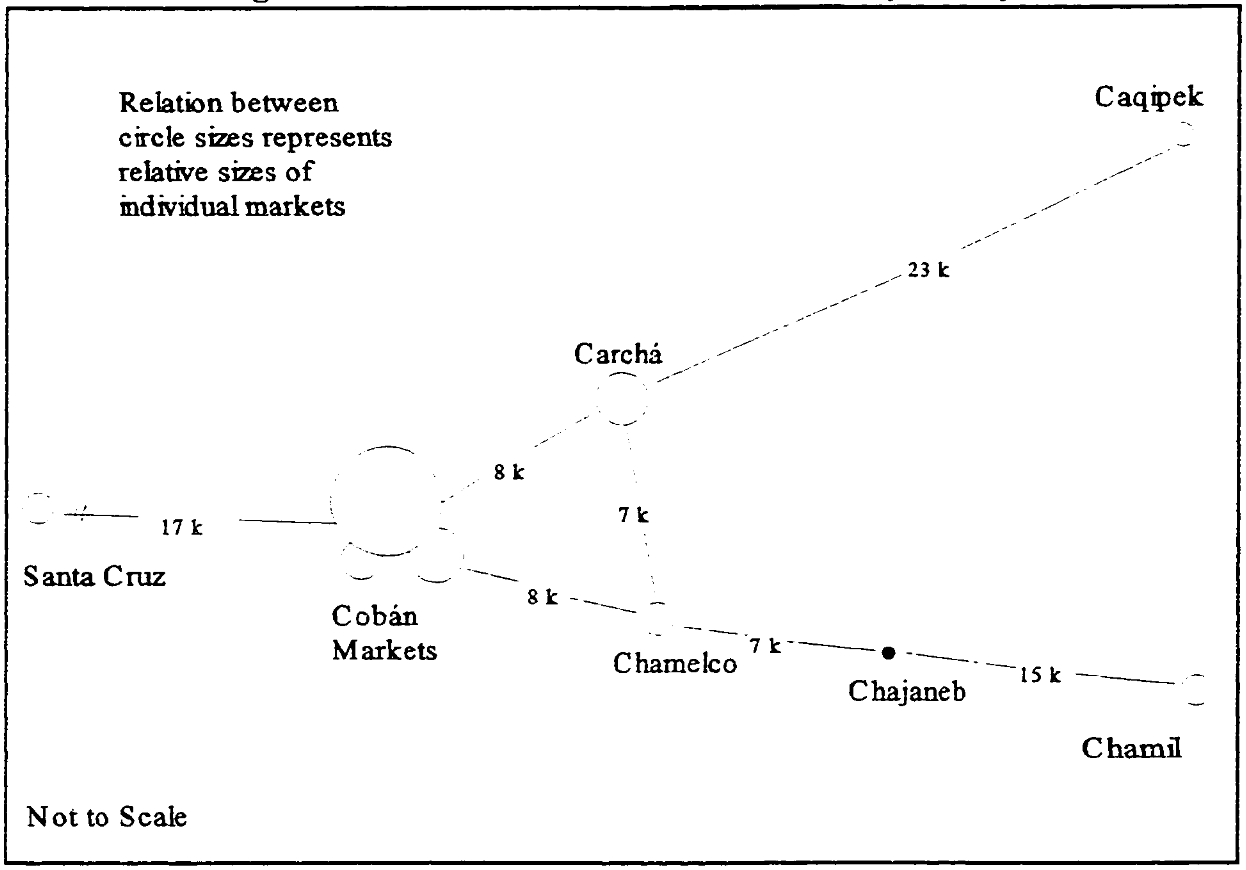
In the lowlands of Sa Mox, the chainsaw is a status symbol and dexterity with a chainsaw is a potent mark of masculinity. While the lack of large stands of softwoods precludes the need for a board-maker economic specialization, there is significant opportunity for more generalized work with a chainsaw. The density of many of the lowland woods also makes the use of the metal **aro** less efficient, forcing wood workers to use their m-long blades "freehand." An accomplished lumberman in the lowlands cannot only down an enormous tree with incredible accuracy, but can also cut square beams on unstable terrain through dense woods without the use of any guide. Such skill can command wages equaling or surpassing those of the highland woodcutters (approximately 60Q/day). The combination of large forests with high tree diversity, the basic exclusivity of the forests to males, and the economic incentive bringing males into the forest with frequency, has an impact on the distribution of knowledge concerning the Q'eqchi' system of plant lexicon to be discussed in Chapter Nine.

Harvesting forest resources, the behavioral predecessor of house construction, exemplifies the process of adaptation to lowland forests. In terms of a house, the *needs* largely remain unchanged. People need shelter, perhaps of different proportions with different characteristics, in both communities and the need to acquire wood products brings people — almost exclusively men — into the forests. The vastly different forest communities of the regions — and, most specifically, the density of woods in those forest communities — require a radically different behavioral repertoire. The process by which humans alter this repertoire is yet another clear example of cultural adaptation.

The harvesting of fuelwoods also involves culturally adaptive mechanisms. The recent arrival of families to the region and the resultant firewood left by the burning and felling of trees for corn planting creates a unique scenario for fuelwood collection. With time, agriculture will become more intensive, little primary forest will be left to clear, and these fuelwood sources will be exhausted. The *needs* surrounding fuelwood will remain. The directions the adaptation could take, and the consequences that that adaptation has on other aspects of behavior, remain to be seen.

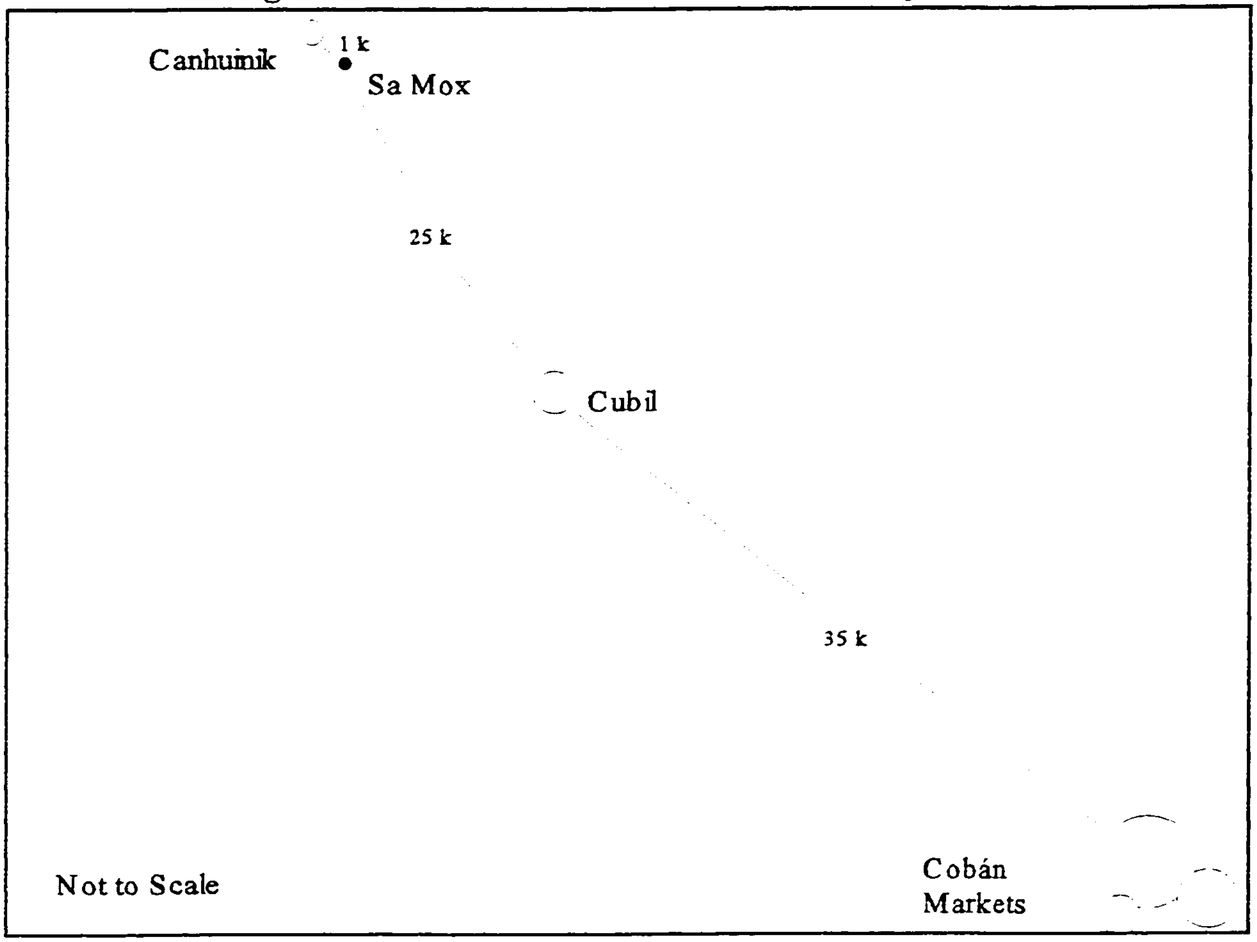
Chapter Eight: Local and Regional Market Plants

Figure 8.1: Markets Available to the Community of Chajaneb



Markets figure prominently in nearly all the classic ethnographic descriptions of 20th-century historians and ethnographers (e.g., Bunzel 1959; McBryde 1947; Tax 1952). The markets that captured the attention of so many scholars have a tremendous time depth and many of their description and conclusions also remain relevant for modern ethnographic investigations. Ethnohistoric evidence suggests that the movement of goods along both water- and land-based routes occurred during preHispanic times and were doubtless regulated by

Figure 8.2: Markets Available to the Community of Sa Mox



market centers and administrative units (Feldman 1985:15). Conclusive ethnohistoric evidence highlights the Cobán market as figuring prominently in these preHispanic and Colonial exchange systems, linking the many larger markets of Central Guatemala (Rabinal, Salama, Chinautla) with those of Eastern Guatemala (Chiqimula, Zacapa, Jalapa) (Feldman 1985:16-18). This chapter will describe the local markets available to the communities of Chajaneb and Sa Mox, not for reasons relating to economic or social interchange, but because *markets serve as collection points for both familiar and exotic plants, are centers of economic activity that* *inspire individuals to find, harvest, and process plant products, and ultimately contribute to the process of innovation and perpetuation of behavior related to plants.* This chapter will briefly describe the cultivation and preparation of some of the economically most important plant species and plant products and will demonstrate that markets frequently expose highlanders to lowland plant cultivars and contribute to the process of adaptation for future migrants destined for the lowlands.

Plants Linking the Verapaz with the International Market

Coffee (*Coffea arabica*). Although Guatemalans as a nation embrace the orchid called *monja blanca* (*Lycaste virginalis*; **saqi hix**) as their national botanical symbol, no plant comes close to coffee in terms of economic, social, and historical importance. The coffee bean was first cultivated in Yemen around AD 1000, spread through Arabia and the Arab world with the seventh century Muslim expansion, made its way to Italy *via* Constantinople in 1615, and finally crossed the Atlantic to the shores of French Guiana in 1722 (Starbird 1981). It arrived in Guatemala sometime in the mid 18th century, but was essentially an ornamental curiosity until the 1830s (McCreery 1994:161).[1] Although large-scale, export-bound plant and animal products extended back to the 16th century in Guatemala, with coffee the process would dramatically affect the lives of the Q'eqchi' in Alta Verapaz. Despite poor infrastructure and

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[1]The first recorded drinking of coffee occurred in Antigua, Guatemala in 1743 where the plant had been introduced by the Jesuits. In 1760 that same religious order began experimenting with the plant's cultivation (King 1974:92).

little knowledge of cultivation techniques, the *Consulado de Comercio* looked south to Costa Rica and began encouraging coffee cultivation over cochineal in the 1850s (McCreery 1994:162).[2] The liberal economic reforms in the 1870s and the arrival of the first German coffee entrepreneurs would instigate what could only be called a landscape revolution, with the highly attractive, rubiaceous bush taking over previously forested land.

The history of that landscape revolution — and the impact it had on the countless Q'eqchi' families who would make the export of the commodity economically feasible — is brilliantly described by Náñez (1970) and need not be rehashed here. Similarly, a description of the cultivation process has appeared in numerous cultivation handbooks and repeating that information here would do little to propel forward the general thesis of adaptation. Nevertheless, several aspects of this history and cultivation process are important for this discussion.

Most importantly, the ecology of the coffee tree demands, in most cases, the use of trees for shade cover. Coffee cultivators are known for experimenting with a variety of shade trees and this practice has often resulted in coffee plantations approaching silvicultural stations (Beaucage and Taller de Tradición Oral del CEPEC 1997). Shade grown cropping also has historical roots in the region in the cultivation of cacao (*Theobroma cacao*) under the protective shade of the leguminous tree named *madre cacao* (*Gliricidia sepium*, **q'an te'**). In most large-scale coffee plantations, cultivators most frequently use one of several species of

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[2]Cochineal is a red dye prepared from the dried corpses of the female *Dactylopius coccus*, a scale insect, which live on several species of *nopal* cactus.

Inga, which the Q'eqchi' variously label **chochokl, chelel** or **b'itz'**.[3]

The highland Q'eqchi', like those in Chajaneb, continue to work on large-scale coffee plantations, mostly as short-term laborers during the fruiting months of December through March. But, although the pre-World War II pattern of Q'eqchi' resident/laborers still exists, most Q'eqchi' families maintain a more distant, temporary relationship to the plantation. The Q'eqchi' of Chajaneb, however, still maintain a very close relationship with coffee, as it is one of the most important cultivars in highland home gardens (see Chapter 5). Some of the highland families maintain up to 100 trees (**toon**) of coffee for local consumption and sale to the local market. Chajaneb coffee cultivators have localized the industry and have adapted some of the cultivation techniques borrowed from the plantation. Not surprisingly, intercropping is the most important technique. Growers still maintain *Inga* shade trees, which they prune and use as a source of fuelwood, and also intercrop various varieties of banana (*Musa* X *sapientum*), *Chamaedorea* palms (**k'ib'**), or citrus (*Citrus* sp.) for shade. Unlike on the plantations, where coffee trees are pruned approximately every eight years to stimulate fruit production, the coffee trees of Q'eqchi' home gardens are most often left unpruned and frequently challenge their own shade trees in terms of height.

For home consumption, most Q'eqchi' families prefer to buy dried and pulverized coffee in the Chamelco or Cobán markets. Most red coffee cherries are sold to an ambulatory consumer — most frequently a Q'eqchi' himself — who turns the region's small-scale harvest

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[3]Alta Verapaz was actually a major producer of cacao in the 16th and 17th century until, beginning in the 18th century, other regions began producing the product on a commercial scale (King 1974:91).

over to a buyer in town. The links of this economic chain closely approximate those of the wood merchant as described in Chapter Seven.

As most of the coffee in the Verapaz is grown over 1000 m above sea level, there is plenty of opportunity for short-term labor on the remaining plantations, and getting to them does not require the seasonal migratory patterns that were so destructive to so many Mayan families of the western highlands.[4] Despite the general preference of coffee for altitude, migrants to the Sa Mox region have not given up attempting to grow lowland coffee. Coffee appeared in 96 percent of highland gardens, but *was the only* plant that was found in all lowland gardens. Lowland gardeners called their coffee crop pitiful, rarely maintained more than 50 trees per grower, and had a more difficult time finding local buyers. Possibly accounting for its persistence, coffee was frequently listed as one of the most important medicinal plants. Reported in 45 and 55 percent of the highland and lowland questionnaires, respectively, fresh coffee leaves are heated on the *comal* and used as hot compresses to relieve headaches. In preHispanic and colonial times, it was the tobacco leaf (*Nicotiana tabacum*) or castor bean (*Ricinis comunis*) that was used for this purpose (Orellana 1987:107-108). Interestingly in terms of folk taxonomy, the lowland migrants have also applied the label "**kape**" to a rubiaceous tree, *Posoqueria latifolia*, which they call **kape' che'**. The label application must be based on anatomical similarity, for no uses of the tree were reported.

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[4]This is not to say that work on the plantations of the Verapaz is not difficult. Plantations closer to town — and those subject to more stringent controls and audits — pay laborers the minimum wage of approximately 18 Q/day with no benefits if workers are not employed more than 60 days. As the season is quite short, few laborers are needed for periods that exceed 60 days. In the plantation further from town, plantation owners are frequently more-exploitive of Q'eqchi' labor (Anonymous, pers. comm., March 2000).

Cardamom. In some respects, cardamom (*Elettaria cardamomum*) is the lowland version of coffee. But, more recently, cardamom cultivation is on the rise at higher elevations and the economic chain of cardamom is more intricate and links people of both highland and lowland origin.

Cardamom, a perennial of the ginger family, has its natural origins on the South coast of India and Sri Lanka and was first reported in European sources in 400 BC as a cure for urinary tract infections. The plant is native to the monsoon forests of that region at altitudes between 760 and 1500 m above sea level (Purseglove 1981: 581). In Europe the plant shared and in Asia it continues to share an interesting role with — coincidently — coffee: as coffee was thought to suppress potency and libido, it was commonly taken with cardamom that was thought to counteract those negative effects (Swahn 1991:116). In 1914 the German immigrant/entrepreneur Oscar Kloeffer brought seeds to Guatemala and started the first cardamom plantation on *finca* China Sayub in Alta Verapaz (Lüttman 1985:5). Guatemala, the third largest producer nation of cardamom, was also the first Latin American country to specialize in its production. In the 1940s the plant was brought to Costa Rica where it has enjoyed less success as a widespread cultivar (Matamoros 1980:2-3). Around this time it was also brought to Guatemala's *boca costa* where it is still widely cultivated.

Unlike coffee, which plays such an important culinary role in the daily home economics of Q'eqchi' families, cardamom is somewhat of a mystery to most producers. In Asia the spice is used in rice, vegetable, and meat dishes; in Arabia the spice is used, interestingly, to flavor coffee; in Scandinavia the spice flavors cakes, buns, and pastries (Purseglove 1981:597). In Guatemala no medicinal properties have been ascribed to the plant, beyond the use of dried seeds as a popular remedy for bad breath. Although the spice may be unimportant from a culinary standpoint, the cultivation and sale of cardamom helps shape the life of many lowland families.[5]

Cardamom plays a role in the lives of *every* family in Sa Mox. The lowland questionnaire revealed that families plant a mean of 23.35 *cuerdas* of land (SD=16.98) in cardamom, second only to corn, 25.9 cuerdas (SD=14.37). Conveniently, the labor involved in the maintenance and harvest of cardamom fits perfectly with the agricultural cycle as described in Figure 6.2 of Chapter Six. The beauty of cardamom is that it requires little weeding and maintenance throughout the year, the only serious dedication of time comes in the harvesting (**sikok**, **molok**) months of October, November, and December, the exact "off" months of the two corn cycles.

Cardamom can be propagated vegetatively by the division of rhizomes, or it can be planted as seedlings. Frequently, the Q'eqchi' of Sa Mox will buy seedlings from a distributor in the neighboring market town of Cubil for 15 - 25 centavos each.[6] These seedlings, also

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[5]Cardamom is currently planted a many elevations throughout Alta Verapaz. Despite its natural preference for altitudes between 760 and 1500 m above sea level, it was generally planted at elevations below 1000 m. This may, however, be due to the availability of land in northern Alta Verapaz rather than any criteria for elevation. More recently, cardamom is being planted throughout the department, regardless of altitude. In Chajaneb, for example, it appears in 17 percent of inventoried home gardens.

[6]Because the Q'eqchi' of Sa Mox do not cultivate cardamom from seed and are infrequently involved in the cardamom nursery, I begin with the purchase of seedlings. Interested readers can consult Purseglove et al. (1981:586-587).

called **toon**[7], are then planted in 1.5 m square intervals and are usually supported with the help of a small twig. Like coffee, the most important biological factor for maximum fruit production is sunlight, and the cardamom classes are generally divided based on their ability to tolerate sunlight. Although Pöll (1990) identifies 11 "types"[8] based on morphological characteristics, the Q'eqchi' label four different varieties: **saqi tz'i'** ("white cardamom"), **rax tz'i'** ("green cardamom"), **pach' tz'i'** ("water drop cardamom"), and **tor tz'i'** ("blind chicken cardamom"). The **saqi tz'i'** variety is the poorest, but can be grown in the sunniest conditions; **rax tz'i'** is the most common variety in Sa Mox and is grown in moderate shade; **pach'** and **tor tz'i'** are of similar quality to the **rax** variety and can be grown in the shadiest conditions.

Although cardamom is sometimes grown intercropped with coffee and can thus take advantage of the already established shade trees, the **rax tz'i'** of Sa Mox is grown as a monocrop and is generally planted in a forested area where most of the canopy has been removed and all of the undergrowth is removed. Shade is provided by the remaining forest edges and by the fact that the cardamom groves are generally planted in the valleys surrounded and shaded by limestone outcroppings.

Although individual **toon** of cardamom are planted initially, in most cases the rhizomes of these plants divide and form the common cardamom clusters that dominate much of the landscape. The first harvest generally occurs three years following the initial session of planting

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[7]Note that **toon** most frequently refers only to the bole of woody plants. It is interesting that the term is applied to the stems of this ginger.

[8]Pöll (1990) uses the term "*tipos*" instead of "*variedades*" based on her assumption that these morphological types are responsive to soil and climatic conditions rather than genetic coding.

and fruits can be harvested from each cluster for 8 to 10 years following the first fruiting. After that decade, new seedlings are purchased and planted, or rhizomes from old fields are gathered and planted in a new area.

As noted earlier, although weeding takes place at sporadic intervals throughout the year, the most important labor inputs for cardamom take place in October through January — the harvesting season. Like coffee, harvesters "pick" berries, and apply the verb **sikok** ("to pick") or **molok** ("to choose') rather than **koloq** ("to harvest"). Also like coffee, the harvesting of berries often requires large amounts of short-term labor, and, if a Sa Mox community member has more than 10 *cuerdas* of cardamom, this will require hired labor. Interestingly, most of that hired labor comes from highland, indigenous communities. I recall my first November in Alta Verapaz asking for the whereabouts of a mother's young boy — "**xko chi xsikok tz'i'**" i.e., "he went to harvest cardamom." Cardamom, then, like the importation of lowland corn during highland scarce times, is another vital link between highland and lowland communities and serves to expose highlanders to lowland environments.

Unfortunately, I never had the opportunity to join a labor party of cardamom pickers, nor was I in the lowlands during the prime harvesting season. Although I attempted to get a friend to bring me with him during a November labor trip, he refused to do so because the work was exceedingly difficult and the mosquitoes and *fer-de-lance*s were deadly. Highlanders of Chajaneb generally make three-week trips to the lowlands, where they are fed and sheltered and paid 30Q a day for harvesting — twice the daily wage for *milpa* cleaning and 60 percent more than a day of coffee picking. The conditions are, I was told, extremely difficult. Unlike coffee, whose fruits mature at about chest high, cardamom fruits at ground level as with most members of the family Zingiberaceae, and pickers are forced to bend at the knees and waist. Also, unlike the bright red berries which serve as signs for ripeness, each individual cardamom fruit must be squeezed to test for ripeness. This is apparently why the verb **molok** ("to choose") is more frequently applied to the process, rather than **sikok** ("to pick"). My friend's warning of the pests was not an exaggeration: the *fer-de-lance* does tend to make cardamom clusters home, and the mosquitoes — which do transmit *vivax* malaria — are also serious helth threats.[9] In addition to these pests, laborers frequently complain about the heat and humidity, although they are quite happy with the pay. The conditions of the lowlands must not be so terrible, for many migrants to the lowlands got the idea of a permanent relocation based on their short-term experiences as cardamom pickers.

Mature cardamom fruits are picked and placed in the common **kostal** and, although young men make up most of the seasonal laborers, all ages and both sexes of the lowland, permanent residents participate in the process. At the end of a day, groups of men gather with their **kostal** sacks full of cardamom and wait for the buyer to arrive. At about 5:30 a Q'eqchi' man will pull up in a pickup truck and set up his scale of 2-pound increments. During my stay in Chajaneb, which started in January, I was thankfully privy to the process of exchange. In January, cardamom was being bought green (**toj rax**) for 4.15Q/lb.; by the time I left Sa Mox

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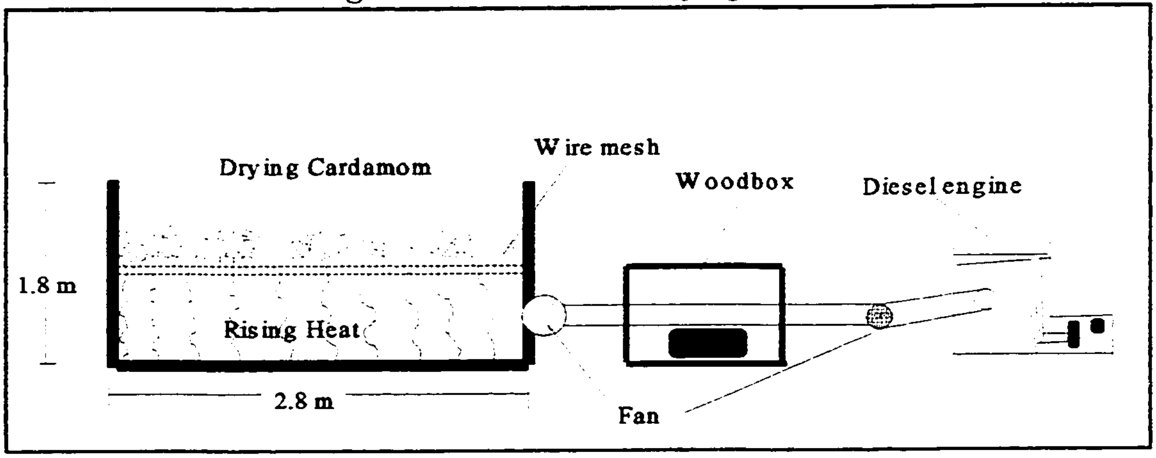
[9]Although the highland Q'eqchi' are out of the range of the *vivax* mosquito, the lowland migrants and highland laborers in the lowlands are not. The lowland questionnaire reported **rax kiyop** (malaria) as the most worrisome illness. Not surprisingly, where there is the disease one also finds the "cure" — *Neurolaena lobata* (**tres punt, ka mank**) of the family Asteraceae is used as a tea to calm the symptoms of malaria.

four months later, the price had risen to 5.10Q/lb., but, by this time, there was very little cardamom left to pick. Prices swing widely based on availability throughout the year, but they can also vary dramatically from one year to the next. In 1995, for example, green cardamom was being purchased for 1.75Q/lb; in 1990 it went for 8.20Q/lb during the same months. Buyers will then turn a profit by selling the cardamom **toj rax** to an owner/operator of a drying facility. Such a facility existed in Sa Mox, many others were located in Cubil. In my experiences with the buyers and driers of Sa Mox, buyers could generally sell their crop at a eight percent price increase. Interestingly, unlike the culturally segregated coffee production scheme, cardamom buyers and many cardamom driers were Q'eqchi' and not *ladino*. Cardamom driers are housed in a wooden structure and can be easily spotted by the humming of a diesel generator and the presence of large quantities of firewood ringing the wooden house

Figure 8.3: Cardamom Drying Machine



(Figure 8.3). Firewood is almost exclusively of hot-burning **wachil** (*Dialium guianense*). A load of green cardamom will take approximately 38 hours to dry, which represents a large expense given the diesel-powered engine that drives the fans and the wood that produces the necessary heat. But the operator can turn an excellent profit, as one *quintal* of cardamom can fetch 2500 Q, a 450 percent net increase even when the green fruit is at its most expensive.

It is at this stage of the cardamom production process that *ladinos* become the dominant cultural group, although the Q'eqchi' will enter the process once again further down the line. Once cardamom is dried, it is generally purchased in large quantities by *ladino* merchants in Cobán, Carchá, or, less frequently, Chamelco. The now-dry fruits are heaped into large, concrete warehouses. At this point, Q'eqchi' *females* — exclusively females — will approach the warehouse supervisor and receive the *quintales* of cardamom which they will bring back to their homes and sort (see Figure 8.4).

Figure 8.4: Woman Sorting Dried Cardamom

In the months following the new year, and following the most productive harvest months, the *aldea* of Chajaneb is filled thick with the smell of cardamom. Almost every household has a small roofed area with a slanted wooden table in order to sort their cardamom. Women will spend any and every spare moment of the day sifting through *quintales* of cardamom, sorting the now-yellowish, dried seeds into five classes (**pie**). Women will spend between three and five days separating the sack seed by seed and, once returned to the warehouse in separate sacks, will receive a payment of 40 Q. The women I spoke with were not in the least bit interested what the peculiar seed was used for, but were happy to go about their sorting, popping a "class five" seed in their mouths as a mouth freshener every now and then. Once the segregated seed leaves the community, it returns to the *ladino* merchants, is purchased by *ladino* wholesalers from Guatemala City, and eventually departs for Arabia in the hands of Arab importers.

Pimento (*Pimienta dioica*). Far beyond the economic, social, and cultural importance of coffee and cardamom is pimento, labeled by the Q'eqchi' as **pens**. Pimento is a common tree throughout the Greater Antilles and Central America. In the mid 18th century exports to Europe became so profitable that the tree began to be cultivated in groves, especially in the then British Colony of Jamaica (Purseglove 1981:287). It is from these Jamaican groves that we get the term "walks," as the colonists particularly enjoyed a stroll through the aromatic groves of pimento.

In Guatemala, pimento exists in abundance in the wild, but, for the purposes of the market, wild seeds are considered inferior to those of cultivated pimento walks. It was once thought that the seeds must pass through the gut of a bird in order to germinate (Purseglove 1981:289); it is now recognized that the seeds germinate quite easily and rapidly under many ecological conditions. Although seedlings are sometimes cared for in nurseries before transplanting, with just a little bit of extra care and weeding, it is quite simple to "cultivate" a pimento walk with little preparation. It is also common to see pimento intercropped with and providing shade for coffee.

Fruits are picked in July and August, before they ripen and, like coffee and cardamom, must be picked by hand. Not surprisingly, the Q'eqchi' apply the term **sikok** to this process. Fruits are gathered in *costales* and are put through one of two processes to remove the water content of the fruit. Most commonly, fruits are left in the *costales* to ferment for two to three days. Alternatively, the *costales* are dunked in and out of boiling water. Both processes also help fix the color of the seed from dark brown to black. Finally, the seeds must be sun dried for three to ten days or dried on plates of *lamina* in an oven for four hours. Once dried, the seeds are shaken over a mesh screen to remove the remnant stems (M. Bachhuber, pers. comm., February 2000).

Like coffee, and like cardamom, the seeds are sold green to an intermediary buyer for approximately 125Q/*quintal*. The buyer, following the fermentation and drying process, can then sell the pimento for as high as 600Q/*quintal* in Cobán. Unlike coffee and cardamom, the entire pimento cultivation and market process affects relatively few Q'eqchi', appearing in 17 percent of highland gardens and not appearing at all in lowland gardens. Given the New World origin of the plant and its ubiquity, I also questioned, if one does not sell the seeds at market, what *can* you do with the plant? Most individuals had no use for the plant whatsoever, but a few noted that it was once used as a cure for rheumatism and Orellana (1981:227) confirms that the powdered berries may be used to quell flatulence and dyspepsia and "may be incorporated in stimulant lotions and plasters which may be useful in cases of rheumatism." Current research also points to the berries of pimento as the principal flavoring for the traditional cacao spice, rather than the capsicum chile (A. Bradburn, pers. comm., March 2001; Swahn 1991:172).

Despite the varied use among a variety of different culture types, these three plants are processed with very similar mechanisms: "beans" are picked by hand, the pulp is removed, and the seed is dried. These three plants have also helped shape the trajectories of many Q'eqchi' in Chajaneb and Sa Mox. Their importance in home economics is paralleled in the plant world only by corn and beans. For the specific goals of this dissertation, cardamom is the true key, for the cardamom production process crosses any and all altitudinal divisions in the Verapaz. Most importantly, cardamom effectively draws laborers into temporary contracts in the lowlands — contracts that not only expose highlanders to lowland plants, but inspire highlanders to take up permanent residence in the lowlands. With the exception of the dried coffee bean, these plants essentially skip the regional markets of Cobán, Carchá, and Chamelco, although the merchants may reside in those towns. It is the production and marketing of plants important in the regional economy that will be the focus of the next segment.

Regional Plants for the Regional Markets

The regional markets of Figures 8.1 and 8.2 are focal cultural units in the lives of the people of Chajaneb and Sa Mox, respectively. The Cobán market complex, of three separate markets, is the point the two study sites share in common, is the largest of the region, and will be the centerpiece of this segment.

Three markets facilitate the exchange of plant and non-plant products in Cobán: the central market, the terminal market, and the Cantonal market. As the number of vendors increased at the central market and the volume of market-related traffic became unbearable, the Cantonal market and terminal markets were opened in 1985 and 1990, respectively (Trutmann 1999:3). Despite these constructions, all three markets are nearly impenetrable most days of the week and traffic remains unbearable in the streets surrounding the central market. Unlike the "classic" Mesoamerican markets which convene once or twice a week, the Cobán market is open and selling strong every day of the week. This business is testament to the fact that the market brings permanent and transient vendors from around the country, vendors which bring goods from a number of different climatic and vegetative zones.

Most of the plant-based trade is concentrated in the central market. Vendors who occupy permanent stalls are more frequently *ladino,* are located indoors, and pay up to 600Q/month for space. Vendors on the circumference of the market sell products at a much smaller scale, are almost always indigenous (Q'eqchi' or otherwise), and are required to pay 25 *centavos* daily. The interior of the market is typically occupied by 47 permanent stalls selling various goods, 12 vendors of pork products, 12 vendors of beef products, and 16 small prepared food stands; 175 vendors will typically occupy the sidewalks surrounding the interior market.

Many of the plant products sold in the market's interior and exterior can be classed as "unprocessed," but before simply enumerating those products, I will briefly describe the production procedure of three plant goods processed in the highlands of Chajaneb: baskets, maguey fiber, and reed floor mats. Interestingly, the lowland community of Sa Mox processes *no* plants for sale in the market.

However unfortunate in the eyes of romanticists in search of authenticity, plastic is the material of choice for most goods traded in the market. The time depth of grass containers in Mesoamerica is extraorinary, extending back as far as 6500 BC in the Tehuacán Valley, Mexico (Sayer 1990). But approximately 20 years ago, ceramic *tinajas*, gourds, and baskets began being replaced by plastic containers that mimicked the original shape of these storage vessels. Ceramics are the rarest of the old containers, aside from the *incensarios* commonly used to burn **pom** resin (*Protium copal*). Gourds of *Lagenaria siceraria* and *Crescentia alata*, both originating in the lowlands, still show up in some of the highland market stalls, but with much less frequency than 20 years ago. Baskets, mostly from Rabinal to the south and from the highest peaks of the remaining cloud forests, are perhaps the most common of the three old container types.

Basket making in the Verapaz highlands is quickly disappearing alongside with the craft's most important component — a grass called **amay** (Unidentified, sterile grass).[10] For this reason — and because the process brings people, mostly males, into the primary forest — I will describe basket construction in some detail. The division of labor for basketry is highly segregated: males venture to the tallest peaks to gather the **amay**, and women weave the **amay**

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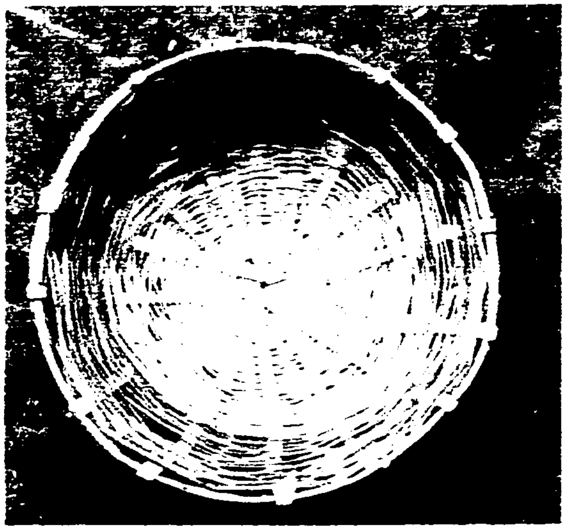
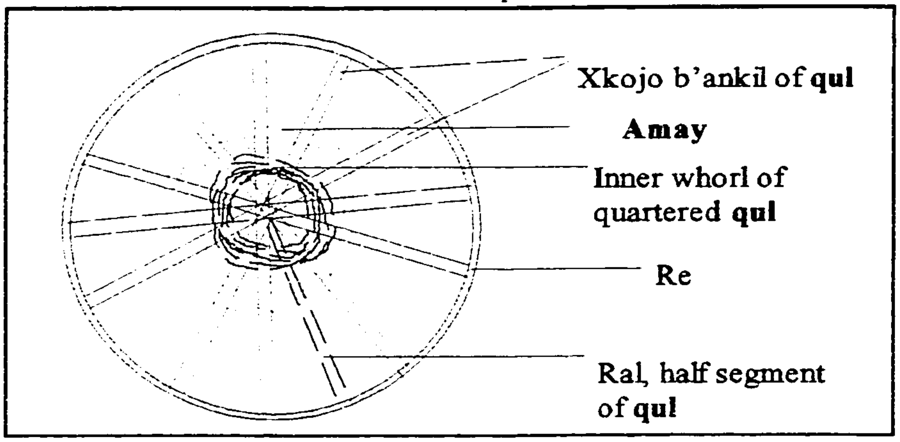
[10]Wilson (1972:256) reports the main plating material as **sex k'im** (*Lasiacis rhizophora*) and states "**sex k'im** appears to be strictly confined to old forest floor sites and even there it is harder to come across than **qonti'** (a common vine). This trailing grass is rare enough to be an article of trade among basket makers..." Based on this description, I suggest that **sex k'im** and **amay** may be one in the same.

Figure 8.5: A Completed Basket



fibers into the other structural components of the basket. **Amay** grass is an understory plant that dominates the plateaus of the few mountain tops that have remained forested. The grass is collected only after it has reached two m tall and three cm in diameter. The grass fibers will eventually be woven through a supporting structure called **xkojo b'ankil** and linked to the mouth of the basket, **re**. The supporting structure can be made from one of many useful vines, classed **qulb'** (*Smilax* sp., among others); the **re** is also gathered from the primary forest tree called **ab' ku** (*Oreopanax echinops*), although Wilson (1972:255) reports the use of **saqyool** (*Solanum nudum*) for the same purpose. All three construction components must be dried in the strong sun for two full, sunny days.

Table 8.6: Structural Components of the Basket



First the **qulb'** of the **xkojo b'ankil** are cut with a knife to produce a flat edge and then sectioned into .75 m pieces. The 2 cm-diameter vine pieces are then split into fours with a sharp knife — never with a machete. These quartered pieces are then flattened by pulling the segments between the knife edge and the sitting-woman's thigh. The diameter of the basket's floor can be varied by increasing the number of **qulb'**, the height of the walls by their length. A small, 18-cm-diameter, 10-cm-deep basket, for example requires seven **qulb'** strips that overlap one another to form 14 spokes of a wheel (see Figure 8.5 and 8.6). An additional half segment of **qulb'**, called **ral** ("youngster"), is laced into the center to ensure that there will always be an odd-number of spokes in the wheel of **xkojo b'ankil**. Smaller strips of **qulb'** are cut and interwoven between the spokes to hold them fast. Once the initial passes around the hub are made with the **qulb'**, the **amay** begins to be laced in. A small basket, as in Figure 8.6, can be made with just four **amay** stems. Once dry, the outermost, chlorophyllic stem cells are first removed by passing the sections against a sharpened knife blade held at a 90-degree-angle to the stem. These long strips are then quartered into segments approximately .25 cm-wide and woven tightly against the inner bundle of **qulb'**. When the desired basket diameter is reached, the segments of **xkojo b'ankil** are then bent at a 90--degree angle to form the basket walls. When the desired wall height is reached, the spoke segments of **qulb'** are doubled over at flaps of three cm and the flap ends are inserted into the wall weave of **amay**. This process forms the loop into which the **re** is inserted. Once the flattened stem of the **re** is inserted, a final piece of **qulb'** is tied around the overlapping **re** segments and the basket is complete. Once the forest products are gathered and dried, a woman can weave a small basket of superior quality in approximately three hours — if she is lucky, she can sell the basket for four Q. Most of these highland baskets make their way to the Cobán market by way of the two peripheral markets in

Figure 8.7: Scraping a Leaf of Maguey

Caqipek and Chamil.

The processing of maguey fibers into high-quality cordage has a long history in the Alta Verapaz, especially at mid-elevations (like Chajaneb) where *Furcrea guatemalensis* grows so abundantly.[11] Sacks of these fibers were always in high demand, but became increasingly important in the late 1800s when coffee became an important trade item and when the mines of Caqipek opened in the first half of the 20th century (King 1974:105). Several families in Chajaneb specialized in the production of maguey fiber. The plant was all but absent in the lowlands of Sa Mox where this natural cordage is most frequently replaced with aluminum wire or nylon cord — infrequently do lowland market-goers purchase maguey twine in the Cobán market.

A specialist in maguey twine will often maintain a roughly-hewn living fence of maguey (**ik'e**) around his home.[12] The oldest leaves of the plant — those growing closest to the ground — are severed from the stem and the spines along each side of the limb are scraped away with a machete (see Figure 8.7). A large, smoldering fire is started in the yard, and the **ik'e** leaves

[11]It is also likely that one to several species of the genus *Agave* are also used interchangeably with *Furcrea*.

[12]Wilson (1972:232) recognized three classes of maguey, presumably all of the same species: **saq ik'e**, **kaq ik'e**, and **rax ik'e**. Although Chajaneb informants recognized the three varieties, only the **saq** ("white") variety was said to be used in production.

are strewn over the fire and constantly reorganized around the flame until all the leaves turn a consistent yellowish-brown. A machete is stuck into the succulent leaves to remove them from the flame and to toss them into a large pit. The leaves are then covered with leaves, grass, and other plant debris and are left to rot for approximately two weeks. When the leaves are fully rotted, an end it attached to a plank of *Liquidambar styraciflua* with a small length of cord and the putrid pulp is removed from each leaf by scrapping a blade lengthwise as shown in Figure 8.9. The scrapping process (**johok**) is a messy process requiring the scraper (**aj johonel**) to wear a plastic apron to avoid staining his clothes. The maguey leaf is then turned 180 degrees on the plank and the remaining pulp is removed, leaving many hundreds of strands of fiber. This fiber is then washed in running water and hung out to dry on a clotheslines, usually also of **ik'e**. Some vendors then bundle the twine as individual fibers, but, just as frequently, the women will twine and braid the individual fibers before going to market. To twine (**b'aqok k'aam**), a woman — almost always a woman — gathers several lengths of free fiber and whips the fibers with a switch to soften them. The fiber lengths are then doubled over, the doubled end placed under the heel, and the two loose ends are rapidly rolled between, and along the length of, her entire hand, as one might do while trying to start a fire with block and dowel. Wilson (1972:240) states that the ash of **tza'aj** (*Veronia leiocarpa*) was used to dust the fibers, but I never noted this practice. These fiber groups will then be paired with another group, braided, and tied to form the completed length of cordage. These lengths are then brought to market or sold directly to yet another specialist who will craft hammocks (**ab'**) and net bags (**champa**) from the cordage. The simple cordage is used in almost every highland household for clothesline, chicken leashes, bag tie-offs or in any other situation where cordage is needed. The weaving of bags, nets, and hammocks is a lengthy process, a description of which would not advance the goals of this dissertation. A detailed summary of the process can be found in Wilson (1972:240-254).

Finally, albeit briefly, I will describe the process of *petate* (**poop**) construction. These reed mats are prevalent in Alta Verapaz and throughout Guatemala and such an integral part of Annis' (1987) study of the economic dynamics of Aguas Calientes. In seasonally inundated river bottoms of the highlands, large stands of *Phregesides communis* (**aj**) dominate this comparatively rare vegetative community. When these grasses reach approximately two cm in diameter they are gathered with a machete and the node-sheaths are removed by passing the blade lengthwise along the stem. The cut lengths measure approximately two m and are set upright against the side of the house to dry in the sun for approximately two days. Once dry, a handful of three stems is taken and beaten (**tenok**) with a hammer (**temb'al**) of pine (*Pinus oocarpa*). The beating intends to crack the thick nodal fibers so they can lie flat. Once these fibers are destroyed, a nail or segment of stick (**lau**) is used to split the stems into two halves, each approximately 3-cm wide. With this process complete, the labor of mat-making becomes the responsibility of females. The system of weaving the reed fibers remained a bit of a mystery to me: there was a basic pattern of "two-under, two-over," yet the starting point for each successive row changed in a pattern that I could never completely discern. Whatever the pattern, after each completed row, a small, flat rock was used to tamp the weave tight. Women could make three large (2X2 m) mats in one afternoon, and could sell these at market for approximately 2 Q each.

Unprocessed or Marginally-Processed Market Plants

The majority of market plants include those that I label "unprocessed" or "marginally processed." What is most interesting about this category is the sheer number and the representation of plants from many different climatic zones throughout Guatemala. The vendors of the Cobán market come from many different municipalities within Alta Verapaz and from many departments of the country bringing plant curious and mainstays to the Q'eqchi' families. The market, most especially the central Cobán market, then, represents a source of plant knowledge that would otherwise be inaccessible to most families. At the same time, the market serves as an impetus for economic exchange and security, fueling the production of local cultivars. As the diversity of plants in the peripheral markets are in most cases represented in the central Cobán market, and because this market is shared by both Chajaneb and Sa Mox families, my enumeration focuses specifically on central Cobán. Table 8.1 is a partial list of the plants that frequently appear in the central Cobán market.

On the 87 total plants represented in the central Cobán market, 36.8 percent have origins outside of the highlands of Alta Verapaz. Of these 32 plants, however, only 31.3 percent could be considered of the lowlands in the region of Sa Mox. The Cobán market, then,.can only marginally be considered as a learning tool in preparation for understanding the cultivars of the lowlands. Nevertheless, it is a source of constant and frequent input of new

Table 8.1: Partial List of Plant Products from the Cobán Central Market

Scientific Name	Spanish	Q'eqchi'	Origin	Use
Allium cepa	cebolla	seb'oy	AVP-Highlands	edible bulb
Allium ampeloprasum	puerro	seboy	GC	edible bulb and leaf
Allium sativum	ajo	anx	Huehuetenango	bulb as food flavoring
Alocasia macrorhiza	malang	ox	AVP-Highlands	edible tubers
Amaranthus retroplexus	bledo	ses	AVP-Highlands	meat flavoring
Ananas comosus	pina	ch'op	AVP-Lowlands	edible compound fruit
Apium graveolens	apio		GC	food spice
Apium petrosedum	perejil		AVP-Highlands	spice; med-root a purgative
Bixa orellana	achiote	xayau	Rabinal	food coloring; med-
Brassica oleraceae	coliflor		AVP-Highlands	edible inflorescence
Brassica oleraceae	brocolí	brok	AVP-Finca Chichen	edible inflorescence
Byrsonima crassifolia	nance	ch'i	Chamelco	edible fruits
Calathea allouia	hoja	moxl	AVP-Highlands	food wrapping
Capsicum annum	chile seco	ik	Cahabón	fruit as spice
Capsicum annum	chile verde	rax ik	Cobán	fruit as food flavoring
Carica papaya	papaya	put	El Oriente	edible fruit
Chamaedora sp.	pacaya	k'ib'	AVP-Highlands	edible inflorescence
Chenopodium sp.	apazote		Chamelco	edible fruit
Citrullus lanatus	sandia	sandiy	AVP-Highlands	edible fruit
Citrus limonia	limón	lamuj	AVP-Highlands	edible fruit
Citrus sinensis	naranja	chin	Boca Costa	edible fruit
Cocos nucifera	coco	kok	Petén	edible seed
Coffea arabica	café de oro	kape	Cobán	seeds for beverage
Coriandrum sativum	cilantro	silant	Tactic	leaves as spice
Cucumis sativus	pepino		?	edible fruit
Cucurbita moschata	ayote	k'uum	GC	edible seeds
Cyphomandra betaceae	tomate del arbol	che' pix	?	edible fruit
Daucus carota	zanahoria	sana'or	?	edible tubers
Eryngium foetidum		samat	Cobán	leaves as spice
Eucalyptus globulus	eucalipto	yucalipt	AVP-Lowlands	med.-leaf for coughs
Hibiscus rosa-sinensis	rosa de jamaica	klavel	GC	leaves for tea
Luffa cylindrica	estoraque	estrep	AVP-Lowlands	dried fruit for sponge
Lycopersicon sp.	tomate	pix	GC	edible fruits
Malus pumila	manzana	mansan	Chichicastenango	edible fruit
Mangifera indica	mango	mank	Rabinal, Zacapa	edible fruit
Manihot esculenta	yucca	tz'in	AVP-Lowlands	edible tubers
Matricaria chamomilla	mansanilla	mansaniy	AVP-Highlands	medicinal
Mentha virides	hierba	isk'i'ij	Chamelco	leaves as spice
Musa X *sapientum*	banano	tul	AVP-Lowlands	edible fruit
Musa X *sapientum*	plátano	ch'ol tul	Polochic	edible fruit
Ocinum basilieum	albahaka blanca	saqi alb'ak	Cobán	leaves as spice; medicinal
Ocinum micranthum	albahaka morada	alba'ak	?	leaves as spice; medicinal
Opuntia sp.	nopal	xap che'	Eastern Deserts	med.- stems for dysentery

Scientific Name	**Spanish**	**Q'eqchi'**	**Origin**	**Use**
Origanum majorana	orégano	oreg	Chamelco	leaves as spice
Oryza sativa	arroz	aros	Polochic	edible cereal
Persea americana	aguacate	o	El Quiché	edible fruits
Phaseolus coccineus	piloy	nun kenq'	Rabinal	edible fruit
Phaseolus vulgaris	ejote	rax kenq'	Chamelco	edible
Phaseolus vulgaris	frijol negro	qeq'i kenq'	Cobán	edible legume
Phaseolus vulgaris	frijol blanco	saqi kenq'	Cobán	edible legume
Phaseolus vulgaris	frijol rojo	kaqi kenq'	El Quiché	edible legume
Physalis philadelphica	mil tomate	mil tomat	Cobán	leaves as meat flavoring
Pimenta dioica	chile pimento	pens	AVP-Highlands	fruits as spice
Pimpinella ansium	aniz	anis	GC	med.-leaves as stimulant
Piper nigrum	pimienta	kaxlan ik	GC	spice
Pouteria mammosa	zapote	sal tul	AVP-Lowlands	edible fruit
Pouteria viridis		rax tul	AVP-Highlands	edible fruits
Protium copal	copal	pom	Cahabón	resin in religious ceremony
Prunus domestica	ciruela		Chichicastenango	edible fruit
Prunus persica	molocotón	loras	Cobán	edible fruit
Psidium guajava	guayaba	pata	AVP-Lowlands	edible fruits
Pyrus communis	pera	per	AVP-Highlands	edible fruit
Raphanus sativus	rábano	rab	Chamelco	edible fruit
Rosmarinus officinale	romero		?	leaves as spice
Rubus floribundus	mora	tokan	AVP-Chicacnab	edible fruit
Ruta graveoleus	ruda	arud	AVP-Highlands	med.-leaf for heart problems
Saccharum officinarum	panela	ki'	El Quiché	sweet delicacy
Salvia pupurea	salvia santa	tu tz'unun	San Cristobal	meat flavoring
Sechium edule	guisquil	chima	AVP-Highlands	edible fruit
Solanum nigrum	tomaquilete	maak'uy	AVP-Highlands	meat flavoring
Solanum tuberosum	papa	paps	AVP-Highlands	edible tubers
Syzygium aromatucum	clavo	clav	GC	spice
Tagetes erecta	hoja de muerto	tutz	Cobán	ornamental, for graves
Theobroma bicolor	cacao	b'alam	AVP-Lowlands	seeds for traditional beverage
Theobroma cacao	cacao	kakaw	Cahabón	seeds for traditional beverage
Thimus vulgaris	tomillo		Quetzaltenango	leaves spice
Triticum sp.	trigo	trig	GC	edible cereal
Vitus sp.	uva	tusub'	GC	edible fruit
	pericón		AVP-Highlands	medicinal
	uña de gato		Western Highlands	
		xilka	Cobán	
	altamisa		Cobán	
	calawala		?	
	orejuela		?	
	pirinueta		AVP-Highlands	
	flor de tilo		GC	
	paterna		Teleman	

cultivars, mostly exotic, temperate cultivars. Even more importantly, the markets serve as something of an equilibrating tool, homogenizing the knowledge of cultivars for people from both lowland and highland communities.

At the time of the Spanish invasion, the Q'eqchi' were much more circumscribed to the highlands of Alta Verapaz, with hostile neighbors effectively cutting them off from the lowlands. Trade of lowland plants in these times, and in preHispanic times, certainly exposed highlanders to the wonders of lowland cultivars. As the Q'eqchi' were used as military emissaries in the 16th and 17th centuries against the Manche Chol and Lacondón speakers of the lowlands, and as the Q'eqchi' continued to participate in the exchange of cacao and achiote throughout the 17th century in the lowlands (King 1974:25), these and other cultivars must have remained central to the highlanders. During colonial times, and even into the 20th century, trading excursions into the lowlands must have been difficult. As recently as two years ago, it was an arduous, 12-hour journey by bus to reach the lowland trading center and military post of Playa Grande (Dennis et al. 1988). Once the Sa Mox bridges were completed in 1998, nearly eight hours was cut from this journey and the markets of Cobán became a real source of income and cultivar inspiration for an enormous geographical area.

Chapter Nine: Q'eqchi' Plant Lexicon

"... for words and language are not wrappings in which things are packed for the commerce of those who write and speak. It is in words and language that things first come into being and are."
— Martin Heidegger's *Introduction to Metaphysics*, 1959, p.3

"Colonists are very apt to bestow names of the old country on to the trees and herbs of the new, whenever they find any resemblance, either in the aspect or products to the family of plants at home."
— Richard Spruce's, *Botanist on the River Amazon*, 1908, p.105

"We mostly eat maize and plants."
— Rigoberta Menchu's, *I, Rigoberta Menchu*, 1995, p.51

The previous five chapters have described in detail the various ways in which the Q'eqchi' of Chajaneb and Sa Mox *use* plants from the forests and from local and regional markets for house construction, in home gardens, and in agriculture. In each of the five chapters, I argued that as families moved from the highlands to the lowlands, they encountered fundamentally new plant resources. In order to meet the changing needs associated with the five rubrics analyzed, individuals and groups modified their behavior vis-à-vis these new plant communities. This process of behavioral modification I call cultural adaptation. In this chapter I suggest that the process of cultural adaptation to new plant communities is facilitated by the rapid reorganization of existing plant lexemes and acquisition of new plant lexemes.

Unlike a child born with no inventory of plant lexemes, migrants to the lowlands bring with them a bewildering knowledge of plants as well as their names, uses, and characteristics. It is not surprising, then, that recent arrivals to the lowlands make use of this plant knowledge acquired in the highlands, and, as Richard Spruce noted, "bestow names of the old country on to the trees and herbs of the new, whenever they find any resemblance, either in the aspect or products to the family of plants at home" (Spruce 1908:105). In order to track this process systematically I begin by analyzing plant lexeme acquisition in the highland study site of Chajaneb. This process of lexical acquisition, I argue, is in itself another adaptive mechanism that, for migrants, is carried out at least twice in a lifetime. I will demonstrate that myriad variables play a role in the adaptive process of lexical acquisition. Some of those variables are "plant-dependent," that is they depend on the nature of the characteristics of the plant and the relationship between human and plant interactions. Others are "informant-dependent," and are based on qualities of the individual in question. Following a short description of the methods used in gathering data, four analytical sub-sections are presented which adopt three statistical tools: a) a multivariate analysis of plant nomenclature variability; b) a quantitative and qualitative description of the total variability in morphemes, i.e., the plant lexical inventory; c) a look at lexical models with consensus analysis and average agreements to determine "correct" names; and d) a focus on correct and incorrect plant names employing descriptive statistics, correlations, and the comparison of sample means.

These tools are then consecutively applied to a cohort of informants in the lowlands of Sa Mox to understand better the process of adult lexeme acquisition versus child acquisition. In such an analysis several trends of lexical adaptation emerge. First, there is a clear and vital relationship between the importance of plants in terms of utility and the ways that plant names are applied. Second, there is a definitive time frame of lexical acquisition that, I believe, is also intimately connected to plant utility. Finally, males and females construct both their adult and child lexical repertoire at different paces, to different degrees, and from different perspectives. Not surprisingly, these differences are also related to how different sexes *use* plants. I draw three overarching conclusions in this chapter: 1) understanding the diversity of labels applied to the plant world tells us more about the utilitarian relationships people have with plants (e.g., Hunn 1982) than the overarching system of hierarchical classification (e.g., Berlin 1992); 2) the lexical acquisition of plant names in a new environment constitutes an elementary adaptive mechanism associated with migration because it facilitates the process of communication and ultimately renders the use of plants into a recognizable, moderately cohesive pattern; and 3) distant and recent histories make migrants to the lowlands *preadapted* to lowland plant communities.

Methodology and Method: The Possibilities and Problems of the Plant Trail

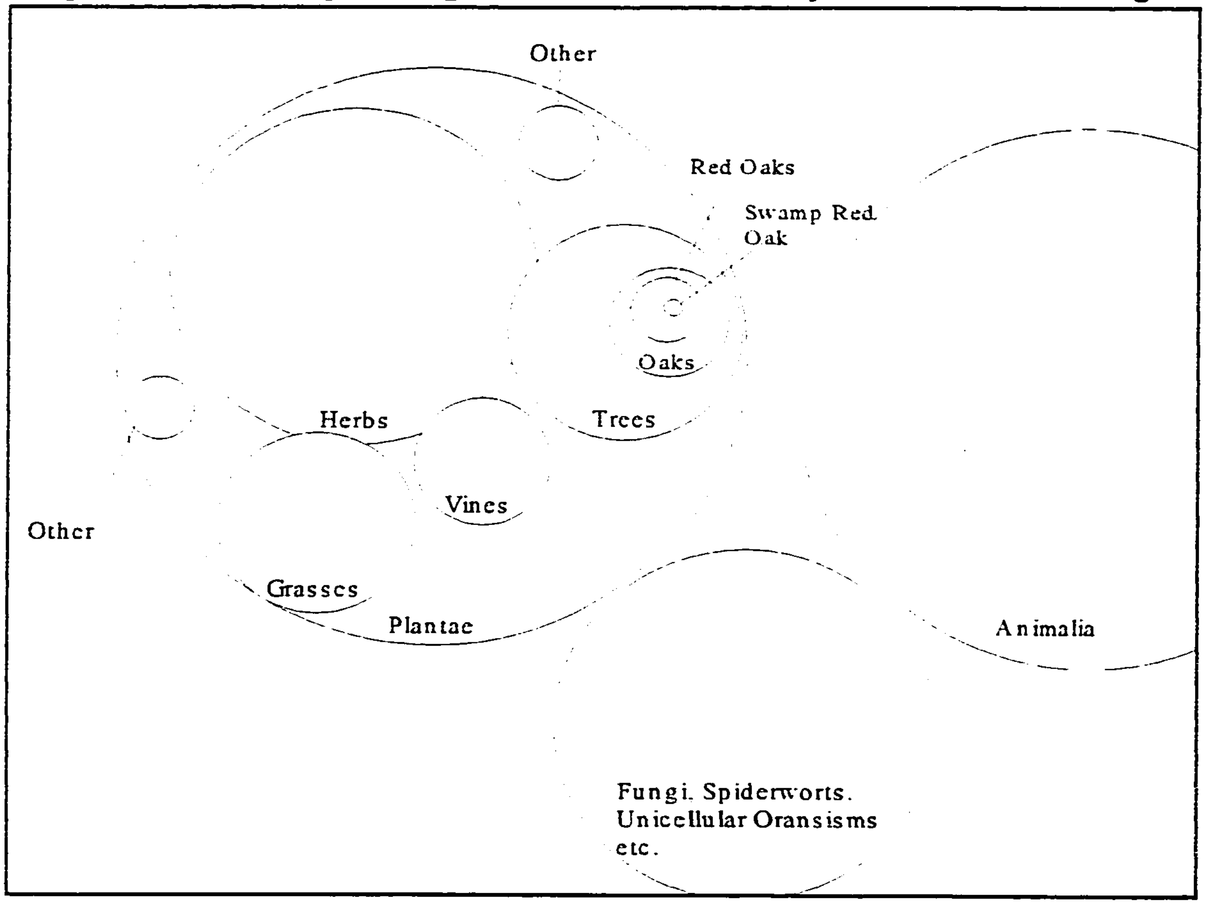
Questions concerning the naming of biological organisms or other abiotic elements of nature fall squarely within the rubric known as ethnobiology. Volumes have been written on the development of this mode of inquiry and need not be repeated here.[1] However, within the framework of anthropology the works of Harold Conklin, beginning with his widely cited yet unpublished 1954 doctoral dissertation, is often marked as the flowering of the field, and from

[1]Although the Brent Berlin's *Ethnobotanical Classification: Principles of Categorization of Plants and Animals* (1992) is written from a particular perspective, some would say with an axe to grind, it is nevertheless less an awesome treatment of ethnobiological classification over the past five decades. Many of my ideas stem from this work. Scott Atran's (1996) *Cognitive Foundations of Natural History* is also an amazing compilation of ethnobiological history, stretching to the foundations of Western intellectual thought.

that time two noticeable divisions have developed around trying to answer the question "Why do human societies classify nature in the ways they do?" (Berlin 1992:5). One camp, labeled relativist and championed most vocally by Roy Ellen (e.g., 1986), finds that, because cultural groups and individuals differ in innumerable ways, the scientific comparison of ethnobotanical cultures is essentially futile. The other camp, labeled comparativist and championed most vocally by Brent Berlin, "seeks to discover and document general features of cross-cultural similarities that are widely if not universally shared" (Berlin 1992:11). These camps have their counterparts throughout the sundry fields of interest within anthropology as a discipline.

As I approached the question of plant classification in the field with two Q'eqchi' communities, I must admit that my opinions and goals were most influentially shaped by writings of the comparativist camp. Through fieldwork with Q'eqchi', I expected to find the all-too-familiar cognitive Venn diagrams in order that they may better understand the relationship between various plant of classification at work (see Figure 9.1). Like an amateur American naturalist who would say, "A swamp red oak is a type of red oak, a red oak is a type of oak, an oak is a type of tree, and a tree is a type of plant," I expected to find the vast majority of the Q'eqchi' within the two study areas to replicate this sequence, therefore further demonstrating that all human beings are equipped with a set of cognitive Venn diagrams to

Figure 9.1: Venn diagram of *Quercus shumardii* Buckley, in relation to other organisms



facilitate the understanding of the relationship between species and between plant species and the rest of the "natural" world. Nature's observable discontinuities would be obvious, be recognized, and be labeled consistently. When it immediately became apparent that there did not exist a label for plants as a whole, i.e. there was no labelled, Berlinean "unique beginner," — and the presence of a "covert unique beginner" was questionable — and that people sometimes made statements like Rigoberta Menchu's above, my belief in this cognitive model began to dwindle.

Nevertheless, in order to demonstrate this hierarchical model, and in order to find the one or two informants who could name everything correctly and, thus, be able to tell me all about Q'eqchi' plant use, I would perform what is known as a plant trail experiment in both communities. The plant trail experiment was pioneered by Brian Stross in reference to the acquisition of Tzeltal plant names by young children (1973). Unlike the ethno-ornithologist who is forced to taxidermize their highly mobile specimens (e.g., Berlin, Boster, and O'Neill 1981), ethnobotanists work with objects that, for the most part, remain in one place. Barring a harvest, a session of weeding, the random vandalization of tree-tagged plants and the like, a plant trail allows a researcher to expose participants to a relatively stable, uniform set of specimens. Although the plant trail may seem somewhat mundane at first glance, it yields an enormous set of data that can be subjected to several strenuous statistical tests which allow the researcher to test hypotheses on plant name consensus, plant name acquisition, and plant lexical diversity. Ethnobiologists are using this method with more frequency, as can be seen with a quick glance through the *Program and Abstracts* of the Seventh International Congress of Ethnobiology (e.g., Zarger in Berlin and Berlin 2000; Zarger and Stepp in Berlin and Berlin 2000). It is from these two plant trails, and the countless hours of ethnographic participant observation, that all the data from the remainder of this chapter were derived.

In the highland community of Chajaneb, a total of 95 participants were led along a trail containing 113 specimens; in Sa Mox 42 individuals participated in a trail that contained 102 specimens. Through interviews conducted in Q'eqchi', biographical data were first collected on each participant, and then participants were simply asked to give a Q'eqchi' name for each plant along the trail. Participants were prompted to do whatever necessary to the stimulus in order to determine the name and were instructed to answer simply "I do not know" (**ink'a**

ninaw) if the plant was unknown to them. It was important that the ethnographer not touch the stimulus as this could inspire participants to define the part rather than the whole. Once a respondent gave a name, there was no further questioning or prodding for a more specific name by the ethnographer. All data were recorded on microcassette, transcribed into print on a mechanical typewriter, and eventually entered into spreadsheet format for analysis.

In order to achieve any degree of continuity between middle-range theory testing and higher-order assumptions on the nature of ethnobotanical inquiry, it was important to test a sample that was at least qualitatively representative of the study communities as a whole. The same holds true for the selection of plants. Because I spent over a year in Chajaneb, it was easy to get a large, diverse sample of the approximately 350 persons in the community to agree to participate in the plant trail. Fifty-four males and 41 females, ranging in ages from 5 to 75 and 5 to 69 participated in the Chajaneb trail. In the lowlands, because I was only there five months and was without my wife, and because of the cultural restrictions imposed on females in terms of forest landscapes (see Chapter 7), it was much more difficult and less appropriate to try and convince females to take a stroll through the woods. As a result, only males participated in the lowland trail. Their ages ranged from 6 to 46. The summary of plants on the trails and participants is enumerated in Table 9.1.

My idea was to begin the plant trail near the start of the research in order to identify "expert" informants. Yet, as trust needed to be first established and a degree of familiarity with the local flora was paramount, these plant trails occurred at the terminus of the field season. Actually, what turned out to be the highland plant trail, occurred after several failed attempts.

Stross (1973) placed more emphasis on plant diversity and had his participants — mostly children under 14 years of age — walk an eight-hour trail broken up into two four-hour segments. The trail totaled over 200

Table 9.1: Summary of Plant Classes on the Two Trails

	Trees	Herbs	Ferns	Orn.Flwrs.	No Class	Grasses	Moss	Water Plants	
Highlands	42	36	7	3	5	6	7	0	
percent	37.2	31.9	6.2	2.7	4.4	5.3	6.2	0	
Lowlands	53	21	2	1	2	2	0	1	
percent	52	20.6	2	1	2	2	0	1	
	Mushrms.	Crops	Thorns	Epiphytes	Sedges	Bananas	Vine	Gingers	**Sum**
Highlands	2	9	2	3	1	1	0	0	113
percent	1.8	8	1.8	2.7	0.9	0.9	0	0	100
Lowlands	1	5	2	2	3	2	3	2	102
percent	1	4.9	2	2	2.9	2	2.9	2	100

plants and was undoubtedly more representative of the local Chiapan flora than my experiment in Alta Verapaz. After attempts at a long trail, I soon learned that children quickly become tired, frustrated, or bored along such a trail, dramatically skewing answers that would have been given under less stressful conditions. I shortened the trails to around 100 plants which could be completed in under two hours. As described above, the choice of plants was somewhat arbitrary, but by focusing on selecting an adequate representation of plants — domesticates, non-domesticates; trees, shrubs, and herbs; useful and superfluous, exotic and mundane plants — I achieved a qualitative representation of the local flora. The plants of the highland and lowland trails appear in Table 9.2 and 9.3, respectively.

Table 9.2: Plants of the Highland Trail

No. Plant	Plant Family	Scientific Name	Emic Category	# Resp.[1]	Response 1st Position[2]
1	Pinaceae	*Pinus pseudostrobus* Lindl	tree	3	chaj
2	Balsaminaceae	*Impatiens* sp.	flower	7	utz'u'uj
3	Liliaceae	*Yucca elephantipes* Regel	no class	5	k'uuk'iil
4	Cupresaceae	*Cupressus lusitanica* Miller	tree	4	sipres
5	Rubiaceae	*Coccocypselum hirsutum* Bartling ex DC.	herb	29	?
6	Pteridaceae	*Pteris muricella* L.	fern	5	sisb'
7	Adiantaceae	*Adiantum* sp.	fern	28	?
8	Verbenaceae	*Verbena littoralis* HBK.	herb	25	?
9	Asteraceae	*Melanthra nivea* (L.) Small	herb	16	sajal
10	Piperaceae	*Piper ubellatum* L.	herb	21	?
11	Fruticose lichen[3]	*Usnea* sp.	moss	16	q'ux
12	Poaceae	*Pennisetum purpureum* Schumach.	grass	10	zacat
13	Rhamnaceae	*Rhamnus capreaefolia* Schlecht.	tree	19	sub'
14	Rutaceae	*Citrus sinensis* (L.) Osbeck	tree	2	chin
15	Solanaceae	*Solanum americanum* Miller	herb	7	maak'uy
16	Poaceae	*Paspalum conjugatum* Bergius	grass	20	?
17	Squamulose lichen[3]	*Cladonia* sp.	mushroom	12	okox
18	Squamulose lichen[3]	*Cladonia* sp.	mushroom	15	okox
19	Caprifoliaceae	*Viburnum blandum* Morton	tree	19	tz'unun che'
20	Plantaginaceae	*Plantago major* L.	herb	23	?
21	Myrsinaceae	*Rapanea myricoides* (Schlecht.) Lundell	tree	11	xub' ti
22	Rubiaceae	*Crusea calocephalia* DC.	herb	26	?
23	Rutaceae	*Citrus nobilis* Lour. var. *deliciosa*	tree	7	mandarina
24	Clethraceae	*Clethra suaveolens* Turcz.	tree	12	ka q'ut
25	Fabaceae	*Mimosa* sp.	thorn	4	wara k'ix
26	Asteraceae	*Eupatorium semialatum* Benth.	tree	23	kimal che'
27	Rosaceae	*Rubus sapidus* Schlecht.	herb	8	k'ix
28	Asteraceae	*Perymenium grande* Hemsl.	tree	8	tza'aj
29	USS[4]		herb	32	?
30	Rutaceae	*Citrus limonia* Osbeck	tree	9	lamuj
31	Asteraceae	*Verbesina turbacensis* HBK.	herb	17	rok xa'an
32	Rubiaceae	*Palicouria* sp.	herb	29	?
33	Apiaceae	*Hydrocotyle mexicanum* Cham. & Regel	herb	29	?
34	Asteraceae	*Dahlia imperialis* Roezl ex Ortgies in Regel	herb	5	tz'oloj
35	Solanaceae	*Solanum torvum* Swartz	herb	19	k'ix
36	Melastomataceae	*Miconia* sp.	tree	28	?
37	Melastomataceae	*Miconia* sp.	tree	28	?
38	Myrsinaceae	*Rapanea myricoides* (Schlecht.) Lundell	tree	12	xub' ti
39	Asteraceae	*Polymnia maculata* Cav.	herb	18	axl
40	Asteraceae	*Polymnia caxacana* Sch.	herb	17	?
41	Lamiaceae	*Hyptis scandens* Epling	herb	23	?
42	Tiliaceae	*Triumfetta dumeforum* Schlecht.	herb	25	?

Table 9.2: Continued

No. Plant	Plant Family	Scientific Name	Emic Category	# Resp.	Response 1st Position
43	Rutaceae	*Citrus limetta* Risso	tree	10	lim
44	Lauraceae	*Persea americanum* Mill	tree	3	o
45	Rosaceae	*Rubus adenotrichus* Schlecht.	herb	12	tokan
46	Agavaceae	*Furcrea guatemalensis* Trelease	no class	2	ik'e
47	Piperaceae	*Peperomia lenticularis* Dahlstedt	herb	26	?
48	Bromeliaceae	*Vriesia heliconoides* (HBK.) Hook, in Walp.	epiphyte	24	?
49	Ebenaceae	*Diospyros khaki* L.	tree	14	?
50	Sapotaceae	*Pouteria viridis* (Pittier) Cronquist	tree	3	rax tul
51	Poaceae	*Axonopus compressus* (Swartz) Beauv.	grass	9	pachaya
52	Myrtaceae	*Psidium guajava* L.	tree	6	pata
53	Gleicheniaceae	*Dicranopteris pectinata* (Willd.) Underw.	fern	25	sisb'
54	Tiliaceae	*Triumfetta* sp.	herb	13	goiyo
55	Asteraceae	*Spilanthes americanum* (Mutis) Hieron	herb	19	?
56	Asteraceae	*Bidens squarrosa* HBK.	herb	10	xub'ay
57	Fabaceae	*Phaseolus coccineus* L.	cultivar	3	kenq'
58	Phytolaccaceae	*Phytolacca rivinoides* Kunth & Bouché	herb	23	?
59	Dryopteridaceae	*Rumohra adiantiformis* (G. Forst.) Ching	fern	22	?
60	Convolulaceae	*Ipomoea purpurea* (L.) Roth	herb	20	chiklin
61	Poaceae	*Zea mays* L.	cultivar	3	wa
62	Fabaceae	*Phaseolus vulgaris* L.	cultivar	9	kenq'
63	Saurauiaceae	*Saurauia villosa* DC.	tree	8	xo'ot
64	Adiantaceae	*Ananthacorus* sp.	fern	14	sisb'
65	Gesneriaceae	*Phinaea* sp.	herb	20	?
66	Cyperaceae	*Scleria secans* (L.) Urban	sedge	23	?
67	Convolulaceae	*Ipomoea tiliacea* (Willd.) Choisy in DC.	herb	11	is
68	Rubiaceae	*Coffea arabica* L.	tree	2	kape
69	Bromeliaceae	*Catopsis* sp.	epiphyte	18	?
70	Arecaceae	*Chamaedora tepejilote* Liebm. In Martius	tree	2	kib'
71	Liliaceae	*Anthericum eleutherandrum* (Koch) Moore	herb	25	?
72	Rosaceae	*Pyrus comunis* L.	tree	11	pera
73	Commelinaceae	*Tradescantia guatemalensis* C.B. Clarke	herb	14	tzimaj
74	Poaceae	*Panicum xalapense* HBK.	herb	11	q'ol pim
75	Fabaceae	*Erythrina berteroana* Urban	tree	4	tz'in te'
76	Lauraceae	*Persea schiedeana* Nees	tree	4	koiyo
77	Rosaceae	*Eriobotrya japonica* (Thunb.) Lindl.	tree	10	nisp
78	Marantaceae	*Calathea allouia* (Aubl.) Lindl.	cultivar	5	moxl
79	Musaceae	*Musa* X *sapientum* var. *rubra* (Firm.) Baker	banana	11	saqi keenay
80	Asteraceae	*Verbesina lanata* Robins. & Greenm.	tree	10	jow
81	Liliaceae		no class	12	kaqi q'een

Table 9.2: Continued

No. Plant	Plant Family	Scientific Name	Emic Category	# Resp.	Response 1st Position
82	Araceae	*Xanthosoma violaceum* Schott, Oesterr.	cultivar	8	ox
83	Asteraceae	*Tagetes erecta* L.	flower	10	tutz
84	Araceae	*Xanthosoma violaceum* Schott, Oesterr.	cultivar	13	ox
85	Asteraceae	*Tithonia diversifolia* (Hemsl.) Gray	herb/tree	6	konon
86	Ulmaceae	*Trema micrantha* (L.) Blume	tree	20	?
87	Rubiaceae	*Palicourea gaeottiana* Mart.	tree	16	rax wak
88	Anacardiaceae	*Rhus striata* Ruiz & Pavón	tree	6	am che'
89	Iridaceae	*Tritonia crocosmiflora* Nichols.	flower	27	utz'u'uj
90	Scrophulariaceae	*Castilleja arvensis* Schlecht. & Cham.	herb	16	?
91	Euphorbiaceae	*Sida rhombifolia* L.	herb	27	?
92	Melastomataceae	*Arthrostemma ciliatum* Ruiz & Pavón	herb	35	?
93	Lauraceae	*Persea donnell-smithii* Mez ex Donn.	tree	16	o max
94	Hamemelidaceae	*Liquidambar styraciflua* L.	tree	3	okob'
95	Cyanthaceae	*Cyathea arborea*	tree	17	ch'ut
96	Melastomataceae	*Miconia* sp.	tree	29	?
97	Guttiferae	*Vismia mexicana* Schlecht.	tree	25	?
98	Fabaceae	*Dalbergia* sp.	tree	22	?
99	Fabaceae	*Dalbergia* sp.	tree	22	?
100	Verbenaceae	*Lippia substrigosa* Turez.	tree	20	q'ol che'
101	Myricaceae	*Myrica cerifera* L.	tree	22	wa ut
102	Umbelliferae	*Daucus carota* L.	cultivar	14	zanahoria
103	Proteaceae	*Macadamia integrifolia* L.	tree	11	?
104	Solanaceae	*Lycopersicon esculentum* L.	cultivar	7	pix
105	Chloranthaceae	*Hedyosmum mexicanum* Cordemoy	tree	11	onk
106	Aspleniaceae	*Ctenitis excelsa* (C. Chr.) Tard. & C. Chr.	fern	24	?
107	Poaceae	*Saccharum officinarum* L.	cultivar	5	utz'aal
108	Fabaceae	*Mimosa invisa* Mart.	thorn	13	k'ix
109	Cannaceae	*Canna indica* L.	herb	13	tzukl
110	Euphorbiaceae	*Ricinus comunis* L.	herb	15	aceit
111	Casuarinaceae	*Casuarina equisetifolia* L.	tree	14	sipres
112	Adiantaceae	*Ananthacorus angustifolius* L.	fern	21	?
113	Bromeliaceae	*Tillandsia* sp.	epiphyte	23	?

[1]Total number of responses, including all phonetic, lexical, and syntactic variation
[2]"?" Indicates a response of "I don't know."
[3]Higher order plant group other than family
[4]Unidentified, sterile specimen

Table 9.3: Plants of the Lowland Trail

No. Plant	Plant Family	Scientific Name	Emic Category	# Resp.[1]	Response 1st Position[2]
1	Verbenaceae	*Lippia myriocephala* Sclecht. & Cham.	tree	2	sak atz'um
2	Bixaceae	*Bixa orellana* L.	tree	3	xayau
3	Myrtaceae	*Psidium guajava* L.	tree	2	pata
4	Solanaceae	*Solanum hispidum* Pers.	herb/tree	6	k'ix
5	Euphorbiaceae	*Manihot esculenta* L.	cultivar	3	tz'in
6	Fabaceae	*Gliricidia sepium* (Jacq.) Steud.	tree	6	q'an te'
7	Euphorbiaceae	*Sida rhombifolia* L.	herb	6	mesb'el
8	Myrsinaceae	*Parathesis donnell-smithii* Mez	tree	6	suu chaj
9	Lamiaceae	*Leonurus sibiricus* L.	herb	7	?
10	Fabaceae	*Inga micheliana* Harms	tree	6	chochokl
11	Fabaceae	*Inga* sp.	tree	12	b'itz
12	Musaceae	*Musa X sapientum* (Firm.) Baker	banana	8	minis
13	Rubiaceae	*Coffea arabica* L.	tree	2	kape
14	Rosaceae	*Licania platypus* (Hemsl.) Fritsch	tree	9	jolob'ob'
15	Poaceae	*Digitaria* sp.	grass	6	pachaya
16	Anacardiaceae	*Mangifera indica* L.	tree	3	mank
17	Moraceae	*Cecropia obtusifolia* Bertoloni	tree	5	ch'oop
18	Fabaceae	*Dialium guianense* (Aubl.) Sandwith	tree	3	wachil
19	Bromeliaceae	*Ananas comosus* (L.) Merrill	cultivar	2	ch'op
20	Fabaceae	USS[4]	tree	6	kub' te'
21	Asteraceae	*Vernonia deppeana* Less.	tree	6	semem
22	USS		tree	9	k'ix poy
23	Asteraceae	*Tithonia diversifolia* (Hemsl.) Gray	tree	7	konon
24	Fabaceae	*Inga punctata* (Willd.)	tree	14	?
25	Pontederiaceae	*Pontederia sagittata* Presl.	water plant	6	nab'
26	Fabaceae	*Acacia* sp.	herb	9	?
27	Cyperaceae	*Scleria secans* (L.) Urban	sedge	8	sek
28	Araceae	*Monstera pertusa* (L.) de Vriese	vine	13	?
29	Clusiaceae	*Vismia camparaguey* Schlecht.	tree	7	q'an paraway
30	Piperaceae	*Piper auritum* HBK.	herb	10	?
31	Melestomaceae	*Bellucia costaricensis* Cogn.	tree	8	manzan
32	Melestomaceae	*Bellucia grossulariodes* (L.) Triana	tree	9	chajla k'im
33	Moraceae	*Castilla elastica* Cervantes	tree	5	kik' che'
34	Vochysiaceae	*Vochysia hondurensis* Sprague.	tree	6	san juan
35	Moraceae	*Ficus* sp.	tree	9	?
36	Moraceae	*Ficus* sp.	tree	9	?
37	Adiantaceae	*Adiantum wilesianum* L.	fern	13	?
38	Araceae	*Monstera pertusa* (L.) de Vriese	vine	13	?
39	Asteraceae	*Elephantopus spicatus* Juss. ex Aubl.	herb	13	?

Table 9.3: Continued

No. Plant	Plant Family	Scientific Name	Emic Category	# Resp.	Response 1st position
40	Araceae	*Anthurium crassinervium* (Jacq.) Schott	herb	11	yuk
41	Bromeliaceae	*Catopsis* sp.	epiphyte	9	utz'u'uj
42	USS		herb	15	?
43	Cyperaceae	*Scelria purdiei* L.	sedge	3	sek
44	Myrsinaceae	*Parathesis cubana* (A. DC.)	tree	11	saqi suu chaj
45	Arecaceae	*Bactris balanoidea* (Derst.) Wendl.	tree	11	k'ix kib'
46	Araceae	*Xanthosoma robustum* Schott	no class	6	maraak
47	Pteridaceae	*Pteris* sp.	fern	8	sis
48	Piperaceae	*Piper amalago* L.	herb	10	ob'el
49	Boraginaceae	*Cordia spenesuus* L.	herb	11	?
50	Bromeliaceae	*Androlepis skinneri* (K. Koch) Brongn.	epiphyte	10	?
51	Melestomataceae	*Miconia* sp.	tree	11	?
52	Asteraceae	*Eupatorium odoratum* L.	herb	12	?
53	Poaceae	*Guadua* sp.	sedge	18	?
54	Melestomataceae	*Mouriri parvifolia* Benth.	tree	11	?
55	Fabaceae	*Mimosa invisa* Mart.	thorn	15	k'ix
56	Fabaceae	*Inga leptoloba* Schlecht.	tree	11	?
57	Asteraceae	*Bidens squarrosa* HBK.	herb	10	?
58	Asteraceae	*Eupatorium barletti* Robinson	herb	12	?
59	Asteraceae	*Neurolaena lobata* L.	herb	14	tres punto
60	Zingibereaceae	*Elettaria cardamomum* Maton	cultivar	5	tz'i
61	Asteraceae	*Eupatorium* sp.	herb	10	?
62	Asteraceae	*Ageratum* sp.	herb	15	?
63	Hymenomycetes[3]	*Coriolus* sp.	mushroom	12	okox
64	Fabaceae	USS	tree	14	?
65	Verbenaceae	USS	herb	16	kis kaway
66	Zingibereaceae	*Renealmia aromatica* Kunth	ginger	10	tz'i
67	USS		tree	15	?
68	Annonaceae	*Annona scleroderma* Safford	tree	12	?
69	Burseraceae	*Protium multiramiflorum* Lundell	tree	16	?
70	Euphorbiaceae	*Alchornea latifolia* Swartz	tree	18	?
71	Fabaceae	*Hymenaea courbaril* L.	tree	7	pak
72	Fabaceae	*Inga leptoloba* Schlecht.	tree	14	?
73	Euphorbiaceae	*Euphorbia leucocephala* Lotsy	tree	10	?
74	Asteraceae	*Bidens triplinervis* HBK.	herb	7	xub'ay
75	Musaceae	*Musa sapientum* var. *rubra* (Firm.) Baker	banana	5	cha tul
76	Poaceae	*Zea mays* L.	cultivar	2	k'al
77	Convolvulaceae	*Ipomoea indica* (Burm.) Merrill	herb	14	?
78	Poaceae	*Paspalum conjugatum* Bergius	grass	10	pachaya

Table 9.3: Continued

No. Plant	Plant Family	Scientific Name	Emic Category	# Responses	Response 1st Position
79	Fabaceae	*Inga spuria* Humb. & Bonpl. ex Willd.	tree	11	b'ach
80	Fabaceae	*Inga laurina* (Swartz) Willd.	tree	7	palal chochokl
81	Malvaceae	*Hibiscus rosa-sinensis* L.	flower	7	klavel
82	Rutaceae	*Citrus nobilis* var. *deliciosa* Lour.	tree	4	mandarina
83	Fabaceae	*Pithecolobium saman* (Jacq.) Benth.	tree	9	?
84	Piperaceae	*Piper donnell-smithii* C. DC. ex Donn.	tree	8	?
85	Araceae	*Xanthosoma violaeum* Schott	cultivar	7	ox
86	Fabaceae	*Inga fissicalyx* Pittier	tree	9	chelel
87	Malpighiaceae	*Byrsonima crassifolia* (L.) HBK.	tree	2	ch'i'
88	Melastomataceae	*Conostegia xalapensis* (Bonpl.) D. Don	tree	9	?
89	Moraceae	*Artocarpus altitis* (Parkinson) Fosberg	tree	5	kastanya
90	Sapindaceae	*Sejania* sp.	vine	10	?
91	Rutaceae	*Citrus sinensis* (L.) Osbeck	tree	2	chin
92	Verbenaceae	*Stachytarpheta frantzii* Polak.	herb	9	?
93	Solanaceae	*Solanum trizygum* Bitter	thorn	8	k'ix
94	Fabaceae	USS	tree	19	?
95	Fabaceae	*Erythrina guatemalensis* Krukoff	tree	5	tz'in te'
96	Liliaceae	*Yucca elephantipes* Regel	no class	6	?
97	Rutaceae	*Citrus maxima* (Burm.) Merrill	tree	8	tronk
98	Arecaceae	*Cocos nucifera* L.	tree	3	kook
99	Zingerbeaceae	*Costus sanguineus* Donn. Smith	ginger	7	?
100	Cannaceae	*Canna indica* L.	herb	11	tzukl
101	Amaranthaceae	*Iresine calea* (Ibáñez) Standl.	herb	8	?
102	Burseraceae	*Bursera simaruba* (L.) Sarg.	tree	6	ka'kai

[1]Total number of responses, including all phonetic, lexical, and syntactic variation
[2]"?" Indicates a response of "I don't know."
[3]Higher order plant group other than family
[4]Unidentified, sterile specimen

Using Multivariate Analysis to Understand Variation in Plant Lexemes

The most striking figures that emerge from Tables 9.2 and 9.3 are the surprisingly large numbers of responses for many plants of the two trails, and the large number of "I do not know" responses which appear as the most common response. For the highland trail of Chajaneb every plant stimulus generated an average of 14.8 names per plant and 33.6 percent of the trail plants received an "unknown" response. The figures for the lowlands are similarly surprising: an average of 8.71 names per plant and 38.2 percent "unknowns." Taking into consideration that when more people participate on a trail, more names will be generated, the figures must be adjusted to take into account the total number of participants. This adjustment yields a figure of .156 names/plant/person for the highlands and .207 names/plant/person for the lowlands. These similar — and peculiarly large — figures deserve further exploration.

Variability in lexemes occurred at three primary, linguistic levels: phonemic, lexical, and syntactic. Phonemic variation, by far the most important source of variability, could in some instances be considered dialectical variation. In many cases, though, the variation was extant between individuals and therefore must be considered idiolectcal. At the level of syntax, the majority of variation occurs around the formation of possession. This type of variation occurs frequently in other cultural domains and does not appear to vary at the dialectcal, familial, or idiolectcal level, but seems to vary even within the responses of one individual. Finally, and most interestingly, is the variation at the level of lexeme, where actual "mistakes" are made, "guesses" are given, and descriptions emerge. Table 9.4 below highlights these variable trends.

Table 9.4: Examples of Variability

Variation Type	Scientific Name	Plant Family	Examples and Glosses
Phonemic	*Sida spinosa*	Malvaceae	mesleb', mesb'e, mesb'el
			<mes- from mesunk, "to sweep">
	Bursera simaruba	Burseraceae	ka'aj,kaq'aj
			<kaq, "red", characterizing bark>
	*	*	che', te'
			<tree>, dialectical, te' borrowing
			from lowland chol
	*	*	k'aam, k'ajam
			<vine>, dialectical, k'ajam coming from
			eastern, Lanquin dialect
Syntactic	*Coccocypselum hirsutum*	Rubiaceae	xpix akach, pix li akach, xpix li akach
			<all denoting "turkey's tomato">
	Anthericum aurantiacum	Liliaceae	xklaux li k'uch, xklauxi k'uch
			<denoting "hawk's" or "wild" klaux
Lexical	*Eupatorium semialatum*	Asteraceae	b'ak che', k'imal che'
			<"bone tree" or "bitter tree">
	Neurolaena lobata	Asteraceae	tres punt, k'amank
			<"3 points," Sp. or "bitter mango">
	Ceiba pentandra	Bombacaceae	inup, yax te'
			<unanalyzable morpheme or yax "tree">

Because of this high variation in lexicon, and because many of the names given did not appear to be "wrong guesses" or merely descriptive terms, I first wanted to approach the variation *without assuming that there was always a correct answer for every plant.* To avoid this assumption, I focused on the characteristics of the plant in relation to the community rather than the characteristics of the individuals participating in the experiment. In order to do so, it became necessary to formulate a numerical coefficient to characterize the lexical variation in each plant. The simple number of different responses was not adequate, as it did not in any way indicate how many individuals responded to each name. For example, two plants receiving a score of "2 responses" does not differentiate between the extremes of high consensus (94 individuals giving one name, one individual giving the other) and low consensus

(48 individuals giving one name, 47 giving the other). A statistical coefficient of entropy or uncertainty was adopted to deal adequately with diversity, called an "entropic coefficient:"[2]

Figure 9.2: The Entropic Coefficient

$$EC = \sum n_i \log (n_i)$$

where "n_i" is the number of individuals who responded with name "i,", and "log" is the natural log. Note that if n_i=0 the product $n_i \log(n_i)$=0. This measure is akin to the Shannon uncertainty coefficient used in the Boster, Berlin, and O'Neill study of correspondence between Jivaroan and Western, Linnean taxonomic categories (1986:580) and is also derivable from the Kullback-Leibler distance of a probability distribution from uniformity. The entropic coefficient for each plant is a number between 0 and (N log N), where N is the total number of respondents. A score of "0" represents a scenario where no two people agree on a name, and a score of (N log N) represents unanimous agreement on a single name.

With the entropic coefficient of each plant as the dependent variable, three independent variables were chosen — plant utility, anatomical character, and plant ubiquity — and a number on an ordinal scale of one to five was assigned to every plant on the two trails. These variables were chosen based on the hypothesis that highly useful plants, anatomically unique plants, and plants with a wide distribution throughout the region would yield a high degree of lexical

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[2]This mathematical description of variation was kindly offered by Dr. John Liukkonen of the Department of Mathematics at Tulane University.

uniformity that would be reflected in the entropic coefficient. With this model, for example, corn (*Zea mays*) would receive a score of "5" for utility, "5" for anatomical character, and "5" for distribution. Corn is used as the principal food stuff, in religious ceremony, as a house thatch, etc., its anatomical character makes it easily recognizable, and it is ubiquitous in the landscape.

A least-squared regression of the entropic coefficient was then performed on the three covariates. This assumes that the entropic coefficients are normally distributed, have random variables whose means are a linear function of the covariate values, and whose derivations from their means are independent, normal error terms of all the same variance. Residual plots were produced and established such that this is at least approximately the case. Regressions were exacted on the total highland data set, the highland set of females, the highland set of males, and the total lowland data set comprised, not by design, of all males.

To further increase the reliability and validity of the data, samples of all the plants of both trails were collected (Pelto and Pelto 1996:33). Following the basic rules of ethnobotanical collecting as described in Martin (1995), every plant was collected in triplicate, pressed in the field, dried in the nearest neighboring town with electricity and a plant drier (Cobán, Alta Verapaz), and identified and stored at the Koch Herbarium, Tulane University, New Orleans, Louisiana.

There is no doubt that myriad factors contribute to the extreme variation in nomenclature found on the two plant trails. Limitless analyses could be performed to point to the characteristics of the participants that play a role in their use of plant labels, and that will be considered later. I cannot deny that the experimental conditions themselves were a cause of some variety, e.g., plants come into flower at different times, plants get weeded and must be replaced by a similar replica of the original stimulus. Finally, the instrument in the experiment — D. Collins — caused some variation when he mistakenly touched a leaf while pointing to a stimulus and elicited the lexeme "leaf." With caution, this last form of variation could be held to a minimum.

Appendix 3 lists the entropic coefficients of each plant on the trail — the dependent variable — and the three covariates of utility, anatomical character, and ubiquity. Table 9.5 summarizes the regression output and Table 9.6 reports the influence of the three independent variables.

Table 9.5: Summary of Regression Output

Plant Trail	Multiple R	R Square	Adjusted R	Standard Error	Number Observations
Highland Total	0.653025	0.426441	0.410655	48.16399	113
Highland Males	0.64678	0.418325	0.402315	27.36263	113
Highland Females	0.481293	0.231643	0.210496	30.38556	113
Lowland Total	0.420069	0.176458	0.151248	20.71827	102

Table 9.6: Summary Output of the Three Covariates, *P<.05*

Plant Trail & Independent Variables	Coefficients	Standard Error	tStat	P-Value	Lower 95%	Upper 95%
Highland Total						
Utility	26.43079	4.235265	6.240646	**8.53E-09***	18.03664	34.82494
Anatomical Character	14.32945	5.958657	2.404812	**0.017866***	2.519591	26.13931
Ubiquity	4.779233	4.423858	1.080331	0.282379	-3.9887	13.54717
Highland Males						
Utility	14.8327	2.406113	6.164589	**1.22E-08***	10.06386	19.60153
Anatomical Character	7.007665	3.385196	2.070091	**0.040807***	0.298321	13.71701
Ubiquity	3.627522	2.513255	1.443356	0.151788	-1.35366	8.608709
Highland Females						
Utility	11.01293	2.671932	4.121711	**7.36E-05***	5.71252	16.30861
Anatomical Character	7.151108	3.75918	1.902305	0.05977	-0.29946	14.60168
Ubiquity	-1.17434	2.790911	-0.42077	0.674748	-6.70584	4.357147
Lowland Total						
Utility	7.301146	2.262839	3.226543	**0.001704***	2.810617	11.79168
Anatomical Character	1.852168	3.133419	0.591101	0.555814	-4.366	8.070337
Ubiquity	1.606764	2.280407	0.704595	0.482733	-2.91863	60132158

The R Square values of Table 9.5 are revealing, especially in the case of the lowland plant trail where the covariates only explain 17.6 percent of the variation of the entropic coefficient. Clearly, other factors come into play in the lowlands. Utility and anatomical character have explanatory power, for the highland plant trail population as a whole and for the cohort of males with p-Values below .05. For the highland female cohort and the lowland plant trail population as a whole, only the covariate "utility" is significant. Once the p-Values were considered for the three covariates, a final model was developed. This is presented in Table 9.7.

Table 9.7: The Final Model

Plant Trail & Independent Variables	Coefficients	Standard Error	tStat	P-Value	Lower 95%	Upper 95%
Highland Total						
Utility	27.2165	4.175577	6.517937	**2.23E-09**	18.94113	35.49117
Anatomical Character	15.9584	5.769103	2.6766183	**0.006654**	4.525384	27.39141
Highland Males						
Utility	15.4288	2.382047	6.477118	**2.71E-09**	10.70814	20.14946
Anatomical Character	8.244066	3.291108	2.504952	**0.013712**	1.721861	14.76627
Highland Females						
Utility	10.81995	2.622412	4.125954	**7.20E-05**	5.622945	16.01696
Anatomical Character	6.750846	3.623204	1.863225	**.065098**	-.4295	13.93119
Lowland Total						
Utility	8.538675	1.909027	4.472789	**2.04E-05**	4.751219	12.32613

The use of what I call the Entropic Coefficient as a measure of uniformity or variation in response has sincere relativity to the many culture-as-consensus models, but approaches the problem from the perspective of the plant rather than the person. The ordinal values used in this study are somewhat problematic and arbitrary. Long field seasons resulting in firsthand understanding of Q'eqchi' plant use and botanical diversity of the region maximizes the validity and reliability of these variables. The use of ranked variables, such as those used in duplicate bridge scoring or a form of normal scores, deserves to be investigated further (J. Liukkonen, pers. comm., September 2001).

Nevertheless, the overwhelming and repeated significance of the utility variable — for both males and females in the highlands, and for the total data set of both plant trails — is telling. My expectation that the more a plant is used, the higher the degree of consensus around the plant's label was overwhelmingly confirmed. Anatomical distinctiveness, a slightly more difficult characteristic to measure on an ordinal scale, was an important contributing factor to plant label consensus among the total highland cohort and for the highland males. Highland females, as can be seen in Tables 9.6 and 9.7, are just higher than the accepted $p<.05$ level and are, therefore, only arbitrarily excluded from significance. Interestingly, for the lowlands, anatomical character was not an important characteristic for understanding plant nomenclatural consensus, possibly because the lowland residents have less familiarity with their botanical surroundings given their shallow time depth in the region. Finally, plant ubiquity did not contribute to higher consensus. Although this seems contradictory at first, I recall continuously asking my Q'eqchi' neighbors in Chajaneb the name for the very, very common *Crusea calocephali* (Rubiaceae) and being told "the small blue weed," "the purple weed," "the flower of the forest," etc.

Qualitatively, much can be said about the tremendous variation derived from the two plant trails. First, one should consider the role of prevarication and mistakes. Honest mistakes, that is, where an individual confuses one plant for another, seemed like rare occurrences. Indeed, there were cases — especially among several highland tree species that had low anatomical character variables. Most often, instead of responding "I don't know," or "I forgot," people used descriptive terminology from their lexical palette. This we may call non-malicious prevarication. This was especially common among children, but many adults, wanting to appear "in the know" as far as plants are concerned, also participated in the creative use of botanical lexicon. What is interesting — and especially relevant in the field of folk taxonomy —

is *how* they were creative. Before considering the degree of consensus among certain measurable groups within the two communities, and before considering how plant nomenclature varies according to the characteristics of humans, I will discuss the various patterns concerning creativity in botanical lexicon, i.e. the lexical, botanical inventory.

Patterned Creativity in Plant Lexicon

Tables 9.8 and 9.9 below summarize the total responses generated by the two plant trails. Twenty percent of the total highland stimuli were given the "I do not know" response (**ink'a ninaw**); the figure was 28.8 percent for the lowlands. As both the plants and the participants varied between two trails, these figures do not allow for any statistically significant comparison, however, it is viable to say that nearly 25 percent of all the 15,019 plant/person responses did not generate data. Aside from this data-scarce rubric, the trail produced an enormous set of useful data on plant lexemes. In this section I describe in some detail the lexical palette people use in identifying plants, for it appears as if the palette is essentially the same in the highlands as it is in the lowlands.

For both trails, plant anatomical parts are frequently used as "fall back" lexemes when a more specific lexeme is not known. Where unitary lexemes are concerned, the use of only an anatomical part could never be considered a "correct" name unless it was shared by an overwhelming majority of the population. For example, "branch" or "leaf" would never be used

Table 9.8: Summary of 10,735 Lexemes Generated through the Highland Plant Trail

I. Unitary Lexemes-8,314 (77.4%)[1]	**II. Compound Lexemes-2,421 (22.6%)**
A. Unknown-2,280 (27.4)	**A.** Adjective/Noun-715 (29.5)
B. "Forgot"-47 (.57)	1. Color Referent-508 (71.0)
C. Anatomical Part-456 (5.5)	a. White-95 (18.7)
1. Flower-210 (46.1)	b. Red-157 (30.9)
2. Leaf-24 (5.3)[2]	c. Green-164 (32.3)
3. Leaf (xaq)-2 (.44)	d. Yellow-82 (16.1)
4. Thorn-220 (48.3)	e. Black-1 (.2)
D. Larger Order Plant Group-775 (9.3)	f. Blue (Sp.)-2 (.4)
1. Life Forms-416 (53.7)	g. Purple (Sp.)-7 (1.4)
a. Tree-37 (8.9)	2. Size Referent-46 (6.43)
b. Herb-187 (45.0)	a. Big-1 (2.2)
c. Grass-160 (38.5)	b. Small-45 (97.8)
d. Vine-32 (7.7)	3. Smell Referent-6 (.84)
2. Other Higher Order-359 (46.3)	4. Taste Referent-36 (5.0)
a. Mushroom-76 (21.2)	5. Texture Referent-22 (3.1)
b. Fern-195 (54.3)	6. "True" Referent-11 (1.5)[3]
c. Moss/Lichen-65 (18.1)	7. Gerund+Life Form-86 (12.0)
d. Sedge-13 (3.6)	**B.** Possessive Phrases-297 (12.3)
e. Tall Grass-10 (2.8)	**C.** Definite Article+Noun-98 (4.1)
E. Generic Name(Sp.)-911(11.0)	**D.** Life Form/Plant Part-134 (5.5)
F. Generic Name(Eng.)-6 (.07)	**E.** Animal+Life Form-378 (15.6)
G. Generic Name(Q'eq)-3839 (46.2)	**F.** Other-702 (29.0)

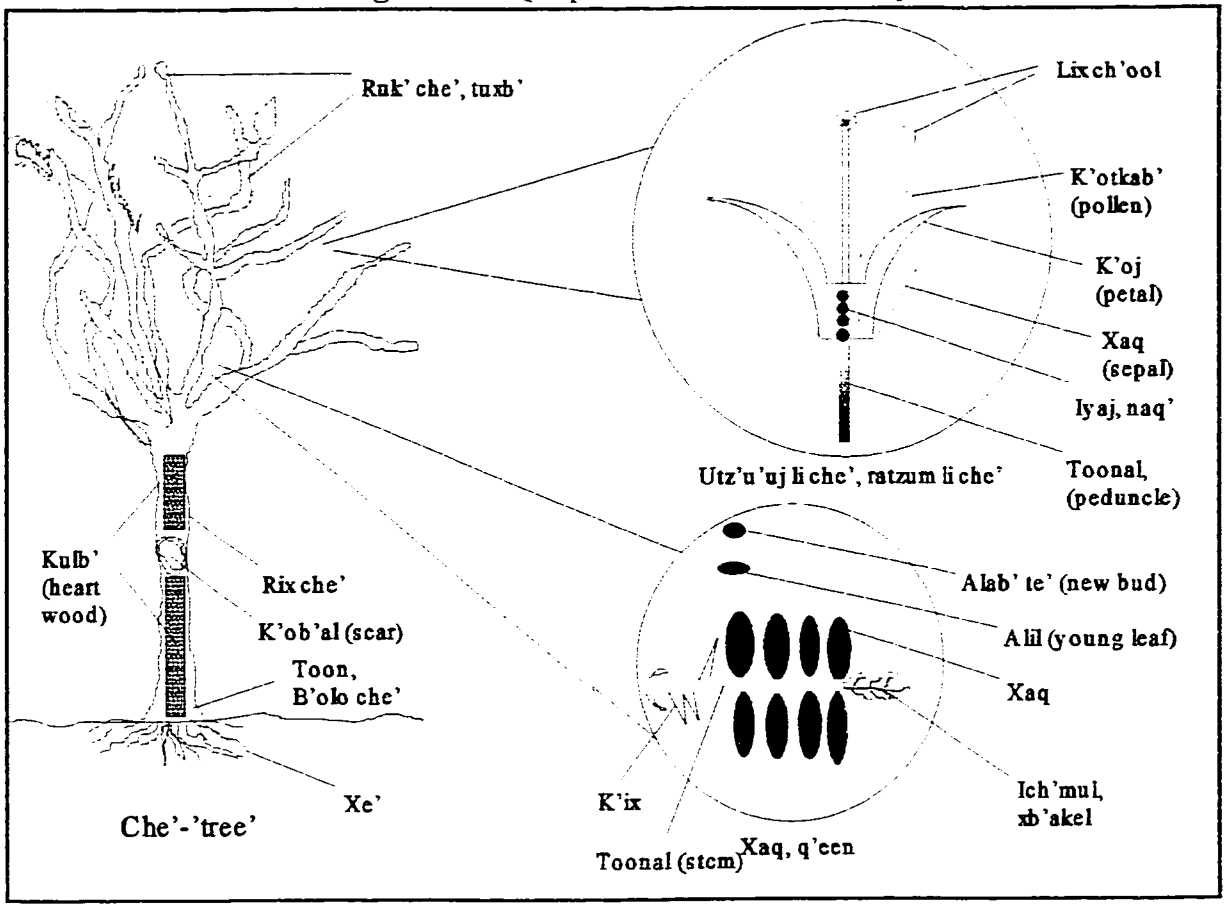
[1]Percentages refer to the contribution of the category immediately superceding the category, e.g., "Vine" makes up 7.7 percent of the "Life Form" category, which makes up 53.7 percent of the "Larger Order Plant Group" category, which makes up 9.3 percent of the unitary lexemes, which make up 77.4 percent of the total responses.
[2]Both the term "**q'een**" and "**xaq**" are used to mark the English gloss "leaf."
[3]The "true" referent is a common cross-cultural pattern for marking an emic prototype of a group, in Q'eqchi' this is done with the adjective **yaal**.

Table 9.9: Summary of 4,284 Lowland Plant Trail Responses

I. Unitary Lexemes-3446 (80.4%)	**II. Compound Lexemes-838 (19.6%)**
A. Unknown-1233 (35.8)	**A.** Adjective/Noun-302 (36.0)
B. "Forgot"-42 (1.2)	1. Color Referent-182 (63.5)
C. Anatomical Part-174 (5.0)	a. White-72 (39.6)
1. Flower-72 (41.4)	b. Red-36 (19.8)
2. Leaf-3 (1.7)	c. Green-1 (.55)
3. Thorn-99 (56.9)	d. Yellow-65 (35.7)
D. Larger Order Plant Group-300 (8.7)	e. Black-8 (4.4)
1. Life Forms-139 (46.3)	2. Size Referent-45 (14.9)
a. Tree-15 (10.8)	a. Big-16 (35.5)
b. Herb-48 (34.5)	b. Small-29 (64.5)
c. Grass-62 (44.6)	3. Smell Referent-40 (13.2)
d. Vine-14 (10.1)	4. Taste Referent-8 (2.6)
2. Other Higher Order-161(53.7)	5. Texture Referent-9 (3.0)
a. Mushroom-26 (16.1)	6. "True" Referent-6 (2.0)
b. Fern-31(19.3)	7. Gerund+Life Form-12 (4.0)
c. Moss/Lichen-20 (12.4)	**B.** Possessive Phrases-33 (3.9)
d. Sedge-66 (41)	**C.** Definite Article+Noun-12 (1.4)
e. Tall Grass-18 (11.2)	**D.** Life Form~Plant Part-54 (6.4)
E. Generic Names (Sp.)-361(10.4)	**E.** Animal+Life Form-162 (19.3)
F. Generic Names (Q'eq)-1336 (38.7)	**F.** Other-275 (32.8)

to identify a certain species of oak in English. When coupled with other terms, like colors, higher order categories, or specific lexemes, the "quality" of the answer is increased, just as a fanciful "branch oak" is more likely to identify a specific oak or **kaqi q'een** ("red leaf," Liliaceae) identifies a common woody shrub used to mark territory. Anatomical terms like head (**jolom**), foot (**ruk**), and hair (**rismal**) are also important to consider, as they are thought to identify the covert, Berlinean "unique beginner." In Q'eqchi', and in many other folk taxonomies of horticultural peoples and hunter gatherers, there is no term that classifies the plant kingdom of a whole. For Q'eqchi', **xul** delineates all animals as separate from other

Figure 9.3: Q'eqchi' Botanical Anatomy



varieties of life, but nothing identifies plants, so the question then becomes, do the Q'eqchi' conceptualize plants as a unique category if there is no label present? Balée (1989:5-6) and others (e.g., Berlin 1976 and Berlin et al. 1973) believe that the presence of lexemes exclusively labeling plant anatomical parts is indicative of the covert, unique beginner. Figure 9.3 highlights the plant anatomical terms I collected during fieldwork.

Some of these terms are not exclusive to the plant domain, but instead can apply to human anatomy, houses, and other features of the landscape, like mountains. **Ruk che'** ("tree's arm"), **ichmul** ("vein"), **rix che'** ("tree's skin"), and **lix ch'ool** ("the heart," for androecium and gynoecium) all fall into this category. This pattern, it should be noted, also applies to common English plant anatomy — tree "limb," leaf "vein," "heart wood," and tree "trunk," for example — yet this does not necessarily deprive the plant world of an exclusive domain. In some instances there is more than one anatomical term that *is* applied to very commonly-used anatomical parts: **xaq/q'een** (leaf), **ratzum/utz'u'uj** (flower), **tuxb'/ruk' che'** ("tree limb"). Interestingly, these paired terms generally split between domesticates and non-domesticates, with the first label of each pair applying to the previously-discussed **namok** ("it is there") and the second to the **awimk** ("it is planted") category. This points, once again, to the importance of utility in the Q'eqchi' plant naming system. The presence of a labelled unique beginner for the animal world — **xul** — seems to set up a situation where the plant world is included in a covert category that could be glossed "non-animal," rather than the presence of a covert unique beginner for plant.

In many instances plant trail participants would "generalize" a plant and label it with what has come to be called a "life form." Life forms often mark biologically diverse species, are generally the first labeled Berlinean strata for horticulturists, and do not reflect natural classes of organisms (Berlin 1992:166-167). Balée (1989:6) has also recognized that the life form category among the Amazonian Ka'apor are frequently polysemous, and cover utilitarian concepts like "posts" or "cordage." In Q'eqchi', we see an exact replica of the

Ka'apor data: the term **che'** glosses both with "tree" and "post," and **k'aam** glosses with both "vine" and "cordage." Also like the Ka'apor, the Q'eqchi' frequently label plants with a life form label plus the addition of an adjective. A synopsis of the variety of possible adjectives associated with life form labels appears later in this section along with the discussion of compound lexemes. It must be noted that this lexical pattern allows participants to be extremely descriptive, and frequently makes discerning the difference between an agreed upon, accepted name, and a name based simply on a descriptive phrase.[3]

Life form categories, then, are confused both by polysemy and by this technique of description. In Q'eqchi', the four "life form" labels — **che'/te'** ("tree"), **k'aam** ("vine"), **pachaya** ("grass"), and **pim** ("herb") — exhibit these and other confusing characteristics that ultimately detract from the ever-important "life form" status attached by many ethnobiologists. At the same time, they cannot be relegated to a lower taxonomic category because they *can* and *do* refer to groups of organisms. For one, these life forms are frequently used in conjunction with one another (e.g., **k'aam che'** "vine tree"), with other higher order plant groups (e.g., **okox che'**, "mushroom tree"), and, most commonly, with anatomical parts (e.g., **k'ix che'** "thorn tree"). Secondly, these life form lexemes are not always used to define mutually exclusive groups. Beyond the term **che'** or **te'** which seem to be near

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[3]For example, Balée cites the Ka'apor ***ka'a-yu*** as a label for the Composite *Eupatorium macrophyllum*, which can be glossed as "yellow vine" (Balée 1989:9). In Q'eqchi', examples like this abound: take *Miconia glaberrima*, which is labeled as **saqi che'**, or "white tree." Are our Ka'apor and Q'eqchi' informants *naming* a plant, or are they *describing* a plant. In my opinion, the first option may very well be a precursor of the second. Once a descriptive phrase becomes widely shared in the community — which can be gleaned through consensus analysis, we may conclusively say that the plant has been named and is no longer being described. Description, therefore, is one important adaptive mechanism for naming.

exclusive categories, **k'aam** and **pim**, and **pachaya** and **pim** frequently overlap. Thirdly, the polysemy of the term **pim** seriously calls into question the use of the term as a salient, cognitively exclusive concept. **Pim** can describe a weedy corn field, a weed in a cornfield, secondary growth, a plant with no use, a pasture, a vine, and almost any other plant or vegetative community beyond cultivated plants and large trees. **Pim** is also mystified further by its use in describing plants along a continuum, that is, some plants can be "more **pim**" than others. Fourth, it must be noted that one plant's life form label can actually vary with time: a recently-germinated species of *Eupatorium semialatum* may at first blend nicely with a patch of grass and be considered **pachaya**, it may grow into a sapling and "become" **pim**, before it is a large, useful tree and "attains" **che'** status. Finally, I find it difficult to separate these life forms from other larger-order groups like mushrooms, thatches, mosses, or ferns. They, too, mark biologically diverse species, are generally the first labeled Berlinean strata for horticulturalists, and do not reflect natural classes of organisms (Berlin 1992:166-167). They also share the characteristics common to Q'eqchi' life forms and should not be considered a different "level" of group. One must conclude that the flexible use of these life form terms — and what have been called "intermediate" or "higher order" taxa — ,with all the intricacies described above, "demotes" them to mere adjectives — adjectives that are extremely helpful for describing a before unknown community of plants.

The largest category of unitary lexemes are those Q'eqchi', Spanish, and even English lexemes that are unanalyzable — what Berlin et al. (1974:27) would call simple primary lexemes. Many of the plants that frequently carry foreign labels are distant or recently introduced cultivars, although that is not always the case. Cardamom (*Elettaria cardamomo*) was introduced to Alta Verapaz around the turn of the century and is sometimes referred to with the Spanish *cardamomo*. Much more commonly, in 72 percent of the plant trail cases, it was referred to as **tz'i**. **Tz'i'**, interestingly, also refers to the domesticated dog and is therefore an example of what Balée would call a "metaphorical, simple primary lexeme" (Balée 1994:187). As **tz'i** is also used to refer to almost all members of the ginger family, sometimes with adjectives attached, it is almost certainly an example of generalizing a post-Hispanic plant with a pre-Hispanic term.

Moving to the compound lexemes, the inventory exponentially expands. These productive primary lexemes and unproductive primary lexemes are numerous and just as plastic as the unitary lexemes. The productive primary lexemes, those that incorporate life form labels that refer to the taxa in which they belong, most frequently use the Mayan color terms — **q'ek** ("black"), **sak** ("white"), **q'an** ("yellow"), **rax** ("green/blue"), and **kak** ("red") — and, following Q'eqchi' syntactic structure, in compounds add a final high, front vowel "i," and back the velar /k/ to post-velar /q/, e.g., **q'ek**, becomes **q'eqi che'**, **sak** becomes **saqi che'** (Stewart 1980:126). As noted earlier, these productive lexemes also incorporate other "higher order" plant terms and even other life form terms.

The unproductive primary lexemes follow many of the same patterns noted in other ethnobiological tomes: the true/false dichotomy, the wild/domesticated dichotomy, the incorporation of animal species, and the use of sensory adjectives. Unlike the case with the Ka'apor who tend to emphasize the "false" end of the spectrum, the Q'eqchi' plant trail participants most frequently tended to emphasize a plant as the true, or "prototypical" member of a category. They do this with the adjective **yaal**. More frequently than labeling specific plants, the term **yaal** is used as a descriptive term to denote some semblance of a prototype, as in the phrase, "**li chaj aran, a'an yaal che',** that pine over there that is a true tree."

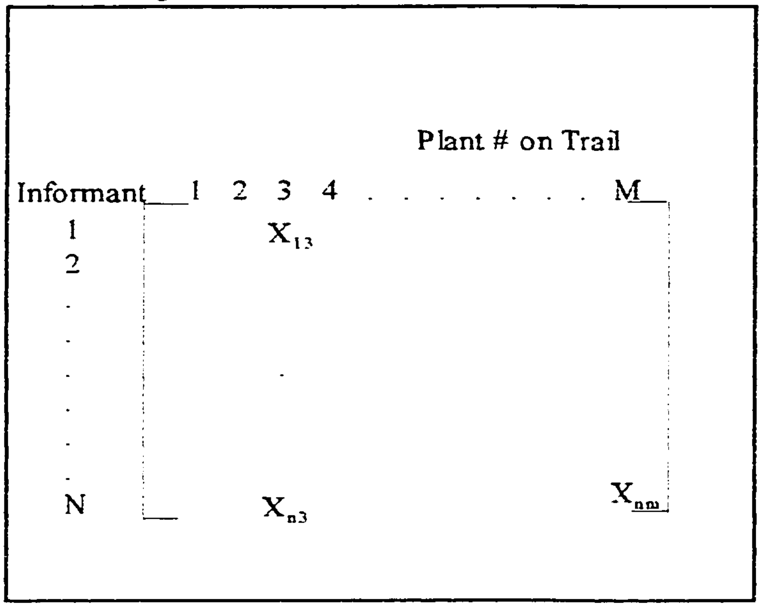
The terms **namok** and **awimk** have already been discussed in some detail as labels for the respective categories "wild" and "domesticated." However, these terms are never applied to plant labels, nor are they used as "fall back" descriptive terminology. Furthermore, even these terms, which I consider to be relative pillars of exclusion, have a degree of overlap. In plant labels, terms are used exclusively to define the "wild" category. **K'iche'** (forest) segregates **sal tul k'iche'** (*Manilkara* sp.) from **sal tul** (*Pouteria mammosa*); **k'uch** (hawk) segregates **xklaux k'uch** (*Anthericum aurantiacum*) from **klaux** (*Lilium longifiorum*); **ch'ol** ("uncivilized" human) segregates **ch'ol tul** (*Musa X sapientum*, plantain variety) from **tul** (other bananas).

The most frequent animal terms employed in plant lexemes are b'a (gopher, *Orthogeomys* sp.), **b'alaam** (ocelot, *Felis pardalis*), **b'ach'** (howler monkey, *Alouatta palliata*), **ch'o** (rat, *Sygmodon hispidus*), **halaw** (paca, *Agouti paca nelsoni*), **hix** (jaguar, *Felis onca*), **kaway** (horse, *Equus* spp.), **max** (spider monkey, *Ateles geoffroyi*), and **tz'i'** (dog, *Canis familiaris*). It is common for these animal names to be applied in areas where those animals are completely absent, although this is more probably a case of over hunting and habitat destruction that effectively eliminates an animal around an occupied area than simply incorporating unfamiliar animals. Finally, these animal terms are frequently paired with sensory terms to describe plants, most frequently, **chu** denoting a strong, usually unpleasant odor.

The enormous data set enumerated in Tables 9.7 and 9.8 could be categorized *ad infinitum*; categorizing them any further, however, would not contribute to the purposes of understanding lexical adaptation to new environments. It is quite sufficient to say that the data demonstrate that the term *unproductive primary lexeme* is ironic — for, in Q'eqchi', it would appear that, for this category, the productivity of language is at its apex. Perhaps this plasticity in lexicon represents a bastardization from a time when plant names denoted exclusive groups, were categorical and hierarchical, and were shared throughout the community. Perhaps this is the normal state, a state which happens to be flexible because it must accommodate the barrage of newly introduced and newly encountered plants that the Q'eqchi' — lowlanders and highlanders alike — meet on a day to day basis. Although I must admit that there may have been a time when people were more dependent on plants and had a more stable, more shared lexical palette, I also want to avoid overestimating the stability and consensus of botanical names. For this reason I have purposefully excluded a list of lexemes, beyond those names given specifically for the plant collection (see Appendix 1). Nevertheless, after 18 months of ethnobotanical fieldwork, I can qualitatively say that I could recognize certain names as "correct" and others as merely "descriptive." In the following section I make use of consensus analysis in order to quantitatively judge my qualitative "hunches" on correctness. I conclude by analyzing the data set in terms of these "correct" names and the process of lexical adaptation.

Assessing Lexical Models with Agreement Matrices and Consensus Analysis

Figure 9.4: The First Consensus Matrix



Consensus analysis arrived on the anthropological scene in the early 1980s as a way to increase authenticity and viability in ethnographic research. It was pioneered largely through the work conducted at the School of Social Sciences, University of California, Irvine and has been effectively applied to the plant world. The 1986 paper by Romney, Weller, and Batchelder (1986) developed the mathematical model of consensus and need not be replicated in detail here. Atran et al. (1999) and Weller (1987) are also excellent examples of the use of consensus modeling. Here I will demonstrate simply how the model was applied to the plant trail data and summarize the conclusions that allow me to more accurately define "correct" plant names and plant experts.

The process begins by consolidating some of the diversity described in the previous

Figure 9.5: The Agreement Matrix

Infor. #

	1	2	3	4	5	6	7	8	9...
1	1	.62	.41						
2	.62	1							
3	.41		1		.95				
4				1					
5			.95		1				
.									
.									
.									

Column 1 ave. = mean competence inf.#1

two sections. For the purposes of consensus, we can readily consider the variability around phonetic and syntactic responses as equal, i.e. the responses **te'** and **che'**, and **xlaux k'uch** and **xklaux li k'uch** are cognitively equivalent. Also, two respondents answering with the generalizing **che'** are not agreeing to the same extent as two respondents giving more specific labels, as in **tzunun che'**. Finally, and most importantly, participants answering "I don't know" cannot be given equal consensus status. Taking these three variables into consideration, individual lexical responses were numbered and 113X95 and 102X42 matrices were constructed in the fashion of Figure 9.4. These matrices were then coded into Microsoft Excel and were transformed into 95X95 and 42X42 agreement matrices by commanding the program to read matching answers in the above matrix as "1," and non-matching answers, including any pair that contained an "I don't know response" (coded as ".") as "0." These machinations were then averaged to determine the percent agreement between informant 1 with informant 2, informant 1 with informant 3, and so on. This process yields the second, or agreement, matrix shown in Figure 9.5. With this matrix complete, the mean competence for each informant could be derived by the average of the column or row (Romney et al. 1986:331) and the overall competence for the trail can be computed by averaging all columns and rows after removing the total agreements of each informant with himself or herself. The average agreements of the entire data sets are in themselves valid statistical tools. The highland agreement matrix averaged .732, indicating that the "average" respondent was in agreement with all other respondents 73.2 percent of the time; the figure for the lowlands was .661. A two tailed ttest revealed a t-ratio indicating a significant difference between these means at alpha=.05. In order to confidently assess the competence of individuals that make up the matrix, the two agreement matrices were incorporated into Anthropac 3.2 and factor analysis was applied.

Factor analysis is first and foremost a data-reduction tool. In ethnobiology it is principally used to identify the "ideal" informant, ideal in the sense that he or she most closely approximates the average amount of knowledge for a particular cultural domain. For example, a plant trail with ten informants will produce a 10X10 agreement matrix. If everyone agreed on every question of the plant trail, a factor analysis would allow the researcher to "reduce" the data to one of the ten informants. In this case, any of the 10 individuals would be the "ideal" informant. The most important data category in this type of analysis is the 1st Factor Eigenvalue Score. The 1st Factor Score identifies the presence or absence of a unified model in the data set. To determine if a single, underlying model holds for all informants from a populations, three criteria must be met: 1) the ratio of the latent root of the first factor to the second factor must be high; 2) the first factor eigenvalue accounts for a large portion of the variance; and 3) all individual first factor scores are positive and relatively high (N. Ross, pers. comm., March 2001). In order to combat the subjectivity of these terms, statisticians generally agree that the ratio of criteria number one should be 3:1. Table 9.10 summarizes the factor scoring and demonstrably shows that the criteria for a single model of plant lexicon exists for both the highland and lowland data set. Furthermore, that the average 1st factor score for the highlands is significantly larger than for the lowlands indicates that this model is more uniform in the highlands, an expected situation given the longer time depth and greater cultural homogeneity of that study site.

Table 9.10: First Factor Eigenvalues and Mean Factor Scores

Highlands	eigenvalue	variance	**Highlands**	average 1st factor	average 2nd factor
fact1	36.46	0.74			
fact2	1.57	0.03		.859	.028
Lowlands			**Lowlands**		
fact1	28.44	0.68		.817	.026
fact2	2.43	0.06			

Given that a statistically significant model exists in terms of eigenvalues, it is viable to examine the 1st factor scores of participants on the trail, attempt correlations with age, and identify "ideal" informants with particularly high 1st factor scores. Table 9.11 summarizes this information.

First, there is no strong correlation between age and 1st factor scores, that is, the older an informant is tells very little about how close he or she may be to the ideal informant. There is, however, a relatively strong, negative correlation between age and unknown scores in both the

Table 9.11: First Factor Scores and Correlation Coefficients

	score	n
Average HPT Agreement	0.731997	2352
Average LPT Agreement	0.66052	1722
Correlation Coefficient; HPT: Age v. First Factor	0.055013	49
Correlation Coefficient; LPT: Age v. First Factor	-0.04822	42
Correlation Coefficient; LPT: Yrs. Sa Mox v. First Factor	0.304929	42
Correlation Coefficient; HPT: Age v. Response Unknown	-0.3466	49
Correlation Coefficient; LPT: Age v. Response Unknown	-0.62724	42
Correlation Coefficient; LPT: Yrs. Sa Mox v. Response Unknown	-0.20661	42
Average HPT First Factor; Adults	0.863913	23
Average HPT First Factor; Kids	0.855385	26
Correlation Coefficient; HPT Adults; Age v. First Factor	-0.06423	23
Correlation Coefficient; HPT Kids; Age v. First Factor	0.225983	26
Average LPT Unknown Response	29.35714	42
Average LPT Unknown Response; Adults	22.57143	21
Average LPT Unknown Response; Kids	36.5	21
Average HPT Unknown Response	18.65306	49
Average HPT Unknown Response; Adults	11.6087	23
Average HPT Unknown Response; Kids	24.88462	26
Correlation Coefficient; HPT Adults; Age v. ? Response	0.1424	23
Correlation Coefficient; HPT Kids; Age v. ? Response	-0.22963	26
Correlation Coefficient; LPT Adults; Age v. ? Response	-0.73193	21
Correlation Coefficient; LPT Adults; Yrs. Sa Mox v. ? Response	-0.23738	21
Correlation Coefficient; LPT Kids; Age v. ? Response	-0.37294	21
Correlation Coefficient; LPT Kids; Yrs. Sa Mox v. ? Response	0.209213	21

highland and lowland trails, indicating elder informants consistently answer "I do not know" with less frequency. For the lowlands of Sa Mox, the correlation is much less significant (-.237) between 1st factors and the amount of time spent in Sa Mox. In other words, people arrive in Sa Mox with significant information regarding plant names — significant in the sense that information is shared. Individuals arriving to Sa Mox cannot be treated as "blank slates" as a newborn might be in his or her place of origin. Ages will be considered in more detail in the discussion of "correct" plant names to follow.

Going back to the individual 1st factors of informants, a group of five individuals in the highlands and three from the lowlands have scores that would make them the most ideal of the total 137. They are all males between the ages of 21 and 40. All eight individuals were no surprise at all, which is confirmation to the fact that the mathematical application of consensus analysis, in most cases, is a reflection of anthropological intuition. These informants also worked out to be my primary ethnobotanical informants throughout my time in Alta Verapaz, though they were not selected *a priori* based on their 1st factor scores. After 18 months of work among these communities, it would be absurd if I *did not* subjectively recognize these ideal informants. The same holds true with plant names — after doing trail after trail, and after living in working in and amongst the very plants, one gets a very good feeling about what are "correct" or widely agreed upon names, and what are merely guesses or descriptions. Where the consensus analysis becomes especially helpful is in the cases of individuals plants where the "correct" name is not so self-evident. In these cases — which composed approximately 15 percent of each trail — I could make the more quantitative judgement on correctness based on the responses of these eight, ideally-enculturated individuals. It is to the analysis of the correlations, averages, and comparisons of mean of these correct terms that I now turn.

Correct v. Incorrect Responses

As I can now more confidently speak about the accuracy of plant lexemes across informants of the plant trail, I am able to say something quantitative about the patterns that emerge. Where the analysis of variability in nomenclature approached the problem from the characteristics of the plant and the consensus analysis shed light on participants, with correct score analysis one can search for nomothetic principles from both angles. Although hundreds of variables most likely impinge on the ultimate model, for the purposes of this dissertation I concentrate on age, sex, years in the Sa Mox community, domesticates v. non-domesticates, and trees v. non-trees. The descriptive statistics relevant to the discussion follows in Table 9.12.

Several trends emerge from a quick scan of these descriptive statistics. First, the remarkable similarity of average scores between the highland males and lowland total (all males) stands out. Second, comparing males and females in the highland data set demonstrates that, on average, males score more correct responses than their female counterparts. Third, and perhaps most significantly, is the wide gap between the averages for

Table 9.12: Descriptive Statistics Assessing Correct Names

Final Review: Descriptive Stats	N	Mean	Standard Deviation	Sum of Squares
Highland Total(113 plants)	95	0.479	0.12	1.364
Highland Females	41	0.445	0.109	0.477
Highland Males	54	0.505	0.123	0.804
Lowlands Total(102)	42	0.509	0.131	0.707
Highlands, all awimk(33)	95	0.767	0.099	0.928
Highlands, all awimk, females	41	0.75	0.091	0.332
Highlands, all awimk, males	54	0.78	0.104	0.575
Lowlands, all awimk (22)	42	0.808	0.118	0.568
Highlands, traditional awimk(28)	95	0.839	0.0988	0.918
Highland, traditional awimk, females	41	0.831	0.092	0.337
Highland, traditional awimk, males	54	0.845	0.104	0.577
Lowlands, namok (80)	42	0.428	0.139	0.797
Highlands, namok(85)	95	0.364	0.3152	8.346
Highlands namok, females	41	0.321	0.123	0.602
Highlands namok, males	54	0.397	0.133	0.93
Highland trees(42)	95	0.621	0.164	2.53
Highland trees, females	41	0.556	0.148	1.04
Highland trees, males	54	0.7	0.16	1.36
Lowland trees(51)	51	0.597	0.138	0.786
Highland non-trees(71)	95	0.396	0.103	0.99
H. non-trees, females	41	0.38	0.094	0.356
H. non-trees, males	54	0.408	0.108	0.617
Lowland non-trees(51)	51	0.423	0.134	0.735

domesticated and semi-domesticated plants (**awimk**) and non-domesticates (**namok**). Domesticated plants are named correctly with more accuracy in both data sets and across genders in the highland data set. Associated with this trend is the disproportionally large variability associated with scores of plants in the **namok** category, indicating that individuals

Table 9.13: t-tests Comparing Several Pairs of Means

Comparison	Pooled Standard Dev.	Standard Error of Difference	t ratio	Degrees of Freedom	Reject Null Hypothesis at .05?
Highland					
male v.	0.117	0.024	2.5	93	yes
female					
H. namok	0.124	0.025	3	93	yes
male v.					
female					
H. awiimk	0.098	0.019	1.58	93	no
male v.					
female					
H. trad. awiimk	0.099	0.02	0.65	93	no
male v.					
female					
Highland males	0.016	0.0033	1.21	94	no
v. Lowlands					
Highland trees	0.137	0.02	13.1	188	yes
v. H. non-trees					
Lowland trees	0.137	0.03	5.8	82	yes
v. L. non-trees					

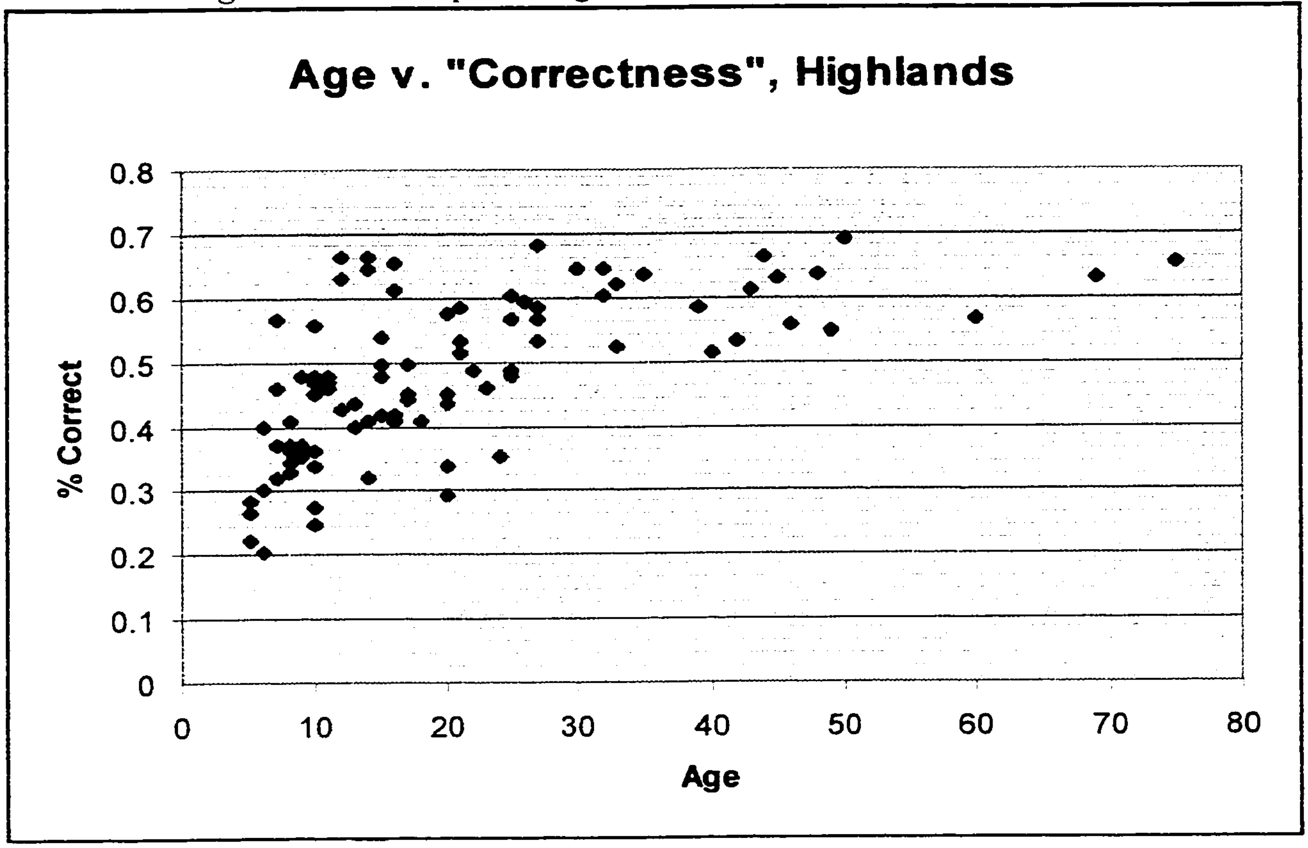
fluctuate widely around the mean in comparison with domesticates, where individuals tend to congregate at the mean. Finally, there is the much higher scoring of plants that fall in the tree (**che'/te'**) category in comparison with non-tree species. Table 9.13 tests the relationships between some of these means using a student's t-test set up for comparing means of two sample population with pooled standard deviations. These basic, analytical tools reveal that males score significantly higher than females in the entire highland trail and in the highland non-domesticate category, and that trees are consistently and significantly named with more accuracy than non-trees. Conversely, highland males and the lowland sample show no significant difference in labeling accuracy and therefore must be considered as individuals of one population. And finally, for both the highland and lowland domesticates and semi-domesticates, there is no significant difference between the percent correct responses of males and females.

Table 9.14: Correlations Based on Several Variables

Correlations				Correlation with Specific Age Groups		
				Total Plant Trail		
H. Total correct v. age	95	0.623		HF 0 to 26	0.666	
H. females correct v. age	41	0.745		HF 27 & up	0.217	
H. males correct v. age	54	0.615		HM 0 to 15	0.671	
				HM 17 & up	0.419	
L. Total correct v.age	42	0.678		L 0 to 15	0.771	
L. correct v. yrs. In Sa Mox	42	0.515		L 16 & up	0.553	
L. plnt score v. utility	102	0.541				
L. plnt score v. anatomy	102	0.363				
L plnt score v. dist.	102	0.429				
H. all awimk(33)v. age	95	0.515				
H. all awimk. Female v. age	41	0.626				
H. all awimk. male v. age	54	0.478				
H. trad. awimk(28) v. age	95	0.591				
H. trad. awimk female v. age	41	0.666				
H. trad. Awimk male v. age	54	0.558				
L. awimk(22) v. age	42	0.607				
L. awimk(22) v. yrs. in Sa Mox	42	0.521				
				Namok Plants		
H. namok(85) v. age	95	0.601		HF 0 to 27	0.701	
H. namok(85). female v. age	41	0.726		HF 28 & up	0.143	
H. namok(85). male v. age	54	0.601		HM 0 to 16	0.645	
				HM 17 & up	0.434	
L. namok(80) v. age	42	0.673				
L. namok(80) v. yrs. in Sa Mox	42	0.497				
Highland trees(42) v. age	95	0.534				
H. trees v.female ages	41	0.674				
H. trees v. male ages	54	0.552				
Lowland trees(51) v. age	42	0.611				
Lowland tree(51) v. years in Sa Mox	42	0.493				
Highland non-trees(72) v. age	95	0.659				
H. non-trees v. female ages	41	0.748				
H. non-trees v. male ages	54	0.634				
Lowland non-trees(51) v. age	42	0.698				
Lowland non-trees(51) v. yrs.in Sa Mox	42	0.499				

In order to assess the relationship between age and lexical accuracy, simple correlations were formulated. These data are presented in Table 9.14. In both the highland and lowland data sets there is a strong correlation between age and lexical accuracy. This is not surprising in and of itself, yet a closer look at the distributive pattern reveals some interesting trends. Two simple scatter plots presented as Figures 9.6 and 9.7 demonstrate that the correlations approach a logarithmic curve rather than a simple correlation. This indicates that there appears to be a certain age, sometime

Figure 9.6: Scatterplot of Age v. Correct Score Percentage, Highlands



before old age, where individuals reach maximum accuracy in terms of plant lexical knowledge. Although there appears to be similar correlations between males and females in terms of age and lexical accuracy, scatterplots were produced for these subgroups to assess the patterned distribution. These data are plotted in Figures 9.8 and 9.9. Intuitively, a quick scan of these two

Figure 9.7: Scatterplot of Age v. Correct Score Percentage, Lowlands

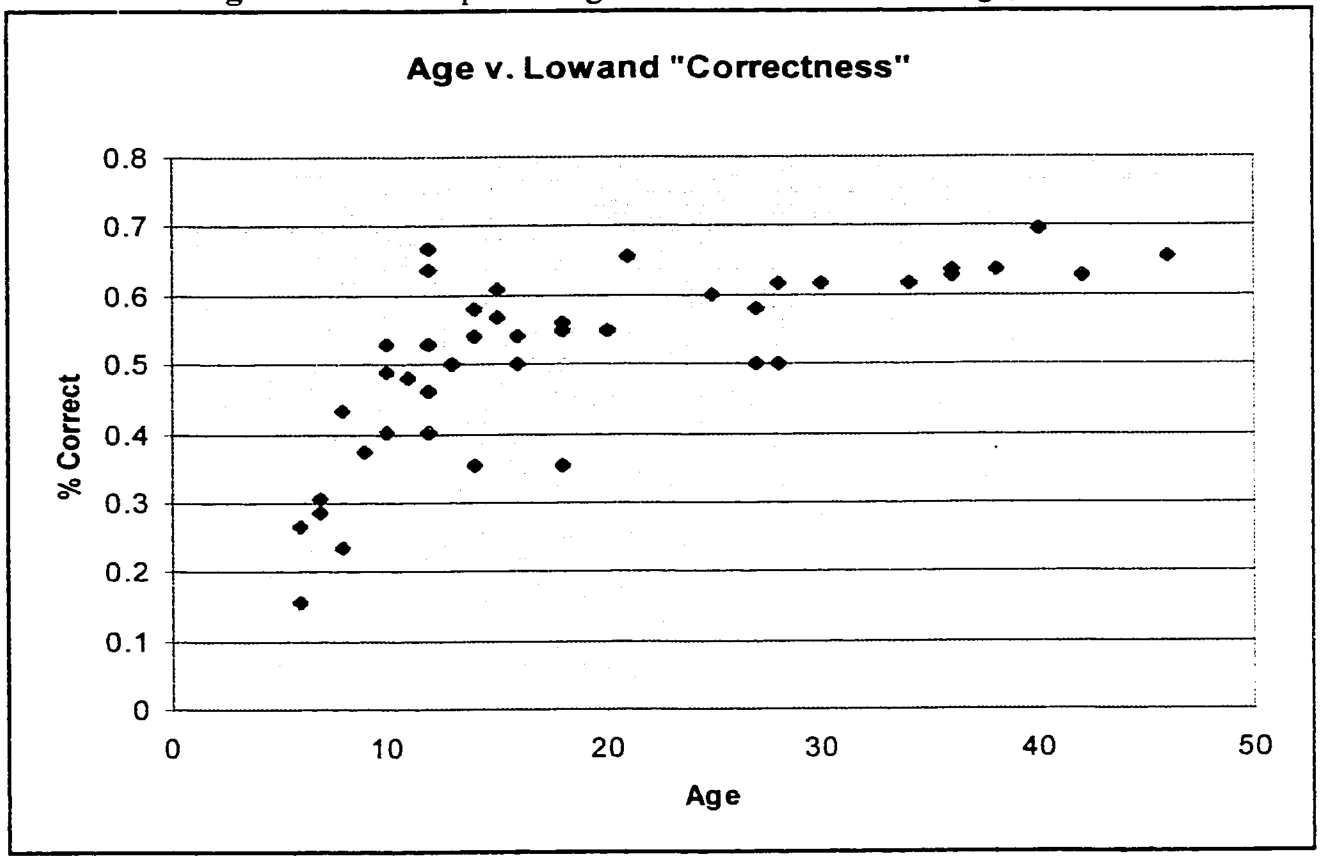
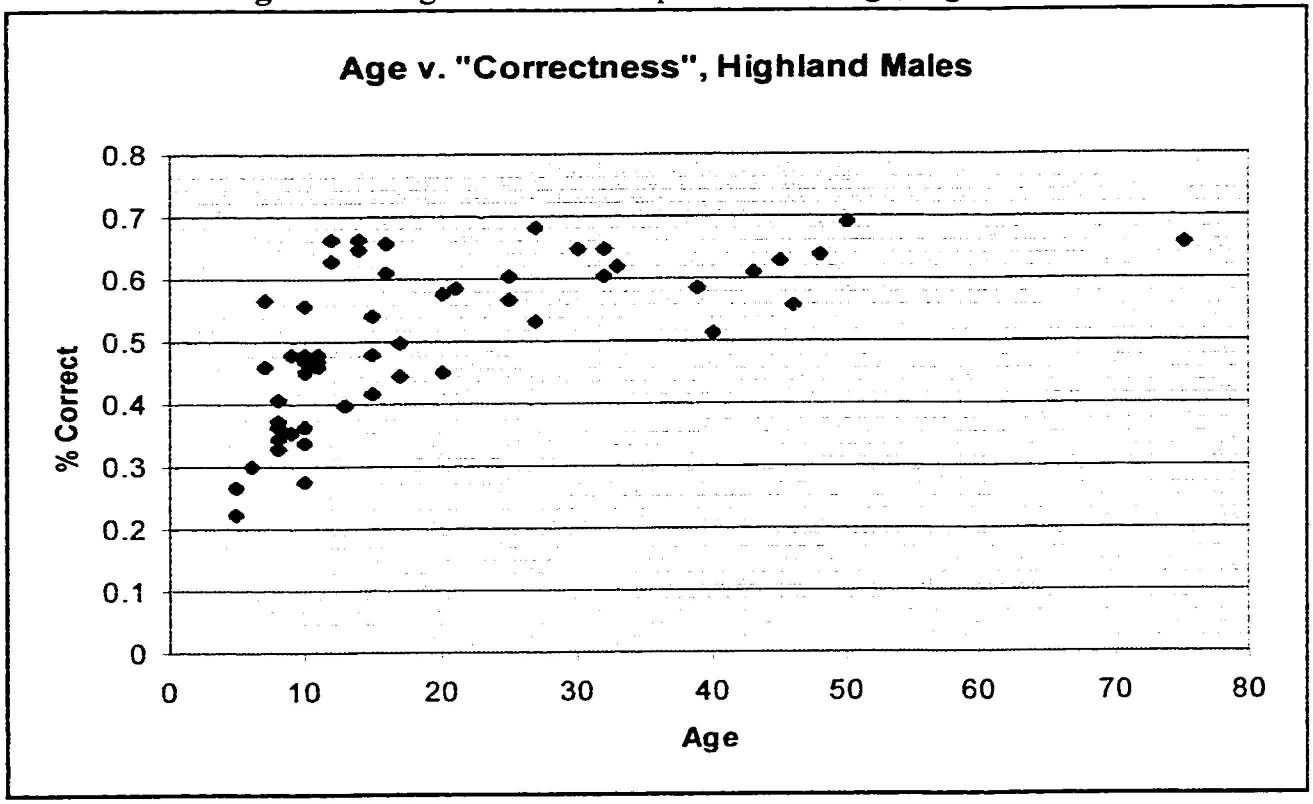
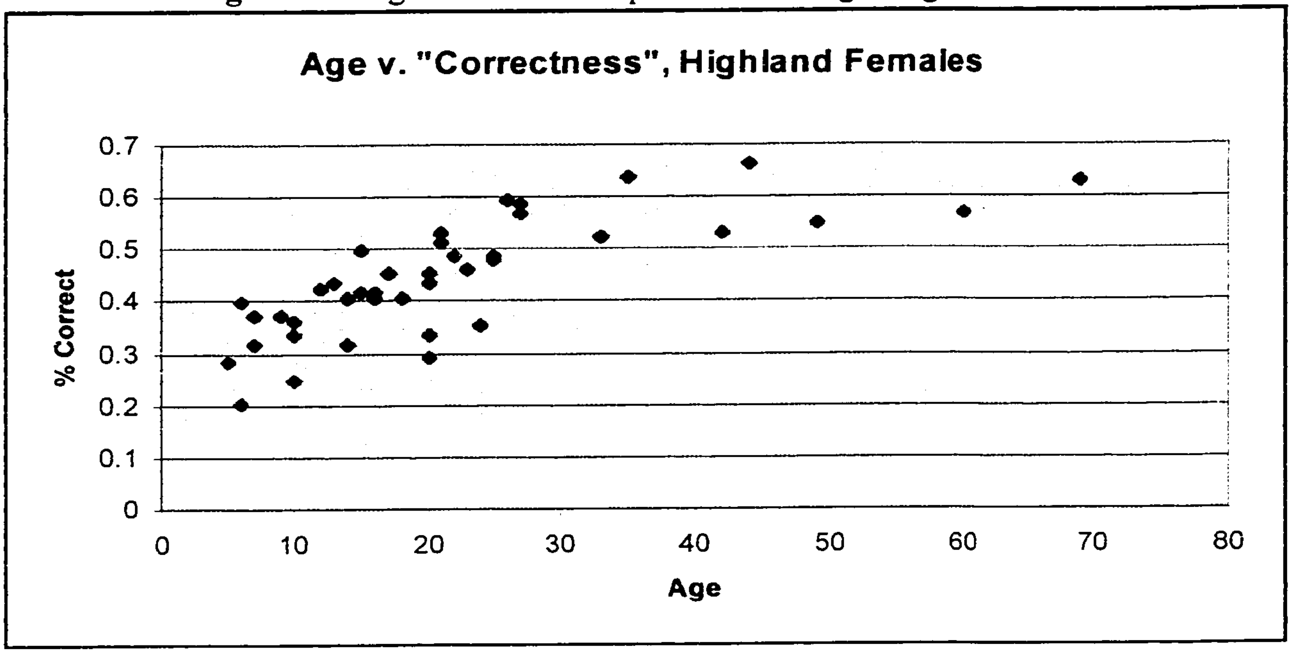


Figure 9.8: Age v. Correct Response Percentage, Highland Males



figures reveals a relatively apparent trend: males appear to reach an age of maximum accuracy qualitatively *earlier* than females. In order to pinpoint the age where the learning curve of males and females appears to fall off to "0," I broke down the age-correlation data into several age groups to find where the leveling off occurred. These correlations appear on the right-hand-side of Table 9.14 above and corroborate the evidence presented in the scatter plots. Males appear to reach their plant-recognition prime by the age of 15, compared to women who do not reach that age until 26.

Figure 9.9: Age v. Correct Response Percentage, Highland Females



This trend appears to be consistent for the entire plant set, for the plants of the **namok** category, and for those of the **awimk** category. Although females may take longer to reach an average accuracy slightly below males, in every set of comparisons where males and females are involved, female correct scores are more highly correlated with age than for males. With these sets of comparisons, it is truly unfortunate that I was unable to obtain female scores in the lowlands. Given the consistency of comparisons, though, I would expect many of the trends to be similar, although females would most-likely unable to identify as many lowland **namok** as in the highlands.

In terms of the comparisons between trees and non-trees, I hypothesized that, given the clarity and exclusiveness of the tree category, and given the distinctiveness of many trees in terms of plant anatomy, trees would be more consistently recognized and accurately labeled. The data reported in the lower-half of Table 9.14 confirm these expectations. In both the highlands and the lowlands, and with males as well as females, trees are consistently labeled with correct names more frequently than non-trees. Interestingly, non-trees appear to correlate more closely with age than trees in both trails and, although males name trees and non-trees more accurately than females, the correlation with age in both categories is substantially higher.

Again, the plant trail data have the potential to be categorized and analyzed in countless ways — I have selected but a few categories that I considered relevant to the understanding of the acquisition of plant names and how this relates to the process of lexical adaptation to new environments. With the data presented from the three types of statistical tests and the qualitative section on the lexical inventory I now turn to interpretation.

The Meanings behind the Data

Lexical Variability. In the highland plant trail, a plant's degree of utility and its distinctiveness of anatomy were important variables helping explain the amount of variability in lexicon. For the lowlands, only utility appeared to play a role. This is a fairly logical correlation: the more a group of people use a plant, the greater the need to communicate effectively with an agreed upon plant label.

It seems obvious that the more people are led along the trail, the more variability each plant will generate. This is a function of exposing a plant to more people who do not recognize the plant, and who in turn proceed to give a descriptive term or phrase. And what of time? Holding the composition of a plant community constant, will the variation in plant lexemes increase or decrease the longer that community remains in contact with the plants? Plant labels, like other cultural phenomena, exist beyond their bearers, and, like culture, have trajectories that outlast users of plant labels. Based on the lasting trajectories of plant lexemes and the importance of utility derived from this analysis, I would conclude that lexical variation would remain continuously tied to use. When a plant falls from favor among a cultural group — because of its extinction or its replacement — the labels encasing that plant will become more variable. With this reasoning it follows that, because lowlanders continue to *use* plants to the same degree and continue to *use* plants to meet many of the same needs, plant labels will not necessarily be more variable. By some mechanism, label agreement surrounding useful plants is reached rather quickly (in this case, less than 18 years) and does not appear to follow a pattern of a) enter a new environment; b) go through a substantial period of applying a varied, descriptive terminology until, c) a uniform set of plant names is agreed upon.

The Inventory of Plant Names. Assuming that the plant trails were moderately representative of the flora in both environments, it appears that people label plants with essentially the same tools. Not surprisingly, these tools for labeling plants frequently reflect aspects of plant anatomy or the way in which plants are used. In cases where individuals are confronted with a plant that they do not recognize, they tend to "fall back" on plant anatomy for naming. In most of these cases, unrecognized plants would be those that were rarely if ever used. However, some frequently used plants with low-variability labels have names based on plant anatomy or use. Rationally, the lexemes for plant anatomy preempted plant labels, and the combination of sensory adjectives with plant anatomical parts may have been the most primitive scheme for the development of plant names.

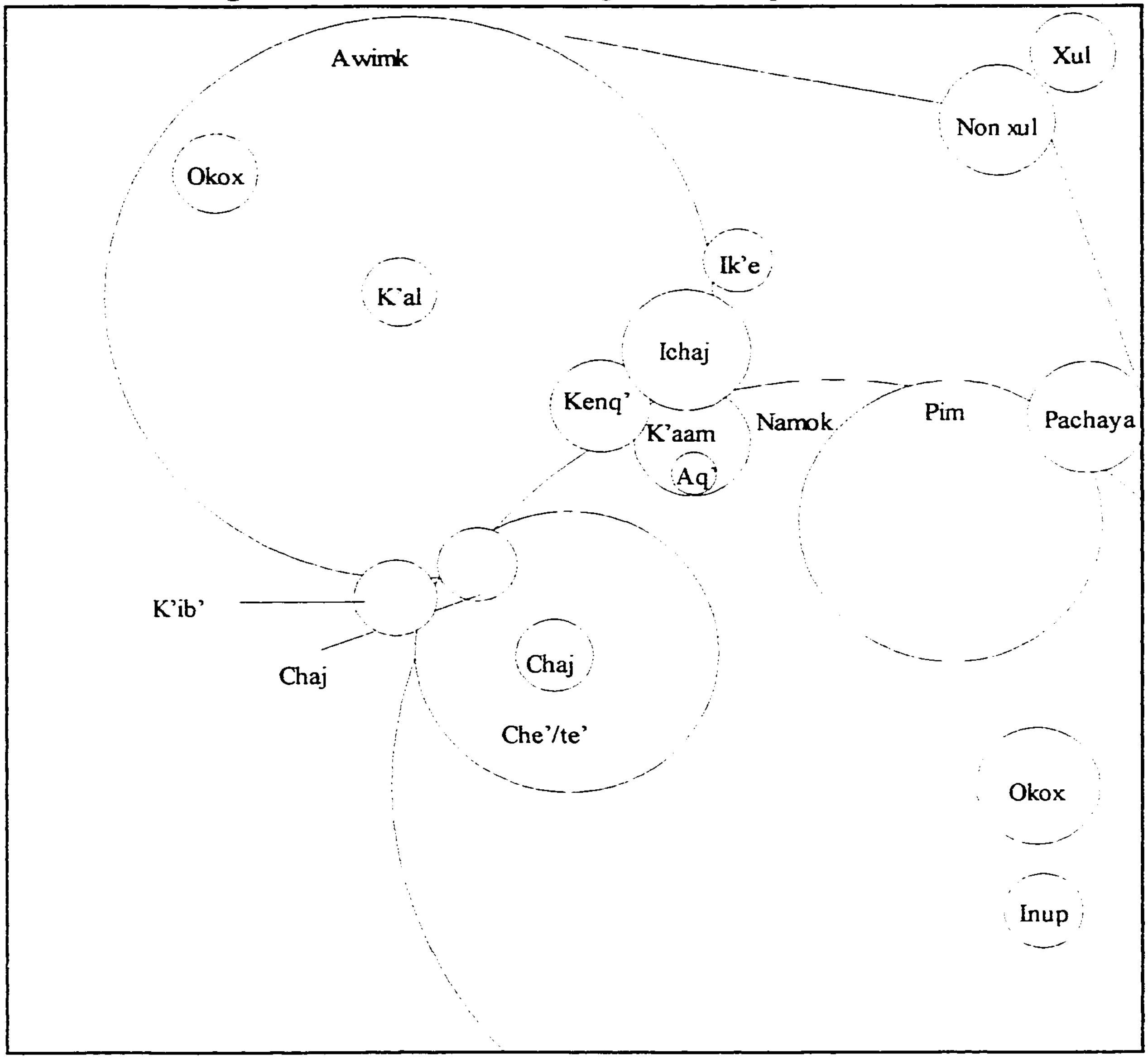
Berlin's "life forms," like the combination of sensory adjectives with plant's anatomical parts, appears to also be used as "fall back" terms. **Pim** is a particularly pragmatic term that can be applied to almost any non-domesticated plant. As domesticated plants frequently inspired consistent and correct labels in the trail, **pim** was also the most notable "fall back" term. This is most likely due to the fact that the term was developed historically through the expansion of terms designating "weeds," "medicinal plants," and "underbrush" (Brown 1979:368).[4] The lexical palette of the lowlands is inflated somewhat by the incorporation of various dialectal groups into one community. After 18 years of cohabitation, dialectal variants have remained. Those originating in the eastern extreme of the Q'eqchi' ancestral habitat continue to use the terms **k'ajam** and **te'**, while those from the west

[4]Brown's paper incorrectly limits the Q'eqchi' life form for tree to **che'**, failing to recognize the Cholan borrowing of **te'**. He also mistakenly uses **q'een** and **q'ul** as like forms for herb and vine, when **q'een** is equated with "leaf" and **q'ul** is a vine used for tying. He also fails to recognize **pachaya** as a life form label for "grass."

use **k'aam** and **che'**. Conversely, plants native to the lowlands that have life form-based lexemes are not converted to the life form label for that dialect, e.g., **q'an che'** and **q'an te'** are different plants and maintain their respective life form terms regardless of the origin of speaker. It follows that, although highlanders may apply highland names to lowland plants, the life form labels remain fixed. Finally, where Berlinean "generic" terms are concerned, it appears from the highland and lowland data that the Q'eqchi', as farmers rather than hunter-gatherers, follow the trend of using generics to name classes of individuals (Brown 1986:10). By moving to the lowlands, highlanders also encounter new species that fit well within the generic classes of the highlands. As a result, terminal generics may not increase in number, but the number of individuals represented by these terms may increase.[5]

[5]An excellent example of this occurs around the terminal generic term **tz'i'** (literally, "dog"). Highlanders moving north have not only classified many newly encountered gingers into this generic term, but have also incorporated the introduced, cash-crop cardamom (*Eleutaria cardamomo*) into the group. This example demonstrates that plants as widely related as the Linnean family can and are frequently equated with "terminal" generic terms.

Figure 9.10: Revised Venn Diagram for Q'eqchi' Plant Terms*



*The largest circles represent the basic emic division of domesticates and semi-domesticates (**awimk**) from non-domesticated and escaped domesticates (**namok**). Even the highly salient term for tree (**che'**) is not entirely bound by one of these two terms. Other larger order terms like **okox** (mushroom) can exist in both categories. Prototypical groups representing the two largest subgroups occur closest to the center, e.g., **k'al** (*Zea mays*) for the **awimk** class. **Ichaj** (edible greens) also occurs at the borders of the classes. **Pim** (herb/weed) is confined to the **namok** class, but can also occur outside of the dual classification entirely as it can also refer to plant communities in their entirety.

Finally, this inquiry into the Q'eqchi' lexical inventory and expansion of the highland inventory by movement to the lowlands forced me to reexamine the hierarchical, Berlinean classification scheme as presented in the Venn diagrams of Figure 9.1. There is no labeled unique beginner, and the generalization of many plant terms to other cultural domains calls into question its saliency or its existence as a covert concept. Instead, plants appear to belong to the covert unique beginner I have glossed "non-animals" that is juxtaposed to the labelled unique beginner for animal, **xul**. Life form labels, beyond the label for "tree" which appears to be ancestral in the Mayan language family (see Brown 1979), are not exclusive categories and are not as culturally salient as proposed by many ethnobiologists. I have reorganized the traditional Venn diagram based on the importance of utility and have replaced the traditional life forms with the classes **awimk** and **namok**. Figure 9.10 is a better approximation of the actual cognitive model for Q'eqchi' plant lexemes.

Cultural Consensus. The Cultural Consensus Modeling (CCM) of this chapter was used primarily as a tool for recognizing "ideal" informants so that more accurate assessments could be made of the "correct" responses to the plants of both trails. Because the lowland trail produced responses that are indicative of a widely shared model of plant names, I conclude that, despite a wide variety of points of origin and an entire host of unfamiliar plants, a consensus is reached in a remarkably short time period. On a purely methodological note, I can also corroborate the fact, established in Atran et al. (1999), that average first factor scores can be closely approximated with average agreement scores.

Correct Plant Names. Correlation results based on the two plant trails further emphasize the cultural saliency of the basic, cognitive division between the Q'eqchi' plant classes **namok** and **awimk**. Furthermore, both characteristics of the participant population (age, sex) and the plant population (plant class, utility, tree/non-tree) impinge on the accuracy with which people identify plants correctly.

Interestingly, the number of years an individual has spent in Sa Mox is not nearly as good an indicator of accuracy as age. Two explanations could be posited. First, if the distribution of plants was equal across highland and lowland Q'eqchi' landscapes, one would expect age and the character "years in Sa Mox" to be equally telling. Through quantitative analysis of plant habitat types, I know this is certainly *not* the case. Second, it could be the case that the *combined total of useful lowland and highland names makes up the lexical repertoire of the Q'eqchi' as a language group*. I believe this second explanation to be the case.

Other cultural domains of the Q'eqchi' and certain historical occurrences have served to distribute lowland lexemes through the highlands and highland lexemes through the lowlands. Although the Q'eqchi' at the time of Spanish occupation were primarily a highland group, for the past 500 years they have had significant contact with the lowlands. Even particular prehispanic outposts like the site of Chamá are surrounded by many lowland plant varieties. Following the Hispanic occupation, the Q'eqchi' continued their forays into the lowlands, further establishing lowland plant lexicon. To this day many Q'eqchi' men make economic ends meet by employing themselves as traveling merchants. Most often, their travels lead them to the northern lowlands. In terms of domesticates, regional markets bring products from the lowlands to the highlands, expanding an individual's familiarity with lowland plant varieties and accelerating the acquisition of their names. In sum, although the Q'eqchi' as a whole could be described as a highland group, highland communities like Chajaneb are essentially lexically *pre-adapted* to life in the lowlands by the historical and contemporary experiences with plants of lowland vegetative communities.

Chapter Ten: Conclusion

"...like a rivet that twists, evades, hesitates through slow miles, and then leaps violently down over a succession of cataracts, man can be called a crisis animal. Crisis is the most powerful element in his definition."
— Loren Eisley's, The Night Country, 1971, p.157

"Other traits are essentially historical: we have five fingers because the vertebrate developmental program produces five digits; five may or may not be the optimal number for every kind of amphibian, reptile, bird, and mammal, but selection can only operate on existing variation. Apparently, some changes are simply not genetically feasible. This sort of evolutionary constraint is called phylogenetic inertia."
— Gould and Keeton, Biological Science, 1996, p. 470

Crisis or need is the catalyst of human cultural adaptation. For the families of Sa Mox the principal reaction to crisis was migration. Migration is in itself a fundamental human adaptation to stress. More than any other non-human animal, humans have the uncanny ability to change place, yet they can never completely shed the experiences that shaped them in their place of origin. At the same time, neither are they bound by prior experience — although there is certainly cultural inertia, in no way does it have the same hold as its more stubborn twin, phylogenetic inertia.

Knowledge — of plants, animals, languages, custom, food — is the most powerful tool human beings have in terms of their extraordinary ability to adapt. Knowledge, like people themselves, can cross expansive stretches of both time and space. In the case of the Q'eqchi' migrants to the lowlands of Sa Mox, knowledge of plants has in fact transcended spatial and temporal obstacles, yielding a group of individuals essentially *preadapted* to a distant but not wholly unfamiliar environment. The Q'eqchi' are principally a highland people, yet throughout history individuals speaking Q'eqchi' have made forays into the lowlands, capturing transmissible knowledge along the way. Before the arrival of the Spanish, the Q'eqchi' occupied an expanse that allowed them to intercept and interact with the people and products of the highlands and lowlands. Following the Spanish occupation of the region, the Q'eqchi' were hired as mercenaries in the pacification process of their northerly neighbors the Lacandón and Manche Chol (King 1974). The 17th century saw the Q'eqchi' venturing into northern Alta Verapaz in order to acquire cacao and annatto from the sweltering lowlands (King 1974:23). There can be no doubt that during these colonial centuries the highlanders acquired a knowledge of life in the lowlands. That this was so is permanently etched in the Q'eqchi' language with borrowings from Chol — most notably the adoption of the Chol terms **te'** ("tree") and **kajam** ("vine") as synonyms for **che'** and **kaam**. With the arrival of 19th century Guatemalan independence and the quest for cash crops, traditional Q'eqchi' agriculturalists were forced to take up permanent occupation in the lowlands. But, although the 60 km that "separates" the highlands and lowlands must have represented days of travel time 200 years ago, the distance was not impassable. Extensive trail systems continue to connect highland and lowland landscapes and these trail systems were the principal means of travel up until recent times. In the 1930s, the national desire to connect the northern wilderness with the populated highlands drove infrastructure development in Alta Verapaz and Petén. Q'eqchi' speakers provided the labor. Political violence during the past five decades and land shortage in the past four decades have made the lowlands of the north an attractive alternative lifestyle.

In sum, the Q'eqchi' as a language group, are somehow quite worldly. This worldliness has softened the transition that many families have made in attempting a new life in the lowlands.

Yet the lowlands of Sa Mox are still new to the families arriving from the Chamelqueño highlands. Chapter Three has established that, despite sharing an underlying geology of dolomitic limestone, the vegetative backdrop is qualitatively and quantitatively different and thus qualitatively and quantitatively unique to migrants. The examination of house construction, home gardens, agriculture, forest products, markets, and lexicon has described the cultural patterns that arise when people are faced with fundamentally different plant resources. They are processes that involve both maintaining tradition — a kind of cultural inertia — and breaking tradition. Over the 18 years that have passed since the first arrivals to Sa Mox, patterns have emerged throughout the community that could only be called a lowland Q'eqchi' cultural pattern. The mechanisms by which this pattern come to be I have called cultural adaptation.

Houses, perhaps better than any other of the cultural domain, exemplify the process by which individuals actively manipulate and unconsciously change behavior and language in the face of changing human needs and human ecological conditions. The basic need of shelter from the elements has remain essentially unchanged, yet the "elements" are fundamentally different as are the resources available for construction. Corner posts are the defining element of Mayan houses. They bear the weight of the roof, their positioning determines the floor area, and their durability ultimately determines the life span of the house. Consensus concerning the species appropriate for such responsibility has been met in the lowlands. However, unlike the fast-growing, durable, workable **tza'aj** (*Perymenium grande*), the trees **wachil** (*Dialium guianense*) and **muuy** (*Manilkara zapota*) do not come in such manageable packages. Builders in search of these beams must contend with trees of enormous girth and high specific gravity, and the most feasible way to do so is with a chainsaw. And with this saw comes an array of largely unconscious design patterns based on the ramifications of square posts and the ability to quickly cut precise angles. In terms of wall materials, a certain amount of cultural inertia has prevailed, resulting in builders searching for malleable softwoods to cut into **tz'alam che'**(glossed "jail wood"). Making an adjustment for year-round heat and differences in available resources, some families have adopted the **kuuk** (glossed "squirrel") wall type that avoids the incredible effort and expense of sawn boards. Interestingly, despite the presence of many long-lasting palms, metallic **lamina** is the overwhelming favorite roofing material. Although measurably less comfortable in the heat than thatched houses, the house of **lamina** — and of saw wall boards — is seen as a more durable, acceptable, and respectable structure. More recent arrivals to Sa Mox have the experience and expertise of the first arrivals; they also have the knowledge and experience acquired before their arrival, and they have the opportunity to experiment and innovate.

Home gardens are an integral part of both highland and lowland communities. The simple presence of gardens in the lowlands is indicative of cultural inertia. Nothing is grown in these gardens that could not be bought in one of the available markets, and with people producing a surplus of corn and a crop of cardamom, lowland families are not as dependent on their garden as are their highland counterparts. Nevertheless, 83 percent of my highland survey participants produced a plant product in their gardens for sale in the market — the number for the lowlands was just 22 percent. Clearly, this indicates that the strong link that exists between garden produce and market produce in the highlands does not quickly replicate itself in the lowlands.

Despite the various and sometimes distant points of origin for the families of Sa Mox, they produce gardens that are fundamentally similar yet fundamentally different from the selection of highland gardens. Lowland gardens are smaller in size, are more precisely defined from other vegetative communities, have enclosed spice gardens, contain fewer species on average, and have different compositions. Despite these differences, lowland and highland gardens do share 34 "core" species in common, species that are both important to the repertoire of household food consumption and more flexible in terms of the environmental conditions under which they can grow. Some species, although they perform poorly in the heat of the lowlands, are planted anyway — they too carry a degree of cultural inertia. Multi-Dimensional-Scaling has demonstrated that highland gardens cluster around a more or less particular suite of species, yet exhibit individual "expert" growers who experiment with many more, sometimes exotic, plants. The lowlands show no such pattern, indicating a degree of residents' conservatism and unfamiliarity with the new possibilities of cultivars available to lowland planters. With more time, I would expect experts or experimenters in the lowlands to emerge. Finally, and most importantly, Euclidean distance dendogram analysis has revealed that lowland gardeners from similar places of origin *do not* plant more similar gardens than those families of different places of origin. This is indicative of one of two things: a) the gardens from the various places of origin are essentially similar or b) arriving families do not attempt to replicate what they had in the highlands in their new gardens. I expect both possibilities to be at work, with the historical interchange between highlands and lowlands mildly homogenizing Q'eqchi' gardens, and with arrivals to Sa Mox adjusting cultivars to the new possibilities and constraints that the lowland climate and ecology presents.

Chapter Two demonstrated that those who speak the Q'eqchi' language are indeed a highly variable group, making the appropriate unit of analysis difficult to determine. Nevertheless, the characteristic that best describes most Q'eqchi' is their participation in non-mechanized corn agriculture. Although corn harvesting is certainly not the most appropriate — or optimal — possibility given the ecological characteristics, the cultural inertia corn carries is insurmountable. And not just the fact that corn is the species of choice, but the method of planting corn has remained largely unchanged. Where foreign "development" volunteers have arrived in Alta Verapaz year after year preaching more "appropriate" agriculture, their ideas have had very little impact. Movement to the lowlands has, nevertheless, inspired several adaptive changes.

The fact that two cycles of corn can be planted in the lowlands instead of just one is both the fundamental reason for moving to the lowlands and the principal point around which most other behaviors are reorganized. Self-sufficiency in corn was in most cases the reason for moving to Sa Mox and, in most cases, this goal has been reached. Two corn crops eliminate the need to be involved in other economic enterprises and the time involved all but eliminates such possibilities, save one — cardamom production. As a result, Sa Mox is a much more homogeneous unit — all families grow two cycles of corn, basically have enough corn to feed themselves throughout the year, and then work the cardamom fields when the two annual harvests are completed. The behaviors evolving around this new cultural complex have many implications, for example a) more consistent cash in hand decreases the need to be selling in the market and increases the ability to be buying in the market; b) higher corn volumes and more distant fields inspire the need for alternative storage — the **k'uuleb'aal hal** (glossed, "corn bodega"); c) more available land allows for more extensive agriculture; d) more extensive agriculture requires clearing forest; e) downed forests yield new and different sources of firewood; f) lower population density decreases the need to mark precisely agricultural plots with typical plant-based markers; and g) larger expanses of agricultural fields make the application of chemical herbicides preferable to weeding with a hoe. This agricultural lifestyle is emically seen as an improvement over highland agriculture. In the eyes of conservationists, it is this lifestyle that tells the demise of the northern forests.

Chapter Three quantitatively differentiated the highland and lowland forests. Chapter Seven demonstrated that these forests are also qualitatively different and that the qualitative differences effectively reduce the exposure of females to the forested environment. The woods of Sa Mox are considered dangerous, dank, and extensive — considerations that generally limit females to an existence within the **k'aleb'aal** ("corn fields/town"). Males continue to harvest forest resources in Sa Mox, largely for construction purposes. The principal adaptation for working in the lowland forest environment is the complete abandonment of the saw frame (*tapesco*) in favor of the chainsaw. But this change is also occurring in the highlands and is, therefore, more indicative of an overall efficiency improvement.

The discussion of international and local markets described in Chapter Eight demonstrates that the local markets serve as yet another homogenizing factor among residents throughout the Alta Verapaz, and that Q'eqchi' participation in the coffee market does not shape lives to the same degree as cardamom. Infrastructure improvements that began in the 1930s and continue to this day make access to the Cobán markets more feasible, higher numbers at those markets mean increased demand, reduced prices, and less dependency on smaller, more distant markets like Caqipek, Chamil, Chamelco, and Canhuinik. The Carchá market has somehow remained competitive. Lowlanders and highlanders reach the Cobán market with frequency and purchase similar products like plastics and nylons that have reduced the need for the manufacture of plant- and earth-based products like ceramics, baskets, maguey twine, and reed mats. Highlanders — with more access to the raw materials and more time for home production — produce these more traditional products with much greater frequency than lowlanders.

We have archaeological and historical evidence of highland exposure to the lowlands. This exposure has influenced plant lexicon to a much greater degree than it has plant-related behavior. Data from the plant trail experiment have shown that the basic organizational structure of plant lexicon has not significantly changed with a move to the lowlands. However, the data indicate a structure quite different from the Berlinean model: the most fundamental division of organisms leads to two "unique beginners" — animals (**xul**) and non-animals (covert and unlabeled); the basic division of the non-animal world, most specifically plants, exists between those that involve emically obvious human involvement (**awimk**) and those that "are simply there" (**namok**); and the only life form of real cognitive saliency is the tree (**che'** or **te'**).

The unfortunate absence of females in the lowland plant trail experiment eliminates women from any quantitative comparison between highlands and lowlands. Males of both communities and females in the highlands more consistently recognize and label those plants that they use. This is shown most dramatically in the dramatic correct response percentage of the **awimk** category versus the **namok** category: **awimk** are correctly labeled with twice the accuracy of **namok** plants. The male learning curve is of similar, logarithmic structure to the female curve, but indicates that males reach their maximum labeling skill at an earlier age than females. Accurately labeling plants is an important adaptation to an unfamiliar environment. Labeling and use, as two strands, proceed through time along an increasingly tight double helix. In one situation, like corn, the two strands become one and the product is universally used and universally labeled throughout the community. In a second situation, the two strands unravel: the use and labeling of a plant is now only recognized by scattered individuals, in some cases the label is completely dropped and, for example, a plant *used* to cure skin lesions is *labeled* "**b'an reli xox**" — "skin lesion medicine."

***

The Q'eqchi' are atypical when compared to most indigenous groups of Guatemala.

The enigmatic Q'eqchi', in one sense, are quite "worldly" and have occupied or visited many distant, foreign lands. At the same time, the Q'eqchi' of Alta Verapaz are somewhat backward, isolated, and conservative — they have not unified politically nor have they become involved in vegetable agriculture like other indigenous groups of the western highlands. Distant historical forces, more developed infrastructure, and increased exposure to ideas outside the Verapaz have played a role in homogenizing the Q'eqchi'. Knowledge and behavior concerning plants is certainly different from individual to individual and from community to community, but the forces of homogenization in this arena are at play as well.

The 700,000 people that speak Q'eqchi' and their migration into the tropical lowlands of the Petén and Alta Verapaz have certainly caught the attention of the conservation community. To this community, the behavior of the Q'eqchi' in the lowlands is not appropriate. Atran et al. (1993) argue that:

> ... two sets of factors militate against preservation of Lowland ecology: (i) linguistic isolation coupled with a compact social structure that foreclose intercultural exchanges apt to convey appropriate Lowland techniques; and (ii) selective use of Highland techniques (clear-cutting, cash cropping, continuous cultivation) coupled with failure or inability to transfer Highland techniques favoring forest maintenance. Moreover, Q'eqchi' immigrants tend to invoke corporate and ceremonial ties with the sacred Highland mountain valleys when faced with economic and ecological problems. This may function to detour access to ecological information relevant to Lowland commons survival (Atran et al. 1993:7603).

This dissertation has demonstrated that one migrant, lowland community does not hold on dearly to highland behaviors. Secondly, it has by default demonstrated that highland agricultural techniques do not necessarily favor forest maintenance in the first place. Thirdly, I found no evidence that the lowlanders of Sa Mox maintain corporate and ceremonial ties to the highlands and have suggested that those ties in the highlands are far less important than 20 years ago. Neither the highlanders of Chajaneb nor the lowlanders of Sa Mox practice agriculture or forestry that would be looked upon favorably by conservationists. Conditions outside and within the control of the Q'eqchi' community have led to a more or less constant state of crisis where corn is the only and ultimate security blanket. Until these conditions are relieved, until the factors pushing the Q'eqchi' northward are assuaged, and until a system of land tenure yields incentive, lowland and highland ecology will go on changing. Even with these adjustments, change and concomitant adaptation are inevitable. Reactionary ecological planning cannot and will not succeed in designing the ecologically Noble savage.

Partial Glossary of Plant-Related Terms

Corn Specific	*leekink* - to tie corn in bundles of five
aweel - late emerging corn	*litz'ok* - the third corn grinding
aj awb'eet - hired corn planter	*masb'a'e* - napkin for wrapping *tortillas*
awk - to plant corn	*moqoq* - the poorest corn for animal consumption
awleb' - corn seed bag; digging stick	*muuq* - head-high corn
b'alaq - corn cob	*mux* - cooked grain of young corn
b'oq' poch - a large plain tamale	*muxaj* - *atole* of green corn
b'uch - cooked corn	*mux'aj* - *atole* of tender corn
b'uchik - to cook corn	*ob'en* - general term for tamale
chaklich - an early sprouting corn variety	*pachk'im* - dried corn stalks for chicken fence
chapok k'al - to harvest corn	*pajajnak* - to feed chickens dried corn
chaqihal - dried corn	*parutz'* - a disfigured corn seed
ch'amb'ul - *atole* prepared with sugar	*pixilal* - knot used to tie corn husks
ch'ol hal - corn planted at high elevations	*pixok hal* - to tie corn into bundles following harvest
hal - corn on the cob	*pochb'i* - a general term for *tamales*
hesb'il - corn dough that is almost ready for *tortillas*	*poch'ok* - the first corn grinding
hesok - the second corn grinding	*pom q'em* - thick *tortillas* usually saved for dogs
humal - corn husk	*posol* - cold water and corn paste, slightly fermented
iswa - *tamale* of green corn	*q'eel ru* - a damaged corn grain
ix - hulls of corn seed	*q'em* - the corn dough
ixim - corn	*q'olok* - to harvest corn
iximak - to remove corn from the cob	*q'olonel* - harvester of milpa
jayil wa - special class of thin *tortilla*	*q'ux* - moss or lichens
jorank - to toast a *tortilla*	*rax ixim* - green corn, as in **kux**
ka' - grinding stone	*rax hal* - green corn, as in **kux**
ke'ek - to grind corn	*raxke'* - tortilla of green corn
ke'leb' - table for grinding corn	*rax awk* - to plant corn without proper prayer
kojlenk - to stir *atole*	*rax uq'un* - corn dough beverage
k'aj - corn flour prepared without boiling (pinol)	*retalil li tuub'* - marker for harvesting corn
k'al - corn field	*rismal hal* - corn tuft
k'alb'eetak - to hoe for wage	*rix ixim* - the seed coat of corn grain
k'aleb'al - place of the corn field; village	*sob' ru* - a degrained cob or corn
k'alek - to weed with a hoe; also for other crops	*sol* - corn beverage with a pinch of salt
k'alom - workers to hoe fields	*sukuk* - a *tortilla* sandwich with beans in the middle
k'amb'ob' - large-grained corn of highlands	*tusuk* - to stack corn
k'atk'al - corn planted on burnt field	*tz'u'uj* - *tortillas* with whole beans cooked on griddle
k'il - flat griddle for cooking *tortillas*	*ub'en* - *tamales* with pork or chicken
k'ilank - to toast (a *tortilla* or otherwise)	*uq'un* - atole
k'oolwa - leftover *tortillas*	*wa* - *tortilla*; also food
k'orech - dried tortillas for travel food	*xep* - *tamale* with beans
k'uluj - *tamales* with sugar	*xorb'il* - a less common term for *tortilla*
k'uuleb'aal hal - house for grain storage	*xorok* - to pat out a *tortilla*
k'ux - corn on the cob	*xtz'i' li kal* - the brace roots of corn
leek - a tied bunch of corn ears	*xut* - tamale of ground beans

Non-Corn Specific	
ab' - a hammock of maguey fiber or otherwise	*ichaj* - a leafy vegetable, usually edible
aj - a mat made specifically from the stems of **aj**	*ichajib'k* - to eat pasture
al - seedling or young fruit	*ik* - chile
alab'te' - sprout or bud	*iyaj* - seed
alil - immature leaf or fruit	*jay ru* - landscape with few weeds
amche'o'k - to get covered with **am che'** pustules	*johok* - to scrape maguey
ani - a less common term for fermented **b'oj**	*johonel* - a scraper of maguey
aq' - a class of vines good for tying	*jotzok* - to scrape the bark or stem with machete
aq'inel - someone that weeds crops	*juyuk* - to add *achiote* to a meal
aq'ink - to weed fields	*kala'* - an edible palm, usually *corozo*
atz' che' - a generic term for "beam"	*kaqi chaj* - heart of pine, Sp. *ocote*
atz'um - flower; usual of non-domesticates	*ka'aw* - replanting
atz'umjenaq - a plant that has flowered	*ka'awink* - to replant a terrain
atz'umjik - flowering period of a plant	*ka'uuchink* - to yield fruit a second time
awas - a malevolent spirit of the woods	*kulb'* - heartwood of a tree
awimk - a crop	*kumkumink* - to remove apical meristem of a plant
awinel - a planter	*kurb'enk* - to chop wood quickly, as with a hatchet
awinik - planting season	*kuruxink* - to cut a log or tree into pieces
awok - to plant seed or propagate vegetatively	*kuuk* - a house wall of many, thin, wooden poles
b'ak'leb' - plant for tying	*kuut* - a raceme, or "hand," of bananas
b'al pim - dense thicket	*k'aam* - vine
b'an - medicine, often of a plant variety	*k'ab'* - bean stew
b'aqsotz' -diagonal beam in a roof	*k'aj* - flour
b'ar - small length of wood for wire wrapping	*k'aj che'* - sawdust; scraps of wood
b'ayl - reed	*k'aj ik* - dried, ground chile powder
b'e ch'o - horizontal roof pole	*k'anha'* - swamp or flooded forest
b'esexink - to prune or trim	*k'atk* - forest fire
b'et po - a sprouting **ch'ima**	*k'ehok u* - to fruit
b'iritaq - a weed patch	*k'iche'* - forest
b'oj - fermented juice of sugar cane	*k'iche'b'aalik* - to travel in the woods
b'ook - aroma, as in a flower	*k'iche'ob'aal* - place in the forest for cutting firewood
b'ukuk - to stir a cacao drink with the fingers	*k'im* - thatch; sedge
cha - ash	*k'imal ch'och'* - landscape denuded of trees
chaal re kab' - ridgepole	*k'imal kab'l* - a house of thatch
champa - a handbag of maguey twine	*k'imub'k* - to gather thatch
chank'ari's - another term for b'oj	*k'imunk* - to thatch a house
chaq' - ripe	*k'ix* - spine; thorn
chunak - the stoney seed of **rax tul** or **sal tul**	*k'ix ru* - spiny
ch'ixb' - wooden rack for drying chile	*k'ob'al* - a knot or scar in the tree bole
ch'ool - flower gynoecium and androecium	*k'oj* - petal
ch'oqok - to pick fruit	*k'okaamil* - to lose leaves, as with a breeze
ch'oxok - to knock fruit out of a tree with a stick	*k'okb'enk* - to gather fruit
ch'up - the navel of a navel orange	*k'ok k'aq* - the wood forming a loft
eeb' - a thick diameter pole used as a ladder	*k'otkab'* - pollen
ele'oqink - to germinate	*lancha* - food wrapped in leaves for cooking
heto - nuisance tree branches	*lapaxink* - to plant one by one
hirom - a plant that has been watered	*lapok* - to bury poles, as in corner posts

Non-Corn Specific, Continued	*tenok kenq'* - to harvest beans
lokxik - part of roof A-frame	*tochb'enk* - to cut fruit
lowok - to eat fruits or vegetables	*toon* - stem; trunk
mar u - a plant's last fruit	*tonal* - stem of a vine; peduncle of a flower
mokooch - any palm leaf used as umbrella	*tump* - a large, stoney seed
mok'lok - emergence of tree's first leaves	*tux* - knot of a tree
mul - weeds after being weeded	*tuxb'* - tree limb
naq' - seed	*tz'ak* - house wall
oqech - cornerpost	*tz'alam che'* - wall boards
paach kape - row of coffee plants	*tz'amb'a* - roof beams
pachaya - general term for grass	*tz'i'* - any member of ginger family
parutz'il - a cultivar in bad condition	*waakab'* - wax of tree resin or otherwise
paspan - an edible plant	*xaal* - crotch of tree
pat che' - a branch that serves as post-hole digger	*xaq* - leaf
pech'ok che' - to work with wood	*xb'akel* - plant vein
pek rix - seed covering or thick fruit rind	*xche'elkape* - coffee plantation
pim - weed; herb	*xeel* - leaf wrapping
pimok - to get weedy	*xe'* - root
pom - resin of *Protium copal*	*ya'al* - stew
pomib'k - to extract copal resin	*yok'ok* - to cut plants with machete
poop - reed mat	
qapok - to cut with a machete	
qeer - a planted line of cultivars	
q'eem - mulch or organic fertilizer	
q'een - a leaf, usually of a domesticate	
raara - heavily spiced with pepper	
ral - basket part	
rax - immature plant part	
renk - typical tunic weave in Chamelco	
rich mul - plant vein	
rix - bark of a tree; skin of a fruit	
rokox anum - poisonous mushroom	
ru - fruit	
ru chaj - pine cone	
ruk - small length of wood for wire wrapping	
ruq' li che' - tree limb	
sajnak - to fell a tree	
sakil - squash seed	
sak che' - material upon which thatch is applied	
sek - sedge	
seel - container of calabash gourd	
seer li oqech - two long, horizontal roof beams	
simb' - bamboo	
sisb' - fern	
si' - firewood	
si'ik - to gather firewood	
si'nel - one who markets firewood	
taab' - tumpline	
tem - a wooden bench	

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Appendix 1: Alphabetical List of Plant Species Known to the Q'eqchi'

Family and Species	Collection Number(s)	Common Names(s)
ACANTHACEAE		
USS (unidentified, sterile specimen)	DAG136	cham okop
ADIANTACEAE		
Adiantum sp.	LPT36	sisb'i ha
AGAVACEAE		
Furcrea guatemalensis Trealease	Edgar Cuc 2327892	ik'e
USS	Edgar Cuc 362787	kanya
ALISMATACEAE		
Sagittaria latifolia Willd.	LPT28	k'aam
AMARANTHACEAE		
Amaranthus caudatus L.	WS317	ses
Iresine celosia L.	DAG104	kaqi pim
ANACARDIACEAE		
Rhus striata Ruiz & Pavón	WS247	am che'
APIACEAE		
Eryngium foetidum L.	WS316	samat
Hydrocotyle mexicana Cham. & Schlecht.	WS170	(pim)
ARACEAE		
Alocasia macrorhiza (L.) Schott	HPP10	ox, saqi ox, kaqi ox
Monstera pertusa (L.) de Vriese	DAG119	b'an ra u
ARALIACEAE		
Oreopanax echinops (Schlecht. & Cham.) Dcne. & Planch	WS417	(che'), ab' ku
ARECACEAE		
Atrocaryum mexicanum Liebm.	DAG089	ak te'
Bactris sp.	LPT44	k'ix' k'ib'
Chamaedorea (graminifolia?) H. Wendl.	WS274	k'ib'
Chamaedorea sp.	WS327	k'ib' k'iche'

ARECACEAE cont.		
Chamaedorea sp.	LP5, DAG035	k'ib' k'iche'
Cocos nucifera L.	LPP3	kook
Cryosophila argentea Bartlett	DAG120	komum
Crysophila sp.	LPP2	komum
Geonoma mexicana Liebmann ex Mart.	LP5	pamak
ASTERACEAE		
Ageratum houstonianum Mill.	LPT59	lokap
Ageratum houstonianum Mill.	WS280	saqi lokap
Bidens squarrosa Kunth	WS073	xub'ay
Bidens triplinervis Kunth	WS712	xub'ay
Dahlia imperialis Roezl ex Ortgies	WS356, WS446	tzoloj
Eupatorium semialatum Benth.	WS358	b'ak che', kimal che'
Eupatorium sp.	LPT51	saqi pim
Elephantopus spicatus Juss. ex Aubl.	LPT41	(pim)
Matricaria courrantana DC.	WS182	mansaniy
Melanthera nivea (L.) Small	WS283	sajal
Neurolaena lobata (L.) R.	DAG010, LPT66	tres punt, k'amank
Perymenium grande Hemsl. var. grande	WS251	tz'aj, tza'aj
Perymenium grande Hemsl.	WS364	tz'aj, tza'aj
Polymnia maculata	WS703, WS074	axl, qani axl
Polymnia oaxacana Sch.	WS002	kaqi axl
Tagetes erecta L.	WS175, WS034	tutz'
Tithonia longiradiata (Bertol.) Blake	WS446	sun
Verbesina lanata Robins. & Greenm.	WS124	jow
Verbesina turbacensis Kunth	WS057, WS100	rok xa'an
Vernonia deppeana Less.	WS003	semem
Vernonia leiocarpa Kunth	HPT101	q'an tza'aj
Vernonia mollis Kunth	LPT21	semem
USS	LPT48	q'eqi xep
USS	WS113	q'an ru
USS	WS409	akab' ki'
USS	WS264	saqi lokap
BALSAMINACEAE		
Impatiens balsamina L.	HPT2	(utz'u'uj)
BEGONIACEAE		
Begonia schrank var. tovarensis (Klotzsch) Irmscher	DAG107	b'an re li xox
Begonia sp.	WS220	kaqi tu' tzunun

BETULACEAE		
Carpinus caroliniana var. tropicalis Donn. Smith	WS299	mes che'
Ostrya virginiana var. guatemalensis (Winkl.) Macbride	WS141	mes che'
BIXACEAE		
Bixa orellana L.	WS028 DAG066	xayau, kaqi xayau, rax xayau, saqi xayau
BOMBACACEAE		
Ceiba pentandra (L.) Gaertn.	LPP1	inup, yax te'
Ochroma lagopus Swartz	DAG558	puj b'ach
BORAGINACEAE		
Cordia spinescens L.	DAG046	q'eqi xep
BROMELIACEAE		
Anaanas comosus (L.) Merrill	LPP6	ch'op
Catopsis cucullata L.	WS257	ikl
Catopsis sp.	WS319	ikl
USS	WS140	ikl
BURSERACEAE		
Bursera simaruba (L.) Sarg.	LPP4	ka'aj, kak'aj
Protium multiramiflorum Lundell	LPT68	kaqi pom
CACTACEAE		
Epiphyllum sp.	DAG082	tiqil b'ak
CANNACEAE		
Canna indica L.	DAG559, Edgar Cuc 3627894	tzukl
CAPRIFOLIACEAE		
Viburnum amatenangense Lundell	WS062	tzunun che'
Viburnum hartwegii Benth.	WS253	tzunun che'
CASUARINACEAE		
Casuarina equisetifolia L.	WS114	pinabet, suu chaj
CHLORANTHACEAE		
Hedyosmum mexicanum Cordemoy	WS267, WS081	oonk

CLETHRACEAE		
Clethra suaveolens Turcz.	WS050, WS126, WS445	k'a q'ut
CLUSIACEAE		
Clusia flava Jacq.	DAG054	tolox
Vismia camparaguey Sprague & Riley	DAG123	q'an parawai
COMBRETACEAE		
Terminalia amazonia (J. F. Gmel.) Excell in Pulle	DAG557	q'an xan
COMMELINACEAE		
Callisia monandra (Swartz) Schult. in Roem and Schult.	WS067	tzimaj, kolon
Callisia multiflora (Mart. & Gal.) Standl.	WS093, DAG058	tzimaj
CONCOLVULACEAE		
Ipomoeae purpurea (L.) Roth	WS365	chiklin
Ipomoea purpurea (L.) Roth	WS184	chiklin, tzap xik
Ipomoeae triloba L.	DAG131	tzap xik, sayub'
Ipomoeae sp.	DAG074	sayub'
CUCURBITACEAE		
Cayaponia racemosa (Mill.) Cogn. in DC.	DAG132	k'um paap
Cucurbita mosachatus Duchesne	WS708	k'um
Cucurbita pepo L.	WS248	k'um
Lagenaria siceraria (Molina) Standl.	DAG085	seel
Luffa cylindrica (L.) Roem.	DAG083	estrep
Sechium edule (Jacq.) Sw/	WS704	ch'imaj
CUPRESSACEAE		
Cupressus lusitanica Miller	Edgar Cuc 2367892, WS127	sipres
CYPERACEAE		
Cyperus mutisii (Kunth) Griseb.	WS284	k'im
Rhynchospora sp.	LPT27	sek
Scleria bracteata Cav.	DAG111	sek
Scleria secans (L.) Urban	LPT42	sek
USS	WS234	patz k'im
USS	WS200	k'im ha, k'im ch'o
DAVALLIACEAE		
Rumohra sp.	WS262	tumin pim

EQUISETACEAE		
Equisetum myriochaetum Schlecht. and Cham.	WS260	tze' kaway
EUPHORBIACEAE		
Acalypha macrostachya var. hirsutissima (Willd.) Muell	DAG061	sisik'
Dalechampia tiliifolia Lam.	DAG110	la'
Euphorbia cotinifolia L.	DAG600	tz'a ixk
Hevea brasilensis Muell.	DAG124	uhl
Manihot esculenta Crantz	WS003	tz'in
Ricinus communis L.	WS300	aceit
FABACEAE		
Acacia angustissima (Mill.) Kuntze.	LPT26	xul kenq'
Acacia hindsii Benth.	DAG072	sub'in
Cassia reticulata Willd.	LPT91	q'an che'
Erythrina berteroana Urban	DAG130	tz'in te'
Gliricidia speium (Jacq.) Standl.	DAG093, DAG600	qan te'
Inga fissicalyx Pittier	LPT83	chelel
Inga laurina (Swartz) Willd.	DAG092	palal
Inga sp.	LPT11	chochokl
Inga sp.	DAG129	kaqi chochokl
Phaseolus coccineus L.	WS118, WS192	lool kenq'
Phaseolus coccineus L.	WS027	nun kenq'
Phaseolus vulgaris L.	WS001	q'eqi kenq'
Pisum sativum L.	DAG601	che' kenq'
USS	DAG065	chiklin
USS	LPT80	yaxhab'
FAGACEAE		
Quercus corrugata Hook.	WS004, HPP2	ji
FLACOURTIACEAE		
Casearia sp.	DAG067	b'ajlak che'
Xylosoma sp.	WS021	sib' che'
GESNERIACEAE		
Phinaea repens (Donn.-Sm.) Solereder	WS117	kaqi pim
HAMAMELIDACEAE		
Liquidambar styriciflua L.	WS006, WS095	okob'

IRIDACEAE		
Tritonia crocosmiiflora Nichols.	WS058	b'akex
LAMIACEAE		
Catopheria chiapensis Gray ex Benth.	DAG079	b'ajlak che'
Ocimum micranthum Willd.	DAG084, WS 181	albaka
USS	LPT9	(pim)
LAURACEAE		
Nectandra membranacea (Swartz) Griseb.	LP10, LP1	sak si'
Persea americana Mill.	Edgar Cuc 2327892	o
Persea donnell-smithii Mez ex Donn. Smith	WS008	o max
Persea shiedeana Nees	WS256	koiyo
LILIACEAE		
Anthericum aurantiacum J. G. Baker ex Hemsl.	WS144, WS043	klaux li kuch
Dracaena americana Donn. Smith	DAG113	k'uuk'il k'iche'
Lilium longiflorum Thunb.	Edgar Cuc 5	asusen
Yucca elephantipes Regel	Edgar Cuc 3627894	k'uuk'il
USS	WS274	kaqi pim, kaqi q'een
USS	WS046	koq' choop
LYCOPODIACEAE		
Lycopodium clavatum L.	WS089	k'aam chaj, sib' li na'
Lycopodium contiguum Klotzsch	WS215	k'aam chaj
MALPIGHIACEAE		
Byrsonima crassifolia (L.) Kunth	WS085	ch'i
MALVACEAE		
Gossypium mexicanum Todaro	DAG096	pochi' nok
Hibiscus rosa-sinensis L.	DAG001	(utz'u'uj), klavel
Sida acuta Burm.	Edgar Cuc 2327892, WS255	mes q'een
Sida spinosa L.	DAG556	mesleb', mesb'el
Wissadula excelsior (Cav.) Presl	DAG077	chup akuch'
MARANTACEAE		
Calathea allouia (Aubl.) Lindl.	Edgar Cuc 2327892	mox, moxl

MELASTOMACEAE		
Arthrostemma ciliatum Ruiz & Pavon	WS090, HPT92	tzelek' tz'ak, utz'ajl kuch
Bellucia costaricensis Cogn.	LPT31a	nimxak
Bellucia grossularioides (L.) Triana	DAG042	manzana roos
Clidemia octona (Bonpl.) L.	WS196	xapmax
Conostegia icosandra (Sw.) Urban	WS207	ch'e'er re li k'aleb'al
Conostegia xalapensis (Bonpl.) D. Don	DAG016, LPT85	tza'aj, che'er
Miconia chamissois Naudin	LPT50	ch'e'er
Miconia desmantha Benth.	WS701	ch'e'er
Miconia glaberrima (Schlecht.) Naudin	WS228, WS055	ch'e'er, saqi che'
Miconia guatemalensis Cogn. in Donn. Sm.	WS174	saqi che'
Miconia impetiolaris (Sw.) Don.	DAG701	xoy, ch'e'r xoy
Miconia punctata (Desr.) D. Don	DAG557	kaqi chajlal k'im
Miconia mexicana (Humb. & Bonpl.) Naudin	DAG016	xcomun lix xoy
Miconia sp.	LPT85	saqi che'; che'e'r
Monochaetum floribundum (Schlecht.) Naudin	WS226, WS566	kaqi pim
Mouriri parvifolia Benth.	LPT52a	(che')
Topobea calycularis Naudin	WS261	(che')
MONIMIACEAE		
Siparuna nicaraguensis Hemsl.	WS096	chu che'
MORACEAE		
Artocarpus altitis (Parkinson) Fosberg	LPP12	kastanya, mazapan
MUSACEAE		
Heliconia bihai L.	DAG027	k'erk
Musa X sapientum	HPP5	tul
MYRICACEAE		
Myrica cerifera L.	WS249, WS048	wa'ut
MYRSINACEAE		
Parathesis donnell-smithii Mez	LPT8	suu chaj
Rapanea myricoides (Schlecht.) Lundell	WS012	xub'ti, xub'uti
MYRTACEAE		
Eucalyptus globulus Labill.	DAG095	yukalipt
Eugenia jambos L.	DAG047	manzana roos
Pimenta dioica (L.) Merrill	WS155	pens
Psidium guajava L.	Edgar Cuc 3627894	pata', ch'amach'

OXALIDACEAE		
Oxalis corniculata L.	WS217	k'aq'
Oxalis hayi Kunth	WS286	(pim)
PASSIFLORACEAE		
Passiflora coriacea Juss.	WS318	granadix ch'o
Passiflora edulis Sims	Edgar Cuc 3627894	granadix
PHYTOLACACEAE		
Phytolacca icosandra L.	WS225	yakl
Phtolacca rivinoides Kunth and Bouché	DAG045, WS177	yukl, tiaql
Phytolacca rivinoides Kunth & Bouché	WS041	yakl
PINACEAE		
Pinus oocarpa Schiede	WS443	chaj
PIPERACEAE		
Peperomia coban C. DC. in Donn. Smith.	WS555	(pim)
Peperomia maculosa (L.) Hook	WS026	par q'een
Peperomia quadrifolia Kunth	HPT47	xcandel pim
Piper aduncum L.	LPT30	tiq' rak
Piper geniculatum Donnel-Smithii & C. DC. ex Donn. Smith.	LPT82	tiq' rak che'
Piper ixocubvainense Standl. & Steyerm.	LPT81	(pim)
Piper pseudoasperifolium C. DC. in DC.	WS053	b'iritak', tiq' rak
Piper tuerckheimii C. DC. ex Donn. Smith.	DAG032	telom q'een
Piper umbellatum L.	WS428	tiq' rak
Piper sp.	WS321	(pim)
PLANTAGENACEAE		
Plantago major L.	WS137	yanten, rak tzi'
POACEAE		
Andropogon schenanthus L.	WS702	telimon
Zea mays L.	HPP1, WS193	k'al, ixim
USS	HPP4	amay
USS	WS024	simb'
USS	Edgar Cuc 2327892	gyegye
USS	WS236	ye k'ej
POLYPODIACEAE		
Polypodium sp.	HPT80b	quxb'

PONTEDERIACEAE		
Pontederia sagittata Presl.	DAG068	naab'
POLYGALACEAE		
Polygala floribunda Benth.	WS265	rajxuk
RHAMNACEAE		
Rhamnus capreaefolia Schlecht.	HPT13	sub'
Rhamnus discolor (Donn. Smith) Rose	WS031	sub'
ROSACEAE		
Eriobotrya japonica Lindl.	WS709	nisp
Licania platypus (Hemsl.) Fritsch	LPT14	jolob'ob'
Prunus persica (L.) Stokes	WS246	loras
Prunus sp.	WS385	q'iib'
Rubus adenotrichus Schlecht.	WS084	tokan
RUBIACEAE		
Blepharidium guatemalense Standl.	WS601	yax te'
Cephalis tomentosa (Aublet) Vaahl	DAG602	tzap xik k'iche'
Coccocypselum hirsutum Bartling ex DC.	WS094	pix akach
Coffea arabica L.	WS083	kape
Crusea calocephala DC.	WS359	chuchum
Hoffmania conzittii Robinson	WS157, WS111, WS020	krus che', b'on che'
Morinda panamensis Seem.	WS004	q'an che'
Palicourea gaeottiana Mart.	WS154	rax wak
Palicourea sp.	HPT32	rosario
Posoqueria latifolia (Rudge) R. & S.	DAG126	kape che'
Psychotria fruticetorum Standl.	WS009	rax wak
Rondeletia amoena (Planch.) Hemsl.	WS005	ch'amach' o
Rondeletia amoena (Planch.) Hemsl.	WS082	q'eqi che'
Sommera guatemalensis Standl.	WS106	yax che'
USS	WS109	ha che'
USS	WS011	tul che'
RUTACEAE		
Citrus aurantifolia (Christm.) Swingle	WS061	lamuj
Citrus aurantium L.	DAG024	arang
Citrus nobilis Lour. var. deliciosa (Tenore) Swingle in Sarg.	WS118	mandarin
Citrus sinensis (L.) Osbeck	WS258	chin
Ruda chalapensis L.	WS179	arud

SAPOTACEAE		
Manilkara achras (Mill.) Fosberg	DAG121	muuy
Manilkara sp.	DAG114	sal tul k'iche'
Pouteria mammosa (L.) Cronquist	DAG711	sal tul
Pouteria viridis (Pittier) Cronquist	WS301, WS118	rax tul
SAURUAIACEAE		
Saurauia kegeliana Schlecht	WS712	kaqi xo'ot
Saurauia villosa DC.	WS270	saqi xo'ot
SAXIFRAGACEAE		
Hydrangea macrophylla (Thunb.) DC.	WS047	ortens
SCROPHULARIACEAE		
Castlleja arvensis Schlecht. & Cham.	WS091, WS262	jolom pich
SOLANACEAE		
Capsicum frutescens L.	WS042	koq ik, ik
Capsicum lanceolatum (Greenm.) Morton & Standl.	WS054	kum ik
Nicotiana tabacum L.	Edgar Cuc 2327892	li may
Physalis gracilis Miers	WS135	mil tomat
Physalis gracilis Miers	DAG137	sum mil tomat
Solanum americanum Miller	WS079	maak'uy
Solanum hartwegii Chapm.	WS218	paj, pajl
Solanum nigrescens Mart. & Gal.	DAG101	kop
Solanum nudum L.	WS032	sakiyol
Solanum nudum L.	WS391	akab' ki'
Solanum tuberosum L.	WS707	kaxlan is
Solanum turvum Swartz	LPT4, LPT91	k'ix che', (k'ix)
Solanum sp.	WS406	ch'on te'
Solanum sp.	WS392	q'eqi sakiyol
TILIACEAE		
Belotia campbelli Sprague	DAGPAR1	cha'ib'
Triumfetta grandiflora Vaahl	WS298	gwoiyo
Triumfetta semitriloba Jacq.	DAG052	gwoiyo
Triumfeta sp.	DAG127	b'ach'
ULMACEAE		
Trema micrantha (L.) Blume	WS191	q'iib'

URTICACEAE		
Boehmeria caudata Swartz	DAG555	lolo sam
Boehmeria ulmifolia Wedd.	WS195	lolo sam
VERBENACEAE		
Lanata camara L.	HPT58	(pim)
Lippia substrigosa Turez.	Edgar Cuc 2367892, Edgar Cuc 3627894, WS276	q'ol che', q'an tza'aj
Stachytarpheta cayennensis (L. Rich.) Vahl	LPT090	raxki'op pim
Verbena litoralis Kunth	WS149	verbena
USS	LP23	chu che'
VIOLACEAE		
Rinorea guatemalensis (Wats.) Bartlett	LP4, DAG112	wolwol, kau'il che'
VITACEAE		
Vitis bourgaeana Planch. in DC.	WS198	tusum, tusub' k'aam
VOCHYSIACEAE		
Vochysia hondurensis Sprague	LPT31	san juan, san juan che'
WINTERACEAE		
Drimys granadensis L.	WS395	ik' che'
ZINGIBERACEAE		
Elettaria cardamomum Maton	LPT60	tz'i
Renealmia aromatica Kunth	LPT66	tz'i
USS		
	DAG116	joljol
	DAG702	sam aj tz'a
	WS703	jab'al che'
	WS076	tab'nay
	DAG105	b'olay che'

Appendix 2: Individual Highland and Lowland Forest Plots

HP No.1

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Frequency	Scientific Name
okob'	8	36.4	0.1512	67.6	60	*Liquidambar styriciflua*
onk	4	18.2	0.0069	3.1	45	*Hedyosmum mexicanum*
am che'	1	4.5	0.0019	0.85	70	*Rhus striata*
jow	1	4.5	0.0019	0.85	20	*Verbesina lanata*
rax wak	5	22.7	0.0068	3.04	60	*Palicourea gaeottiana*
tzunu che'	2	9.1	0.053	23.7	50	*Viburnum blandum*
b'on che'	1	4.5	0.0019	0.85	5	*Hoffmania conzittii*
Total	22	100	0.2236	100		
No. Spec.	7					

HP No.2

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
tzunu che'	5	25	0.0304	4.5	50	*Viburnum blandum*
b'ach	1	5	0.106	15.8	5	*Croton* sp.
okob'	6	30	0.1185	17.6	60	*Liquidambar styriciflua*
ka' q'ut	2	10	0.017	2.5	70	*Clethra suaveolens*
chaj	4	20	0.394	58.5	35	*Pinus oocarpa*
wa' ut	1	5	0.007	1	10	*Myrica cerifera*
koiyo'	1	5	7E-07	0.1	5	*Persea shiedeiana*
Totals	20	100	0.6729007	100		
No. Spec.	7					

HP No.3

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
mes che'	13	39.4	0.1648	51.2	10	*Carpinus carolineana*
okob'	6	18.2	0.0369	11.5	60	*Liquidambar styriciflua*
ji	13	39.4	0.1186	36.9	40	*Quercus corrugata*
saqi xo'ot	1	3	0.0013	0.4	15	*Saurauia rubriformis*
Totals	33	100	0.3216	100		
No. Spec.	4					

HP No.4

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
ka' q'ut	6	21.4	0.2424	52.1	70	*Clethra suaveolens*
mes che'	7	25	0.067	14.4	10	*Carpinus carolineana*
rax wak	1	3.6	0.0075	1.6	60	*Palicourea gaeottiana*
chaj	1	3.6	0.1164	25	35	*Pinus oocarpa*
okob'	1	3.6	0.0014	0.3	60	*Liquidambar styriciflua*
am che'	1	3.6	0.003	0.6	70	*Rhus striata*
jow	3	10.7	0.0066	1.4	20	*Verbesina lanata*
onk	6	21.4	0.0113	2.4	45	*Hedyosmum mexicanum*
tzunu che'	2	7.1	0.0094	2.2	50	*Viburnum blandum*
Totals	28	100	0.465	100		
No. Spec.	9					

HP No.5

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
akl	4	16.7	0.0638	4.2	5	?
q'eqi che'	8	33.3	0.0225	1.5	15	*Swartzia guatemalensis*
chaj	8	33.3	1.398	92.8	35	*Pinus oocarpa*
chu che'	1	4.2	0.0013	0.09	5	*Siparuna nicaraguensis*
saqi xo'ot	1	4.2	0.0019	0.11	15	*Saurauia rubriformis*
am che'	2	8.3	0.0195	1.3	70	*Rhus striata*
Totals	24	100	1.507	100		
No. Spec.	6					

HP No.6

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
okob'	10	33.3	0.1503	12.1	60	*Liquidambar styriciflua*
chaj	7	23.4	0.9564	76.1	35	*Pinus oocarpa*
onk	7	23.4	0.011	0.89	45	*Hedyosmum mexicanum*
rax wak	1	3.33	0.0026	2	60	*Palicourea gaeottiana*
ka q'ut	4	13.24	0.029	2.3	70	*Clethra suaveolens*
q'iib'	1	3.33	0.0907	7.3	5	*Trema micrantha*
Totals	30	100	1.24	100		
No. Spec.	6					

HP No.7

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
tzunu che'	7	20.6	0.0435	5.2	50	*Vibumum blandum*
okob'	10	29.4	0.4683	56.1	60	*Liquidambar styriciflua*
ka' q'ut	3	8.8	0.108	12.9	70	*Clethra suaveolens*
rax wak	2	5.9	0.0039	0.47	60	*Palicourea gaeottiana*
ji	2	5.9	0.1614	19.3	40	*Quercus corrugata*
am che'	2	5.9	0.0204	2.4	70	*Rhus striata*
onk	5	14.8	0.0191	2.3	45	*Hedyosmum mexicanum*
o max	1	2.9	0.0064	0.77	15	*Persea donnell-smithii*
chochokl	1	2.9	0.0012	0.14	5	*Inga* sp.
wa' ut	1	2.9	0.0025	0.3	10	*Myrica cerifera*
Totals	34	100	0.8347	100		
No. Spec.	10					

HP No.8

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
chaj	3	11.5	0.3185	65.4	35	*Pinus oocarpa*
o max	1	3.8	0.0015	0.31	15	*Persea donnell-smithii*
am che'	1	3.8	0.0057	1.2	70	*Rhus striata*
q'eqi che'	2	7.7	0.0019	0.34	15	*Swartzia guatemalensis*
ka' q'ut	5	19.3	0.0934	19.2	70	*Clethra suaveolens*
okob'	12	46.2	0.0637	13.1	60	*Liquidambar styriciflua*
rax wak	2	7.7	0.0026	0.53	60	*Palicourea gaeottiana*
Totals	26	100	0.4873	100		
No. Spec.	7					

HP No.9

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
mes che'	21	87.5	1.0861	96.6	10	*Carpinus carolineana*
tzunu che'	2	8.33	0.0134	1.2	50	*Vibumum blandum*
tul che'	1	4.16	0.0254	2.2	5	Rubiaceae
Totals	24	100	1.1249	100		
No. Spec.	3					

HP No.10

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
chaj	2	6.1	0.2415	41.9	35	*Pinus oocarpa*
onk	11	33.3	0.0539	2.7	45	*Hedyosmum mexicanum*
rax wak	8	24.3	0.01	1.7	60	*Palicourea gaeottiana*
tzunu che'	1	3	0.1378	23.9	50	*Vibumum blandum*
terak	3	9.1	0.0085	1.5	5	?
tzoloj chich	2	6.1	0.0042	0.73	5	?
yax hab'	1	3	0.026	4.5	5	?
xub' ti	2	6.1	0.0469	8.1	20	*Canavalia hirrutissima*
am che'	1	3	0.0181	3.14	70	*Rhus striata*
q'ana'ix	1	3	0.0152	2.6	5	*Freiera guatemalensis*
ka' q'ut	1	3	0.0137	2.4	70	*Clethra suaveolens*
Totals	33	100	0.5758	100		
No. Spec.	11					

HP No.11

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
saqi che	7	28	0.0224	7.5	10	*Phenax mexicanus*
rax wak	1	4	0.0032	1.1	60	*Palicourea gaeottiana*
xub' ti	1	4	0.0033	1.1	20	*Canavalia hirrutissima*
ka' q'ut	7	28	0.1266	42.3	70	*Clethra suaveolens*
tzunu che'	2	8	0.0089	3	50	*Vibumum blandum*
onk	4	16	0.0295	9.9	45	*Hedyosmum mexicanum*
ji	1	4	0.0956	31.9	40	*Quercus corrugata*
aq'al	1	4	0.003	1	5	*Eugenia* sp.
am che'	1	4	0.0071	2.4	70	*Rhus striata*
Totals	25	100	0.2996	100		
No. Spec.	9					

HP No.12

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
onk	3	11.5	0.034	8.5	45	*Hedyosmum mexicanum*
tza'aj	1	3.8	0.0013	0.3	5	*Perymenium grande*
am che	3	11.5	0.0234	5.8	70	*Rhus striata*
okob'	7	26.9	0.2432	60.5	60	*Liquidambar styriciflua*
manzana	1	3.8	0.001	0.25	10	*Syzygium cuminae*

saqi che'	3	11.5	0.0199	4.9	10	*Miconia* sp.
tzunu che'	4	15.4	0.0297	7.4	50	*Viburnum blandum*
rax wak	2	7.7	0.0018	0.45	60	*Palicourea gaeottiana*
xub' ti	1	3.8	0.0343	8.5	15	*Canavalia hirrutissima*
q'eqi che'	1	3.8	0.0137	3.4		*Swartzia guatemalensis*
Totals	26	100	0.4023	100		
No. Spec.	10					

HP No.13

Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Relative Frequency**	**Scientific Name**
onk	7	33.3	0.0525	15.1	45	*Hedyosmum mexicanum*
tzunu che'	3	14.3	0.0027	0.7	50	*Viburnum blandum*
am che'	1	4.8	0.0021	1.1	70	*Rhus striata*
rax wak	2	9.5	0.0038	1.1	60	*Palicourea gaeottiana*
ka' q'ut	2	9.5	0.05	14.3	70	*Clethra suaveolens*
okob'	5	23.8	0.2347	67.2	60	*Liquidambar styriciflua*
jow	1	4.8	0.0024	0.7	20	*Verbesina lanata*
Totals	21	100	0.3482	100		
No. Spec.	7					

HP No.14

Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Relative Frequency**	**Scientific Name**
chaj	2	6.9	0.2801	65.5	35	*Pinus oocarpa*
rax wak	9	31	0.0143	3.4	60	*Palicourea gaeottiana*
onk	7	24.1	0.051	12	45	*Hedyosmum mexicanum*
ka' q'ut	2	6.9	0.0298	7	70	*Clethra suaveolens*
tzunu che'	5	17.2	0.0235	5.5	50	*Viburnum blandum*
saqi xo'ot	1	3.4	0.0075	1.8	15	*Saurauia rubriformis*
okob'	3	10.3	0.0204	4.8	60	*Liquidambar styriciflua*
Totals	29	100	0.4266	100		
No. Spec.	7					

HP No.15						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Relative Frequency**	**Scientific Name**
sipres	2	9.5	0.0837	21.3	5	*Cupressus lusitania*
chaj	12	57.1	0.2446	62.3	35	*Pinus oocarpa*
chut	2	9.5	0.0137	3.5	10	*Alsophila arborea*
xub' ti	1	4.8	0.001	0.3	20	*Canavalia hirrutissima*
rax wak	1	4.8	0.0008	0.2	60	*Palicourea gaeottiana*
am che'	2	9.5	0.0392	10	70	*Rhus striata*
ka' q'ut	1	4.8	0.0095	2.4	70	*Clethra suaveolens*
Totals	21	100	0.3925	100		
No. Spec.	7					

HPN o.16						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Relative Frequency**	**Scientific Name**
ha che'	9	47.4	0.7634	76.7	25	Rubiaceae
ka' q'ut	3	15.8	0.0312	3.1	70	*Clethra suaveolens*
kaqi xo'ot	2	10.5	0.0162	1.5	20	*Saurauia kegeliana*
yax che'	1	5.3	0.0015	0.2	5	*Brunfelsia* sp.
ji	1	5.3	0.1639	16.5	40	*Quercus corrugata*
okob'	1	5.3	0.013	1.3	60	*Liquidambar styriciflua*
saqi yux	1	5.3	0.0049	0.5	20	*Nectandra* sp.
am che'	1	5.3	0.0015	0.2	70	*Rhus striata*
Totals	19	100	0.9956	100		
No. Spec.	8					

HP No.17						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Relative Frequency**	**Scientific Name**
ka' q'ut	1	4.3	0.0184	10.4	70	*Clethra suaveolens*
ha che'	9	39.1	0.0729	41.1	25	Rubiaceae
kaqi xo'ot	1	4.3	0.0106	6	20	*Saurauia kegeliana*
kaqi yux	1	4.3	0.0008	0.45	20	*Daphnopsis tuerckheimiana*
ji	1	4.3	0.002	1.1	40	*Quercus corrugata*
am che'	3	13	0.0495	27.9	70	*Rhus striata*
chut	1	4.3	0.0041	2.3	10	*Alsophila arborea*
q'an che'	1	4.3	0.01	5.6	5	*Cassia reticulata*
aq'al	1	4.3	0.002	1.1	15	*Eugenia* sp.
saqi yux	4	17.4	0.0072	4.1	20	*Nectandra* sp.
Totals	23	100	0.1775	100		
No. Spec.	10					

HP No.18						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Relative Frequency**	**Scientific Name**
sak atz'um	1	5	0.0095	1.5	5	*Lippia myriocephala*
ha che'	5	25	0.0717	11.1	25	Rubiaceae
rax wak	1	5	0.0015	2.3	60	*Palicourea gaeottiana*
ji	2	10	0.2284	33.5	40	*Quercus corrugata*
am che'	1	5	0.0495	7.7	70	*Rhus striata*
tzunu che'	1	5	0.0135	2.1	50	*Viburnum blandum*
kaqi xo'ot	2	10	0.0738	11.4	20	*Saurauia kegeliana*
o max	1	5	0.169	26.2	15	*Persea donnell-smithii*
aq'al	1	5	0.017	2.6	15	*Eugenia* sp.
kaqi yux	3	15	0.0082	1.3	20	*Daphnopsis tuerckheimiana*
jom che'	1	5	0.0013	0.2	5	*Crescentia alata*
Totals	19	95	0.6434	99.9		
No. Spec.	12					

HP No.19						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Relative Frequency**	**Scientific Name**
ha che'	12	40	0.0587	10.7	25	Rubiaceae
ch'amach o	1	3.3	0.0032	0.6	5	*Rondeletia amoena*
kaqi xo'ot	2	6.6	0.0072	1.3	20	*Saurauia kegeliana*
ka' q'ut	4	13.3	0.0258	4.7	70	*Clethra suaveolens*
am che'	3	10	0.0884	16.2	70	*Rhus striata*
kaqi yux	5	16.7	0.0207	3.8	20	*Daphnopsis tuerckheimiana*
saqi yux	1	3.3	0.008	1.5	20	*Nectandra* sp.
ji	2	6.6	0.3343	61.2	40	*Quercus corrugata*
Totals	30	100	0.5463	100		
No. Spec.	8					

HP No.20 Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Relative Frequency	Scientific Name
ha che'	20	64.6	0.0905	23.5	25	Rubiaceae
ji	1	3.2	0.2488	64.5	40	*Quercus corrugata*
rax wak	1	3.2	0.001	0.3	60	*Palicourea gaeottiana*
kaqi yux	2	6.5	0.007	1.8	20	*Daphnopsis tuerckheimiana*
jow	1	3.2	0.0069	1.8	20	*Verbesina lanata*
loolo sam	1	3.2	0.0065	1.7	5	*Boehmeria caudata*
okob'	1	3.2	0.001	0.3	60	*Liquidambar styriciflua*
manzana	1	3.2	0.0007	0.2	10	*Syzygium cuminae*
saqi yux	1	3.2	0.0023	0.6	20	*Nectandra* sp.
ka' q'ut	2	6.5	0.0206	5.3	70	*Clethra suaveolens*
Totals	31	100	0.3853	100		
No. Spec.	10					

Lowlands

LP No.1

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Frequency	Scientific Name
sak atz'um	8	20	0.0169	8.6	10	*Lippia myriocephala*
semem	1	2.5	0.0044	2.3	10	*Vernonia deppeana*
wab'on	1	2.5	0.0006	0.3	10	Fabaceae
cha'ib'	19	47.5	0.1142	58.4	10	*Belotia campbelli*
kojl	2	5	0.0019	1	30	?
inup	1	2.5	0.0017	0.9	10	*Ceiba pentandra*
kub' te'	2	5	0.0474	24.2	20	Fabaceae
chochokl	2	5	0.0026	1.3	10	*Inga fissicalyx*
saqi suu chaj	1	2.5	0.001	0.5	20	*Parathesis donnell-smithii*
choop	3	7.5	0.0048	2.5	10	*Cecropia obtisifolia*
Totals	40	100	0.1955	100		
No. Spec.	10					

LP No.2

Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Frequency	Scientific Name
wachil	2	14.3	0.2563	43.7	40	*Dialium guianense*
manzan che'	2	14.3	0.0068	1.2	20	*Bellucia grossularioides*
kot tz'i'	4	28.8	0.0056	1	10	?
tzol	1	7.1	0.023	3.7	30	*Muellera frutescens*
ka' q'ut	1	7.1	0.0016	0.3	30	*Clethra suaveolens*
palal	1	7.1	0.0014	0.3	20	*Inga* sp.
q'an te'	1	7.1	0.0211	3.6	20	*Gliricidia sepium*
saqi chajlal k'im	1	7.1	0.0006	0.1	30	*Miconia* sp.
saqi suu chaj	1	7.1	0.2705	46.1	20	*Parathesis cubana*
Totals	14	100	0.5869	100		
No. Spec.	9					

Lp No.3						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Frequency**	**Scientific Name**
chochokl b'itz'	1	12.5	0.0216	1.9	20	*Inga* sp.
wachil	3	37.5	0.8619	77.1	40	*Dialium guianense*
kik che'	1	12.5	0.2289	20.5	20	*Castolloa guatemalensis*
sajab'	1	12.5	0.0006	0.05	10	*Inga* sp.
q'an te'	1	12.5	0.0016	0.1	20	*Gliricidia sepium*
chu che'	1	12.5	0.0038	0.3	10	*Siparuna nicaraguensis*
Totals	8	100	1.1184	99.95		
No. Spec.	6					

LP No.4						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Frequency**	**Scientific Name**
wolwol	1	8.3	0.004	0.1	40	*Rinorea guatemalensis*
aq'al	1	8.3	0.0305	0.8	20	*Eugenia* sp.
q'an xan	2	16.7	3.393	86	50	*Terminalia amazonia*
lech	1	8.3	0.1288	3.3	20	Sapotaceae
wachil	1	8.3	0.1847	4.6	40	*Dialium guianense*
pata k'iche'	1	8.3	0.1705	4.3	20	*Terminalia* sp.
komum	3	25	0.0078	0.2	30	*Crysophila argentea*
o che'	1	8.3	0.0104	0.3	10	Lauraceae
anj che'	1	8.3	0.0165	0.4	10	*?*
Totals	12	99.8	3.9462	100		
No. Spec.	9					

LP No.5 Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Frequency	Scientific Name
kape che'	1	7.1	0.0189	2.5	10	*Posoqueria latiflia*
q'an xan	1	7.1	0.2751	36.8	50	*Terminalia amazonia*
lech	1	7.1	0.1332	17.8	20	Sapotaceae
wolwol	2	14.2	0.0217	2.9	40	*Rinorea guatemalensis*
komum	1	7.1	0.0052	0.7	30	*Crysophila argentea*
saqi chajlal kim	2	14.2	0.0033	0.4	30	*Miconia* sp.
tzol	3	21.4	0.2177	29.3	30	*Muellera frutescens*
sak si'	1	7.1	0.0026	0.3	30	*Nectandra membrenacea*
ak te'	1	7.1	0.0017	0.2	40	*Bactris* sp.
tul che'	1	7.1	0.0683	9.1	10	Rubiaceae
Totals	14	99.5	0.7477	100		
No. Spec.	10					

LP No.6 Common Name	No. Ind.	Relative Density	Basal Area	Relative Dom.	Frequency	Scientific Name
san juan che'	1	12.5	0.0602	7.1	40	*Vochysia hondurensis*
kaqi chajlal k'im	1	12.5	0.0311	3.8	40	*Miconia punctata*
q'an xan	2	25	0.5234	62	50	*Terminalia amazonia*
kik che'	1	12.5	0.1683	19.9	20	*Castolloa guatemalensis*
kenq' xul	1	12.5	0.0025	0.3	10	*Acacia angustissima*
tul k'iche'	1	12.5	0.0555	6.6	20	Rubiaceae
ak te'	1	12.5	0.0027	0.3	40	*Bactris* sp.
Totals	8	100	0.8437	100		
No. Spec.	7					

LP No.7						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Frequency**	**Scientific Name**
saqi chajlal k'im	1	10	0.0007	0.05	30	*Miconia* sp.
san juan che'	2	20	0.1014	6.6	40	*Vochysia hondurensis*
chochokl b'itz'	1	10	0.0165	1.1	20	*Inga* sp.
palal	1	10	0.0015	0.1	20	*Inga laurina*
q'an xan	1	10	1.4	91.4	50	*Terminalia amazonia*
manzan che'	1	10	0.0072	0.5	20	*Bellucia costaricensis*
ak te'	1	10	0.0021	0.1	40	*Bactris* sp.
kojl	1	10	0.0012	0.1	30	?
unknown	1	10	0.001	0.07	10	?
Totals	10	100	1.5316	100.02		
No. Spec.	9					

LP No.8						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Frequency**	**Scientific Name**
ch'ut	1	3.7	0.0123	2	10	*Alsophila arborea*
tzol	8	29.7	0.0813	13.3	30	*Muellera frutescens*
saqi chajlal kim	1	3.7	0.2	32.7	30	*Miconia* sp.
sak si'	4	14.8	0.132	21.5	30	*Nectandra membrenacea*
kojl	3	11.1	0.03	4.9	30	?
kaqi chajlal kim	7	25.9	0.0248	4	40	*Miconia punctata*
ka q'ut	1	3.7	0.0023	0.4	30	*Clethra suaveolens*
san juan che'	1	3.7	0.0027	0.4	40	*Vochysia hondurensis*
q'an xan	1	3.7	0.1275	20.8	50	*Terminalia amazonia*
Totals	27	100	0.6129	100		
No. Spec.	9					

LP No.9						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Frequency**	**Scientific Name**
kaqi chajlal kim	5	22.7	0.0186	3.3	40	*Miconia punctata*
tul k'iche'	2	9.1	0.0104	1.8	30	Rubiaceae
kub' te'	4	18.2	0.4655	82.2	20	Fabaceae
kojl	1	4.5	0.0013	0.2	30	?
wolwol	1	4.5	0.0009	0.2	40	*Rinorea guatemalensis*
kajaj	1	4.5	0.0063	1.1	10	*Bursera simaruba*
chochokl k'iche'	1	4.5	0.0026	0.5	10	*Inga* sp.
lolo sam	1	4.5	0.005	0.9	10	*Boehmeria caudata*
ka' q'ut	1	4.5	0.02	3.5	30	*Clethra suaveolens*
pata k'iche'	1	4.5	0.0044	0.8	20	*Terminalia* sp.
pox	1	4.5	0.0014	0.2	10	*Spondias mombin*
kix poy	1	4.5	0.0027	0.5	10	Fabaceae
ich te'	1	4.5	0.0269	4.7	10	*Tibouchina longifolia*
unknown	1	4.5	0.0007	0.1	10	?
Totals	22	99.5	0.5667	100		
No. Spec.	14					

LP No.10						
Common Name	**No. Ind.**	**Relative Density**	**Basal Area**	**Relative Dom.**	**Frequency**	**Scientific Name**
kaqi chajlal kim	4	16.5	0.0262	10.2	40	*Miconia punctata*
ak te'	1	4.2	0.0016	0.6	40	*Bactris* sp.
wachil	1	4.2	0.038	14.8	40	*Dialium guianense*
aq'al	1	4.2	0.0415	16.2	20	*Eugenia* sp.
kampat	1	4.2	0.0327	12.7	10	?
sak si'	2	8.3	0.0053	2.1	30	*Nectandra membrenacea*
wolwol	7	29.1	0.0181	7	40	*Rinorea guatemalensis*
muuy	2	8.3	0.0672	26.2	10	*Manilkara zapota*
saqi suu chaj	1	4.2	0.0104	4	20	*Parathesis cubana*
tul k'iche'	1	4.2	0.0015	0.6	30	Rubiaceae
komum	1	4.2	0.0044	1.7	30	*Crysophila argentea*
san juan che'	1	4.2	0.0021	0.8	40	*Vochysia hondurensis*
unknown	1	4.2	0.0079	3.1	10	?
Totals	24	100	0.2569	100		
No. Spec.	13					

Appendix 3: The Dependent and Independet Variables, Highland Plant Trail

Plant #	Plant Family	Scientific Name	Entropic Coefficient	Utility	Anatomical Character	Ubiquity
1	Pinaceae	*Pinus oocarpa*	421.5317529	5	5	5
2	Balsaminaceae	*Impatiens* sp.	355.2511685	2	2	2
3	Liliaceae	*Yucca elephantipes*	393.8244243	3	5	4
4	Cupresaceae	*Cupressus lusitanica*	416.0045491	3	4	4
5	Rubiaceae	*Coccocypselum hirsutum*	214.6590511	1	3	2
6	Pteridaceae	*Pteris muricella*	335.8924997	2	4	5
7	Adiantaceae	*Adiantum* sp.	240.6563795	1	3	2
8	Verbenaceae	*Verbena littoralis*	260.1143	1	1	2
9	Asteraceae	*Melanthra nivea*	306.9616136	3	2	3
10	Piperaceae	*Piper ubellatum*	249.5975531	2	4	4
11	Fruticose lichen*	*Usnea* sp.	284.0165799	1	5	3
12	Poaceae	*Pennisetum purpureum*	333.4014188	4	3	3
13	Rhamnaceae	*Rhamnus capreaefolia*	277.4596303	2	2	2
14	Rutaceae	*Citrus sinensis*	427.0697095	4	4	5
15	Solanaceae	*Solanum americanum*	387.7559987	4	3	5
16	Poaceae	*Paspalum conjugatum*	224.6710304	1	2	5
17	Squamulose lichen*	*Cladonia* sp.	256.5575	1	3	4
18	Squamulose lichen*	*Cladonia* sp.	246.882236	1	3	4
19	Caprifoliaceae	*Vibernum blandum*	268.4576765	2	3	5
20	Plantaginaceae	*Plantago major*	263.4692141	2	2	4
21	Myrsinaceae	*Rapanea myricoides*	274.0155789	2	2	4
22	Rubiaceae	*Crusea calocephalia*	234.5586564	1	4	5
23	Rutaceae	*Citrus nobilis* var. *deliciosa*	345.7376461	4	3	3
24	Clethraceae	*Clethra suaveolens*	322.3540921	3	3	4
25	Fabaceae	*Mimosa* sp.	357.1174606	1	4	4
26	Asteraceae	*Eupatorium semialatum*	220.9842611	3	2	3
27	Rosaceae	*Rubus sapidus*	306.1612523	2	2	3
28	Asteraceae	*Perymenium grande*	339.1268162	4	3	3
29	USS		223.2035366	1	2	3
30	Rutaceae	*Citrus limonia*	327.2038	4	3	3
31	Asteraceae	*Verbesina turbacensis*	291.6494634	1	2	2
32	USS		215.077959	3	3	3
33	Apiaceae	*Hydrocotyle mexicanum*	275.1331029	1	2	3
34	Asteraceae	*Dahlia imperialis*	353.3043756	3	3	4
35	Solanaceae	*Solanum turvum*	298.590936	1	3	3
36	Melastomaceae	*Miconia* sp.	243.9359495	1	3	3
37	Melastomaceae	*Miconia* sp.	247.2729047	1	2	3
38	Myrsinaceae	*Rapanea myricoides*	267.6722811	1	2	4
39	Asteraceae	*Polymnia maculata*	257.1760622	1	3	4

Appendix 3 Continued

Plant #	Plant Family	Scientific Name	Entropic Coefficient	Utility	Anatomical Character	Ubiquity
40	Asteraceae	*Polymnia caxacana*	240.7776096	2	3	3
41	Lamiaceae	*Hyptis scandens*	260.5105114	1	4	4
42	Tiliaceae	*Triumfetta dumeforum*	227.5014993	2	4	4
43	Rutaceae	*Citrus limetta*	263.2834067	3	3	2
44	Lauraceae	*Persea americanum*	361.9649037	4	4	4
45	Rosaceae	*Rubus adenotrichus*	286.4290667	2	4	3
46	Agavaceae	*Furcrea guatemalensis*	422.9180472	4	5	4
47	Piperaceae	*Peperomia lenticularis*	243.6384136	1	3	2
48	Bromeliaceae	*Vriesia heliconoides*	238.6650247	1	4	3
49	Ebenaceae	*Diospyros khaki*	235.0403005	3	2	1
50	Sapotaceae	*Pouteria viridis*	421.5317529	4	3	4
51	Poaceae	*Axonopus compressus*	290.8844888	2	3	5
52	Myrtaceae	*Psidium guajava*	421.5317529	3	4	3
53	Gleicheniaceae	*Dicranopteris pectinata*	223.6919291	1	3	3
54	Tiliaceae	*Triumfetta* sp.	260.3024248	2	3	3
55	Asteraceae	*Spilanthes americanum*	219.2065433	3	3	5
56	Asteraceae	*Bidens squarrosa*	365.314644	1	3	5
57	Fabaceae	*Phaseolus coccineus*	311.1367471	5	4	5
58	Phytolaccaceae	*Phytolacca rivinoides*	240.4276955	1	3	2
59	Dryopteridaceae	*Rumohra adiantiformis*	334.2416484	3	3	3
60	Convolulaceae	*Ipomoea purpurea*	240.0181124	1	3	5
61	Poaceae	*Zea mays*	357.0729106	5	5	5
62	Fabaceae	*Phaseolus vulgaris*	321.5363835	5	4	5
63	Saurauiaceae	*Saurauia villosa*	327.2593605	2	3	3
64	Adiantaceae	*Ananthacorus* sp.	249.9516905	1	3	3
65	Gesneriaceae	*Phinaea* sp.	276.2952768	1	2	4
66	Cyperaceae	*Scleria secans*	219.6440332	1	3	4
67	Convolvulaceae	*Ipomoea tiliacea*	284.0209944	1	3	4
68	Rubiaceae	*Coffea arabica*	398.5654591	5	4	5
69	Bromeliaceae	*Catopsis* sp.	265.7319968	1	3	2
70	Arecaceae	*Chamaedorea tepejilote*	419.300386	4	5	4
71	Liliaceae	*Anthericum eleutherandrum*	215.9589921	1	3	3
72	Rosaceae	*Pyrus comunis*	261.4080851	2	2	2
73	Commelinaceae	*Tradescantia guatemalensis*	276.8588146	1	4	4
74	Poaceae	*Panicum xalapense*	271.6789083	1	3	5
75	Fabaceae	*Erythrina berteroana*	395.2107187	4	4	3
76	Lauraceae	*Persea schiedeana*	373.3625366	3	3	4
77	Rosaceae	*Eriobotrya japonica*	271.0531412	2	3	2
78	Marantaceae	*Calathea allouia*	335.3852039	4	4	4

Appendix 3 Continued

Plant #	Plant Family	*Scientific Name*	Entropic Coefficient	Utility	Anatomical Character	Ubiquity
79	Musaceae	*Musa sapientum* var. *rubra*	272.7509961	3	4	4
80	Asteraceae	*Verbesina lanata*	322.0539811	2	3	3
81	Bromeliaceae	*Catopsis* sp.	294.0584982	3	5	4
82	Araceae	*Xanthosoma violaceum*	367.5864308	3	4	4
83	Asteraceae	*Tagetes erecta*	337.6156845	2	3	4
84	Araceae	*Xanthosoma violaceum*	281.5237027	3	3	3
85	Asteraceae	*Tithonia diversifolia*	367.5312706	2	3	5
86	Ulmaceae	*Trema micrantha*	241.9226	1	2	1
87	Rubiaceae	*Palicourea gaeottiana*	298.1035985	2	3	5
88	Anacardiaceae	*Rhus striata*	388.3759136	1	4	4
89	Iridaceae	*Tritonia crocosmiflora*	179.8224999	2	4	3
90	Scrophulariaceae	*Castilleja arvensis*	247.2831129	1	3	4
91	Euphorbiaceae	*Sida rhombifolia*	193.2564215	2	3	5
92	Melastomaceae	*Arthrostemma ciliatum*	174.4988364	2	3	3
93	Lauraceae	*Persea donnell-smithii*	286.0711815	1	3	2
94	Hamemelidaceae	*Liquidambar styraciflua*	421.5317529	4	5	5
95	Cyanthaceae	*Cyathea arborea*	276.1694058	2	5	2
96	Melastomaceae	*Miconia* sp.	224.3051915	1	1	3
97	Clusiaceae	*Vismia mexicana*	206.9042516	2	3	3
98	Fabaceae	*Dalbergia* sp.	240.8520902	1	2	2
99	Fabaceae	*Dalbergia* sp.	242.9180748	1	2	2
100	Verbenaceae	*Lippia substrigosa*	242.0790139	2	3	3
101	Myricaceae	*Myrica cerifera*	228.7583442	3	4	3
102	Apiaceae	*Daucus carota*	304.1361134	2	3	1
103	Proteaceae	*Macadamia integrifolia*	284.4013475	2	3	1
104	Solanaceae	*Lycopersicon esculentum*	381.622095	3	4	1
105	Chloranthaceae	*Hedyosmum mexicanum*	336.4774452	1	4	4
106	Aspleniaceae	*Ctenitis excelsa*	204.4662283	1	3	3
107	Poaceae	*Saccharum officinarum*	373.7574087	4	3	4
108	Fabaceae	*Mimosa invisa*	279.6564235	1	3	3
109	Cannaceae	*Canna indica*	278.5463994	2	3	2
110	Euphorbiaceae	*Ricinus comunis*	259.4580854	2	4	2
111	Casuarinaceae	*Casuarina equisetifolia*	291.5450744	1	3	1
112	Adiantaceae	*Ananthacorus angustifolius*	249.7622418	1	3	3
113	Bromeliaceae	*Tillandsia* sp.	241.5651614	1	3	3

*Higher order plant group other than family
***Unidentified, Sterile Specimen

Appendix 3: The Dependent and Independent Variables, Lowland Plant Trail

No. Plant	Family Plant	Scientific Name	Diversity Index	Utility	Anatomical Character	Ubiquity
1	Verbenaceae	*Lippia myriocephala*	143.7734515	2	3	4
2	Bixaceae	*Bixa orellana*	147.5551782	4	5	4
3	Myrtaceae	*Psidium guajava*	152.2564547	3	3	3
4	Solanaceae	*Solanum hispidum*	115.6734058	1	3	4
5	Euphorbiaceae	*Manihot esculenta*	147.5551782	4	4	4
6	Fabaceae	*Gliricidia sepium*	105.3874316	2	3	4
7	Euphorbiaceae	*Sida rhombifolia*	98.6394099	1	3	5
8	Myrsinaceae	*Parathesis donnell-smithii*	121.6541057	2	2	3
9	Lamiaceae	*Leonurus sibiricus*	125.8234765 1	1	3	3
10	Fabaceae	*Inga micheliana*	130.3929761	2	3	3
11	Fabaceae	*Inga* sp.	65.88963525	2	3	3
12	Musaceae	*Musa* X *sapientum*	81.3576366	4	4	4
13	Rubiaceae	*Coffea arabica*	146.1747411	5	4	5
14	Rosaceae	*Licania platypus*	101.6332112	1	3	2
15	Poaceae	*Digitaria* sp.	106.2301178	3	4	4
16	Anacardiaceae	*Mangifera indica*	124.4379188	3	4	3
17	Moraceae	*Cecropia obtusifolia*	106.1903972	2	5	4
18	Fabaceae	*Dialium guianense*	144.2651986	3	2	3
19	Bromeliaceae	*Ananas comosus*	152.2564547	3	4	4
20	Fabaceae	USS***	121.6541057	1	3	3
21	Asteraceae	*Vernonia deppeana*	113.2330955	2	2	2
22	USS***		85.7238323	1	4	3
23	Asteraceae	*Tithonia diversifolia*	105.8757993	2	3	5
24	Fabaceae	*Inga punctata*	86.54032121	1	3	1
25	Araceae	*Pistia stratiotes*	133.6039628	1	5	5
26	Fabaceae	*Acacia* sp.	102.7323367	1	2	3
27	Cyperaceae	*Scleria secans*	109.7884302	1	3	4
28	Araceae	*Monstera pertusa*	93.66972661	1	3	2
29	Clusiaceae	*Vismia camparaguey*	109.6956861	1	3	3
30	Piperaceae	*Piper auritum*	97.43460749	2	3	2
31	Melastomataceae	*Bellucia costaricensis*	92.12800045	1	3	4
32	Melastomataceae	*Bellucia grossulariodes*	79.5531257	1	3	4
33	Moraceae	*Castilla elastica*	114.4705615	2	2	2
34	Melastomataceae	*Muconia* sp.	121.4531751	3	3	3
35	Moraceae	*Ficus* sp.	116.7710439	1	2	2
36	Moraceae	*Ficus* sp.	116.7710439	1	2	2
37	Adiantaceae	*Adiantum wilesianum*	80.23070545	1	3	3

Appendix 3 Continued

No. Plant	Family Plant	Scientific Name	Diversity Index	Utility	Anatomical Character	Ubiquity
38	Araceae	*Monstera pertusa*	79.5062166	2	4	4
39	Asteraceae	*Elephantopus spicatus*	99.03787343	1	2	4
40	USS***		88.48567385	1	3	3
41	Bromeliaceae	*Catopsis* sp.	82.79084007	2	4	2
42	USS***		87.48309871	1	2	1
43	Cyperaceae	*Scelria purdiei*	144.2651986	1	3	4
44	Myrsinaceae	*Parathesis cubana*	84.57337705	1	2	2
45	Arecaceae	*Bactris balanoidea*	74.56020044	2	3	3
46	Araceae	*Xanthosoma robustum*	114.4630418	1	4	4
47	Pteridaceae	*Pteris* sp.	88.78719632	2	3	4
48	Piperaceae	*Piper amalago*	101.3460423	1	3	4
49	Boraginaceae	*Cordia spenesuus*	100.2331981	1	4	4
50	Bromeliaceae	*Androlepis skinneri*	87.81120584	1	4	3
51	Melastomataceae	*Miconia* sp.	85.41438599	1	2	3
52	Asteraceae	*Eupatorium odoratum*	95.57926911	1	2	4
53	Poaceae	*Guadua* sp.	64.16354282	1	4	1
54	Melastomataceae	*Mouriri parvifolia*	84.63723301	2	3	3
55	Fabaceae	*Mimosa invisa*	77.7069945	1	3	3
56	Fabaceae	*Inga leptoloba*	93.75385099	2	2	2
57	Asteraceae	*Bidens squarrosa*	82.18536951	1	3	4
58	Asteraceae	*Eupatorium barletti*	98.84690373	1	3	4
59	Asteraceae	*Neurolaena lobata*	56.32591963	3	3	3
60	Zingiberaceae	*Elettaria cardamomum*	118.3316557	5	4	5
61	Asteraceae	*Eupatorium* sp.	94.5767942	1	3	2
62	Asteraceae	*Ageratum* sp.	82.34171752	1	3	2
63	Hymenomycetes*	*Coriolus* sp.	87.88689496	1	4	4
64	Fabaceae	USS***	92.28343225	2	2	2
65	Verbenaceae	USS***	72.12071812	1	3	4
66	Zingiberaceae	*Renealmia sromatica*	79.6717616	1	3	3
67	USS***		81.54985089	1	3	2
68	Annonaceae	*Annona scleroderma*	97.03478494	1	2	2
69	Burseraceae	*Protium multiramiflorum*	86.09680435	1	2	2
70	Euphorbiaceae	*Alchornea latifolia*	70.00339678	1	2	2
71	Fabaceae	*Hymenaea courbaril*	95.80195086	2	3	4
72	Fabaceae	*Inga leptolobum*	81.30822217	2	3	3
73	Euphorbiaceae	*Euphorbia leucocephala*	96.32411302	1	3	4
74	Asteraceae	*Bidens triplinervis*	105.2633528	1	3	4
75	Musaceae	*Musa X sapientum*	106.1903972	4	4	4

Appendix 3 Continued

No. Plant	Family Plant	Scientific Name	Diversity Index	Utility	Anatomical Character	Ubiquity
76	Poaceae	*Zea mays*	135.1597707	5	5	5
77	Convolvulaceae	*Ipomea indica*	69.15156396	1	3	4
78	Poaceae	*Paspalum conjugatum*	83.68300475	3	3	5
79	Fabaceae	*Inga spuria*	88.39212362	2	3	3
80	Fabaceae	*Inga laurina*	100.6853228	2	3	3
81	Malvaceae	*Hibiscus rosa-sinensis*	105.4396776	3	4	4
82	Rutaceae	*Citrus nobilis* var. *deliciosa*	124.0284271	4	4	4
83	Fabaceae	*Pithecolobium saman*	101.3472756	2	3	2
84	Piperaceae	*Piper donnell-smithii*	118.6805864	1	3	1
85	Araceae	*Xanthosoma violaeum*	123.1920947	3	3	4
86	Fabaceae	*Inga fissicalyx*	103.0339891	2	2	4
87	Malpighiaceae	*Byrsonima crassifolia*	152.2564547	3	4	4
88	Melastomataceae	*Conostegia xalapensis*	101.6277179	1	3	2
89	Moraceae	*Artocarpus altitis*	111.3751092	3	4	4
90	Sapindaceae	*Sejania* sp.	92.08549865	1	3	2
91	Rutaceae	*Citrus sinensis*	152.2564547	4	4	4
92	Verbenaceae	*Stachytarpheta frantzii*	106.1948045	1	3	3
93	Solanaceae	*Solanum trizygum*	100.143198	1	3	3
94	Fabaceae	USS***	57.13084335	2	4	4
95	Fabaceae	*Erythrina guatemalensis*	129.9823596	2	3	2
96	Liliaceae	*Yucca elephantipes*	105.2175297	2	4	2
97	Rutaceae	*Citrus maxima*	109.4906414	3	3	2
98	Arecaceae	*Cocos nucifera*	127.4704589	3	5	3
99	Zingiberaceae	*Costus sanguineus*	99.11772014	2	3	3
100	Cannaceae	*Canna indica*	81.41981461	2	3	4
101	Amaranthaceae	*Iresine calea*	121.2825522	1	4	2
102	Burseraceae	*Bursera simaruba*	100.1190949	2	4	2

*Higher order plant group other than family
*** Unidentified, Sterile Specimen

Biography

Darron Asher Collins was born on April 6, 1970 in Morristown, New Jersey to Dolores Netty Starr and James Francis Collins. His love for wilderness and conservation brought him to the College of the Atlantic in Bar Harbor, Maine, where he earned a Bachelor of Arts in Human Ecology on June 6, 1992. After traveling through South America on a Thomas J. Watson Fellowship and working for Earth River Expeditions of Accord, New York, Collins reentered academic life at Tulane University. His ethnobotanical work among migrants to the Calakmul Biosphere Reserve in Campeche, Mexico earned him a Master of Arts from the Roger Thayer Stone Center for Latin American Studies. In September 1996 Collins transferred to the Department of Anthropology at Tulane where he continued following his interest in the human ecology of neotropical forests under the direction of William Balée. In May 2001 he began his career with the World Wildlife Fund in Washington, D.C. as the Forest Conservation Coordinator for the Latin American/Caribbean Region. His immediate family includes his wife Karen, his baby Maggie, a mountain bike named Fu, a Toyota pickup named Miss Juanita, and a whitewater kayak that has no name.