Chapter 1

Introduction

The Problem


For me this is ultimately a question of land and labor, i.e., what lands were used and how were they used, and how agricultural labor was organized and recruited. Scholars recognize that regional environmental variation produced a wide range of adaptive agricultural responses from region to region in the lowlands (Sanders 1972, 1973), but
the debate surrounding Maya subsistence runs far deeper than such inter-site variation. Central to the debate lies what I call *demographic dissonance*: the incompatibility of subsistence models and demographic estimates. More specifically, demographic estimates derived solely from settlement pattern research and household archaeology usually exceed population estimates derived from environmental and agricultural research. The two methods of estimation simply do not match up.

Throughout the history of Maya archaeology, three factors have contributed to this problem:

1. *Lack of material evidence*: The material remains of intensive agriculture are few and far between in the Maya lowlands. Present research suggests that less than 20% of the lowlands possess clear and verifiable material remains of intensive agriculture, in the form of terraces, wetland fields, or dikes. Agricultural activity leaves faint material traces unless accompanied by such constructions. This is especially true in the Maya lowlands, where poor preservation of organic and other materials is common (Jones 1994). For example, in the immediate region of Caracol, the location of my research, no pollen cores have been successfully retrieved, despite numerous attempts to do so.

2. *Ethnohistoric and ethnographic variability*: While a handful of ethnohistoric documents discuss Maya agricultural practices during the 16th and 17th centuries, the descriptions lack the quantitative and qualitative information found for Highland Mexico and Peru. When present, contact period information describes
strikingly different demographic conditions than are known archaeologically to have been present during the Classic Period (AD 250 – 800). A similar problem surrounds early 20th century or present day ethnographic descriptions. Maya populations have undergone significant transformations since the last Classic monuments were carved in the ninth and tenth centuries, including European contact, demographic decline, migration, disease, warfare, introduced crops, and more recently exposure to national and international markets.

3. Lack of quantification: A few researchers have developed complex and diachronic simulations of agricultural productivity for the Maya (Wingard 1992, 1996). The majority of estimates reported remain, however, either overly generalized (i.e., extrapolated to the entire Maya lowlands) or simply static carrying capacity figures or production representing the most ideal conditions (Turner 1978b). In part, this lack of quantification may have something to do with previously unavailable technology. Such technology is now readily available, (e.g. GIS, complex simulation engines, and trace element analysis of bone collagen) and researchers have a more refined understanding of the controversial concept, ‘carrying capacity’. Carrying capacity is now recognized as a highly historical, contextual and dynamic idea (Wood 1998).

The central issue however, still concerns contradictory models of productivity and demography.
Early researchers working in the Maya area focused nearly all of their attention on site centers, temples, palaces and carved monuments. And while scholars recognized the importance of agriculture for the abandoned “cities”, no real systematic research was focused on the greater settlement or agricultural features (Lundell 1933, 1937). Cyrus Lundell, for example wrote,

Agriculture played a leading role in the Maya civilization. Its development must have preceded the great epochs of city-building and scientific advancement, in which hieroglyphic writing, the calendar, and the arts were perfected. Without an agricultural system adequate to insure the necessary food supply, it is certain that the Maya could not have reached the heights to which they attained in two periods of their history. (Lundell 1937:65)

In a general sense, early researchers viewed Mayan civilization as ‘too complex’ to be supported by simple, slash and burn agriculture, in which fields are left fallow after cultivation. But the data reported from tropical ecologists, geographers and soil scientists working in the tropics indicated that milpa agriculture was the only method available to the Maya for long-term, sustainable production. Moreover, ethnographic observations and ethnohistoric research suggested a long history of milpa agriculture in the Maya region. For example, Roys (1943: 38) wrote:

The agricultural system of Yucatan offers a startling contrast to the architectural remains everywhere in evidence. Farming methods are, and always have been, so primitive that it is difficult at first sight to believe that they could ever have supported a civilization like that of the Yucatecan Maya. This manner of farming is generally known as the milpa system, a term derived from the Aztec word for cornfield.

As research shifted from the site centers to the settlement and outlying areas, coterminus with the advent of settlement pattern archaeology, major revisions of Classic Maya history and social organization were put forward. In a general sense, much of this
research helped to demystify the Maya (Abrams 1984). Site centers, previously believed to be vacant ceremonial places, are now viewed as densely occupied and vibrant royal centers. Project after project reported high residential densities, showing that the Maya region was densely occupied during the Late Classic (Culbert and Rice 1990). Demographic estimates for specific Maya centers rose dramatically. Researchers began to challenge the milpa perspective of Classic Maya subsistence (Harrison and Turner 1978). On the heels of these revolutionary settlement data, Maya sites were viewed not only as too complex, but also too densely occupied to be supported by milpa agriculture. Many researchers rejected all previous research into tropical ecology and repudiated the use of ethnographic analogies. They examined all possible or impossible intensification or cropping strategies available to the Maya, in an effort to increase the carrying capacity of the lowlands (Bronson 1978; Covich 1978; Culbert, et al. 1978; Fedick 1996; Hammond 1978; Hammond 1979; Harris 1978; Harrison 1978, 1979; Harrison and Turner 1978; Matheny 1978; Pohl, et al. 1996; Puleston, et al. 1982; Siemens 1978; Stavrakis 1979; Turner 1978b, c; Vlcek, et al. 1978; Willey 1978; Wiseman 1978).

Aerial photographs were scoured for any trace of intensive agriculture, such as raised fields; alternative crops, such as the Ramón nut or tubers were proposed; and alternative cropping strategies, such as house gardens and/or arboriculture were conceived (Bronson 1978; Puleston 1978; Siemens and Puleston 1972).

Initially, this revisionist approach to Maya subsistence was well received by many scholars. But as more research was carried out to investigate these possible alternatives,
surprisingly few data were retrieved to support many of the proposed alternatives. Intensive agricultural features, such as raised fields, were not as ubiquitous as thought, nor necessarily contemporary with mature Classic polities. Recent research into raised fields, for example, has produced a wide array of data suggesting a less than uniform application of such technology in the lowlands. In some cases, raised fields are argued to be fully functioning during the height of the Classic (Pyburn 1996), while in others, data illustrates that raised fields represent an early adaptation by inhabitants to the lowland bajos during the Preclassic, before the well documented population growth of the Middle-Late Classic (Pohl, et al. 1996). The material evidence in support of such alternatives dried up as research progressed, suggesting many speculative reappraisals of Maya subsistence might be premature.

Now many researchers hold a more cautious view of Maya subsistence (Fedick 1996). Scholars recognize early assertions by Sanders (1972), who believed that Maya subsistence, intensive or not, was not uniform and in fact, highly variable. Sanders and others suggested that variable patterns of subsistence would have been employed from region to region or even within different regions of sites, to adapt to the ecological diversity found in the lowlands. Interestingly though, this cautious view has not led to a full reexamination of demographic estimates, where the root of the problem may be found.
During the past 150 years, our perception of Classic Maya intensive agriculture has undergone significant transformations. Prior to 1970, archaeologists’ approaches were comparatively even handed, i.e. they attempted to identify methods and data to reconcile demographic and productivity estimates. Recent trends have given greater emphasis to demographic estimates derived solely from settlement pattern and household archaeology. Heavy reliance on a possibly fallible methodology has resulted in a great number of assumptions concerning Maya subsistence, (the primary assumption being that the Maya employed any available technique to meet the estimated subsistence requirements). Essentially, the ‘ends’ have taken precedence over the ‘means’; or better yet, our ideas of the Maya have obscured the Maya in process, (the ends being large numbers of people, with the means being just how these numbers of people were fed).

**The Research**

I designed this research project to specifically focus on the basics of Maya subsistence, *i.e.* to understand and analyze the *material* remains of intensive agriculture, and shift away from theory and model laden approaches that have recently assigned great credence to high population estimates. And while I acknowledge that our understandings of Maya state formation, production, and urbanism are intertwined with conceptions of Maya population density and production, I argue from the data presented here that a more basic approach to subsistence and demography is necessary before we address such broad patterns or theory.
The Goals

I had five specific goals for this project, centered on questions of *land* and *labor*.
1. To fully document the intensive agricultural features found within a northern portion of settlement at the site of Caracol, Belize. This research includes an evaluation of the construction, placement and distribution of the terraces in the study region as well as an understanding of the formation, composition and productive potential of the soils associated with these features (the location of Caracol is shown in figure 1.1 and the location of the research area in relation to Caracol is shown in figure 1.2).

2. To fully document the settlement and associated features within a previously unknown portion of the Caracol site, and to compare this zone with other settlement areas located closer to the site epicenter (again see figure 1.2).

3. To quantitatively estimate the effects of terracing within the Cohune Ridge Region and to evaluate the demographic implications of terracing. Here I rely on the use of computer simulation and GIS in an effort to examine this question diachronically.

4. To evaluate the social conditions of terracing at Caracol, including an understanding of how the landscape within the research area was partitioned and utilized, and how labor was organized and recruited, for agricultural production.

5. To identify how the terraces themselves relate to Maya civilization in general, and particularly to the political economy or ecology of the Caracol rulers, the urban nature of Maya settlements, and traditional conceptions of Maya staple production and trade.
Figure 1.2. Map of the Caracol settlement, illustrating the location of the Cohune Ridge Region, the location of this research. Each red dot represents residential remains.
The Data

Essentially, my research relied on three classes of data.

1. Archaeological settlement survey and excavation.
2. A broad array of environmental data, including soil chemistry.
3. Computer simulations using well documented and tested methods to model the effects of long-term agriculture on the Cohune Ridge environment and the long-term productivity of the soils.

The Setting

The Classic Maya site of Caracol, Belize (*figure 1.1*), is rich in archaeological and epigraphic history, and more important, presents the best-known example of Classic Period agricultural terracing in the Maya region. Terraces dominate the sloping landscape of the Vaca Plateau, which is situated along the western border of modern Belize. Slope, weir and valley bottom terraces, all to be described shortly, are dispersed among the many residential remains, roadways and monumental constructions. My purpose is to document, evaluate and place the terraces within Caracol’s cultural system and the context of the systemic changes documented throughout Caracol’s rich culture history.
Figure 1.3. Map illustrating modern day Belize and bordering countries, with the location of Caracol.
Location/Environment

The site of Caracol is located in the western portion of modern day Belize on the Vaca Plateau, in the foothills of the Maya Mountains (figure 1.3). The epicenter of the site lies roughly 5 km from the Guatemala/Belize border and roughly 500 m above sea level amidst the karstic sloping terrain of the region that varies in elevation from roughly 400 to 600 m above sea level. Annually, Caracol receives between 1000-2000 mm of rain, averaging 1500 mm (see figure 1.4) (Coultas, et al. 1993, 1994). Rain falls for six months and is followed by about six months of relatively dry season. There are no perennial streams, rivers, or other large permanent water sources within 15 km of the site center. The limestone that underlies this region is relatively pure calcite (Coultas, et al. 1993, 1994) and vegetation is composed of a dense, broad-leafed forest with a closed canopy; numerous palm trees also occur in the area (Coultas, et al. 1993, 1994).

Caracol…what we know?

The site of Caracol has been the center of numerous archaeological projects since it was first identified in the 1930’s (Chase and Chase 1987). Caracol is a Classic Maya center showing evidence of occupation from the Preclassic (roughly 600 BC) until the early Postclassic (roughly AD 1100) (Chase and Chase 1987; Chase and Chase 1996a; Chase and Chase 1994b). Its epicenter (shown in figure 1.5) is composed of more than 150 independent structures of significant size, centered upon the largest building, a palace
called Ca’ana (‘Sky House’), which stands more than 40 m tall (figure 1.6). Radiating outward from the epicenter as far as 12 km are causeways or roadways that vary in size and construction (Chase and Chase 2001). Figure 1.2 shows the Caracol settlement and causeways. Although the exact function of the causeways has not been determined, it is clear they are important social and economic features (Chase and Chase 1998b). Each causeway terminates with large clusters of buildings, some with clearly ritual functions, and all with clearly elite or palatial constructions. Recently, the Chases (Chase and Chase 2001) argued that the causeways terminate in administrative/economic centers that served to oversee the distribution of resources. A full review of the archaeology and culture history of Caracol is presented in Chapter 3.

History of Research at Caracol

Rosa Mai, a logger, first discovered the site in 1937 (Chase and Chase 1987). Caracol was reported to the then acting archaeological commissioner A.H. Anderson. Anderson visited the site in 1938 to document it officially, but it long remained relatively unknown to the archaeological community (Chase and Chase 1987). In 1950 Linton Satterthwaite of the University Museum of the University of Pennsylvania initiated the first substantial project at Caracol (Chase and Chase 1987). Satterthwaite carried out three seasons of work between 1950 and 1954 (Beetz and Satterthwaite 1981; Chase and Chase 1994b).
Figure 1.4. Top graph: Observed annual precipitation for a 19 year period, expressed in millimeters. Bottom graph: Monthly averages, minimums and maximums of rainfall for the Caracol region.
Figure 1.5. Map of the epicenter of Caracol. Digitized by Murtha, after (Chase and Chase 1987).
Figure 1.6. Images of Caana, the largest structure found at Caracol.
Satterthwaite expended the majority of his resources during his initial seasons on the removal of many of Caracol’s intact stela and altars (Chase and Chase 1987). He also took wood samples from the only intact lintel at the site for radiocarbon dating, then a very new method (Chase and Chase 1987). Much of the time he spent in the field was devoted to completing a map of the epicenter that recorded 78 structures (see figure 1.5 for a current epicenter map). Satterthwaite also excavated a series of tombs in the epicenter, one of which dated to the Early Classic. During his final season at Caracol Satterthwaite excavated portions of the South Acropolis, where he uncovered at least one Late Classic tomb (Chase and Chase 1987). Satterthwaite’s investigations were the last research effort at Caracol until Paul Healy, of Trent University, worked in the settlement in 1980 (Healy, et al. 1983).

Healy mapped and excavated a small area of the settlement located roughly 2 km east of the Caracol site center. He (Healy, et al. 1983) surveyed a number of house mounds and terraces in the settlement, confirming early reports of terracing in the region by Thompson (Thompson 1931) and Lundell (Lundell 1937). The excavated households and terraces were determined to be Late Classic residences and features based upon the ceramics retrieved. Even though Healy sampled only a small portion of the settlement, he was the first to suggest that Caracol was much larger than previously reported, if not one of the largest Late Classic Maya sites (Healy, et al. 1983).
The most substantial research effort carried out at the site continues today under the direction of Drs. Arlen and Diane Chase of the University of Central Florida. The current configuration of the Caracol Archaeological Project was first conceived during a series of visits to the site during 1983 and 1984 by Arlen and Diane Chase, Mary Miller, Stephen Houston, and John Morris. After initial visits, the project was formally initiated in 1985.

The first three years of the project set out to document the spatial and temporal extent of Caracol, to place Caracol within the larger culture history of the lowlands, and to establish a semi–permanent base camp for future excavations (Chase and Chase 1987). Many of the project’s efforts were geared towards reconnaissance and survey of the site. During these seasons the first seven causeways/roadways were identified. The project also reconfirmed Healy’s conclusions regarding the density of settlement and the widespread existence of agricultural terraces (Chase and Chase 1998a). By 1987 over 1000 structures had been added to the map of 78 buildings completed by Satterthwaite in 1954. Presently over 20 km$^2$ of Caracol have been surveyed. Roughly 905 plaza groups consisting of 4,400 structures have been recorded in the central 16 km$^2$ (figure 1.2).

Many of the early excavations were placed in or around the site epicenter, as Caracol had been severely looted prior to the Chases’ project. Both the B and the A plazas were excavated, along with a few groups lying just outside of the epicenter, e.g., the Northwest Group and Machete (Chase and Chase 1987). These excavations aided the initial interpretations of the site settlement chronology and documented Caracol’s importance in
the early Late Classic, as is most evident from the recovery of Altar 21, a ball court marker that records the warfare and defeat of Tikal and Naranjo by Caracol during the sixth and seventh centuries (Chase and Chase 1987; Houston 1987; Houston 1991). The first of ultimately three settlement programs was initiated during the early years of the Caracol Project. Susan Jaeger Liepens (Jaeger 1991) began a project that documented settlement extending to the southeast, extending away from the epicenter along the Conchita causeway and Romanal causeway (see figure 1.2).

The Chases (Chase and Chase 1987) established the site’s settlement history from the Preclassic through the Terminal Classic. The project also reported structure densities larger than found at many other Maya sites. Liepens (Jaeger 1991) documented no real settlement drop-off along the Conchita causeway, some 5 km long. Her settlement excavations also reconfirmed the Chases’ conclusions that Caracol flourished during the Late Classic (AD 550-850). Additionally, epicenter research documented data that clarified the culture history of the entire Maya Lowlands. Their research called into question the existence of a general ‘hiatus’ in the Middle Classic. Prior to investigations at Caracol, researchers believed that the Maya suffered a mini-collapse around AD 550, predating the large population declines of the tenth and eleventh centuries. Altar 21 shed light on this previously unknown period (Houston 1991). It was during this time that Caracol embarked on a series of successful wars with two large Maya centers, Tikal and Naranjo.
Some basic features of the Caracol settlement were established in these first seasons as well. First, a wealth of burial information was recorded. Second, researchers documented the existence of aguadas, or human made pools designed to trap and manage rainfall (remember that Caracol is located roughly 15 km from the nearest year round water source). Finally, the data recovered served to suggest that Caracol, with its causeways, dense occupation, rich textual history, and abundant burial data, would offer new and unexpected insights concerning Classic Maya settlement and society.

More recent research at Caracol has further expanded the above information base, adding rich details to the culture history of the Maya lowlands. The first of a series of population estimates was derived and fine-tuned (Chase and Chase 1987, 1994 discuss the full methodology for estimating populations at Caracol; however, numerous refined estimates do appear in later publications.). Significant contributions in understanding how the site was organized, (e.g., the interdigitation of household remains throughout the settlement with roadways and terraces), were achieved. According to the Chases, (Chase and Chase 1996a, 1998a, b; Chase and Chase 1994b) Caracol was a city encompassing over 100 km², with causeways extending more than 8 km to the northeast, over 6 km to the southwest and southeast, and at least 5 km to the northwest. Furthermore, Chase and Chase (Chase and Chase 1996a, 1998b; Chase and Chase 1994b) argue that Caracol managed an empire of roughly 12,000 km² with about 1,000,000 persons during the Late Classic (Chase and Chase 1996b).
I discuss the site history and archaeology of Caracol in more depth in Chapter three. And before I address Caracol specifically I introduce in chapter two the broad theoretical and conceptual background for my research. (Do not type text in this document beyond here).