SUBSISTENCE ECONOMY AND CHIEFDOM EMERGENCE IN THE MUISCA AREA. A STUDY OF THE VALLE DE TENA

by

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For many years the argument has been advanced that the agricultural use of different ecological zones by a single ethnic group—usually known as verticality—was an important part of the political economy of chiefdoms and states in the Andes. Such vertical economies would constitute agricultural intensification used to extract surplus and finance the enterprises of elite groups. Specifically, this has been suggested for some Muisca chiefdoms, located in the northern Andes of Colombia. Ethnohistoric accounts suggest an important economic role in the especially large Bogotá chiefdom for the provision of agricultural products derived from this kind of vertical economy in the nearby Valle de Tena region.

This research sought to document the patterns of human occupation in the Valle de Tena and their relationship with agricultural productivity. The main goal was to evaluate the possible relevance of a vertical economy in the Valle de Tena to the emergence of Muisca chiefdoms in the Sabana de Bogotá. To accomplish this goal archaeological data were collected in a systematic survey of 144.7km^2.

Several lines of evidence argue against the idea that the Valle de Tena was a major supplier of agricultural products to the Sabana de Bogotá. They also cast serious doubt on the existence of agriculture in this region organized into a vertical economy. On the contrary, archaeological evidence indicates the presence of independent, compact local communities in the Valle de Tena.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PREFACE

To do archaeology is a huge enterprise that requires the help of many, many people. Fortunately I was so lucky to meet and get help from lots of marvelous persons through my doctoral studies that concluded with the writing of this dissertation.

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1.0 INTRODUCTION

1.1 MUISCA CHIEFDOMS AND THE SOURCES OF SOCIAL POWER

In the sixteenth century, the Spanish described the Muisca groups in the Central Cordillera of Colombia as one of the most politically complex societies they had observed (Anonymous 1988 [n.d.]; Hemming 1979). Two principal hereditary chiefs (at Bogotá and Tunja), backed by religious sanctions, were the most powerful, holding sway to varying degrees over numerous, very small chiefly communities (Broadbent 1964; Correa 2004; Gamboa 2010). The chiefs seemed rich and highly respected to the Spanish (Gamboa 2010; Langebaek 1992; Tovar 1980). Raw materials, including cotton, coca, and gold were acquired from outside the Muisca area. Craft specialists produced valuable goods, including blankets and gold figurines, chiefs accumulated subsistence goods and redistributed them to commoners and important visitors. Spanish Conquest period sources describe common people providing service in chiefly compounds and cultivating lands controlled by the chiefs (Langebaek 1992). "Chief" (*cacique*) is the word most commonly used for Muisca leaders, although Reichel-Dolmatoff (1986) argued that Muisca societies were "pristine states." Following the more common usage, Langebaek (1991) nonetheless proposed a core-periphery system in which Muisca chiefdoms developed at the expense of foothill societies that provided raw materials for Muisca craft production. Chiefs financed their activities through a tributary system (Broadbent 1964; Tovar 1980) said to direct

agricultural surplus upward through secondary leaders, or *capitanes* (Langebaek 1992:102–103). Agricultural production was enhanced by the exploitation of the highly productive, warmer zones lying quite near the Muisca area but at lower elevations (Langebaek 1987b, 1987c, 1992; Lléras and Langebaek 1987).

This vision of Muisca social, political, and economic organization is founded on sixteenth-century historical sources. Archaeological research has thus far supported some parts of it. For example, the archaeological site of El Venado probably represents a second-tier center in the Tunja chiefdom in the northern Muisca area (Boada 2007, 2009). One of the spatially demarcated *barrios* within the settlement yielded especially high proportions of imported ceramics, more desirable meat cuts, serving vessels, and spindle whorls. This has been interpreted as a chiefly compound where standards of living were higher and craft activities and possibly feasting were concentrated. Comparison of household artifact assemblages in the Bogotá chiefdom in the southern Muisca area showed increasingly restricted distribution of decorated ceramics through time, which were spatially associated with such evidence of craft production as spindle whorls (Kruschek 2003). Raised fields are an indication of agricultural intensification near the powerful Bogotá chiefdom (Boada 2006; Broadbent 1964).

This archaeological evidence of at least some degree of both wealth and power in the hands of elites must, however, be balanced against other findings that fail to show the patterns ethnohistoric accounts would lead us to expect. Excavations in Tunja, said to be the seat of one of the most powerful Muisca chiefs, did not reveal differentiated elite compounds, special structures, or particular abundance of elaborate or non-local artifacts (Pradilla et al. 1992). Henderson and Ostler (2003) have argued that settlement organization at Suta in the northern Muisca area shows little household interdependence and no tendency for residences to cluster

near a chiefly compound. Burials with lavish offerings, found in many regions of Colombia and taken as an indicator of wealth, have not been found in the Muisca area—not even in identified chiefly compounds (Boada 1998, 2000). Muisca leaders and their kin were interred in shallow pits with perhaps two or three ceramic vessels and a small gold figurine or two. Regional settlement analysis in the northern part of the Muisca area shows concentrations of population indicating small chiefly centers, but no regional settlement hierarchy appears, and the centers are not located near particularly productive agricultural resources (Langebaek 1995b, 2001).

Whatever the nature of the developmental peak of Muisca chiefdoms, it was reached, along with the highest regional demographic levels, in the last few centuries before the Spanish Conquest. Sedentary settlement, agricultural production, and the use of ceramics date to sometime before 400 B.C. and initiate the Herrera period. Population levels were extremely low; the Muisca area's inhabitants lived in very small settlements widely dispersed across the region. There is no evidence of social differentiation or other common characteristics of early complex society during the entirety of this long period. Dramatic changes took place quite rapidly at the beginning of the Early Muisca period, *circa* 800 A.D. Population growth was extraordinary all across the Muisca territory. Curiously, new settlement showed a proclivity for occupying less productive land (Boada 2006; Langebaek 1995b, 2001). Concentrations of settlement, like those that indicate separate Muisca chiefdoms later on, first appear in Early Muisca times, although none has very many inhabitants. Only one, El Infiernito in the northern part of the Muisca area, has evidence of monument construction in the form of an arrangement of columnar stones (Langebaek 2001). Scholars working in the Muisca area all agree that the beginning of social differentiation, although weak, can be dated to this transition as well (Boada 2006, 2007; Langebaek 2001, 2008). All of the trends initiated in Early Muisca times are seen in intensified

form during the last prehispanic period, Late Muisca (1200–1550 A.D.). Population growth continued strong; population concentrations grew and multiplied; and the locations of these population concentrations can confidently be identified with the specific Muisca chiefdoms documented in sixteenth-century written accounts.

The trajectory of change in the Muisca area is thus unusual for northern South America and in some ways paradoxical. The first relatively weak indications of complex social organization come after an extremely long period of sedentary agricultural occupation at very low population levels. The ensuing rapid, regional-scale demographic growth contrasts sharply with the preceding long period of relative stasis. Despite their short history, Muisca chiefs are depicted by sixteenth-century observers as especially rich and powerful, although these characteristics have at best uneven and ambiguous backing in the archaeological record. Given the intensity of archaeological fieldwork in the Muisca area and the conspicuousness of some commonly encountered indicators of the rich and powerful, the contrast between ethnohistoric and archaeological impressions is not likely the result of just archaeological sampling. As a consequence, however, an unequivocal assessment cannot be provided of how Muisca chiefs accumulated their wealth and power or even of the extent to which the accumulation of wealth and of control over important resources was involved in the emergence of Muisca chiefs and their exercise of political power. This classic theoretical issue has, of course, received considerable attention in the literature on early complex societies and continues to be debated.

We have by now grown accustomed to the observation that there is considerable diversity in the set of societies that mid-twentieth-century cultural evolutionary approaches (i.e. Fried 1967; Service 1962) treated as relatively homogeneous under some label such as "chiefdom." This very diversity has been argued to provide an opportunity to seek patterns which could

enlighten us about the dynamics of such societies (Drennan and Peterson 2006). Earle (1997), following Mann (1986), has proposed that such variation depends on the particular mix of sources of social power manipulated by aspiring leaders. In Thy (Denmark), for example, Earle sees elite power strategies as having their central base in the realm of ideology, whereas in Wanka (Peru) military affairs were a much more important area for elite activity. In Hawaii, Earle sees the particular success of elites in expanding their power as attributable to solid control over subsistence production.

Numerous scholars have applied such a perspective, implicitly or explicitly, to the study of chiefdom trajectories in many parts of the world, including northern South America and Central America. Power in Zuni chiefdoms (Potter 2000), as well as those in Panama (Helms 1991) and the Alto Magdalena of Colombia (Drennan 1995), has been argued to have its most important basis in religion and ideology. Military power has been seen by some as central to chiefdoms in the Cauca Valley of Colombia (Carneiro 1991), in central Arizona (Solometo 2006), and New Zealand (Allen 2006). Kirch (2006) agrees with Earle that control over agricultural land improved by terracing was vital to the power of Hawaiian chiefs. Spencer (1993) has argued along similar lines about the raised fields of the Barinas region in Venezuela and the irrigation systems of the Tehuacán Valley in Mexico. For Gilman (2001) the increased productivity of irrigated land created chiefly power in southeastern Spain. Craft production, prestige goods, and trade are sometimes seen as essential elements of power at Moundville (Knight 2010) and in Philippine chiefdoms (Junker 1999).

Economic power has been placed in a privileged position by a number of scholars, who regard control of the production and/or distribution of goods as the basis of power with the greatest developmental potential from the point of view of aspiring elites (Earle 1997; Hayden

and Villeneuve 2010; Stanish 1992). This view is entirely consistent with the classic cultural evolutionary literature in which early non-egalitarian societies were based largely in systems of belief, whereas later, larger-scale, more hierarchical societies with stronger power in the hands of rulers were founded on economic inequality (e.g. Fried 1967; Service 1962). As several trajectories of chiefdom development in northern South America and Central America have become better known through recent archaeological research, it has come as something of a surprise that indications of the importance of ideology to chiefly power seem so much more abundant than evidence of much economic role for chiefs. This is true of both relatively small scale chiefdoms and those for which there is convincing archaeological evidence of elites integrating fairly large-scale polities. The regions for which this has been argued include Quijos in Ecuador (Cuéllar 2009), the Alto Magdalena in southern Colombia (Drennan 2000), and central Panama (Helms 1991). In a broad overview of the issue, Gnecco (2005) concludes that power in all prehispanic societies in Colombia, except the Muisca and Tairona, had a primarily symbolic basis.

Contradictory arguments have been made for the Muisca. Ideological bases of power have been placed in a central position by some archaeological studies of Muisca chiefdoms (Henderson and Ostler 2005; Langebaek 1995b, 2000). In contrast, Boada (2006) suggests a relationship between chiefly centers and raised field complexes for intensive agricultural production. She also finds evidence that specialized craft production is associated with elite residential areas at El Venado (Boada 2007). It remains a possibility, then, that emerging Muisca chiefs had succeeded in establishing control over the production and/or distribution of important goods in ways that chiefs in other regions of northern South America had not (at least not in archaeologically well-documented regions). If they had, then the very rapid development of

powerful chiefs (fitting the Spanish descriptions of the Muisca) would make sense in terms of models according special developmental potential to power based on such economic control. One specific possibility for this kind of economic control suggested by sixteenth-century documentary sources on the Muisca has not thus far been investigated archaeologically.

1.2 VERTICAL ECONOMY AND THE ANDEAN CHIEFDOMS

The vertically stacked environmental diversity of the Andes has encouraged the complementary exploitation of different ecological zones only short distances apart. As an Inka imperial strategy, this consisted of re-settling entire communities as agricultural colonies in varied environments. The vertical archipelago model described by Murra (1972) for the Inka has been modified and extended to Andean chiefdom societies in northern Peru, Ecuador, and Colombia (Hastorf 1993; Landázuri 1995; Langebaek and Piazzini 2003; Oberem 1981; Salomon 1986). This kind of vertical economy, documented almost entirely from ethnohistoric and ethnographic sources, has been characterized as a quintessentially Andean pattern (Brush 1977; Mayer 2004; Murra 1972; Van Buren 1996). Although vertical economies may have operated in different ways, they have been posed as a common way in which Andean societies exploited the environmental possibilities of closely spaced zones at different elevations in order to extend the range of available food products, to reduce subsistence risk, and to increase food production. It has been argued that increasing food production in this way was intimately connected to the mobilization of surplus by elites. Even more, some scholars have stated that some kinds of vertical economies, like the vertical archipielago, should be understood only in political terms, not as ecological adaptations (Van Buren 1996). Stanish (1992:2) argues that the success of political units "was

due in large part to their ability to maintain access to these distinct productive zones." Landázuri (1995) makes the control of production in different elevation zones the principal factor in social differentiation for the Pasto of northern Ecuador. Reichel-Dolmatoff (1977) makes a vertical economy an essential feature of northern Andean chiefdoms generally. Hastorf (1993) and Langebaek and Piazzini (2003) attribute less of a causal role to vertical economies, although they do see such systems in operation among chiefdoms of central Peru and southern Colombia, respectively. Archaeological research on vertical economies in earlier periods has not been abundant, but at least some studies have not found evidence of them where they had been expected, as in the Quijos region of northern Ecuador (Cuéllar 2009) or the Formative period in the Alto Magdalena of southern Colombia (Quattrin 2001).

In the Alto Magdalena and the Quijos region no ethnohistoric suggestion of vertical economy appears to exist, so the idea that it might depends on the notion of vertical economies as a general Andean tendency. Specifically for Muisca communities, in contrast, sixteenth-century documentary sources speak of control over varied environmental zones at differing elevations (Langebaek 1987b, 1987c, 1992, 1996). Lléras and Langebaek (1987) attribute the special wealth and power of Muisca chiefs that so impressed early Spanish chroniclers to the organized exploitation of the resources of different elevation zones. Two important effects of cultivation in nearby temperate zones stand out for the Muisca. One was to increase subsistence production so as to help sustain the high population densities that developed so rapidly late in the Muisca sequence. The second was to buffer the subsistence risks arising from flooding and frost in the wet, cold, high-elevation Muisca heartland. Risk reduction in particular is discussed specifically in the ethnohistoric sources (Archivo General de la Nación, Bogotá [AGN], Caciques e Indios,1597, Tomo 55, legajo 713r; Simón 1627). Both of these rationales for

integrating nearby more temperate regions into the subsistence economy of the Muisca heartland would be particularly strong in light of the remarkable population growth that took place in tandem with the emergence of social hierarchy from Early Muisca times on (Boada 2006; Langebaek 1995b, 2001).

Given the broadness of the Altiplano in which the Muisca heartland is situated, communities at the margins would have much better access to lower-elevation zones on the mountain slopes. For Langebaek (1996) this puts such communities in a favorable economic position from which they could barter subsistence products from the Altiplano and adjacent temperate regions for craft products which communities more vulnerable to risks from floods and frosts would specialize in producing. The exchange of food and craft products was apparently organized by chiefs and took place in chiefly compounds. Integration of the agricultural production of the nearby temperate zones thus played a pivotal role in the Muisca economy. The emergence of leaders with considerable involvement in the exchange and distribution of both subsistence and craft goods could be attributed to the successful exploitation of this economic opportunity (cf. Lléras and Langebaek 1987). Since no such economic opportunity has been identified for other regions in Colombia where elites seem less involved in economic affairs, this dynamic would help us to understand an apparent difference in the way chiefly power emerged and operated in the Muisca region. The Bogotá chiefdom is especially favorably located in this regard, just at the western edge of the Sabana de Bogotá, where elevation drops down rapidly to the more temperate Tena region below. This could account for the preeminent position the Bogotá chiefdom occupied as one of the largest and most powerful of Muisca polities.

1.2.1 Muisca Vertical Economy in the Tena Region

The Tena region lies only about 15km from the location of the sixteenth-century Bogotá chiefly center in Funza (Figure 1.1). Despite their proximity, the environmental characteristics of the Tena region and the Sabana de Bogotá make a sharp contrast. Funza, at 2550 masl, is cold, flat, and highly vulnerable to frosts and floods. The Tena region can be divided into three different climatic zones: cold (1500–2200 masl), temperate (1200–1500 masl), and warm (700–1200). Climate is less variable from year to year than in the Sabana de Bogotá—thus more predictable and less subject to risk. Not only does the Tena region provide for more reliable subsistence production than the Sabana de Bogotá, it is more productive as well. At its lower elevations, warmer temperatures mean more vigorous plant growth and higher yields per ha. In the warm zone and the lower part of the temperate zone two harvests of maize are possible each year. These different subsistence possibilities for the Sabana de Bogotá and the Tena region were well recognized in the sixteenth century (AGN, C&I, 1597, Tomo 55, legajo 713v).

Langebaek (1987b, 1995a) cites documentary evidence that the subsistence economy of the Bogotá chiefdom did include maize cultivation in the Tena region specifically. There are contradictory accounts of just how this economy functioned. Some sixteenth-century documents describe the Tena region as belonging to the Bogotá chief, but others suggest it belonged to the commoners who actually cultivated it (AGN, C&I, 1597, Tomo 55, legajo 713 r; AGN, Visitas Cundinamarca, 1638, Tomo 62, legajo 240r; Langebaek 1987b; Simón 1627). Tena is noted both as a provider of agricultural products impossible to produce in the Sabana de Bogotá and for providing maize when floods or frost made it difficult to sustain populations in the Sabana de Bogotá on local production (Langebaek 1987b; Simón 1981 [1627]). Some documents make explicit reference to the role that cultivation in Tena played in stimulating exchange and making

possible the chiefly mobilization of surplus through tribute collection (AGN, VC, 1638, Tomo 62, legajo 238v). According to some accounts Muisca chiefdoms were expanding farther into these warmer zones during the sixteenth century, displacing Panche groups by means of warfare (Fernández 1688). European accounts consistently described such Panche groups as totally different than Muiscas. They had a different phenotype, language and customs, but most importantly they were barbarians, if compared to Muiscas, and had a lower level of socio-political organization (Aguado 1582; de Castellanos 1601; Fernández 1688; Simón 1627; Zamora 1701). Some of the most productive lower parts of the Tena region may have been in contention when the Spanish arrived (Falchetti and Plazas 1973). Sixteenth-century documents, of course, do not provide information about the time depth of such dynamics or their possible importance in the processes by which Muisca chiefs emerged.

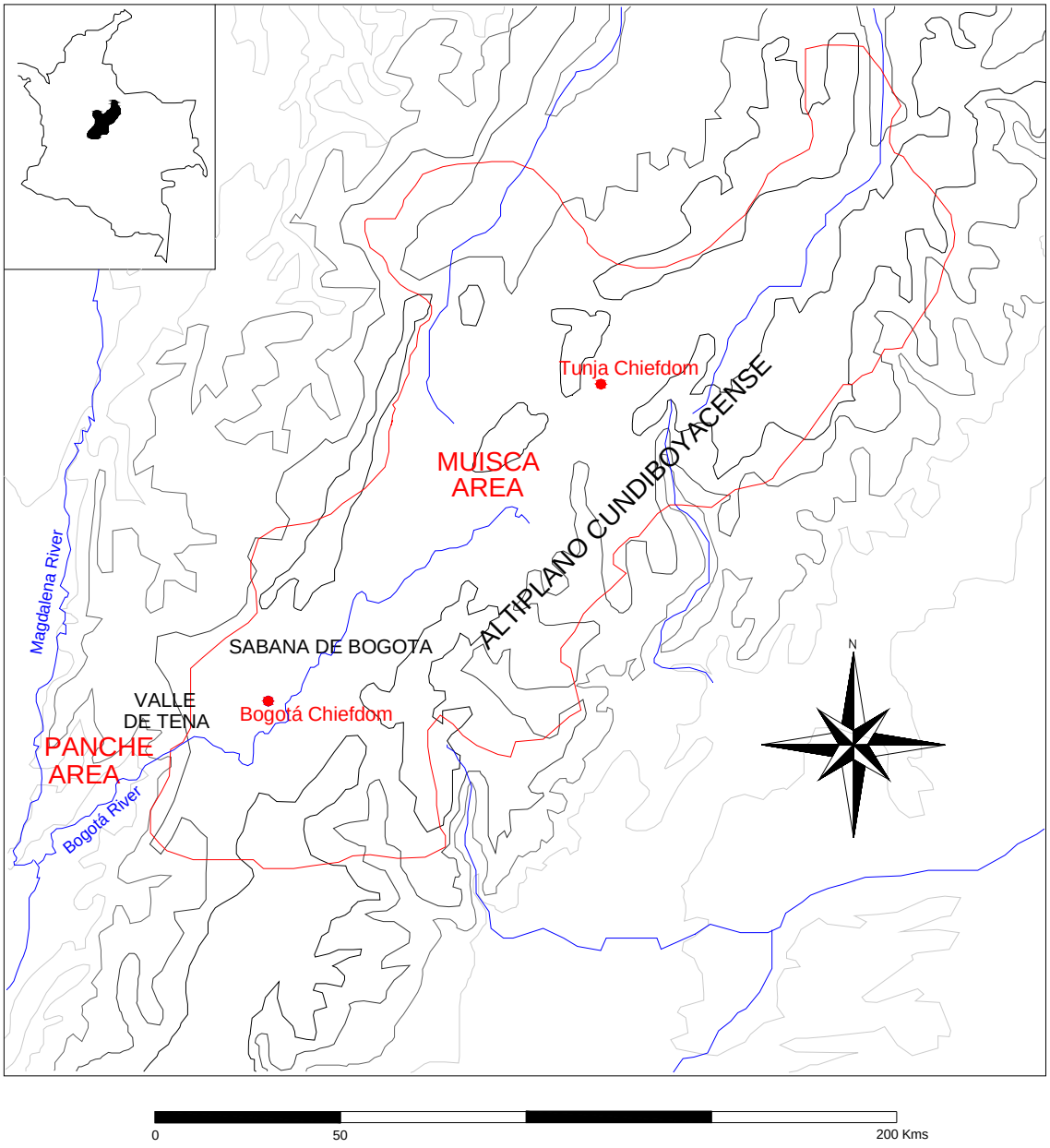


Figure 1.1 Location of the Muisca area and the Valle de Tena.
Based on Falchetti and Plazas (1973)

Archaeological information about the Tena region has been scarce and fragmentary. Evidence exists of Herrera period occupation both in the higher and lower altitudes (Argüello and Rodríguez 2009; Martínez 2011; Rodríguez 2004), but the extent and nature of human occupation during the Early and Late Muisca periods have been unclear. Small-scale

stratigraphic excavations in the highest altitudes, adjacent to the Sabana de Bogotá have yielded Muisca ceramic types after the Herrera occupation. However, in the lowest altitudes, below 1000 masl, Herrera ceramic types are replaced by non-Muisca ceramic types that some scholars have associated with the Panche (Rodríguez 2004). This archaeological research in the Tena region has been especially enlightening in several ways. Since archaeological evidence had, in some instances, not corroborated sixteenth-century accounts of Muisca socioeconomic organization, one wondered whether to place cultivation of temperate and warm zones in Tena in a vitally important economic role on the strength of these accounts alone. Providing (or failing to provide) corroboration of this aspect of the early Spanish accounts would enable us to put the Muisca into comparative perspective with societies in other regions of Colombia where the economic roles of elites seem only weakly developed. Documenting the time depth of any such economic dynamic as may have existed is essential for assessing its developmental role.

1.3 RESEARCH QUESTIONS

The principal goals of the research described here was to document patterns of human occupation and agricultural production in the Tena region, how they change through time, and the possible relationship they may have to the emergence and development of Muisca chiefdoms in the Altiplano. Specifically, this research aimed to answer the following questions:

1. Do changes in the intensity and patterning of occupation in the Tena region suggest the intensification of agricultural production?

2. Do changes in the intensity and patterning of occupation in the Tena region, together with the nature of ceramics, suggest Muisca encroachment into Panche territory (or any other changes in the relationship between the two regions)?

3. If either of these processes are suggested, do they begin in the Early Muisca period and progressively increase into Late Muisca times?

1.4 METHODOLOGY

A systematic complete-coverage archaeological survey of 144.7km^2 combined with small-scale stratigraphic testing was carried out in the Tena region. The survey area, located in the municipalities of San Antonio del Tequendama, El Colegio, La Mesa and Tena, covered a wide range of climatic and soil conditions available along the Bogotá River as it descends toward the Magdalena. The Sabana de Bogotá is delimited along its western edge by a steep, rocky, uncultivable mountain range. The Tena region, and the surveyed area, begin at the foot of this range where deeper soils and gentler slopes at about 2200 masl permit cultivation. The survey area extends westward along the rapidly descending valley of the Bogotá River and includes a patchwork of steeper and gentler slopes and a variety of soils. Down to approximately 1000 masl, maize and other crops are limited to one harvest per year, but the absence of frost and generally warmer temperatures below this elevation make two crops of maize per year possible. The survey area ends at about 750 masl, at a horizontal distance of only 15km from its eastern edge, and only 26km from the chiefly center of the Bogotá polity in Funza. The survey included

locations specifically mentioned in sixteenth-century accounts as temperate zones that provided food to the Muisca in the Sabana de Bogotá (such as Cusio and the Valle de Tena).

The survey was carried out following the methodology used in the Valle de la Plata (Drennan 1985, 2000) and successfully implemented in other regions of northern South America where conditions for archaeological survey are similar to those in Tena (e.g. Boada 2006; Cuéllar 2009; Langebaek 1995b, 2001; Langebaek et al. 2002; Langebaek and Piazzini 2003). Preliminary field visits made before the systematic survey confirmed the suitability of this methodology for the Tena region. Garden plots and larger plowed fields provided good surface visibility, and ceramics of different periods were readily available for collection. The same was true in the fruit orchards that are especially common in the warm zone, where sherds are readily visible on the ground between the trees. As has been the case in other parts of Colombia where regional survey has been successfully carried out, the principal obstacle to surface collection is grass, primarily in land used as pasture. Even in these areas, patches of clearer ground surface do occur, and soils are rarely more than 40–60 cm deep above the subsoil, making them easily tested by shovel probes.

After completion of the survey, a few sites were selected for stratigraphic testing with the aim of confirming (or correcting) the suspected chronological relationships between the ceramic types that occur in the Tena region. As of then, ceramic chronologies existed for both the Sabána de Bogotá and the middle Bogotá River valley. These have worked well for the ceramic assemblages from archaeological excavations in the Tena region (Argüello and Rodríguez 2013; Martínez 2012; Rodríguez 2004). Ceramics readily recognizable as Herrera (the earliest in the sequence) occur across a wide area from the Sabana de Bogotá to the middle Bogotá River valley. In the Sabana de Bogotá and the upper elevations of the Tena region, Herrera ceramics

are followed by Early Muisca ceramics, whereas in the middle Bogotá River valley Herrera ceramics are followed by Early Pubenza ceramics, which appear to be related to the ethnic group called Panche in sixteenth-century documents (Martínez 2011; Rodríguez 2004). Up to now it has been assumed that Early Pubenza ceramics are contemporaneous with Early Muisca ceramics, and follow Herrera ceramics, as Early Muisca ceramics do in the Sabana de Bogotá. Not a single pottery sherd belonging to the Pubenza types was found during the systematic survey, and Muisca potery sherds were consistently found throughout. Therefore, the stratigraphic excavations were conducted to confirm the ceramic sequence and to improve the chronological span of the archaeological periods.

1.5 ANSWERING THE RESEARCH QUESTIONS

The first research question enumerated above concerns the intensification of agricultural production in the Tena region in order to help sustain high population densities in the Sabana de Bogotá. The notion of agricultural intensification conjures visions of large-scale infrastructure works, such as raised field complexes, terracing, and irrigation or drainage (Boada 2006; Earle 1978, 1997; Erickson 2006; Gilman 2001; Hastorf 1993; Stanish 2006). No evidence of such landscape modification has thus far been identified in the Tena region. This is perhaps because these approaches do not seem practical there. The survey was alert to signs of any such technology but none of them were found. It is more probable, however, that increasing agricultural production in the Tena region would have taken the form of working the most productive parts of the landscape more intensively (especially those where two crops can be

harvested each year). This might not even have involved much change in the species planted and harvested. The most archaeologically conspicuous indication of this kind of agricultural intensification is likely to come in the form of shifts in the number of inhabitants and in their distribution throughout the region. As labor investment in especially productive patches of land is increased, it becomes increasingly desirable for farm families to live very close to those patches where they are spending larger and larger amounts of time. This has frequently been observed both ethnographically and archaeologically (cf. Drennan 1988; Drennan and Haller 2007; Hastorf and Earle 1985; Stone 1993). If the aim was to produce surplus in the Tena region so as to transfer it to the Sabana de Bogotá, then population increases in the Tena region would have needed to be sufficient enough to provide the necessary labor for cultivation, but not so great as to increase local subsistence needs to the point that they interfered with the provision of a surplus.

The regional survey provided the data necessary to make population estimates in the Tena region by well-established methods that have been successful in similar research elsewhere (Drennan and Boada 2006; Drennan and Peterson 2011; Kowalewski et al. 1989; Sanders, Parsons, and Santley 1979). These estimates were the basis of comparing any population increases in the Tena region to existing regional settlement evidence of the Muisca population buildup at higher elevations (Boada 2006; Langebaek 1995b, 2001). GIS analysis of survey results focused on the relationship between the distribution of agricultural productivity and the distribution of human occupation and how this relationship changed through time (cf. Drennan et al. 2006; Kennett et al. 2009; Jones 2010; Varien et al. 2000). Nicolas (1989) provides a particularly relevant example of how to use regional settlement data to reconstruct patterns of provisioning large concentrated populations from nearby zones, taking both labor requirements

and productive resources into account, although such an analysis could not be carried out for the Sabana de Bogotá and other adjacent zones due to a lack of settlement evidence from these regions.

Analytical results of the data from the Tena survey could indicate a variety of trajectories of change. It is possible that population levels were relatively low throughout the prehispanic past—perhaps so low as to suggest a labor supply that would not have been sufficient enough to produce much food for transferal to the Sabana de Bogotá. It is also possible that populations grew enough to provide sufficient labor for substantial increases in cultivation, but not enough to have consumed all of the potential surplus. It is this last possibility that would be consistent with the notion that the Muisca economy depended on taking advantage of agricultural production in the Tena region.

The second research question above concerns changing relationships between the Tena region and the Muisca region. If the Tena region did produce agricultural surplus for transferal to the Sabana de Bogotá, there are various possible ways in which this might have been organized. We are accustomed to thinking of empires that establish colonies and administrative centers with the purpose of shipping agricultural surplus off to the imperial heartland. For South America, the Inka empire is the prototypical example. No reasonable reconstruction of Muisca sociopolitical organization, however, is consistent with such an imperial administrative strategy. Such a pattern is not, then, what should be expected in the Tena region. Sixteenth-century documents specifically suggest that ethnically Muisca farmers whose "home" was the Sabana de Bogotá went for varying periods to cultivate land at lower elevations in the Tena region, in order to produce foodstuffs for the populations back home in the Sabana. It is also possible that non-Muisca populations in the Tena region produced surplus foodstuffs that eventually fed Muisca

populations in the Sabana de Bogotá, whether given to Muisca chiefs as tribute, traded to Muisca residents in the Tena region or in the Sabana in exchange for craft products, or exchanged in some other way.

The research discussed here does not pretend to be able to distinguish between all of the potential possibilities. It does, however, take initial steps toward specifying in more detail the nature of the relationship between the Tena and Muisca regions. It is fortunate in this regard that Muisca ceramics are well known and clearly associated with ethnically Muisca groups as of the sixteenth century (Broadbent 1986; Langebaek 1995b; Ome 2006). Both Early and Late Muisca ceramics have been excavated from sites in the uppermost (eastern) part of the Tena region. Non-Muisca (Pubenza) ceramics are documented from farther west. Not much more was previously known, though, of the distributional patterns of ceramics in the Tena region or of how those patterns may have changed through time.

The Tena survey has provided just such information. One idealize pattern against which this information will be compared below is that, at the beginning of the Muisca period, Muisca ceramics only occurred at the uppermost fringes of the Tena region, but became increasingly common farther west, replacing non-Muisca ceramics entirely, even in the more productive lower elevations, by the time of the Spanish conquest. This would suggest a progressive encroachment on the region by Muisca populations at the expense of non-Muisca groups that had previously occupied it, which is consistent with a direct exploitation of the region by the Muisca in order to sustain large populations of the Sabana de Bogotá. If, on the other hand, Muisca ceramics appeared progressively farther and farther west in the Tena region, but in a distribution intermingled with contemporaneous non-Muisca ceramics, then exchange between the two groups seems more likely (perhaps combined with direct exploitation of the region's agricultural

resources by Muisca people living there full- or part-time). Part-time residence by Muisca cultivators would likely result in a pattern of low-density occupations with all or mostly Muisca ceramics in a very dispersed pattern closely associated with patches of the most productive land.

Part-time residence in the Tena region by Muisca from settlements in the Sabana de Bogotá would probably also result in especially strong similarities between the Muisca ceramics of the Tena region and the Muisca ceramics of the Sabana de Bogotá

The third research question concerns the timing of the kinds of changes the first two questions focus on. If the settlement data suggest that agriculture was intensified in the Tena region in order to sustain populations in the Sabana de Bogotá, then knowing just when this happened helps clarify the importance of this process to Muisca social dynamics. If the Tena region shows clear signs of agricultural intensification in Early Muisca times, then the process could have played a major role in the initial emergence of Muisca social hierarchy and political centralization (Boada 2006, 2007; Langebaek 1995b, 2001). If not, then non-economic bases of power would seem even more central in this early stage of increasing social complexity.

If the Tena region shows clear signs of agricultural intensification but not until Late Muisca times, then this economic avenue for political development had little importance in the initial emergence of Muisca chiefdoms, but may have subsequently become vital to chiefly competition for power. This would be especially interesting as it would suggest that, after emerging from a largely religious base, Muisca chiefs might have moved strongly, and relatively quickly, into an active economic role (Langebaek 1995b)—something that established elites in other regions of northern South America did not do, even after a much longer period of time. If this were the case then it could explain why the Muisca seemed so impressive to the Spanish in terms of their heightened development, given the greater developmental potential that a number

of scholars have afforded forms of social power founded on economic control. It would also be consistent with the notion that the Bogotá chiefdom owed its preeminent position among Muisca polities in part to the economics of its favored geographical position, as Langebaek (1996) suggested.

Another possibility is that a vertical-economy involving the Tena region and the Sabana de Bogotá played an important role in both the initial development and subsequent augmentation of Muisca sociopolitical power, which would be indicated by the emergence of such an economy during the Ealry Muisa period and by its intensification during Late Muisca times. Alternatively, it could turn out that agricultural intensification in Tena did not correspond chronologically to the Muisca trajectory at all, suggesting a more local and autonomous process within the Tena region. Such a possibility would argue against economic explanations for the development of Muisca chiefdoms.

2.0 GEOGRAPHICAL BACKGROUND AND SYSTEMATIC SURVEY IN THE VALLE DE TENA

The Valle de Tena is located in the western slopes of the Cordillera Oriental in central Colombia, just 20km away from Bogotá. The area in which the regional survey was carried out includes parts of the municipalities of San Antonio del Tequendama, Tena, El Colegio, and La Mesa (Figure 2.1). The geomorphology of this zone is predominantly characterized by very sloped mountains, cut transversely by the Bogotá River. The eastern boundary of the survey is delimited by a very steep mountain whose inclination reaches 90 degrees. In some portions this "wall" is so steep that no soil is attached to the bedrock. This wall divides the mountainous Valle de Tena region from the flat Sabana de Bogotá. In addition to the Bogotá River, there are other small water courses that cut through the mountains. These waterways were probably used as communication paths between the Sabana de Bogotá and the Valle de Tena during prehispanic times. Nowadays it is possible to reach the Valle de Tena in about one hour by walking from Soacha, located on the western side of Bogotá, to San Antonio del Tequendama, using the pathways alongside these small waterways.

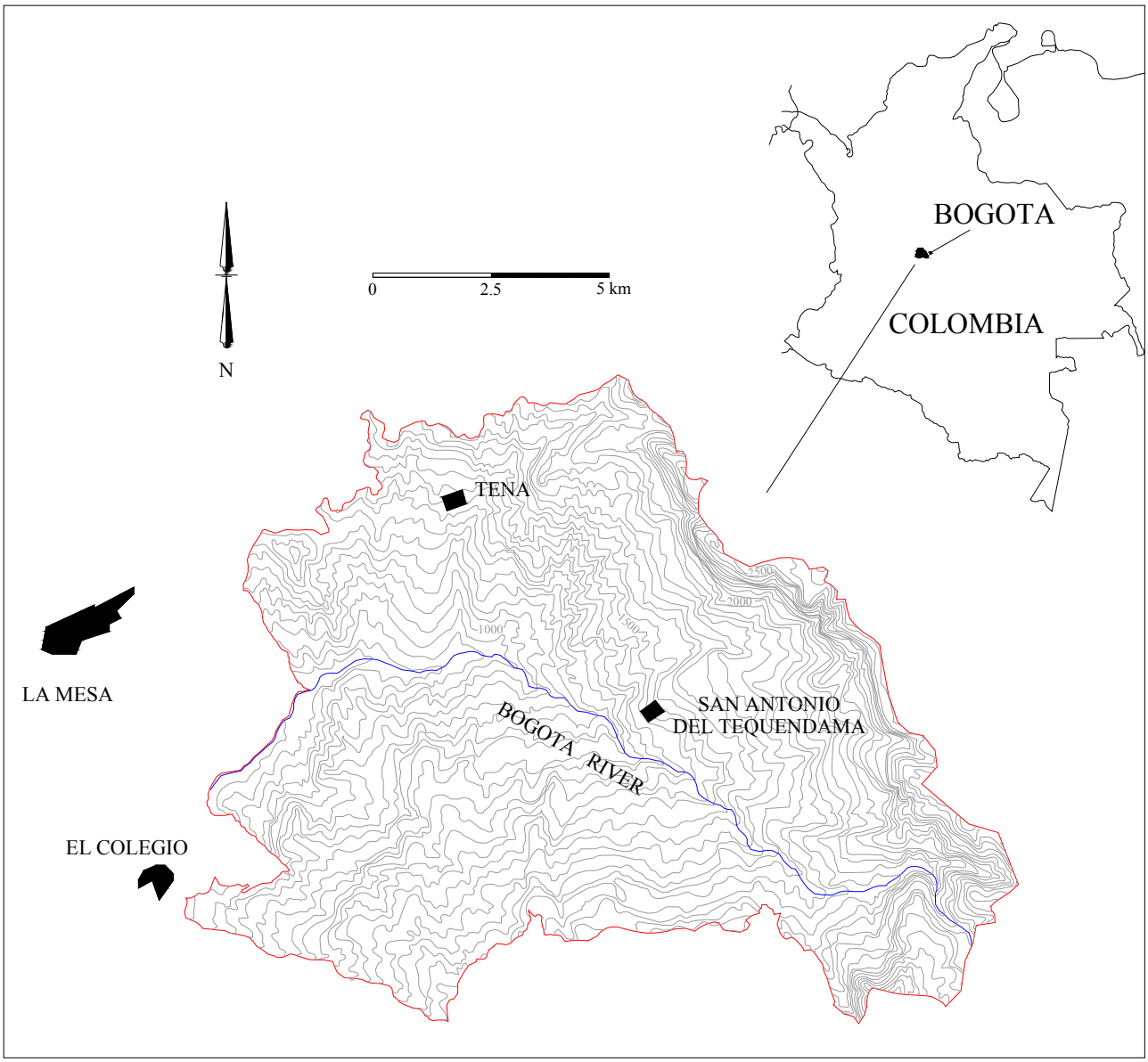


Figure 2.1 Study area

From the bottom of the mountain wall toward the west the mountains are less steep, with inclinations ranging from 10 to 30%. On the top of some of these mountains and along some of their slopes it is possible to find small flat areas suitable for setting households. Very few portions of the surveyed area are level or even rolling lands with inclinations less than 10% (Figure 2.2).

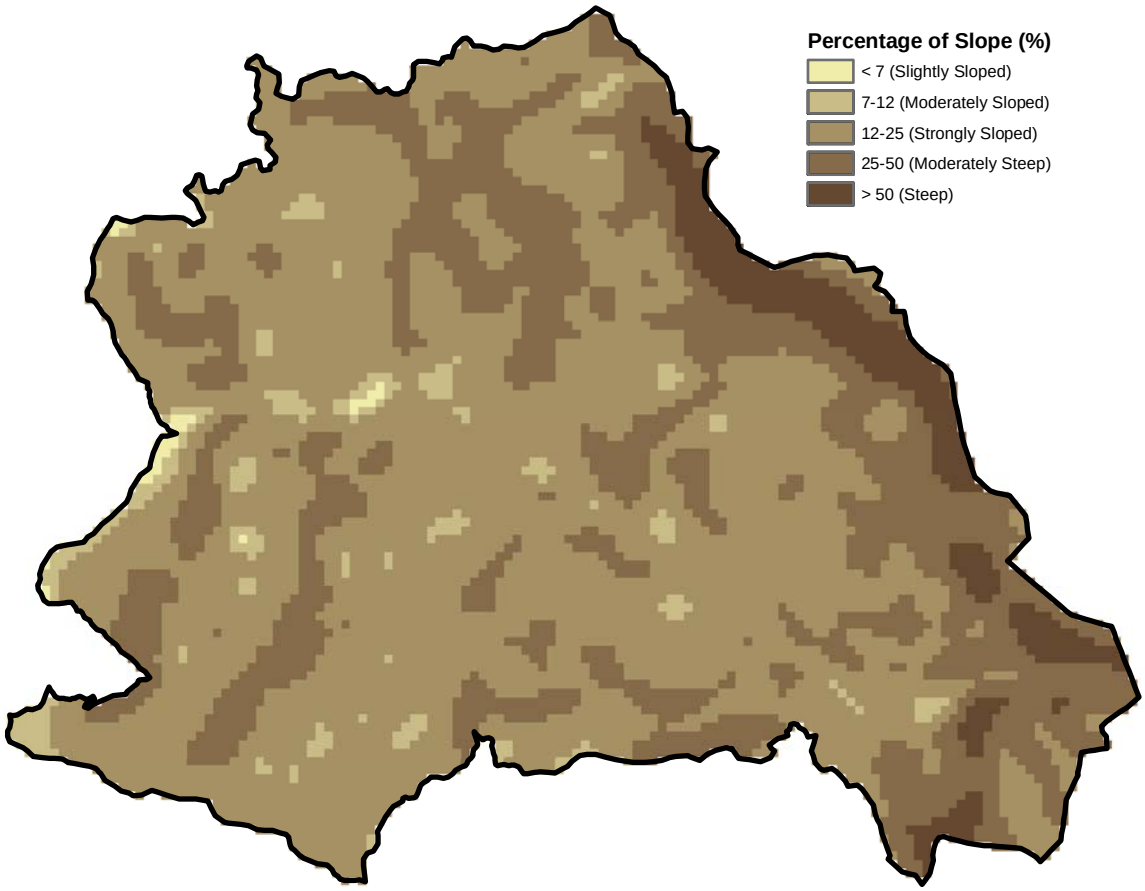


Figure 2.2 Slopes in the surveyed area

The Bogotá River runs from east to west along the central axis of the survey zone. The northern part of the survey zone was delimited by the modern road which links Bogotá with La Mesa, while the southern boundary was delimited by that which connects Bogotá with El Colegio (and the detour that connects this road with La Victoria). The western boundary of the survey, on the northern side of the Bogotá River, was delimited by the Quebrada Negra, whereas on the southern side it was delimited by the Quebrada Santa Marta.

As was mentioned in Chapter 1, the regional survey covered a wide altitudinal range. In the eastern portion, the survey reaches 2600 masl, whereas in the southern part it reaches only 750 masl. This difference of 1850m encompasses important climatic variability. In the eastern

zone the climate is cold, whereas in the west it is much more temperate, even hot along the Bogotá River Basin. Due to the slope of the mountains such variability occurs across a really short distance; only 15 km separate the highest point in the survey zone from the lowest.

2.1 AGRICULTURAL PRODUCTIVITY OF THE VALLE DE TENA

Soil productivity is based on a combination of different variables like climate, nutrient availability, slope, water availability, and effective depth. In the Valle de Tena the main sources of variation in soil productivity are slope, soil acidity, and climate. The characterization of soils in the Valle de Tena is based largely on the soil study carried out in 2000 by the Instituto Geográfico Agustín Codazzi (IGAC), the maps of which are at a scale 1:100,000. Slope data (Figure 2.2) was used to complement this information, as was data obtained from previous IGAC soil studies (1970, 1985).

Within the survey zone soils can be divided up into three productivity categories (Figure 2.3). The first category of soil productivity (I) is composed of two soilscapes; the first of these soilscapes is composed of hills developed from clayey-silt clastic rocks and deposits of volcanic ash (Typic Melanudands), whereas the second is developed from colluvial glacis (Typic Eutrudeps). These zones include slopes ranging from 12 to 25%, altitudes ranging from 1000 to 2000 masl, and a temperate, humid climate (18 - 24 °C) in which annual precipitation ranges from 1000 to 2000 mm (Figure 2.4). These soils are deep and well-drained. They are only slightly acidic and contain high contents of nutrients. Because they occur in only slightly sloping

areas and have low acidity these soils are the most fertile and are the best for agriculture in the entire survey zone.

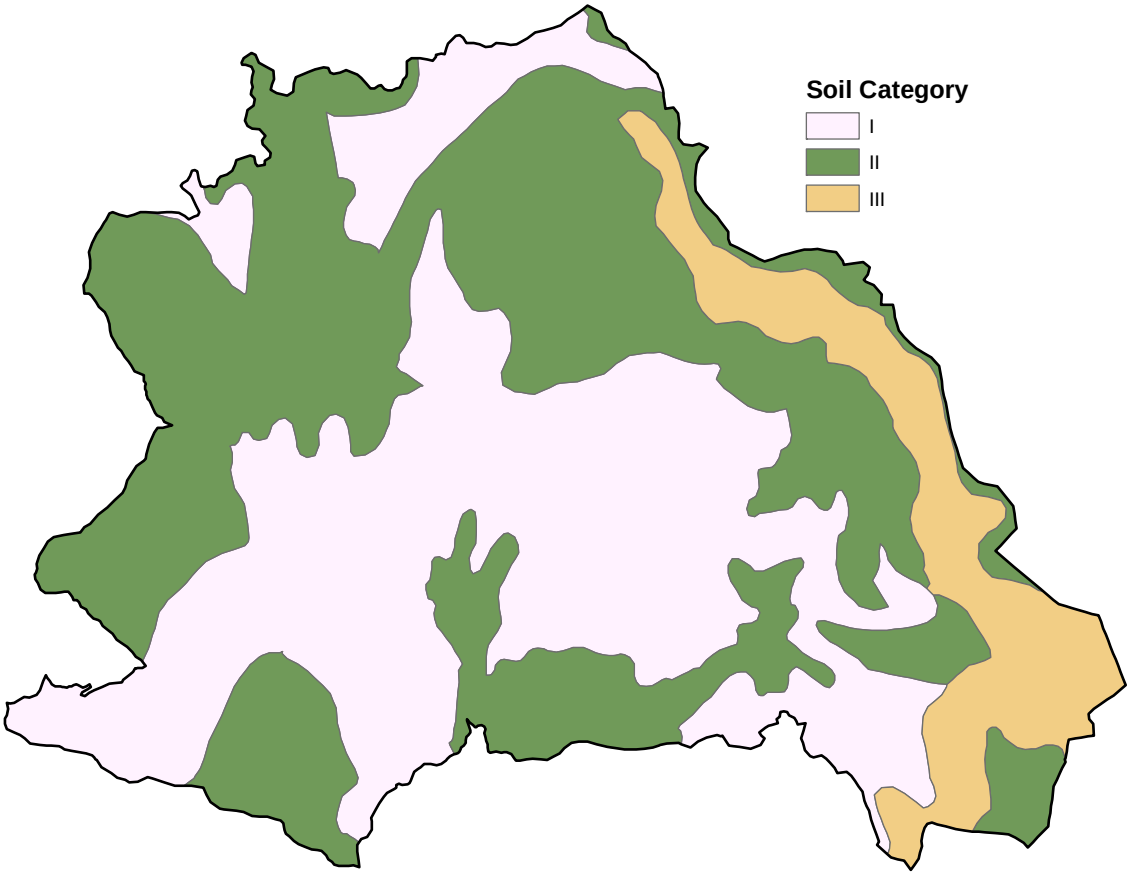


Figure 2.3 Soil categories

Figure 2.4 Slightly sloped areas (Soil Category I)

The second category of soil productivity (II) is composed of three soilscapes. The first soilscape is composed of outcrops with slopes between 25 and 50%; it occurs in altitudes either over 2000 masl (Andic Dystrudepts, Humic Lithic Eutrudepts and Typic Placudands) or between 1000 and 2000 masl (Typic Udorthents) (Figure 2.5). The second soilscape is composed of colluvial glacis with slopes between 12 and 25% and altitudes over 2000 masl (Andic Dystrudepts and Typic Hapludands). The third soilscape is composed of mountains with slopes between 25 and 50% and altitudes between 1000 and 2000 masl (Typic Udorthents).

Soils located in altitudes below 2000 masl are in a temperate and humid climate (18-24°C), where annual precipitation ranges from 1000 to 2000 mm. Soils located above 2000 masl, on the other hand, are in a cold and humid to very humid climate (12-18°C), where annual precipitation ranges from 2000 to 4000 mm. All of these soils are developed from clayey-silt clastic rocks and deposits of volcanic ash, except for the colluvial glacis which are developed

from clastic deposits. All of them provide good drainage and exhibit a range of depths, with some sectors exhibiting exposed rock on the surface. They range from moderately acidic to strongly acidic with medium to high nutrient contents. The acidity, the rocky surfaces, and the degree of slope are the main limitations for agriculture in these zones. Their fertility is moderate overall.

Figure 2.5 Outcrops (Soil Category II)

As mentioned previously, the landscape of the eastern side of the Valle de Tena is dominated by strongly sloped mountains that run from the south-west to the north-east. These escarpments have inclinations above 50%, and in some place can even reach 90% (Figure 2.6). These mountains are located above 2000 masl in a cold and very humid climate (12–18 °C), where annual precipitation ranges between 2000 and 4000 mm. The bedrock of the soil is composed by clayey-silt clastic rocks and deposits of volcanic ash. These soils are classified as Typic Eutrudepts in the middle and upper parts of the mountains and as Typic Hapludands in the

lower parts. They are poorly developed, well to moderately drained, and moderately deep to deep. Although the chemical composition of the Typic Eutrudepts soils (which are moderately to highly acidic with high base saturation and medium to high nutrient content) makes them technically fertile, the degree of slope make them practically uncultivable. This is reinforced by their high susceptibility to erosion and mass removal. The Typic Hapludands soils, on the other hand, have low nutrient content which makes them relatively infertile. Combined these conditions make this zone the least productive area in the entire survey zone (Category III), and in some portions of it agriculture is simply impossible.

Figure 2.6 Escarped mountains (Soil Category III)

As mentioned in the introduction of this study, one of the agricultural advantages of the Valle de Tena, when compared to the Sabana de Bogotá, is the possibility of yielding two maize harvests per year. This advantage was well recognized in ethnohistoric accounts (AGN, C&I, 1597, Tomo 55, legajo 713v; AGN, Visitas Cundinamarca, 1638, Tomo 55, legajo 238v), and it

was the basis for the Langebaek's (1987b) argument about microvertical management in Muisca agriculture.

The vegetative cycle of maize is very sensitive to temperature variation (Ellis et al. 1992; Ospina and Duarte 2012). Although maize has a wide range of adaptation, optimal temperatures for growing range from 20 to 22°C. Temperatures higher than 30°C or less than 10°C inhibits the growing process (Lafitte 2001). Experiments carried out with tropical highland maize obtained significant differences in maize growing rates at different temperatures. Maize cultivated in temperatures between 8 and 16°C took twice as long to grow when compared with maize cultivated in temperatures between 14 and 22°C (Ellis et al. 1992).

In the Andes temperature variation depends mostly on variation in altitude. It is estimated that temperatures increase or decrease by 1 degree for every 100 meters of altitude, so there is a strong correlation between temperature, altitude, and maize growing rates. At sea level the maize life cycle takes around 120 days, whereas at 2600 masl it takes approximately 300 days (Ospina and Duarte 2012). According to these authors the vegetative cycle of maize significantly increases in altitudes over 2000 masl and below 18°C, which is consistent with the findings of Ellis et al. (1992). In temperate climates, around 20°C, the maize life cycle lasts between 110 and 140 days (FAO n.d.), which means in a bimodal climate regime there is the possibility for two harvests a year. According to these data it is thus possible to assume that in cold climates, ranging from 12 to 18°C, it is possible to obtain one maize harvest per year, whereas in temperate climates, ranging from 18 to 24°C, it is possible to obtain two each year. Taken together, these estimates indicate that the threshold dividing those zones capable of sustaining one and two maize harvests per year is situated between approximately 1800 and 2000 masl.

One of the questions that this discussion raises is how much has the temperature changed during the last 3000 years, the span of time for which human occupation has been documented in this study. Paleoclimate studies have demonstrated that once around the time of the Holocene Hypsithermal (*circa* 6000 to 4000 B.P) there was a general shift towards drier conditions, with only minor temperature fluctuations (Vélez et al. 2006). As outlined by Van der Hammen (1992) and Marchant et al. (2001) the Holocene climate then was rather similar to that of today, and the maximum variation is not greater than 1°C (although it is important to note that human intervention during the last part of the Holocene makes paleoclimatic reconstruction somewhat uncertain). As mentioned previously, temperatures in the Andes change about 1°C for every 100 meters of elevation, which means that 3000 years ago the threshold between one and two maize harvests per year was 100 meters below that of today. In other words, in order to account for climatic variation over the last 3000 years it is necessary to assume a range between 1700 and 2000 masl as the threshold dividing those zones able to yield one and two maize harvests per year.

Based on these previous estimates it is thus possible to delineate one zone in which it is possible to yield one maize harvest per year and another in which it is possible to yield two maize harvests per year. Since it is not possible to divide these two areas with a single line it is better to draw a "belt" that indicates the transition zone between them, which accounts for the climate variation during the last 3000 years. This results in a situation in which it is possible to delineate one area in which it would have been possible to yield one maize harvest per year, a second are in which it would have been possible to yield two maize harvests per year, as well as one transitional zone in which either of these two options could have been possible depending on local climate conditions or historical variations in temperature (Figure 2.7).

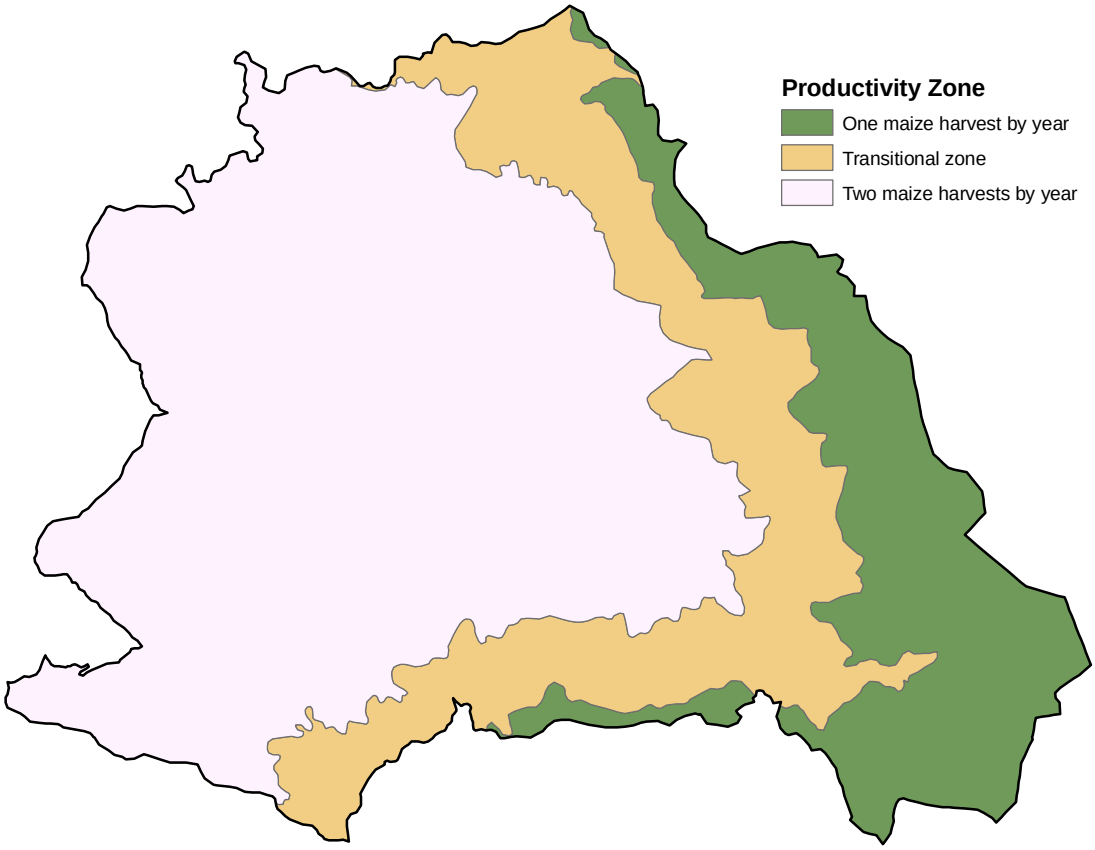


Figure 2.7 Maize productivity zones

Although the main objective of distinguishing between these zones is to provide a basis for estimating maize productivity, it is also useful for evaluating the validity of another statement that comes from the ethnohistoric accounts: that the Tena region was used to provide foods that, because of the climate, were uncultivable in the Sabana de Bogotá. The area in which it is possible to yield one maize harvest per year is thus also the area in which it is possible to yield the same kind of cultigens as in the Sabana de Bogotá; the area in which it is possible to yield two maize harvests per year, thus, is the area in which it would have been viable to cultivate crops that were different than those in the Sabana de Bogotá. Based on ethnohistoric accounts, Langebaek (1987b) provides an extensive list of temperate- and warm-climate products that the Muisca usually consumed but that were impossible to cultivate in the Sabana de Bogotá. Some of

them made up part of the Muisca diet, such as sweet manioc (or yuca; *Manihot esculenta*), chili (or ají; *Capsicum annuum*), arracacha (*Arracacia xanthorrhiza*), pumpkin (or auyama; *Cucurbita máxima*), and pineapple (or piña; *Ananas comosus*). Others, such as coca (or hayo; *Erythroxylum coca*) were an important part of daily and ritual activities, while still others, such as cotton (or algodón; *Gossypium barbadense*) were used to produce cloth. It is important to underscore that some of these cultivars need temperatures above the average temperature of even the lower elevations within the survey zone (around 24°C), such as pineapple, cotton and coca, which usually need temperatures higher than 25°C to grow appropriately. This means that if Muisca people were cultivating such products they probably would have needed to go even beyond the western limit of the survey zone to do so.

2.2 FIELD SURVEY METHODS

Although there are similarities in the rationale underlying most systematic survey methodologies, it is necessary to underscore that there is not one systematic survey that is identical to another. Even in areas with geographic similarities survey methodologies need to be adjusted according to different factors, mostly environmental particularities. This is precisely the case with systematic surveys carried out in the northern Andes. Once a field methodology was established (Drennan 1985), subsequent variations were adopted according to the particularities of the specific regions in which it was to be implemented (e.g. Boada 2006; Cuéllar 2009; Langebaek 1995b, 2001; Langebaek, Cuéllar and Dever 1998; Langebaek and Piazzini 2003). In this sense, the systematic survey of the Valle de Tena was not an exception, since particular features of its

geomorphology made the systematic inspection of the landscape a rather different task when compared with some other systematic surveys in nearby regions.

The Valle de Tena project systematically surveyed an area of 144.7km² (Figure 2.8). The field methodology for the Valle de Tena project is an outgrowth of that which was developed for the Valle de la Plata (Drennan 1985, 2006). It consisted of the systematic inspection of the entire area by walking across it at similar intervals, looking for evidence of prehispanic occupation. As was mentioned in the first section of this chapter, the Valle de Tena is composed mainly of sloping mountains with very little in the way of extensive flat areas. This rugged geomorphology influenced the way in which systematic survey was carried out. Guided by aerial photographs printed at a scale of 1:10.000, survey teams composed of three archaeologists each inspected the landscape looking for flat surfaces, most often on the tops of mountains. Once the survey team reached the tops of the mountains they were able to identify extensive areas in which the grade of the slope made it virtually impossible for human habitation to exist. From there it was also possible to search for other flat areas capable of sustaining human occupation and to establish a route to any such area. Survey teams, then, did not often follow strict transects but rather progressed on the basis of topography. An important concern in systematic regional surveys is the intensity of coverage, which usually ranges between 50 and 100m. For the Valle de Tena an interval of 100m was initially projected, but since flat surfaces on the tops of mountains are generally narrower than 100m survey intervals were not often this wide. Additionally, flat areas were usually separated from each other by much more than 100m.

The environmental conditions of the Tena region, especially in the lower areas, allow for the year-round growth of vegetation. Some such vegetation includes fruit and coffee trees, while others are trees that provide shade to cultivars. These trees are very leafy and just one of them is

able to cover a substantial amount of space. The presence of areas covered by trees was especially challenging for survey teams. In the aerial photographs these areas look like a homogeneous patch of vegetation, preventing the visibility of roads, modern houses, or any other feature with which the archaeologists would have been able to locate their position on the aerial photographs. In some cases survey teams invested large amounts of time trying to figure out where they were amidst these large patches of trees, having only their GPS units to guide them.

Once survey teams reached a flat area they started to look for evidence of prehispanic occupation. When the surface was not totally covered by vegetation, either because it was plowed or because there were exposed patches of soil, the surface was inspected for artifacts. In those instances in which flat areas were covered by grass or other forms of vegetation a small 40 x 40 cm shovel probe was excavated. As documented in other systematic surveys carried out in mountain environments the soil depth was typically shallow, enabling the recovery of cultural artifacts in a shovel probe no deeper than 50 cm. A total of 115 artifact collections were made, 76 of which (66%) were surface collections while 39 (34%) were made using shovel probes.

As in most regional surveys pottery sherds were the type of artifact most commonly collected. Except for in the Cubsio area (Figure 2.8) the average number of pottery sherds recovered from a single collection was usually small, typically not exceeding five sherds. When a member of the survey team encountered a sherd he or she informed the other archaeologists and together they made an effort to find additional artifacts. In some cases, after a very careful inspection, they were able to recover two or three more sherds, while in others they were unable to encounter additional artifacts and were forced to leave the site with only the single sherd.

When artifacts were found, either by means of surface collections or shovel probes, the shape of the flat area was drawn directly onto the aerial photograph. As mentioned previously,

most of the time these flat surfaces consisted of small and isolated areas no larger than 1ha on the tops of mountains. Each collection of artifacts was called a lot and associated with a specific area. For the few cases in which flat areas with prehispanic occupation did exceed 1ha, the area was divided into two or more collection lots. Two or more spatially contiguous collections lots of less than 1ha each were grouped into a site.

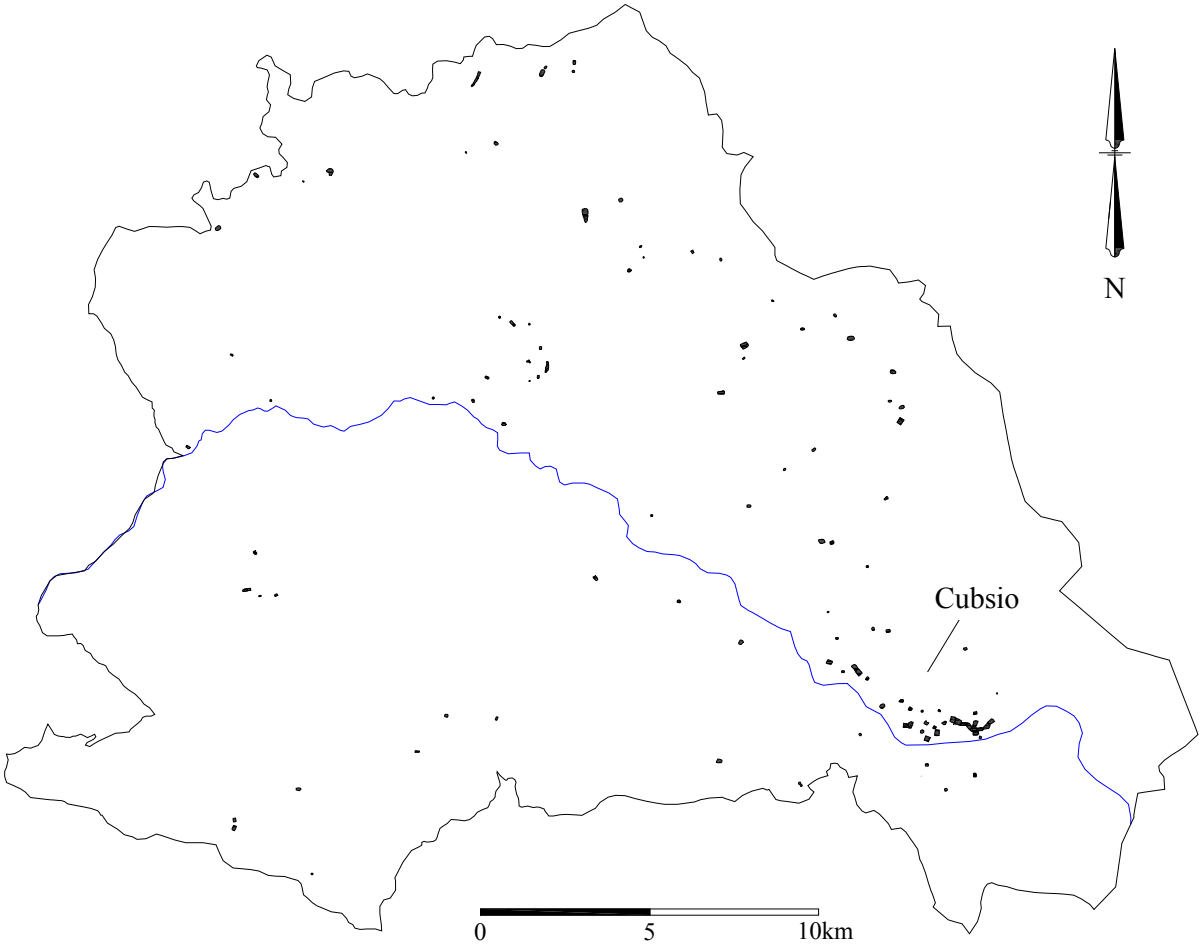


Figure 2.8 Survey lots

3.0 THE CHRONOLOGY FOR THE TENA REGION

Since one of the goals of the Valle de Tena archaeological project was to document temporal changes in patterns of human occupation, it was necessary to provide an appropriate way of dating the archaeological materials collected during systematic survey. As has been emphasized by many archaeologists who have carried out systematic surveys, such field methodologies do not allow for the recovery of information about the temporal occupation of every single site. It is thus necessary to have a chronological scheme that can be applied to the archaeological materials recovered in each site. This chronological scheme is usually developed on the basis of ceramics recovered from stratigraphic excavations or on the basis of a previously established typology. For this project a general typological scheme based on ceramic types was already available (Figure 3.1) (Argüello 2004; Boada 2006; Peña 1991), and previous archaeological excavations in the survey zone (Martínez 2011) and other nearby areas (Argüello and Rodríguez 2013) had already confirmed the presence of these ceramic types within the study area.

Peña (1991)				Langebaek (1995)		Kruschek (2003)		Romano (2003a)		Boada (2006)	
Altiplano		Vertiente		Altiplano		Sabana de Bogota		Sabana de Bogota		Sabana de Bogota	
PERIOD	**CERAMIC TYPES**	**PERIOD**	**CERAMIC TYPES**	**PERIOD**	**CERAMIC TYPES**	**PERIOD**	**CERAMIC TYPES**	**PERIOD**	**CERAMIC TYPES**	**PERIOD**	**CERAMIC TYPES**
Herrera (800 b.C.-130 a.C.)	MCR,MIR, ZRC,ZST	Herrera (10 b.C.-)	SRS, MIR, MCR, ZST	Herrera (800 b.C.-800 a.C.)	MCR	Herrera (800 b.C.-800 a.C.)	MCR, MIR, ZST	Early Herrera (900 b.C.-0)	MIR,MCR, ZST	Herrera (300 b.C.-200 a.C)	MCR,MIR, ZRC,ZST
								Late Herrera (0-700 a.C)	FFQ		
Early Muisca (130 a.C.-)	TFQ,CGT	Early Pubenza (830 a.C.-	PRS	Early Muisca (800 a.C.-1200 a.C.)	Sandy	Early Muisca (800 a.C.-1200 a.C.)	TA, FFQ, FAQ	Early Muisca (700 a.C.-1100 a.C.)	TL	Early Muisca (200 a.C.-100 a.C)	FQ, TL, AQ
		Late Pubenza (800 a.C.-	PP	Late Muisca (1200 a.C-1600 a.C)	GST, GGT, PO,VTG	Late Muisca (1200 a.C.-1600 a.C)	GST, GGT, HL	Late Muisca (1100 a.C.-1600 a.C.)	GT	Late Muisca (1000 a.C.-1600 a.C)	GGT,GST

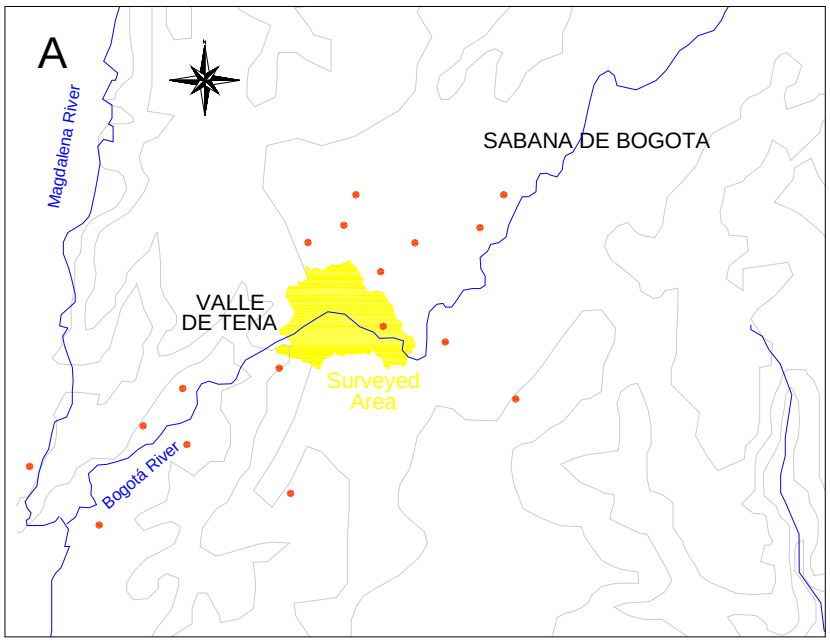
MCR- Mosquera Crushed Rock, MIR-Mosquera Incised Red, ZRC-Zipaquira Red on Cream, ZST-Zipaquira Sherd temper, TFQ-Tunjuelito Fine Quartz, CGT-Cachipay Gray Temper, SRS-Salcedo River Sand, PRS Pubenza Red Slip, PP-Pubenza Policrome, GST-Guatavita Sherd Temper, GGT-Guatavita Gray Temper, PO-Polished Orange, VDG-Valle de Tenza Gray, TS-Tunjuelito Sandy FFQ-Funza Fine Quartz, FAQ-Funza Abundant Quartz, HL-Hard Laminar, TL-Tunjuelito Laminar, GT-Gray Temper, FQ-Fine Quartz, AQ-Abundant Quartz

Figure 3.1 Chronological frameworks for the Vertiente and the Sabana de Bogotá

Ceramic sherds were both the main kind of archaeological material collected in the systematic survey and the only kind of artifacts that could be reliably dated. Therefore, this chapter discusses the chronological framework for the prehispanic occupation of the Tena region based on the ceramic typologies. Based on ethnohistoric sources some scholars have previously suggested the possibility of Panche occupation in the Tena region (Arango1974; Avellaneda 1988; Rodríguez 2004). Spanish accounts emphasized the strong linguistic, cultural, and political differences between Panches and Muiscas (Castellanos 1601; Aguado 1568; Fernández de Piedrahita 1688; Simón 1627; Zamora 1701). It is actually said that these groups were engaged in fierce warfare with one another at the time of European arrival in the Muisca territory, and that the area in which the survey was carried out was part of the Muisca-Panche frontier.

Although it is not possible to assign an archaeological assemblage to a specific ethnohistoric group, as was common during the cultural-historical period of archaeology, there are two ceramic types (Pubenza Red Slip and Pubenza Polychrome) that occur in the middle and lower portions of the Bogotá River Valley (Argüello 2004; Avellaneda 1988; Cardale 1976; López and Mendoza 1994; Peña 1991) that are different from those commonly found in the Muisca area during the later part of the prehispanic period. Both absolute and relative dating

place these ceramic types in the same time frame as those commonly attributed to the Muiscas (Cardale 1976; López and Mendoza 1994; Peña 1991; Salas and Tapias 2002). Following Flannery and Marcus (2012), it is possible to assert that when two regions display strong similarities in their artifact assemblages, it suggests that people from these two regions were actively involved with one another. Conversely, dissimilarity in artifact assemblages suggests limited levels of interregional interaction. The second scenario is that which accords best with the differences in pottery between the Altiplano Cundiboyacense and the middle and lower portions of the Bogotá River Valley. However, it is necessary to underscore that such dissimilarity is a late phenomenon. The two most popular ceramic types, Crushed Rock and Incised Red, both of which belong to the first ceramic period (Herrera), are commonly found across a huge territory spanning from the Magdalena Valley to the northern Altiplano Cundiboyacense (Figure 3.2).



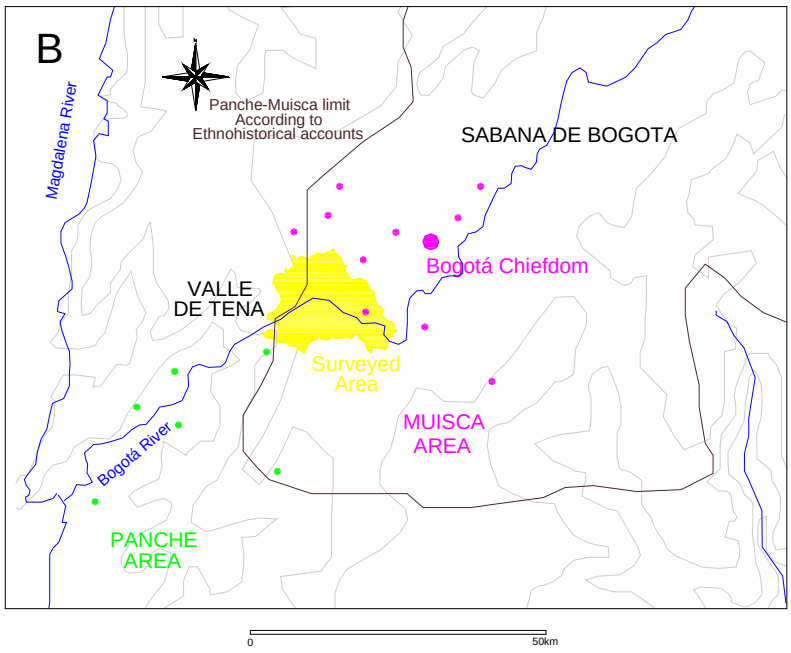


Figure 3.2 A. Zones in which Herrera ceramic types (in orange) have been found. B. Zones in which Panche ceramics (in green) and Muisca ceramics (in magenta) have been found.

All but 44 sherds (3.9%) collected during the systematic survey were classified according to preexisting ceramic typologies. These 44 sherds were unclassified mainly because they were eroded. The rest of the sherds were all assigned on the basis of the Altiplano Cundiboyacense ceramic typologies, though the Herrera types, as mentioned above, were actually part of a macro-regional phenomenon. No pottery sherd collected in the systematic survey resembled the Pubenza Red Slip or Pubenza Polychrome ceramic types, nor were there any sherds suggested the possibility of new ceramic types in the Tena region. This means, following Flannery and Marcus (2012), that people living in Tena were related to those living in the Altiplano Cundiboyacense, but not to those living in the middle and lower parts of the Bogotá River Valley. Considering this assertion within the context of the sixteenth century accounts suggests that people in Tena were related to the Muisca, not to the Panche.

Before going on to the analysis of the Altiplano Cundiboyacense ceramic types it is necessary to say some words about Rodríguez's (2004) claim of finding Panche ceramic types in the area contiguous to that of the Valle de Tena survey zone. According to Rodríguez, a large proportion of sherds collected in both his survey and stratigraphic excavations belong to the Pubenza Red Slip ceramic type. The main problem associated with the Pubenza Red Slip ceramic type is that it is technologically similar to the Incised Red type (Cardale 1976). The variety of tones in the red slip, the firing atmosphere, thickness, texture, and degree of polishing are all similar in these two ceramic types. The main differences between these two types are the forms and decoration (Cardale 1976; Peña 1991), though even some of these features are quite similar as well. The reason for all these similarities was suggested by Cardale (1976). According to her these two ceramic types belong to the same "tradition", and Red Incised is the antecedent of the Pubenza Red Slip type. Since there was nothing like a "catastrophic" change from Herrera to Early Pubenza, it is thus understandable that the division between these two types would not be clear at all. Therefore, in the absence of diagnostic sherds, especially decorated ones, it is difficult to differentiate between them.

Unfortunately, the sample collected by Rodríguez does not contain many diagnostic sherds. This means that the large amount of sherds collected can actually be classified as either Red Incised or Pubenza Red Slip. The two stratigraphic excavations carried out by Rodriguez (2004) do not help much to support his claim of the presence of Pubenza Red Slip in El Colegio. Both of these excavations were really shallow, reaching a depth of only 30 cm, and the amount of sherds recovered was small (n=29 and n=19). In the first stratigraphic excavation Pubenza Red Slip is present in the upper level (n=11), but it is associated with Incised Red (n=8) and Salcedo River Sand (n=1), which belong to the Herrera period. In the second stratigraphic

excavation the quantities of Pubenza Red Slip and Red Incised are the same in the upper level (n=5). Given the presence of Herrera sherds (Salcedo River Sand) in both stratigraphic excavations it would be possible to assign the red slip sherds (either classified as Pubenza Red Slip or Incised Red) as belonging to the Herrera period. The same could be done with the sherds collected in Rodriguez's survey. Of all the collection in which Pubenza Red Slip was identified 60% of them also yielded Herrera ceramic types that were different from Incised Red (whether it be Mosquera Crushed Rock, Salcedo River Sand, or Zipaquirá Sherd Temper) and 42% of the collections with Pubenza Red Slip yielded this type along with Red Incised and other Herrera ceramic types.

These issues raise concerns about the assignation of red sherds to either Incised Red or Pubenza Red Slip and the chronological implications that this has. Such issues, of course, are not the result of problems with Rodriguez's classification, but rather of the lack of change and distinctiveness associated with two thousand years of a "red incised tradition" (Cardale 1976), which extends to other survey studies in which stratigraphic information cannot be collected (Argüello 2004). As will be emphasized later on this chapter, it is precisely this kind of issue that must be resolved through stratigraphic and typological refinement.

3.1 CHRONOLOGICAL FRAMEWORK FOR THE SABANA DE BOGOTÁ

Archaeological research carried out in recent decades in the Sabana de Bogotá has provided a general sequence of prehispanic human occupation dating back at least 11,000 years (Correal 1979, 1981; Correal and Van der Hammen 1977). From that point on a continual stream of human occupation has been documented (Ardila 1984; Correal 1990; Pinto 2003), accounting for

the transition from hunter-gathers to an agricultural way of life. Because there is not any evidence related to the peopling of the Tena region during the Preceramic (11000–7000 BP) and Archaic periods (7000 BP–3000 BP), these time frames will not be considered here.

There is widespread agreement about the existence of three archaeological periods following the Archaic in the Sabana de Bogotá, all of which can be dated through pottery: the Herrera, Early Muisca, and Late Muisca periods. The first ceramic period is called Herrera and is generally associated with the beginning of permanent settlement and the adoption of agriculture. The most common ceramic types associated with this period (Crushed Rock and Incised Red) are often found across an extensive area, including the Altiplano Cundiboyacense, the Bogotá River basin, and some sites in the Magdalena Valley. The broad area across which these ceramic types can be found has been attributed to either the existence of a common cultural tradition or the presence of a very dynamic interaction sphere that included the Altiplano Cundiboyacense and the western slopes. The distinctiveness of this period in terms of its ceramic types was initially proposed by Brodbent (1971) and was later reaffirmed by subsequent stratigraphic tests and similarity analysis, along with radiocarbon dates (Boada 2006; Cardale 1981; Castillo 1984; Kruschek 2003; Langebaek 1986; Peña 1991; Romano 2003a). As archaeological research in the Sabana de Bogotá has added early ceramic sites, it has left less room for the possibility of an even earlier ceramic period based on other early ceramic types.

In addition to Mosquera Crushed Rock and Mosquera Incised Red there are other Herrera ceramic types whose spatial distribution is more restricted. In the Sabana de Bogotá the Zipaquirá Sherd Temper type relates to salt production in the Zipaquirá and Nemocón areas (Cardale 1981). When it is found outside this area it is generally associated with salt trade (Peña 1991). Finally, there is also the Zipaquirá Red on Cream type, which was initially identified in

Zipaquirá and later found in other sites associated with Herrera ceramics. In the Valle de Tena archaeological project the Herrera's ceramic types collected were: Crushed Rock, Incised Red, Red on Cream, and Zipaquirá Sherd Temper (Appendix 1).

The earliest known date for Herrera ceramics is 2750 ± 100 BP (Peña 1991). For some scholars this date marks the beginning of the Herrera period (Langebaek 1995). However, as Boada (2006) has noted, this early date is the only one in a time span ranging from 2750 BP to 2225 BP, after which there are more and consistent dates associated with Herrera ceramics. It would thus be prudent to adopt the year 2225 BP as the beginning of the Herrera period. The latest secure date for Herrera ceramics is 1820 ± 80 BP (Peña 1991). Beginning at this point there is another time span lacking radiocarbon dates in the Sabana de Bogotá, which lasts until 1230 ± 70 BP (Boada 2006). A radiocarbon date from Tunja (1260 ± 120 BP; Castillo 1984) extends the Herrera period for 600 more years. Although the distance to Tunja prevents secure associations with the Sabana de Bogotá ceramic types, the large degree of similarity between the types described by Castillo (1984) in Tunja and those from the Sabana de Bogotá does suggest that this date could be considered for the southern portion of the Altiplano Cundiboyacense.

In sum, previous archaeological research has made it possible to date the Herrera period with a very acceptable level of confidence from 2220 BP to 1800 BP. With much less confidence it is plausible to date the Herrera period from 2800 BP to 1200 BP. A radiocarbon date from a zone very close to the Tena region (cal. 2050 BP) was associated with high proportions of Mosquera Crushed Rock and Mosquera Red Incised. It fits well into these ranges and confirms the suitability of these dates for the middle Bogotá valley (Argüello and Rodríguez 2013).

Contrary to the distinctiveness of the Herrera period, the subsequent archaeological phase in the Sabana de Bogotá, the Early Muisca period, is unclear and problematic. Since Broadbent's

(1971) research in La Herrera it has been noticed that some ceramic types, such as Funza Fine Quartz and Funza Abundant Quartz, occurred later than those of the Herrera period, but probably occurred before other types like Guatavita Sherd Temper and Guatavita Gray Temper, which were contemporaneous with the European invasion (Langebaek 1986). It implies the existence of both Early Muisca and Late Muisca periods, but, because the types assigned to each period are generally found mixed, doubts still remain regarding the ability to differentiate them. Such is the case of the stratigraphic sequences at Cachipay (Peña 1991), Funza (Kruschek 2003) and San Carlos (Boada 2006; Romano 2003a), in which Funza Fine Quartz and Funza Abundant Quartz were found along with Gray Temper ceramics.

One of the main limitations that inhibits the distinction between Early Muisca and Late Muisca ceramic types is the lack of depth of cultural deposits in the Sabana de Bogotá (e.g. Cachipay and Funza). When deep deposits are available, they yield sharper ceramic stratigraphic sequences. In the case of Zipaquirá (Cardale 1981) and San Carlos (Boada 2006; Romano 2003a) it is possible to make some distinction between Early Muisca and Late Muisca types, as it is in the El Muelle sequence, though this particular sequence is not very deep at all (Langebaek and Zea 1983). Figure 3.2 shows the ceramic seriation based on three stratigraphic excavations carried out in San Carlos (Romano 2003a). Regrettably, the low proportions of Herrera ceramics do not help much in clarifying the relationship between Herrera and Early Muisca ceramic types. San Carlos's seriations, however, does provide useful insight into the relationship between Early Muisca and Late Muisca ceramics. In the three stratigraphic sequences it is very clear that the large frequencies of Fine Quartz and Tunjuelo Laminar ceramic types are located below the largest frequencies of Grey Temper. It is also clear that the large proportions of Fine Quartz are below the larger frequencies of Tunjuelo Laminar, which might support Romano's (2003a,

2003b) claim regarding the possibility of differentiating two periods (Late Herrera and Early Muisca) between the Herrera and the Late Muisca. In short, the San Carlos stratigraphic sequence indicates that the largest proportions of Fine Quartz and Tunjuelo Laminar ceramics are found in lower levels, while the largest proportions of the Gray Temper type are found in the upper levels.

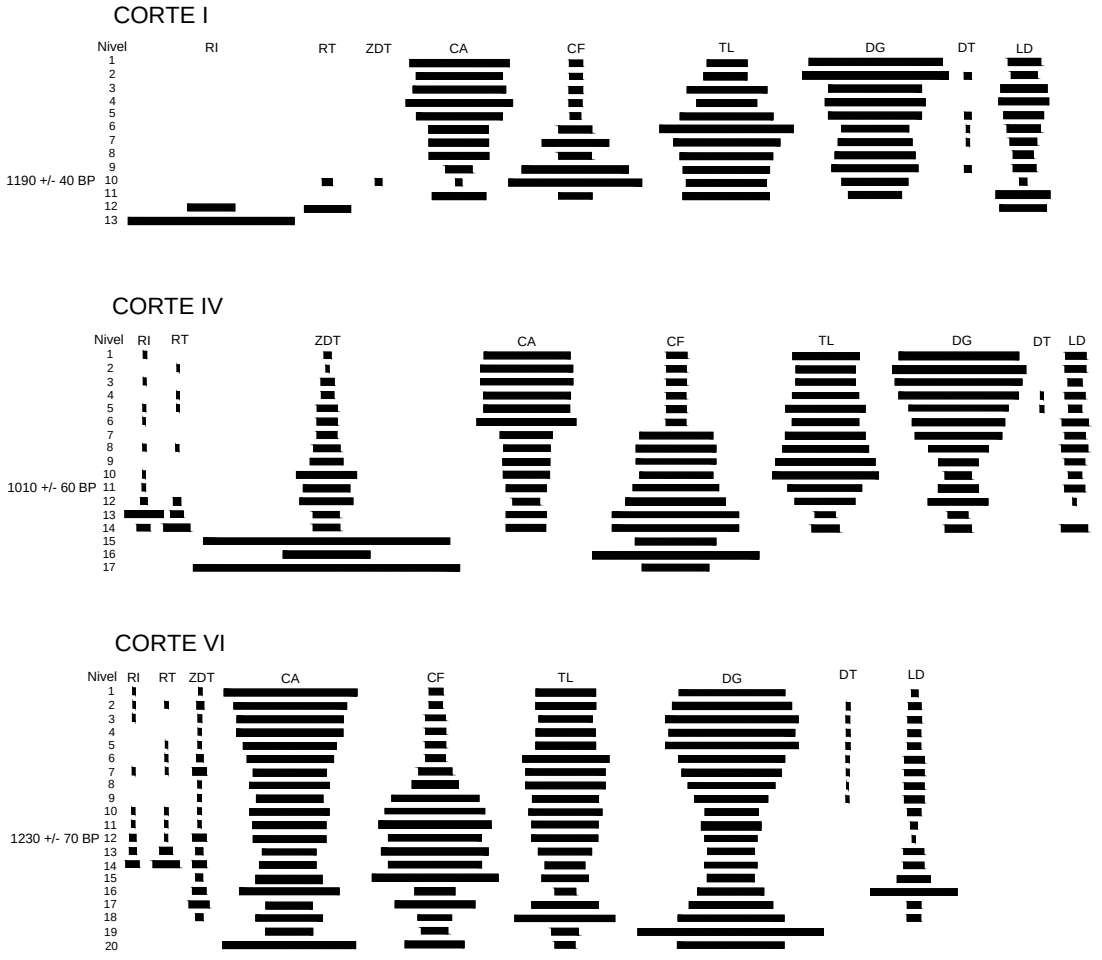


Figure 3.3 Ceramic seriation for San Carlos.
Based on data provided by Francisco Romano

Yet another analysis contributes to reaffirming the distinctiveness between the Early Muisca and the Late Muisca periods. In Funza, Kruschek (2003) found a strong correlation between Fine Quartz and Abundant Quartz ceramic types, and there was also a strong correlation between the Herrera types of Crushed Rock and Incised Red. In the Valle de Tena archaeological project the Early Muisca ceramic types collected were: Fine Quartz and Abundant Quartz (Appendix 1).

Very few radiocarbon dates are closely associated with Early Muisca ceramics, and all of them correspond with the later part of the period (Boada 2006). There are no radiocarbon dates for the time span between 2150 and 1350 BP, the period during which the transition between the Herrera and Early Muisca periods took place (Boada 2006). More confidence exists for the transition between the Early Muisca and the Late Muisca periods, which Boada (2006) dates to around 950 BP. However, radiocarbon dates from Corte IV at San Carlos allows us to extend the Early Muisca period by a few more centuries (Romano 2003a). The date 1010 ± 60 BP falls in the middle of the stratums in which both Fine Quartz and Tunjuelo Laminar are more frequent, and in which Gray Temper is not very common. With these few dates it is thus possible to date the Early Muisca period with a very acceptable level confidence to between 1350 and 950 BP, and with much less confidence to between 1800 and 750 BP.

Romano's (2003b) four-period division for the Sabana de Bogotá deserve mention here. As mentioned previously, it is possible, according to him, to split the Herrera period into Early and Late subdivisions, the latter of which is represented by Funza Fine Quartz ceramics dating from 1950 to 1250 BP. The Early Muisca period in Romano's scheme is represented by Tunjuelo Laminate ceramics, dating from 1250 to 850 BP. If looked at in the light of Boada's (2006) chronological framework, Romano's (2003b) suggests a subdivision for the Early Muisca period.

However, as noted previously, what Romano identifies as the Late Herrera period corresponds to a time frame for which there are no available radiocarbon dates, so it is not possible to subdivide what Boada calls the Early Muisca. Finally, even though Romano's framework were accepted, it cannot be used for Valle de Tena since Tunjuelo Laminate ceramics were not found there.

Once the dates for Early Muisca ceramic types are established, it becomes easier to establish a time span for the Late Muisca period. If the break point of 950 BP (based on the radiocarbon dates provided by Boada [2006]) is correct, then the Late Muisca period can be dated from this point until around 400 BP, the time at which the European invasion begun. The ceramic types that are associated with this period are Guatavita Gray Temper and Guatavita Sherd Temper. A small group of radiocarbon dates confirms the use of these ceramic types just a few centuries before the Spanish invasion (Boada 2006), and both types occur in the upper stratigraphic levels at San Carlos. Additionally, the fact they were in use not long before the sixteenth century suggests that they would have been in use during the time of the Spanish invasion of the Sabana de Bogotá (Ome 2006, Therrien et al. 2002). In the Valle de Tena archaeological project the Late Muisca ceramic types collected were: Gray Temper and Sherd Temper (Appendix 1).

Recently, Boada (2013) has suggested some minor changes to her previous 2006 chronological framework. First, she added one more century to the beginning of the Herrera period, which now starts at 2350 BP. Second, she changed the name of Early Muisca to Late Herrera, although the same range of dates was kept. It seems that Boada is finding more relationships between Herrera ceramic types and those previously called Early Muisca (Boada personal communication 2013), which is a good argument favoring continuity from Herrera to Early Muisca times. This new chronological framework, however, does not change the general

three-period chronological outline previously discussed. Because Boada (2013) does not provide the ceramic types for each period it is thus necessary to assume that they are the same ones previously identified in her 2006 chronological framework.

The Modern period encompasses a very diverse group of ceramic types. Some of them are variations of indigenous pottery that were produced by European technologies, like the wheel, thus resulting in different degrees of hybrid ceramics. Others are ceramic types entirely related to European technology, such as glazed ceramics. The easy part of identifying Modern ceramic is that the introduction of European technologies makes the prehispanic-posthispanic distinction an easy task. The problem with a fine chronological distinction between Modern ceramic types rests on the fact they have been made since the very beginning of the European invasion through the present (Therrien et al. 2002). This means that it is possible to identify a Modern period, but it is not easy to split this time frame into shorter subdivisions. Since it is possible to date the beginning of the Spanish invasion to around 1550, this date constitutes the starting point for the Modern period. Likewise, due to the fact that there has not been much effort made to collect these more recent artifacts, it is possible to date the end of the Modern period to around 1950 AD.

3.2 STRATIGRAPHIC EXCAVATIONS IN CUBSIO

Previous review of the chronological schemes and ceramic typologies for the Sabana de Bogotá provided a framework good enough to date the archaeological materials recovered during the systematic survey. However, there remain some issues that deserve more attention. The Early Muisca period, which is poorly understood in the Sabana de Bogotá sequence, deserved special

attention. As has been established in the cases of Tocarema (Peña 1991) and San Carlos (Boada 2006; Romano 2003a), deep cultural deposits are very useful for understanding the ceramic sequence. Therefore, one of the specific aims of this project was to contribute, if possible, to our understanding of the ceramic sequence and to confirm if the preexisting chronological scheme works for an area outside of the Sabana de Bogotá.

After a preliminary analysis of the ceramics recovered in the systematic survey, some sites were selected that yielded ceramic sherds from different periods (Herrera, Early Muisca and Late Muisca) and were revisited to evaluate the feasibility of carrying out further stratigraphic excavations. Most of them were discarded due to a lack of deep cultural deposits or the scarcity of pottery sherds. Two sites in which small stratigraphic excavations (1x1m test pits) were carried did not yield good results because they only had a few sherds and were quite shallow, no more than 50cm deep. Only in one site it was possible to recover a substantial number of sherds through a large stratigraphic sequence of considerable depth.

This site is located in the vicinity of Cubsio, San Antonio de Tequendama (Figure 2.8). The number of this site as assigned by the regional survey is 30/68. It is located only a few meters away from the Bogotá River, in an extensive flat area situated at the bottom of a concave landform (Figure 3.3). From the systematic survey it was noticed that large amount of sherds belonging to all ceramic periods could be collected there. The excavation of shovel probes provided information about the feasibility of recovering sherds below the surface and the depth of cultural strata. A single stratigraphic excavation was carried out that, by the end, had reached an area of 2 x 2 m. This excavation was carried out by means of 10 cm arbitrary levels. A total of 20 levels were excavated, 19 of which yielded pottery sherds and lithic artifacts. The cultural deposit of Cubsio is very homogeneous, consisting of a typical *a* over *c* horizon. The *a* horizon,

from which all the archaeological materials were recovered, is a dark brown soil with a depth of around 2m. This horizon rests above a *c* stratum of yellow soil that did not contain any cultural material, which was clearly distinguished from the horizon that lay above it (Figures 3.4 and 3.5).

Figure 3.4 General setting of Cubsio 1

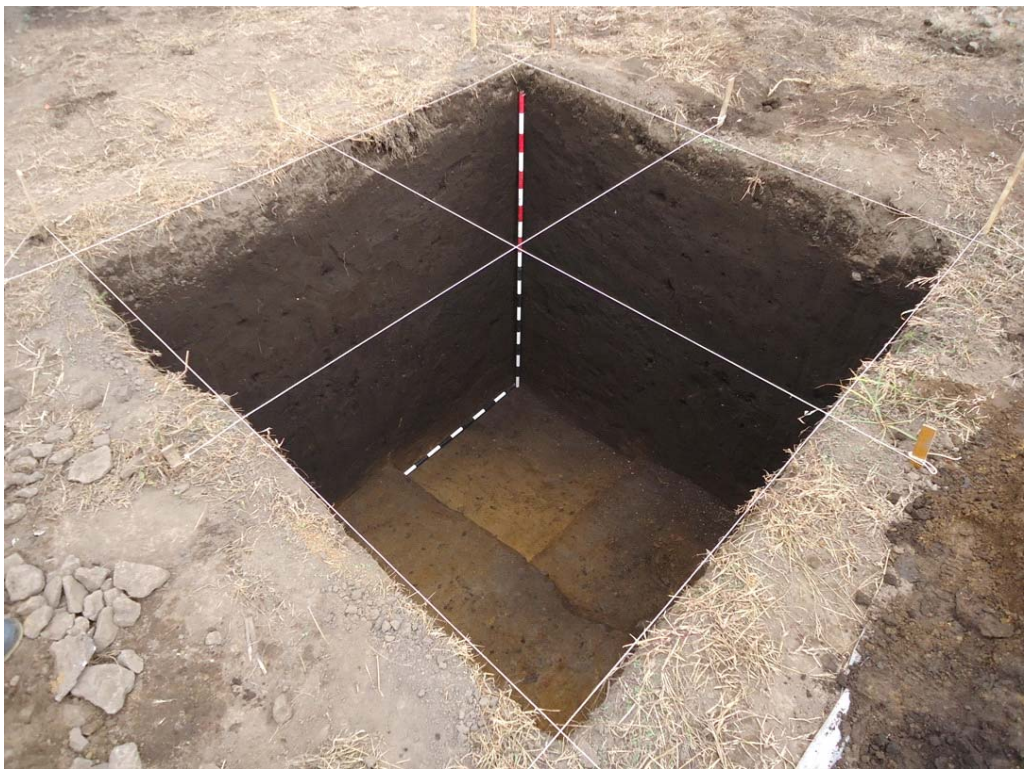


Figure 3.5 Cubsio 1

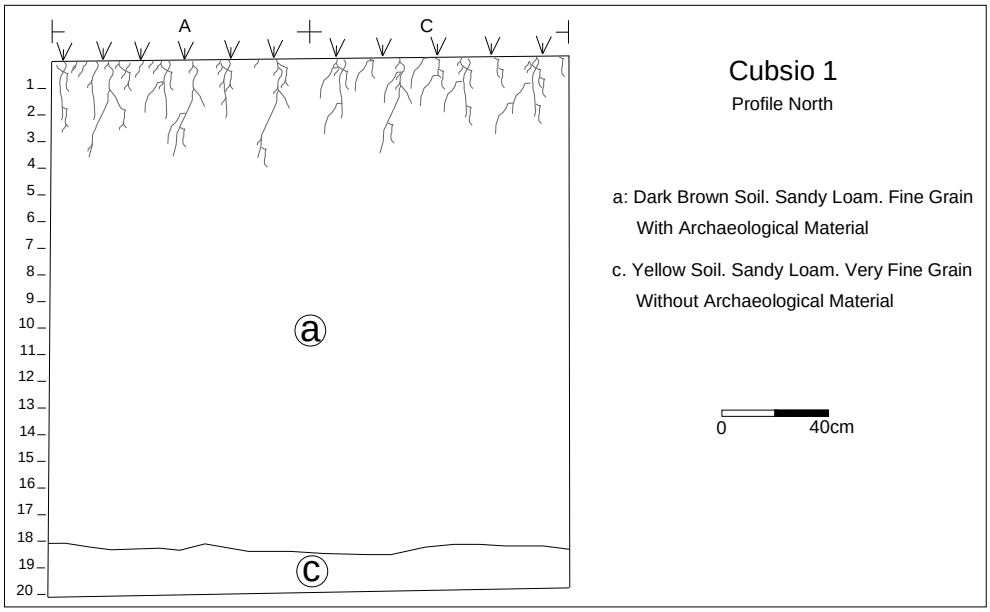


Figure 3.6 Northern profile, Cubsio 1

The archaeological materials from Cubsio were classified according to the Sabana de Bogotá ceramic typologies. As with the materials collected in the systematic survey, the vast majority of sherds from Cubsio were able to be classified using the Sabana de Bogotá typologies, which demonstrates, once again, the existence of these ceramic types in the Valle de Tena region. Only 21 of 460 sherds (4.5%) were unable to be classified, which most of the time was due to their badly eroded surfaces. Once the ceramics were classified the seriation was carried out (Figure 3.6)

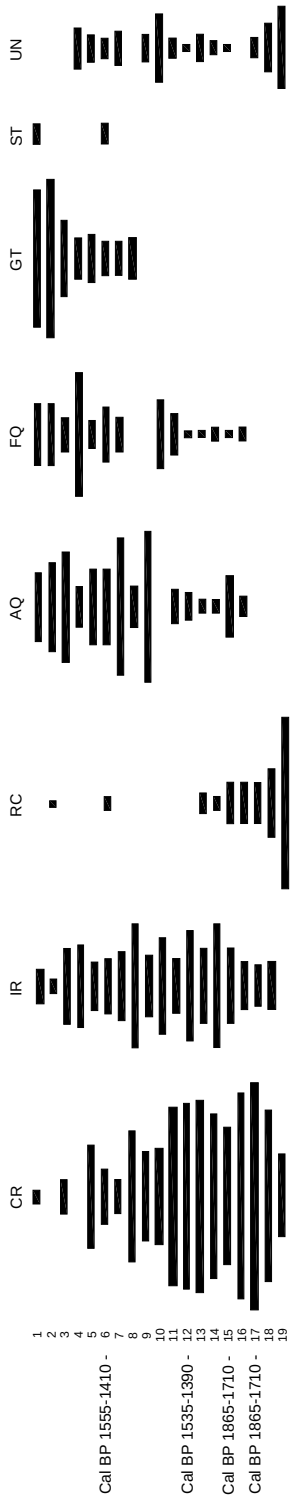


Figure 3.7 Ceramic seriation for Cubsio
(CR: Crushed Rock; IR: Incised Red; RC: Red on Cream; AQ: Abundant Quartz; FQ: Fine Quartz; GT: Gray Temper; ST: Sherd Temper; UN: Unclassified)

The ceramic seriation for the Cubsio site can be summarized as follows. To begin with, the depth of the archaeological deposits allows us to differentiate two distinct time frames. The first is one in which Herrera ceramic types are more popular, which is most clearly marked by Red over Cream and Crushed Rock, both of which were confined to the deepest levels of the excavation. Less clear is the distribution of Incised Red, which appears throughout the entire stratigraphic sequence. The stratigraphic distribution of Herrera types reasserts its preexisting chronological position, and the utility of Red on Cream and Crushed Rock types as good chronological indicators of this period.

A second time frame can be distinguished in the excavation from level 8 upwards. In these levels Herrera types reduce considerably and the Early Muisca types of Fine Quartz and Abundant Quartz become more abundant. The relative abundance of Late Muisca ceramic types (Gray Temper and Sherd Temper) also increases in the upper levels. If the stratigraphic distributions of Early Muisca and Late Muisca ceramic types are compared it is possible to observe that Gray Temper is definitely more abundant in the upper levels of the excavation, confirming its later chronological position in relation to Early Muisca types.

The stratigraphic position of Fine Quartz and Abundant Quartz in the middle and upper levels is consistent with Peña's (1991) findings in Cachipay, which reaffirms the existence of a distinct period after Herrera times. The relationship between these two types and the Gray Temper in Cubsio is similar to that described by Boada (2006) and Romano (2003a, 2003b) in Funza, which adds support to the differentiation between Early Muisca and Late Muisca, although more research is necessary to clarify this.

Four radiocarbon dates from Cubsio help to establish the chronological range of the three archaeological periods. Considerations about the peopling of the Valle de Tena can be

summarized as follows. First, it is confirmed that the Herrera period is not as old as previously stated. The date from Tocarema (2750 ± 100 BP) is the only one that predates 2250 BP across a very large area, from the Altiplano Cundiboyacense to the Magdalena River. To date there is no consistent evidence, except from Tocarema, of ceramics older than 2500 BP in the vast region of the Altiplano, the western slopes, and the Magdalena Valley (Peña 2013). For the Tena region the oldest radiocarbon date is CAL 2050 BP (Beta-266360) (Argüello and Rodríguez 2013). Along with the oldest dates from Cubsio (CAL 1865-1710 BP, Beta-374232 and Beta-374234) they are consistent with Boada's (2006) starting point for the Herrera period. The oldest date for Herrera ceramics comes from Tequendama (2225 ± 35 BP), a site close enough to the Tena region that it can be considered here as the legitimate starting point of ceramic-period occupation in Tena as well.

Second, radiocarbon dates from Cubsio provide some clues that help clarify the period in which Herrera ceramic types became less popular while Early Muisca types became more so. Although dates from level 6 and 12 in Cubsio do not follow the expected chronological order, both of them fit well into the same time range, so they are not inconsistent. Even though the time span is relatively wide (CAL 1555-1410 BP, Beta-374231, CAL 1535-1390 BP, Beta-374233) it is possible to set the beginning of the Early Muisca period to around 1550 BP. At Cubsio it is during this time that Red on Cream almost disappears and that Crushed Rock becomes less popular—these two ceramic types are by far the best Herrera period indicators. It is also around this time that Fine Quartz—the best Early Muisca period indicator—and Abundant Quartz became more popular.

Radiocarbon dates from Cubsio do not provide any information regarding the transition from the Early Muisca to the Late Muisca period. As mentioned previously the Cubsio sequence

only helps to reaffirm the stratigraphic relationship between ceramic types attributed to each period. In the absence of more secure dates it seem appropriate to follow Boada's (2006) date of 950 BP as the beginning of the Late Muisca period. Based on the data from San Carlos it is probable that the Early Muisca period did actually extend a couple centuries beyond this, but it is necessary to confirm this possibility through new radiocarbon dates.

Figure 3.7 summarizes the chronological framework adopted for the Valle de Tena archaeological project, along with the ceramic types belonging to each period. It also provides the time ranges that will be the basis for the subsequent settlement patterns analysis. The ceramic types from Tena are described in Appendix A, and Appendix B provides the sherd frequencies, by type, for both the systematic survey and the stratigraphic excavation in Cubsio.

Period	Years BP	Calendaric Years	Ceramic types
Herrera	2250-1550	300 B.C.-400 A.D.	Crushed Rock
			Incised Red
			Red on Cream
			Zipaquira Sherd Temper
Early Muisca	1550-950	400 A.D.- 1000 A.D.	Abundant Quartz
			Fine Quartz
Late Muisca	950-400	1000. A.D.-1550 A.D	Gray Temper
			Sherd Temper
Modern	400-0	1550 A.D.-1950 A.D.	Dragged
			Glazed

Figure 3.8 Chronological framework for the Tena Region and Ceramic Types

4.0 SETTLEMENT PATTERNS IN TENA

Systematic survey is by far the most appropriate methodology with which to document regional settlement patterns. Drennan's (1985) adaptation of the Basin of Mexico methodology has contributed to the reconstruction of settlement patterns in different north Andean landscapes (e.g. Boada 2006; Cuéllar 2009; Drennan 2006; Langebaek 1995b, 2001; Langebaek and Piazzini 2003). This was the methodology implemented in the Valle de Tena archaeological project, so as to acquire the field data necessary for settlement pattern analysis. Among the multiple advantages of systematic survey is the possibility of comparing several trajectories. Twenty years of regional-scale research in the Altiplano Cundiboyacense has provided ample datasets with which to compare the regional population dynamics of the Valle of Tena (Boada 2006, 2013; Langebaek 1995b, 2001).

At first glance the most salient features the settlement patterns in the Valle de Tena are the very small number of settlements, the very small quantity of pottery sherds, and the small size of most of the sites. In the Valle de Tena only 115 collections (lots) were made in a surveyed area of 144.7 km². These collections yielded only 1105 pottery sherds, 336 (30.4%) of which are not from prehispanic times. Almost all of the sites (86 out of 97) were less than 0.5ha ,and only 3 were larger than 1ha (Figure 4.1). If these numbers are compared with those from other systematic surveys in the nearby Altiplano Cundiboyacense then the differences are quite dramatic. In the 57.7 km² that were systematically surveyed in the municipalities of Suba, Cota,

Funza, and Chía, 1625 collections were made and 18,202 pottery sherds recovered (Boada 2006). This means that in an area of land equivalent to 39% of the Valle de Tena survey zone fourteen times as many collections were made, which in turn yielded fourteen times as many pottery sherds. In the systematic survey of the Fúquene-Susa region 16,408 pottery sherds were collected in 1759 collections, all within an area of 51.3km² (Langebaek 1995b). If the Valle de Tena and Fúquene-Susa region are compared, then it can be concluded that in an area representing 35% of the Valle de Tena survey zone fifteen times as many collections were made, which yielded twelve times as many pottery sherds. Taken together these numbers indicate that a very sparse population existed in the Valle de Tena.

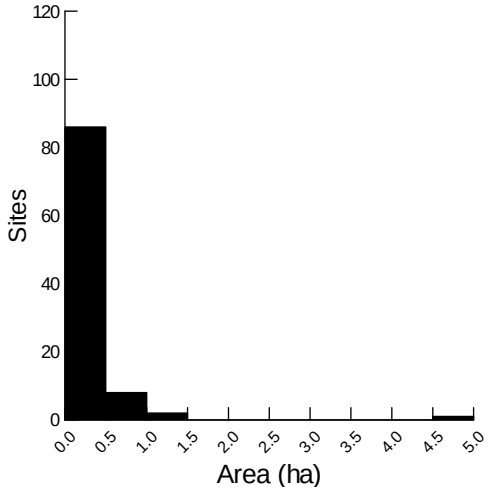


Figure 4.1 Valle de Tena site size distribution

4.1 SETTLEMENT PATTERNS BY PERIOD

4.1.1 The Herrera Period

139 ceramic sherds of the Herrera period were collected, which equates to 12.5% of the total ceramic assemblage. These sherds were found in 35 of the 115 lots (30.4%). Most of the sites (19

out of 24) are smaller than 0.5 ha and only two are larger than 1ha, VT32 (4.13ha) and VT 84 (1.08ha) (Figure 4.2). The occupied area during this period was 11.03 ha, which represents just 0.07% of the total surveyed area. During this period the occupation is scant but not dispersed evenly at all. There is a clear tendency for settlement to occupy the eastern side of the region, at the bottom of the sloped mountains that separate the Sabana de Bogotá from the Valle de Tena; the southwestern side was unoccupied (Figure 4.3).

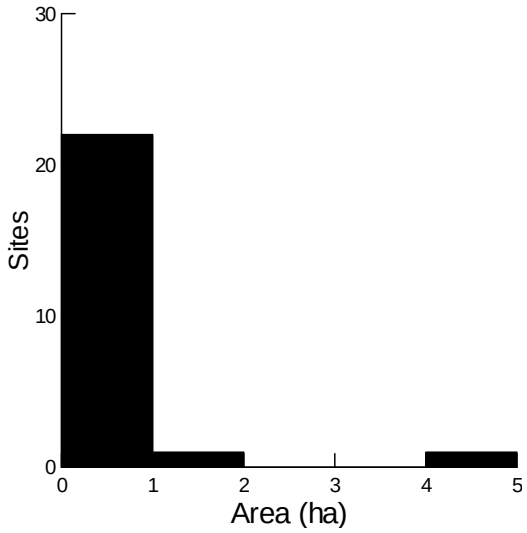


Figure 4.2 Herrera period site size distribution

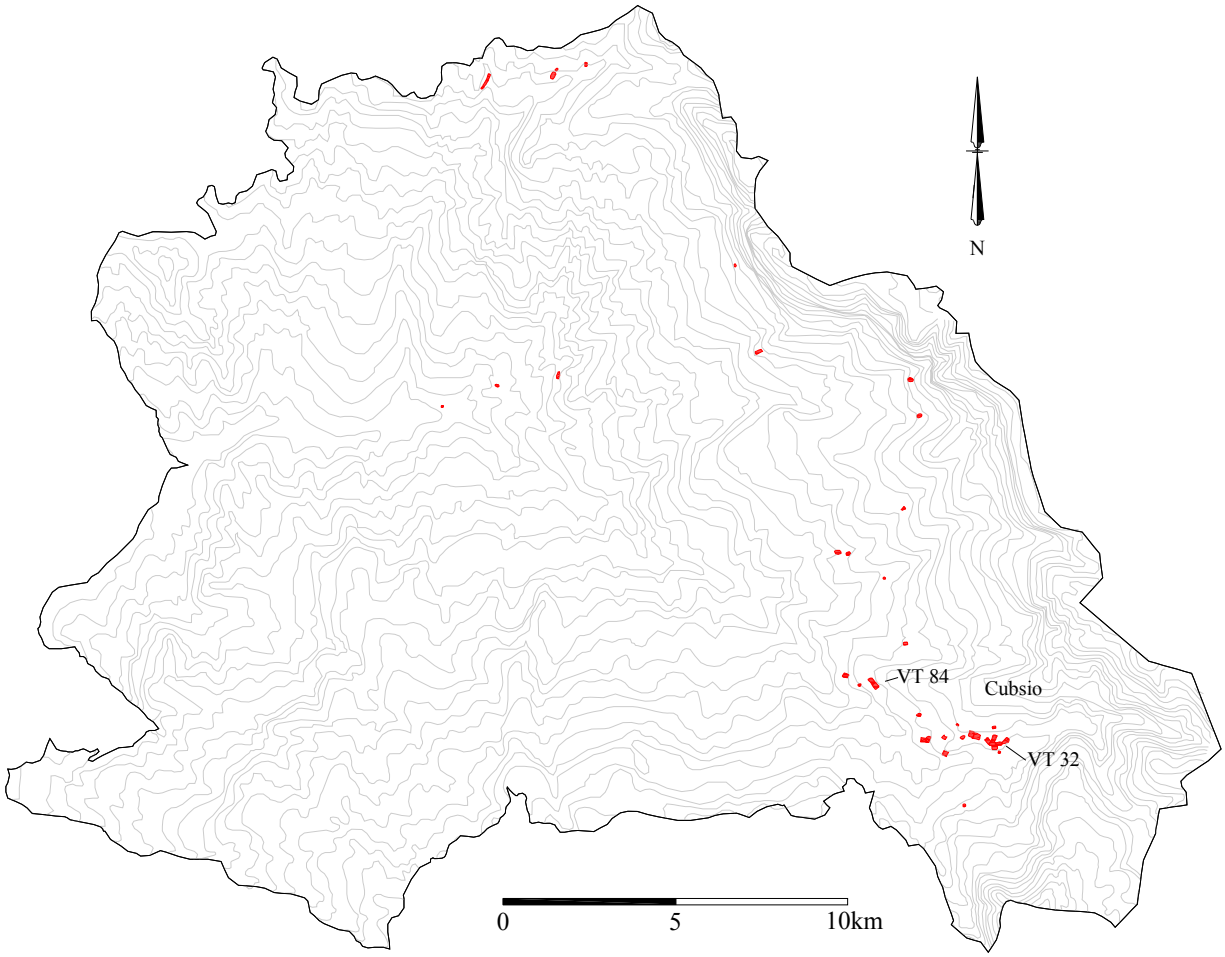


Figure 4.3 Herrera period occupation

Two tendencies in the settlement patterns of the Tena region can be observed for the Herrera period. First, except for the population cluster at Cubsio, the rest of the population lived in widely dispersed farmsteads. The spacing between households is so wide that it is almost impossible to delineate local communities following the methodology of Peterson and Drennan (2005) (Figure 4.4). This means that the group of households located at Cubsio had daily face-to-face interaction, whereas the households outside Cubsio were much too scattered to allow for such intensive interaction (Peterson and Drennan 2005). Second, the Cubsio cluster was, in turn, the center of a larger supra-local community that encompassed many of the dispersed farmsteads

(Figure 4.5). Only 9 lots (25%) were outside of this supra-local community, whose spatial extent was around 37km². This pattern suggests that, despite the fact that many households were spaced to widely to constitute local communities, the majority of them were integrated into a single supra-local community.

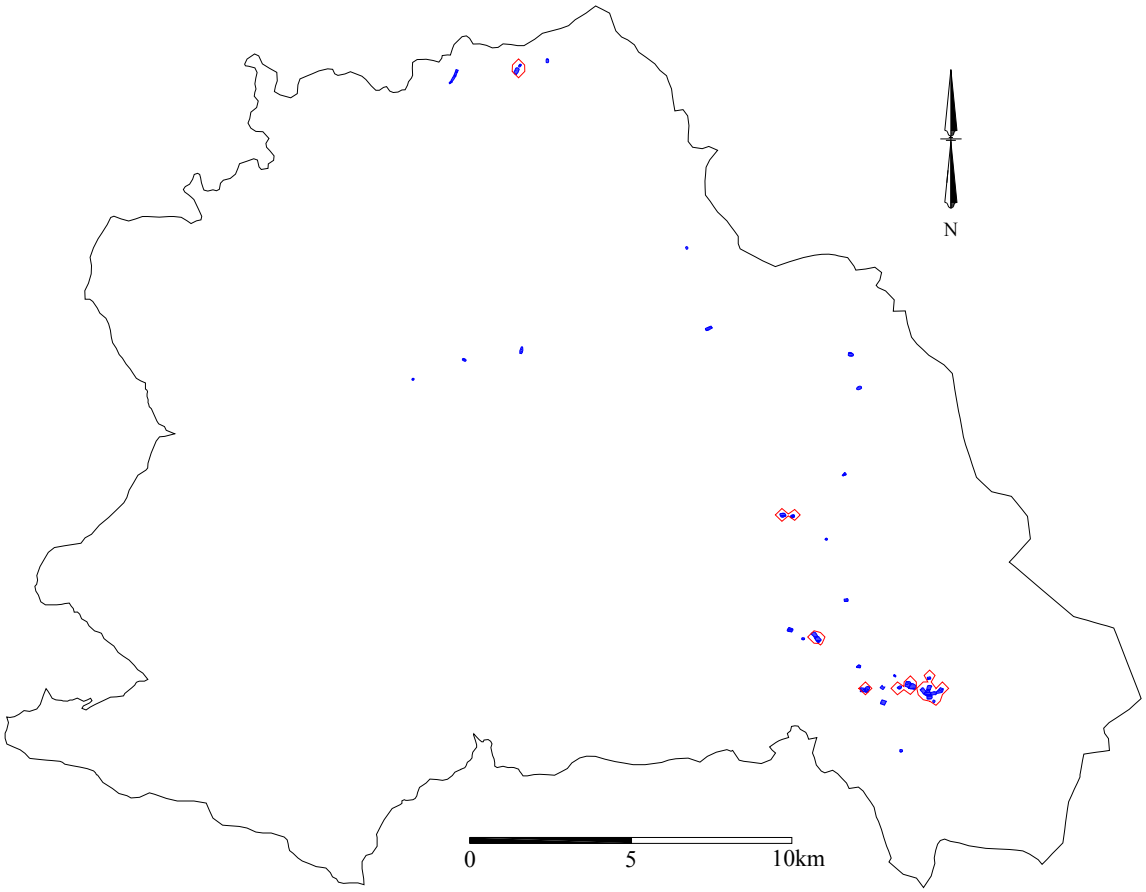


Figure 4.4 Delineation of the Herrera local communities

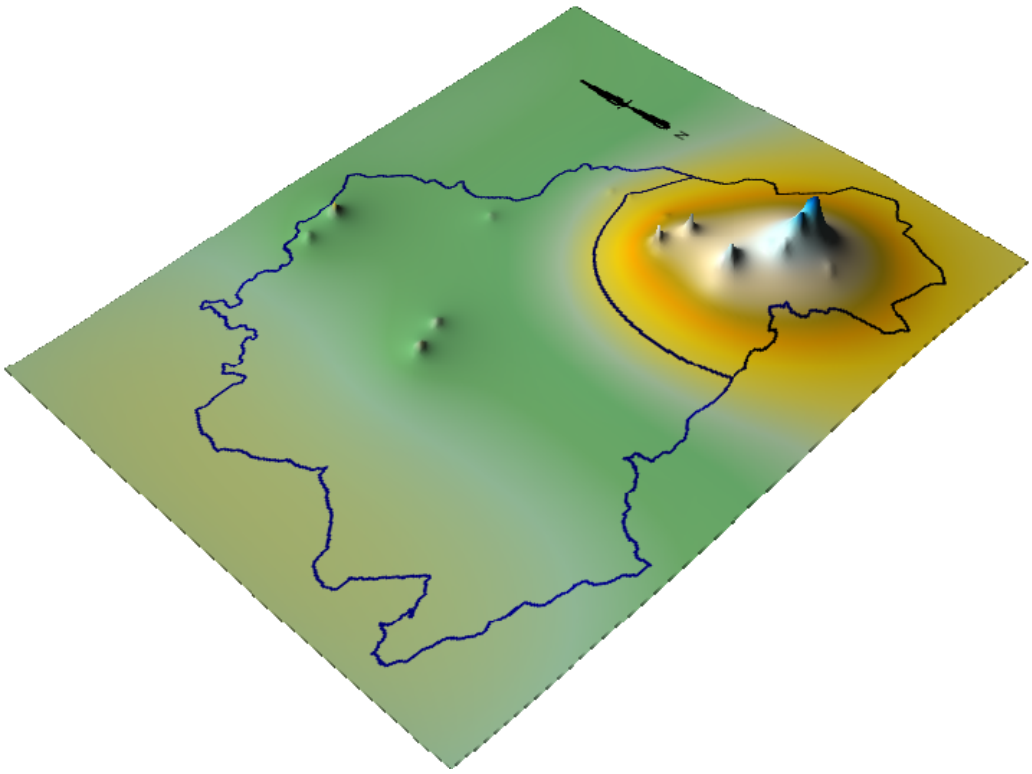


Figure 4.5 Herrera supra-local community

Table 4.1 provides Herrera-period data from four settlement patterns studies in the Altiplano Cundiboyacense and Tena (Boada 2006, 2013; Langebaek 1995b, 2001). The location of these surveys is shown in Figure 4.6. To make these data more comparable the number of lots and the number of sherds were divided by the total area surveyed for each region. These figures clearly illustrate the broad variability in settlement patterns across the Muisca area, which is not necessarily related to the spatial proximity of the survey zones. Although the two surveys in the Sabana de Bogotá (Cota-Suba and Funza-Mosquera-Fontibón) are very close each other, Cota-Suba is more similar to Fúquene-Susa (about 76km away) than to Funza-Mosquera-Fontibón.

It is possible to arrange these five cases into three groups. In the first there is Funza-Mosquera-Fontibón, with *large* numbers indicating large populations. In the second there is Fúquene-Susa and Cota-Suba with *intermediate* numbers. And finally there are the Valle de

Leiva and Tena surveys with *small* numbers. It is also possible to quantify the size of these differences. The number of lots/km² in Tena is twelve times smaller than in Funza-Mosquera-Fontibón, and the number of sherds/km² is eighteen times smaller. This comparison reaffirms the observation about the scant occupation in the Tena region during the Herrera period.

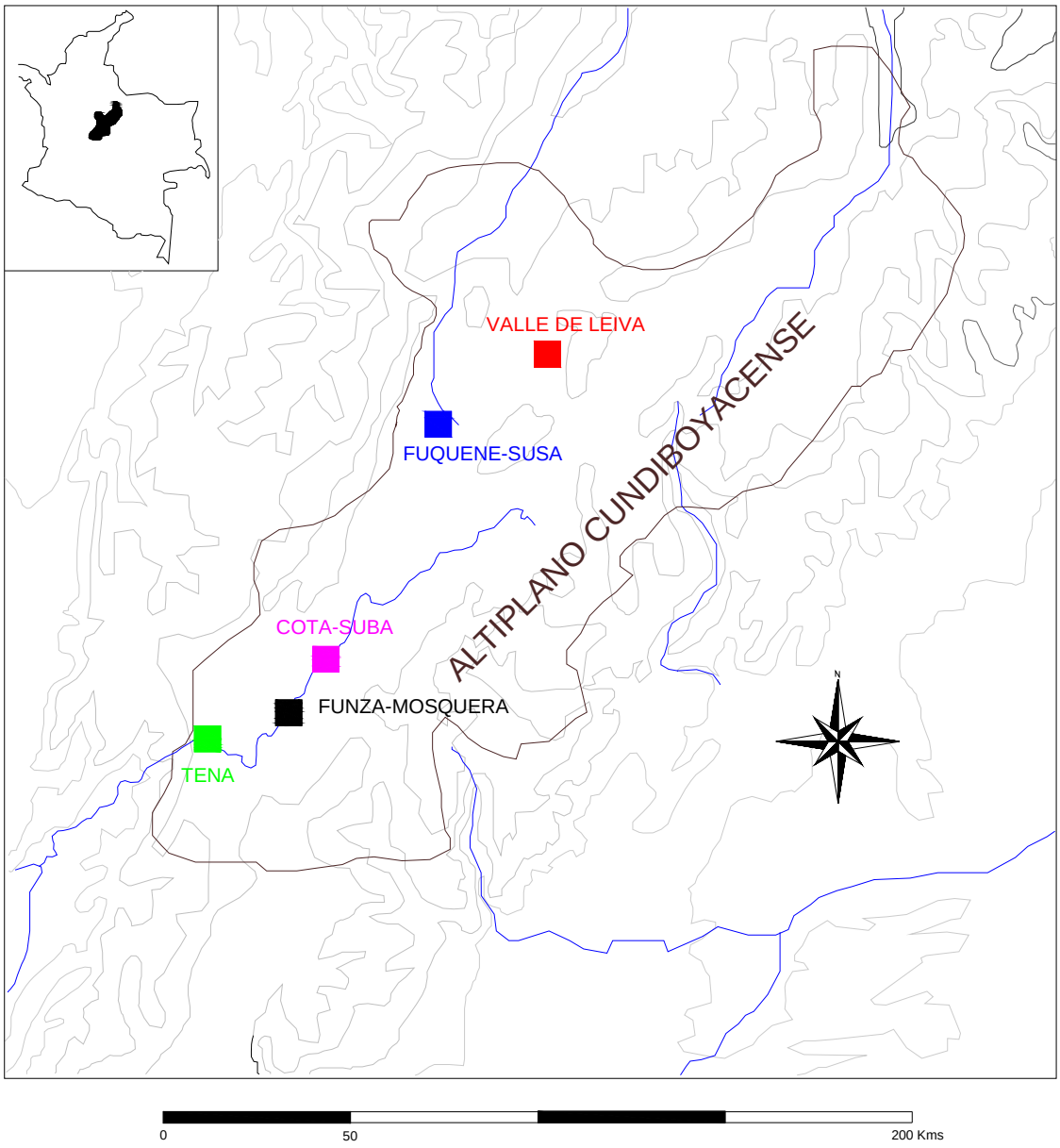


Figure 4.6 Location of the five settlement pattern studies discussed in this text

Table 4.1 Data from five Muisca systematic surveys. Herrera period

Region	Area km²	No. of Lots	%	Lots/Area	No. of Sherds	%	Sherds/Area	Occupied Area (ha)	%
Fúquene-Susa	51.3	58	3.2	1.1	98	0.6	1.9	31.7	0.6
Sabana de Bogotá -Cota-Suba-	57.7	57	3.5	1.0	79	0.43	1.4	20	0.3
Sabana de Bogotá -Funza-Mosquera-Fontibón-	64.3	160	11.6	2.5	1044	4.31	16.2	87.4	1.3
Tena	144.7	35	30.4	0.2	139	12.5	0.9	11	0.07
Villa de Leiva	182.2	24	-	0.1	56	-	0.3	21.7	0.1

Despite these differences between the Tena region and the Altiplano Cundiboyacense it is still possible to observe some overarching similarities as well. In the Sabana de Bogotá, for instance, settlement patterns exhibit a distinction between dispersed and more nucleated settlement like that observed in Tena. Most of the sites were dispersed and smaller than 1 ha, but there were also some small household clusters, one of them covering 11.8 ha (Boada 2006, 2013). A very similar pattern was documented in Fúquene-Susa, where, though most of the sites were small (less than 1ha) and dispersed, there were two large sites measuring 5.79 and 5.21 ha (Langebaek 1995b).

A significant difference in the spatial location of clustered households stands out if Tena is compared to the Sabana de Bogotá and Fúquene-Susa region. In Tena, within an area of 144.7 km², there were two large sites that were very close each other. They actually made part of the only supra-local community for the Herrera period. Although an analysis of supra-local clustering is not yet available for the Sabana de Bogotá, it seems that distance between clusters of households during the Herrera period were large enough to prevent the formation of a single supra-local community. This means that in an area of 122 km² (summing up the area surveyed in Suba-Cota and Funza-Mosquera-Fontibón) there were at least two supra-local communities. Similarly, the distance between the two larger sites in the Fúquene-Susa region was also large

enough to prevent the formation of a single supra-local community during the Herrera period. Clearly these two large sites would have been the centers of two separate supra-local communities, encompassed within an area of 51.3 km².

The exception among these patterns comes from the Valle de Leiva. Although there was a relatively large site of 2.1 ha in this region, there was not any observable break that would indicate a distinct cluster of households. In this region all the sites were small and medium-sized but dispersed.

In sum, these four regions indicate that settlement patterns during the Herrera period were largely dispersed. In three of these regions (Tena, Sabana de Bogotá, and Fúquene-Susa), however, there were some clusters of households of variable size and density that were much more reminiscent of villages.

4.1.2 The Early Muisca Period

When compared to the previous Herrera period there is a substantial increase in both the number of sherds and the number of lots during the Early Muisca period. There are 287 sherds of the Early Muisca period (25.9% of the total assemblage), which is more than double that of the Herrera period, and 66 lots with Early Muisca occupation (57.3%), almost double that of the Herrera period. However, these indicators of growth are not consistent with the overall increase in total occupied area (17.78ha, or 0.12% of the total survey zone), which only increased by 61%. This is because most of the lots of both the Herrera and Early Muisca periods were very small, and the two larger sites that were established during Herrera times remained the roughly same size (in the case of VT 84, with an area of 1.08 ha) or grew only slightly (in the case of VT 32, which increased from 4.1 to 4.9 ha) (Figure 4.7).

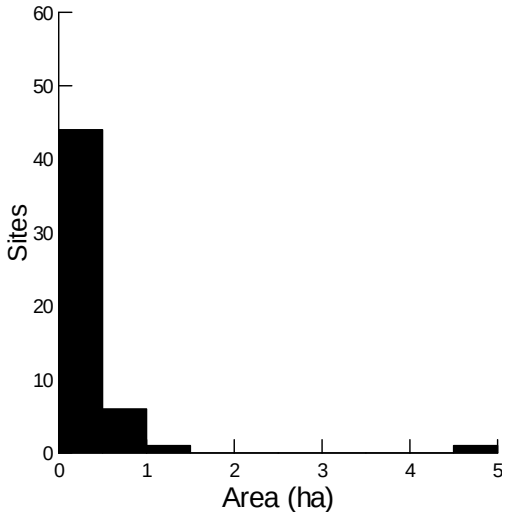


Figure 4.7 Early Muisca site size distribution

There is no noticeable difference in the way settlement was distributed when the Herrera and Early Muisca periods are compared. Almost all of the new Early Muisca lots were located close to Herrera occupation, and 74% of the Herrera lots continued to be occupied during the Early Muisca period. Only a small amount of new sites were located in the southwestern (warmer) zone, which, as for the Herrera period, remained almost unoccupied (Figure 4.8). The clustering of settlement persisted from the Herrera to the Early Muisca period, with only a slight tendency towards household dispersion.

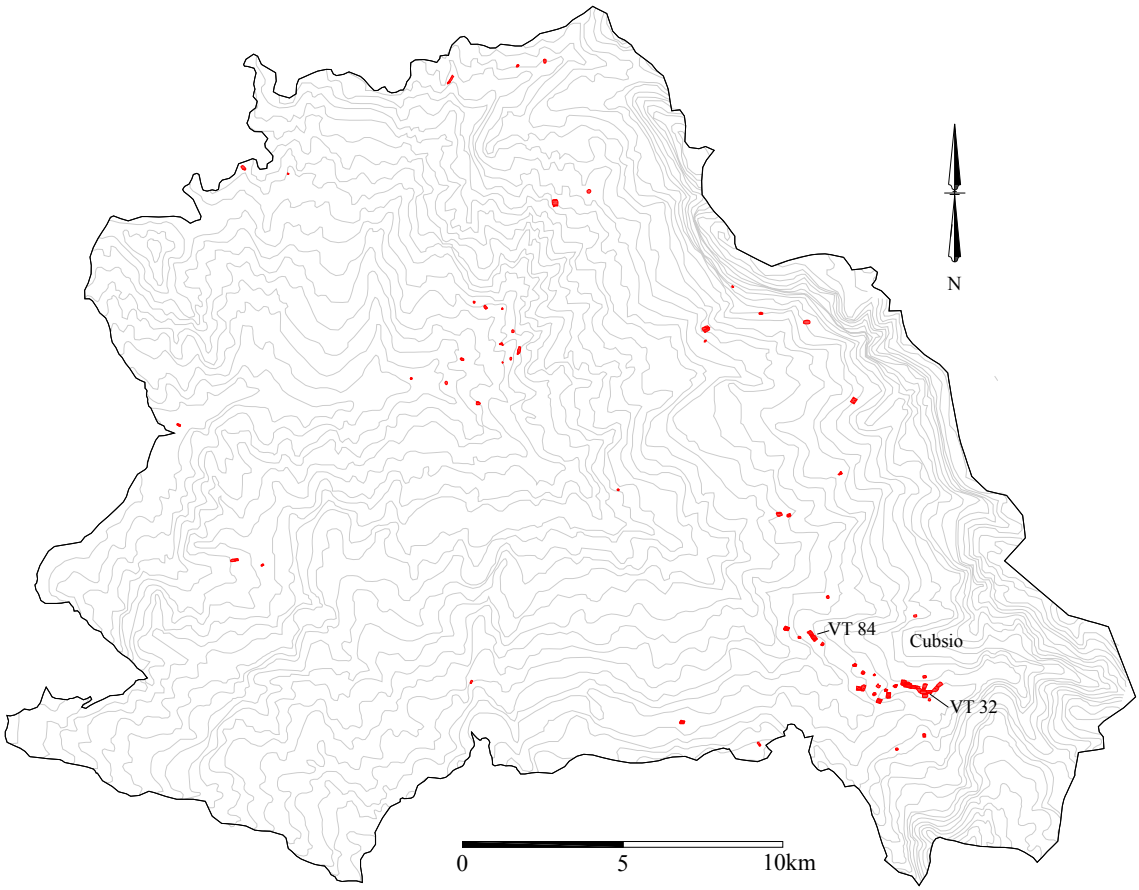


Figure 4.8 Early Muisca period occupation

As with the previous Herrera period it is not possible to group most of the Early Muisca population into distinct local communities. Aside from the Cubsio cluster, only a small amount of lots located in the northern zone are close enough to permit local community delineation (Figure 4.9). At the supra-local level an important change took place. In the northern zone a new supra-local community emerged, which, unlike the supra-local community centered on Cubsio, did not have a single peak (Figure 4.10). The Cubsio supra-local community, which formed during the previous period, reduced significantly in size to approximately 25.7 km², whereas the new supra-local community had an overall area of 35.8 km². The percentage of lots that

remained outside either of these two supra-local communities reduced when compared to the Herrera period. All but 7 lots (10%) were not integrated into any Early Muisca supra-local community.

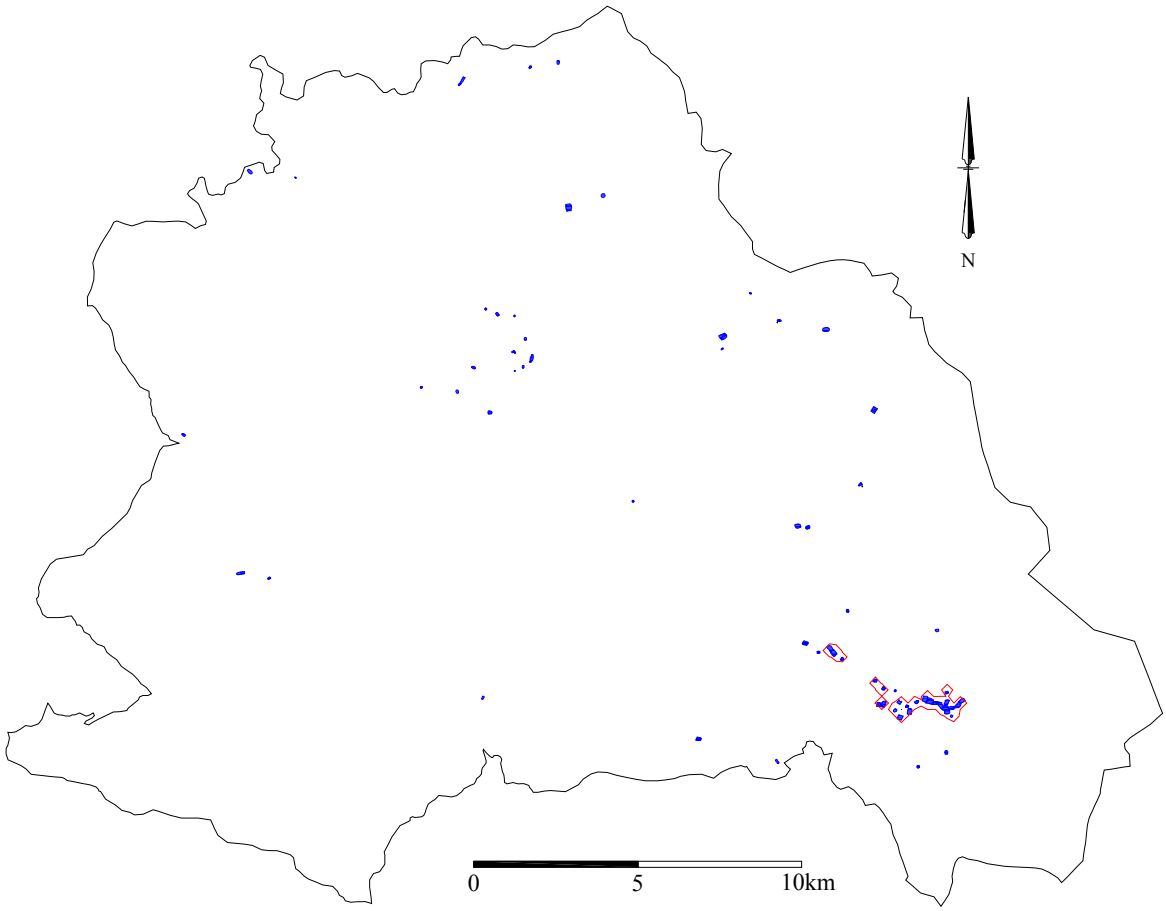


Figure 4.9 Delineation of the Early Muisca local communities

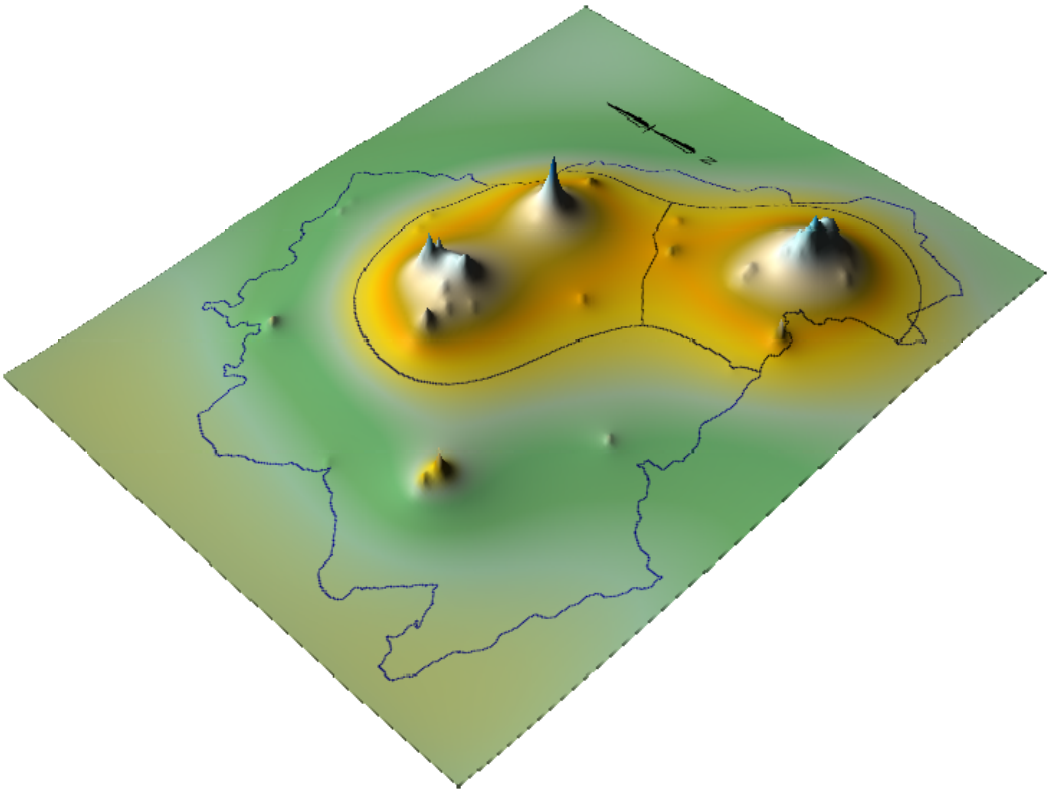


Figure 4.10 Early Muisca supra-local communities

The comparison of the four systematic surveys in the Altiplano Cundiboyacense and Tena again allows one to arrange the settlement patterns of these regions into three groups during the Early Muisca period, though not in the same way as before (Table 4.2). For this period the two surveys in the Sabana de Bogotá are more similar to each other and constitute the first group, having *large* numbers of lots/km² and sherds/km². The Fúquene-Susa region represents the *middle* group in this regard, while the *bottom* group is made up of the Valle de Leiva and Tena regions. This comparison suggests that, even though there was a significant population increase in Tena during the Early Muisca period, this increase was much less pronounced than that observed in the other regions. During the Early Muisca period the number of lots/km² in Cota-Suba is thirty times larger than in Tena, whereas in Funza-Mosquera-Fontibón it is seventeen times larger.

Table 4.2 Data from five Muisca systematic surveys. Early Muisca period

Region	Area km²	No. of Lots	%	Lots/Area	No. of Sherds	%	Sherds/Area	Occupied Area (ha)	%
Fúquene-Susa	51.3	136	7.7	2.7	342	2.2	6.7	61.43	1.1
Sabana de Bogotá -Cota-Suba-	57.7	877	53.9	15.2	4327	23.7	75.0	348.4	6
Sabana de Bogotá -Funza-Mosquera-Fontibón-*	64.3	575	41.7	8.9	7243	30	112.6	343.6	5.3
Tena	144.7	66	57.3	0.5	287	26	1.9	17.7	0.1
Villa de Leiva	182.2	35	-	0.2	795	-	4.4	34.77	0.1

* Boada (2013) calls this period Late Herrera. However it is included here as Early Muisca since it shares its same chronological position

The substantial population growth that is indicated in the Tena region by an increase in both the number of lots and the number of sherds resembles what has previously been documented by systematic surveys in the Altiplano Cundiboyacense. However, from this point on each one of the four trajectories is noticeably different. In the Sabana de Bogotá population growth was accompanied by an increase in the size of household clusters that had been established during the Herrera period. In the Fúquene-Susa region the size of sites remained the same or even decreased, despite an increase in the number of lots and sherds. In Valle de Leiva region two large sites of 5.56 ha and 4.5 ha emerged, which combined contained almost all the regional population. If one wants to consider these changes in terms of how strong or intense they were, it is the Valle de Leiva region in which strongest changes took place. The other three regions, including Tena, exhibit a pattern of population growth that was focused around the household clusters which had already emerged during the Herrera period.

4.1.3 The Late Muisca Period

There was not much change in settlement patterns from the Early Muisca to the Late Muisca periods. During the Late Muisca period there was a slight increase in the number of sherds (n=299, accounting for 27% of total ceramic assemblage), and the number of lots (n=66) was the same as the previous period. During the Late Muisca period most of the sites continued to be very small. The two larger sites of the Early Muisca period either decreased in size during the Late Muisca period (as in the case of VT 32, which decreased from 4.9 to 4.4 ha) or maintained their previous size (as in the case of VT 84). Only one new site (VT 16, with an area of 1.28 ha) was larger than 1 ha (Figure 4.11). The total occupied area decreased slightly during the Late Muisca period, to 16.75 ha (or 0.11% of the survey zone).

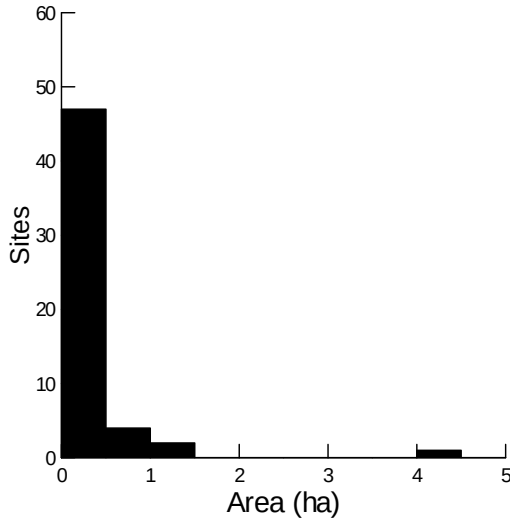


Figure 4.11 Late Muisca site size distribution

During the Late Muisca period people continued to locate themselves along the belt running parallel to the sloped mountains in the east (Figure 4.12). Most of the Late Muisca lots (or 72% of them) were occupied during the previous Early Muisca period. As was the case for

two previous periods it is not possible to delineate local communities during Late Muisca times, meaning that households continued to remain relatively dispersed (Figure 4.13). The tendency towards regional clustering remained almost unchanged during the Late Muisca period as well; during this period the two Early Muisca supra-local communities remained intact (Figure 4.14). The Cubsio supra-local community continued to reduce in size, which now covered an area of about 23.6 km², whereas the northern supra-local community increased its size significantly, to about 55.8 km². The number of lots that were not part of either supra-local community continued to reduce during the Late Muisca period as well, with only 5 lots (or 7.5%) having been outside of a supra-local community boundary.

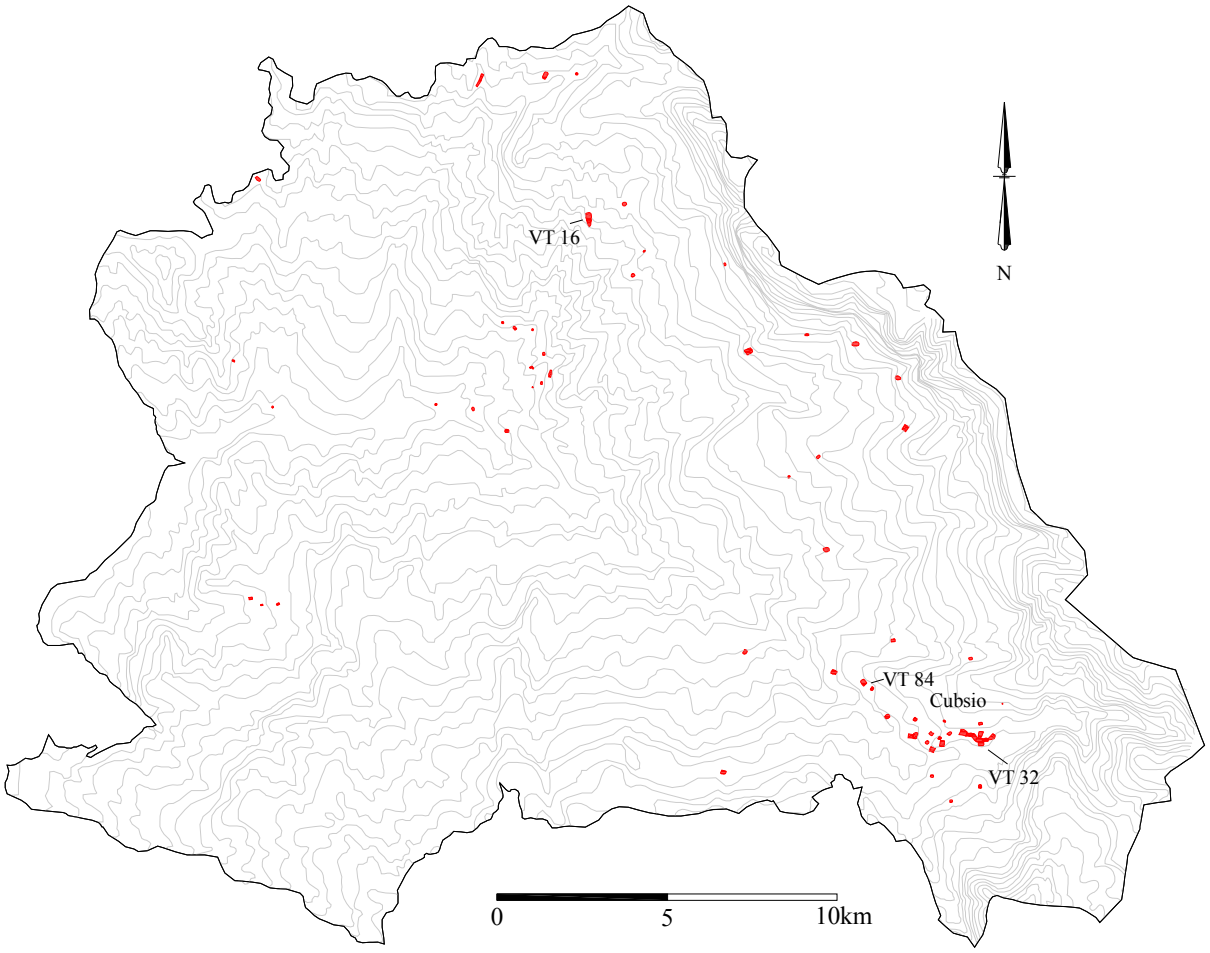


Figure 4.12 Late Muisca period occupation

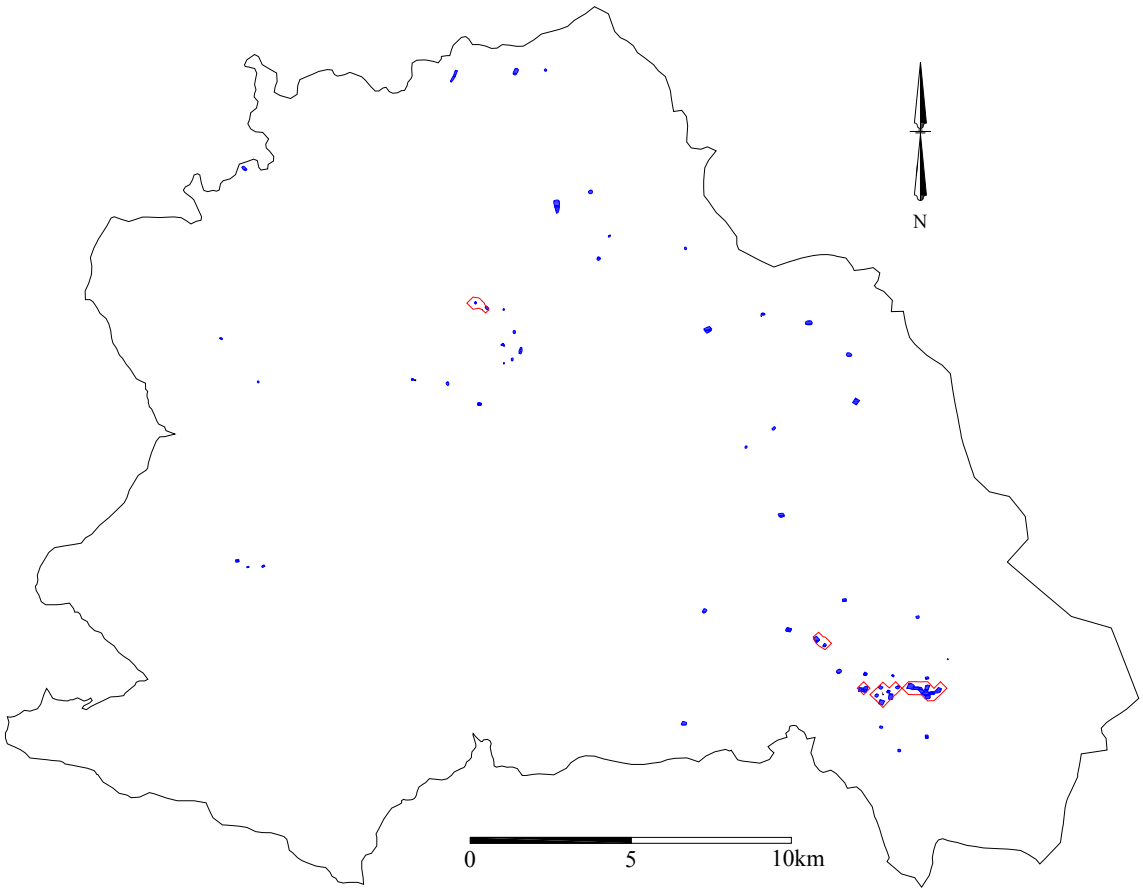


Figure 4.13 Delineation of the Late Muisca local communities

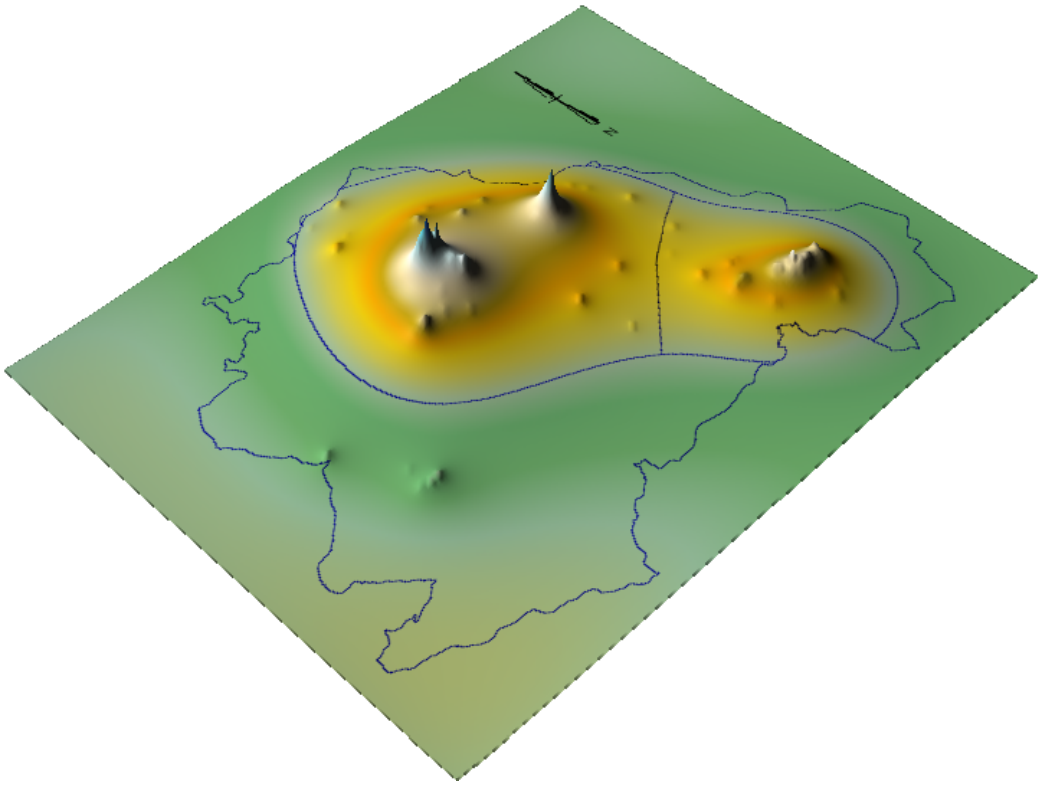


Figure 4.14 Late Muisca supra-local communities

It is for the Late Muisca period in which settlement patterns of the Tena region contrast most strongly with those in the Altiplano Cundiboyacense (Table 4.3). The most apparent difference is that in Tena there was just a slight increase in the number of sherds, and the number of lots remained the same, whereas in the three surveys of the Altiplano Cundiboyacense these numbers continued to grow at considerable rates. During the Late Muisca period Tena was by far the region with the lowest numbers of lots/km² and sherds/km². Valle de Leiva, the region with the *smallest* numbers during previous periods, can now no longer be grouped alongside Tena, as its numbers are more similar to those of the Fúquene-Susa region. The two surveys in the Sabana de Bogotá still have the *largest* numbers by far.

This comparison allows one to quantify the difference between Tena and the regions with largest numbers. For the Late Muisca period the number of lots/km² in Tena is thirty-nine times smaller than the Cota-Suba values and twenty-two times smaller than those of Funza-Mosquera-Fontibón.

Table 4.3 Data from five Muisca systematic surveys. Late Muisca period

Region	Area km²	No. of Lots	%	Lots/Area	No. of Sherds	%	Sherds/Area	Occupied Area (ha)	%
Fúquene-Susa	51.3	497	28.2	9.7	2295	14.9	44.7	195.2	3.8
Sabana de Bogotá -Cota-Suba-	57.7	1123	69.1	19.5	7174	39.4	124.3	450.9	7.8
Sabana de Bogotá -Funza-Mosquera-Fontibón-	64.3	722	52.4	11.2	10058	41	156.4	420.7	6.5
Tena	144.7	66	57.3	0.5	299	27	2.0	16.7	0.1
Villa de Leiva	182.2	330	-	1.8	6118	-	33.6	307.2	1.6

Population growth in the Altiplano Cundiboyacense during the Late Muisca period came along with an increase in the size of sites in all but one of the surveys mentioned. The Funza-Mosquera-Fontibón region witnessed the formation of a central place formed by the integration of the Early Muisca clusters that, due to their increase in size, are now difficult to differentiate. In Fúquene-Susa and Valle de Leiva the larger sites of the previous period increased in size as well. Even though these sites were now more densely populated, the emergence of new sites, some of them of considerable size in previously vacant areas of the landscape, make difficult the delineation of supra-local communities. The only survey in which the size of sites seems not to have increased is Cota-Suba.

All of these patterns are certainly different from those of the Tena region. In Funza-Mosquera-Fontibón previous clusters became one supra-local community. In Fúquene-Susa and Valle de Leiva there is an increase in the size and the number of sites, resulting in the "filling in"

of previously unoccupied areas. None of these processes occurred in Tena during the Late Muisca period, where there was very little change in population dynamics.

4.1.4 The Modern Period

Transformations caused by the European invasion during the 16th century are clearly observable in changes in settlement patterns from the Late Muisca to Modern period. This is an important observation—it stresses again the potential of settlement pattern studies for informing about sociopolitical changes in prehistory.

During the Modern period there was an increase in the number of sherds (n=336, amounting to 30% of the total assemblage), but this increase contrasts with a decrease in both the number of lots (n=49, or 42.6% of the total) and the occupied area (11.31 ha, or 0.07% of the total survey zone), which are now more similar to the Herrera-period figures. As in the previous prehispanic periods almost all the sites were smaller than 0.5 ha, and only one, VT 32, was larger than 1 ha, which grew to 3.39 ha during the Modern period (Figure 4.15). The pattern of settlement dispersal remained prominent, though there is again some evidence of regional clustering in the east. The western area, however, which was scarcely occupied in previous periods, now has slightly more lots than before (Figure 4.16).

As with all the prehispanic periods, the Modern period households were spaced enough to prevent the delineation of local communities (Figure 4.17). Although the site of VT 32, in the Cubsio zone, was again by far the largest site in the entire region, it was not the center of any supra-local community, as it had been during prehispanic times (Figure 4.18). The Cubsio supra-local community just disappeared, whereas the northern one was now the only supra-local community in Tena. This supra-local community, however, reduced in size considerably, now

covering a total area of only 30.5 km². With the dissolution of the supra-local community at Cubsio, and the reduction of the northern supra-local community, the proportion of lots that were not part of any such community increased greatly, to 67% of the total.

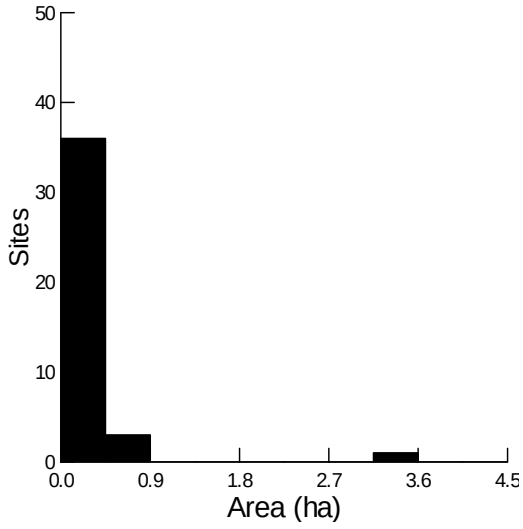


Figure 4.15 Modern site size distribution

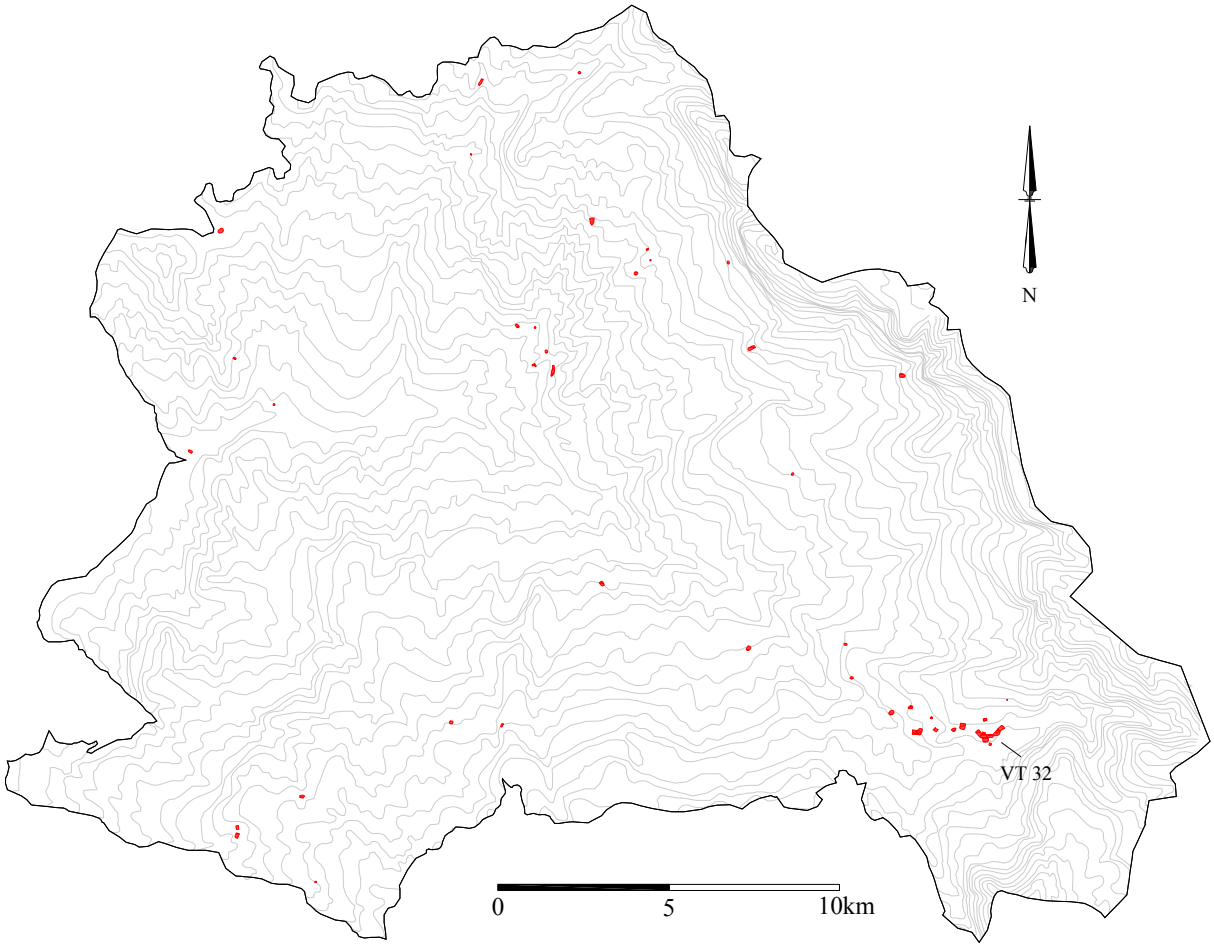


Figure 4.16 The Modern period distribution

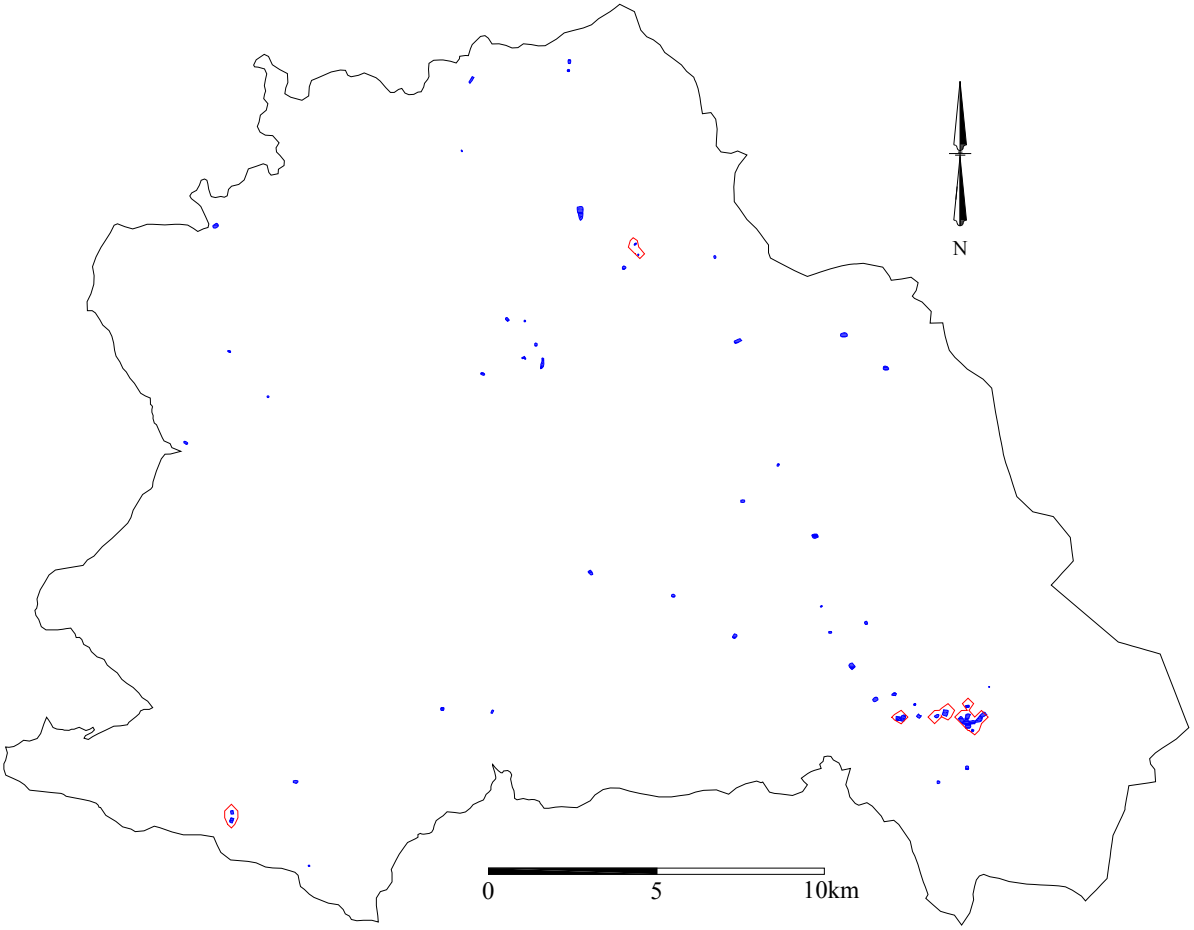


Figure 4.17 The Modern period distribution

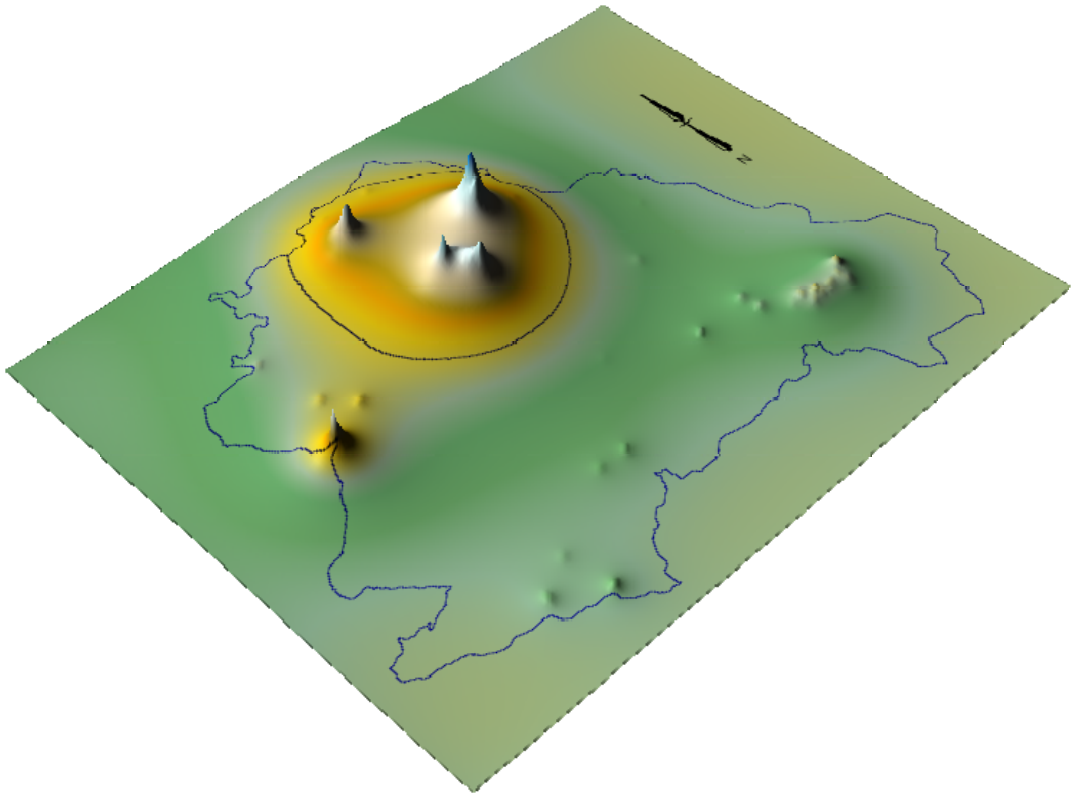


Figure 4.18 Modern supra-local community

Available information about settlement patterns in the Altiplano Cundiboyacense for the Modern period allows for the comparison of changes that occurred in Tena after the European invasion (Table 4.4). The differences between the two sequences in the Altiplano Cundiboyacense (on one hand) and in Tena (on the other) are quite dramatic. The number of lots/km² and the number of sherds/km² is hundred times greater in the Fúquene-Susa region than in Tena.

Table 4.4 Data from five Muisca systematic surveys. Modern period

Region	Area km²	No. of Lots	%	Lots/Area	No. of Sherds	%	Sherds/Area	Occupied Area (ha)	%
Fúquene-Susa	51.3	1602	91	31.2	11887	77	231.7	468	9.1
Sabana de Bogotá -Cota-Suba-	57.7	-	-		-	-		-	-
Sabana de Bogotá -Funza-Mosquera-Fontibón-	64.3	-	-		-	-		-	-
Tena	144.7	49	42	0.3	336	30	2.3	11.31	0.07
Villa de Leiva	182.2	1035	-	5.7	21106	-	115.8	996	5.4

In both Fúquene-Susa and Valle de Leiva the European invasion resulted in sparse populations caused by the depopulation of some nucleated settlements of the Late Muisca period. This process was accompanied by the establishment of new small sites in previously unoccupied areas. The general picture from these two surveys is the "filling in" of the landscape. This picture is certainly different for the Tena region. Although previously unoccupied areas were inhabited, the Tena region is far from being "filled in" during the Modern period.

4.2 DEMOGRAPHY IN THE VALLE DE TENA

There has been a great deal of improvement in methods for reconstructing both relative and absolute population estimates at the regional scale since the pioneering work of Sanders et al. (1979) in the Basin of Mexico. As with regional settlement analysis, methodologies for reconstructing population estimates must be adjusted to suit the particularities of each region and its archaeological record, along with the way in which data was collected. In the Valle de Tena the methodology that is followed is that which was established by Drennan and his collaborators for demographic reconstruction (Drennan et al. 2003; Drennan and Boada 2006; Drennan and

Peterson 2011). However, before proceeding with the calculation of population estimates it is necessary to consider some important issues that are particular to the Tena region.

The first issue concerns the nature of human occupation as it is described in ethnohistoric accounts. As mentioned in Chapter 1 the ethnohistoric accounts all suggest that Muisca occupation of the Tena region was influenced largely by the requirements of vertical agriculture. Although the exact nature of this occupation is not entirely clear, these accounts nonetheless suggest that such occupation may have been temporary. It is not stated whether Muisca farmers occupied the region for days, weeks, or months at a time, but the fact remains that, according to European documents, the Muisca did not occupy the Tena region on a year-round basis. Therefore, in order to calculate reliable population estimates for the Valle de Tena, it is necessary to try to understand how the nature of settlement and the distribution of artifacts and collection lots in this region relate to prehispanic households.

Fortunately, there are some sources that can be used for evaluating this issue. To begin with, there is the simple premise that more people living in one spot during a longer period of time produce more garbage. For societies with year-round movement this is in fact the case, as demonstrated by Ann Osborn's (1979) analysis of the U'wa settlement system. Osborn's observations of the quantities of vessels used by people in different zones, each of which are occupied for different spans of time, indicate that there is a strong correlation between the amount of time (in months) that people occupy an area and the number of vessels that they use (r=0.89, p=0.03, Y=2.85X +10.85) (Figure 4.19).

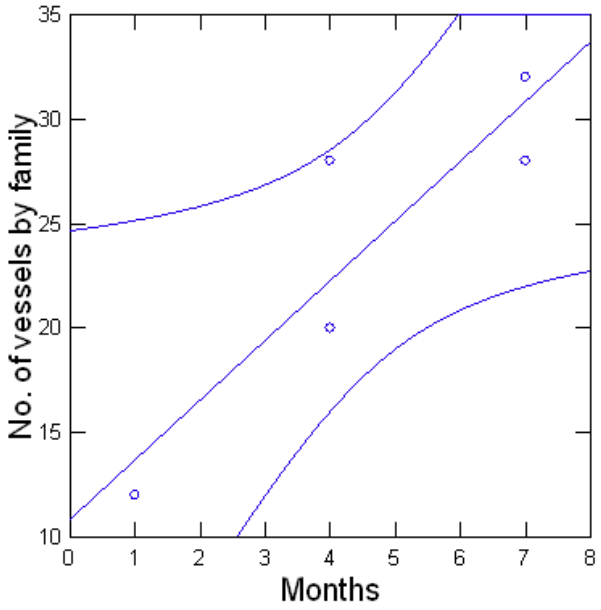


Figure 4.19 Correlation between number of vessels by family and occupation span (in months) for five U'wa families.
(Data from Osborn 1979). 90% confidence zone for the best fit straight line shown

Based on this correlation it is expected that, if the Valle de Tena was a region with temporary occupation, then the number of sherds per household should be less than the number of sherds per household in a region with year-round occupation. Three systematic surveys carried out in the Altiplano Cundiboyacense (the Sabana de Bogotá [Boada 2006], the Valle de Fúquene-Susa [Langebaek 1995b], and Valle de Leiva [Langebaek 2001]) provide useful sources for comparison. For the Valle de Fúquene-Susa and the Valle de Leiva there is no ethnohistoric evidence that suggests population movements related to vertical agriculture, so occupation in these regions can be taken as year-round. According to Langebaek (1996), chiefdoms not located on the borders of the Altiplano Cundiboyacense did not engage in vertical agriculture, and this would have been the case for chiefdoms in the Fúquene-Susa and Valle de Leiva regions, which are located at some distance from the Altiplano Cundiboyacense border. Alternatively, ethnohistoric accounts from the Sabana de Bogotá indicate that people from this zone were actively engaged in vertical agriculture (Langebaek 1987b, 1996).

Whereas settlement data from the Valle de Fúquene-Susa is available (Langebaek 1995c) and can be directly compared to that from Tena, published data from the Sabana de Bogotá and the Valle de Leiva allow for less direct comparisons (Boada 2006, 2013; Langebaek 2001). Because the prehispanic chronologies for all these regions are based on roughly the same sets of data, meaning that the time spans for each period are similar, it is not necessary to carry out a chronological correction. In the Valle de Fúquene-Susa, 581 lots yielded 2738 prehispanic sherds, for an average of 4.7 sherds per lot. In the Sabana de Bogotá (Cota-Suba) the average number of sherds per lot was 4.23 for prehispanic times, with the following breakdown period by period: 57 lots and 79 sherds for the Herrera period, 877 lots and 4327 sherds for the Early Muisca period, and 1123 lots and 7174 sherds for the Late Muisca period. For the Valle de Leiva the average was 14.52 prehispanic sherds per lot, with 24 lots and 56 sherds for the Herrera period, 35 lots and 795 sherds for the Early Muisca period, and 330 lots and 6118 sherds for the Late Muisca period). Finally, for the Valle de Tena there were 91 lots with 725 prehispanic sherds, for an average of 7.96 sherds per lot. Clearly, the numbers for the Valle de Tena are thus well within the range of those of populations that are presumed to represent year-round occupation. Moreover, the average number of sherds per lot in the Valle de Tena is even larger than the average in regions where vertical mobility was not practiced.

We can explore this issue a little further. In the Valle de Fúquene-Susa 237 of the 581 lots with prehispanic sherds (or about 40%) yielded only one sherd, and in 60% of them (or 338 lots) no more than two sherds were recovered. In the Valle de Tena 27 of the 91 lots with prehispanic sherds (or 29% of them) yielded only one sherd, whereas 32 lots (35%) had no more than two sherds. Again, if we are to presume that more people living for longer periods of time at a site produce more garbage, then it is possible to conclude that in the Valle de Tena human

occupation was rather permanent, given that this is the assumption made for the Valle de Fúquene-Susa.

Table 4.5 provides the average number of sherds per lot by period for four regions in the Altiplano Cundiboyacense and Tena. Except for the Early Muisca and the Late Muisca periods in Funza-Mosquera-Fontibón and Valle de Leiva, these data suggest some degree of homogeneity in the number of sherds per lot in different regional surveys. Since Funza-Mosquera-Fontibón and Valle de Leiva are on opposite sides of the vertical agriculture spectrum, it is not possible to relate their large values with differences in the temporality of their occupation. A perfect fit with the expectations of Osborn's findings should result in *large* numbers for both Fúquene-Susa and Valle de Leiva (which are not located on the border of the Altiplano Cundiboyacense, and thus would not have practiced vertical agriculture); *middle-range* numbers for Cota-Susa and Funza-Mosquera-Fontibón (which are located on the border of the Altiplano Cundiboyacense, where vertical agriculture would have been practiced, and people would have lived more months there than in Tena); and *small* numbers for Tena (where vertical agriculture would also have been practiced, and people would have lived fewer months there than in the Sabana de Bogotá). Clearly, the data presented in Table 4.5 do not fit such expectations, and place Tena among zones with potentially different degrees of permanency in occupation.

Table 4.5 Average of sherds per lot by period from five systematic surveys in the Altiplano Cundiboyacense

Region	Herrera	Early Muisca	Late Muisca
Fúquene-Susa	1.68	2.51	4.61
Tena	3.97	4.34	4.53
Cota-Suba	1.38	4.93	6.38
Funza-Mosquera-Fontibón	6.52	12.59	13.93
Valle de Leiva	2.33	22.71	20.39

Ceramic assemblages provide yet another way of evaluating the movement of people between the Sabana de Bogotá and the Valle de Tena. As it was possible to evaluate expectations of year-round movement on the basis of the quantity of ceramic sherds, it is also possible to evaluate the possibility of year-round movement in terms of the expected composition of the ceramic assemblage. Osborn's (1979) ethnoarchaeological study of U'wa people indicates that when a single family has different households at different elevations, and spends some months in each household, the pattern is usually that such family has a complete domestic ceramic assemblage in each household. In this case, variation in the ceramic assemblage is in the quantity of the vessels, not in the kind of vessels. As was demonstrated in the previous analysis, it seems that the settlement patterns in the Valle de Tena do not fit well with a model of year-round movement, in which a single family spends only some months there.

The remaining possibility is that settlement patterns in the Valle de Tena correspond with a daily-round movement, in which people from the Sabana de Bogotá would go to the Valle de Tena to cultivate crops, but return to the Sabana de Bogotá at the end of the day. In this scenario, not only should the amount of ceramic be less in the Valle de Tena, but the kind of vessels should also be different when compared to a "typical" household ceramic assemblage. It can be assumed that if people were just going to Tena to cultivate during the day, they must have carried their food already cooked, along with beverages and serving vessels. Thus, since the total range of food processing activities would not likely have been carried out in the Valle de Tena, there is no reason to suspect that the full household ceramic assemblage should be found there. Specifically, cooking vessels should be absent or very rare, and vessels for transporting beverages and serving should constitute the main kind of pottery present in the Tena region. Regrettably, due to the small amount of diagnostic sherds that were collected during the

systematic survey and the stratigraphic excavations in Tena, a systematic analysis of the ceramic assemblage is not possible. A couple of suggestions, however, can be offered here. First, vessels whose most probable function was cooking (*ollas*) were found in Tena for every period and for each ceramic type (Figure 4.20; Appendix A). The relation between *ollas* and bowls (the kind of vessel whose most probable function is serving, though see the following paragraph) is variable through the different periods. For the Herrera period, 50% of the diagnostic sherds are *ollas*, whereas the other 50% are bowls. For the Early Muisca and the Late Muisca periods this relation is 40% to 60% and 66% to 34%, respectively. Therefore, cooking vessels are not scarce in the Valle de Tena, and their presence in flat areas indicates that the sherds collected through the Tena region are evidence of household activities, rather than garbage produced by transportation and consumption activities that were part of agricultural tasks.

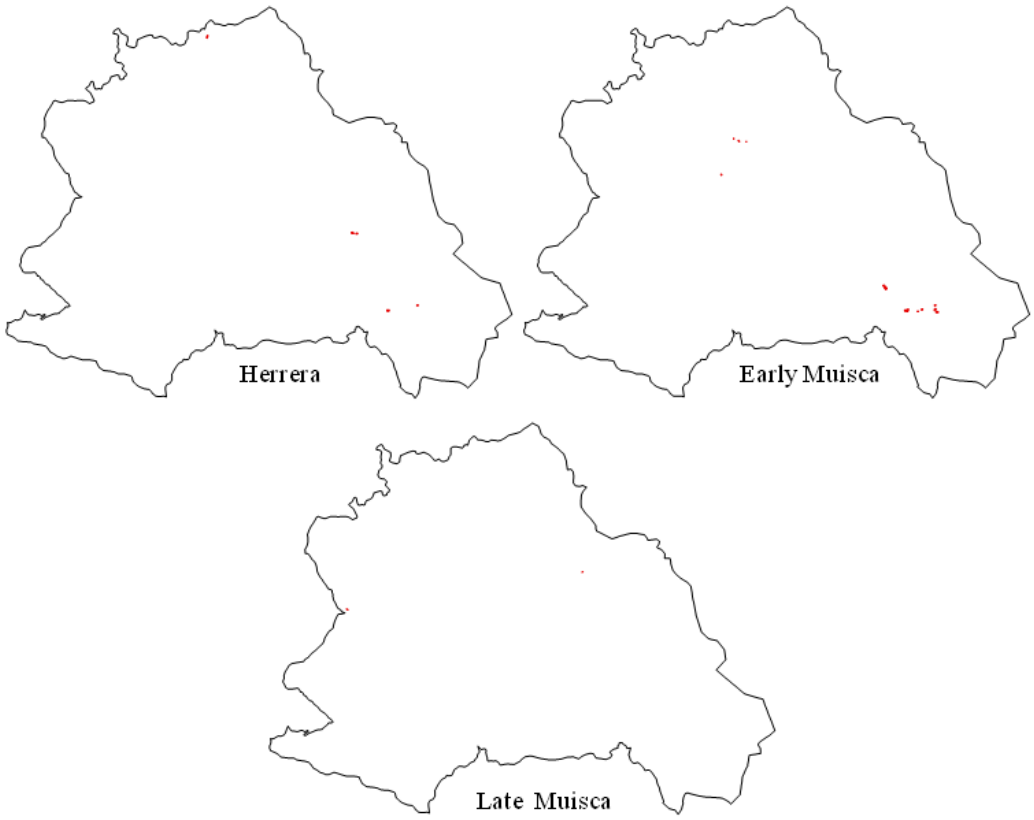


Figure 4.20 Lots in which diagnostic sherds of cooking vessels (*ollas*) were found

The second suggestion that can be made about the ceramic assemblage in Tena is in regard to bowls. In the previous paragraph it was stated that the most probable function of bowls was serving. However, it is clear that large bowls were in fact used for cooking. As can be observed in Appendix A, some of the bowls from Tena are as large that they should be for the purpose of cooking. If they were used for cooking, then the relationship between cooking vessels and serving vessels should slightly more skewed towards the former. In any event, it does not make much sense to carry bowls for serving (because they are heavy and easy to break) when gourds (*totumo*s) were available. The use of gourds (*Crescentia cujete*) as containers has been reported from as early as the Herrera period in the rock shelter of Zipacón (Correal and Pinto 1983), and even today peasants use *totumos* for serving beverages during their daily agricultural tasks.

In sum, neither the analysis of sherd quantities nor that of the ceramic assemblages supports statements about the possibility of monthly or daily movement to the Valle de Tena from the Sabana de Bogotá. On the contrary, the figures obtained in these analyses fit well with the possibility of year-round habitation. It is of course possible that there was some kind of daily movement within the Tena region, but this does not affect the regional population estimates that are estimated here.

One more issue has yet to be dealt with before calculating population estimates. Settlement patterns indicate some degree of population aggregation in the Cubsio zone, aggregation that resembles what is commonly called a village. When the population is dispersed enough, as is the case for the rest of the surveyed area, there is no serious problem for population estimates if each lot is considered to be representative of a single household. This is reinforced by the nature of landforms in the Tena region, in which small flat areas are not usually large

enough to permit the occupation of more than one household. In contrast, in the context of more clustered settlement, one must consider if a single lot can be representative of more than one household.

Archaeological studies of clustered settlement in the Muisca area have called attention to the possibility that more than one family unit lived in areas no larger than 1 ha (Boada 2007; Kruschek 2003). At El Venado it has been estimated that within 1 ha of settlement there would have lived between 4.2 and 1.4 residential units, for the Late Herrera and the Early Muisca periods, respectively (Boada 2007). If the dates of the three archaeological periods in El Venado are averaged, it results in 2.3 residential units per ha.

Two variables might be involved in the underestimation of households per hectare. First is the length of time that houses were occupied. Preliminary analysis of a small sample of modern rural houses indicates that there is a positive correlation between the length of occupation and the area of garbage dispersion (Drennan and Boada 2006). Second is Romano's (2003a) statement that the remains of four "households" at the site of San Carlos actually correspond to a single, but extensive, family. Based on these cases the estimate of 2.3 households per ha at El Venado should be taken as the maximum number of households within a clustered area of settlement.

Osborn (1979) provides an ethnoarchaeological description of a densely populated Chibcha village. Household distribution in the Cobaría village (in the U'wa territory) resembles that studied by Romano (2003a) in Funza, with clusters of houses of related families. The village of Cobaría is composed of 70 families and its size is 57.6 ha, so the area occupied by each family is 0.82 ha. This estimate is similar to that reported by Boada (2006) for the Early Muisca period at El Venado, and is very close to the maximum area for each collection lot (1 ha) in the Valle de

Tena. This figure thus suggests that even in areas with clustered population, like Cubsio, the area occupied by a single household is close to 1 ha, so it is possible to use the estimate of one house per lot for the entire Valle de Tena region.

4.2.1 Relative and Absolute Population

As mentioned previously this study follows an approach to making population estimates developed by Drennan et al. (Drennan et al. 2003; Drennan and Boada 2006; Drennan and Peterson 2011). Estimates of relative changes in regional population are generally based on the comparison of differences in the number of sherds, the number of sherds/century, the number of lots, and the occupied area. A much more refined method is the Area-Density-Index and the Area-Density-Index/Century (Drennan et al. 2003; Drennan and Peterson 2011). For this study the Area-Density-Index and the Area-Density-Index/Century were calculated for both prehispanic sherds (excluding Modern sherds) and all collected sherds (Modern sherds included). Since unidentified sherds comprised only 3.9% of the total ceramic assemblage a "correction" factor was not needed (Drennan and Peterson 2011: 60-61). As mentioned by Drennan et al. consistency in patterns shown by these variables increases the reliability of the conclusions and suggests that sampling bias is not an issue.

All the relative population estimates for the Tena region are consistent with regard to population dynamics during prehispanic times (Figure 4.21). All of them indicate strong population growth from the Herrera to Early Muisca period, and slower growth from the Early Muisca to Late Muisca period. According to all but one approach, population during the Late Muisca period either grew slightly or stayed the same. On the basis of the total area the population appears to decrease slightly during this time.

Much less consistent are changes from the Late Muisca to the Modern period when relative population estimates are compared. The number of lots and the total occupied area suggest a decrease in the regional population, though the strength of this decrease differs between them. In contrast, total sherds, total sherds/century, the Area-Density-Index, and the Area-Density-Index/century all suggest some degree of population growth.

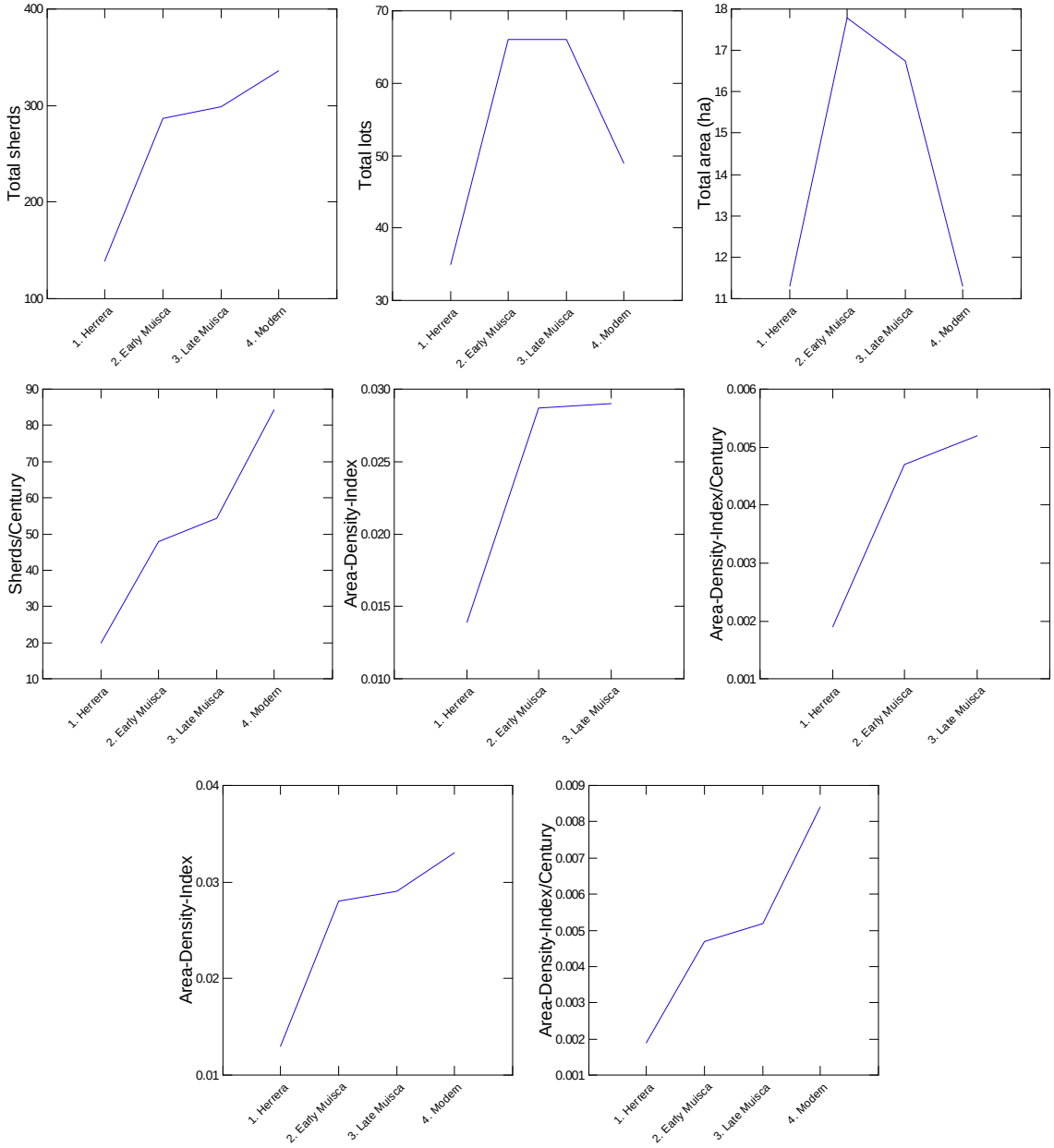


Figure 4.21 Different approaches for estimating relative population changes in the Valle de Tena

The number of lots/km^2 and the number of sherds/km^2 calculated for the four systematic surveys carried out in the Altiplano Cundiboyacense provide a framework with which to compare population dynamics in Tena (Figure 4.22). Even though these two estimates do not indicate exactly the same thing, there are some patterns that can be observed. The first is the very scarce population of the Tena region throughout the entire prehispanic period. As was mentioned previously, population figures for Tena are pretty similar to those for Valle de Leiva, for which low population estimates have already been emphasized (Langebaek 2001), but their demographic dynamics are not similar at all. It is important to stress that at the beginning of the archaeological sequence, during the Herrera period, the five regions are not very different from each other. It is the transition between the Herrera and Early Muisca periods in which population figures really took different trajectories. Even though there is a population increase from the Herrera to the Early Muisca period in all of these regions, such an increase was not the same in each case. Clearly, population growth in the Sabana de Bogotá was much more remarkable than for the other three regions. Prior to this time, though, population figures for Tena do not seem to have been very different than those for Valle de Leiva and Fúquene-Susa.

It is the transition from the Early Muisca to the Late Muisca period in which differences between Tena and the other regions in the Altiplano Cundiboyacense become prominent. From here on population growth that occurred in the Altiplano Cundiboyacense, though different between regions of this area, strongly contrasts with population dynamics in Tena. Even the sequences of Valle de Leiva and Fúquene-Susa, though similar with Tena up to this point, are now clearly different. Even more different are the numbers from the Sabana de Bogotá.

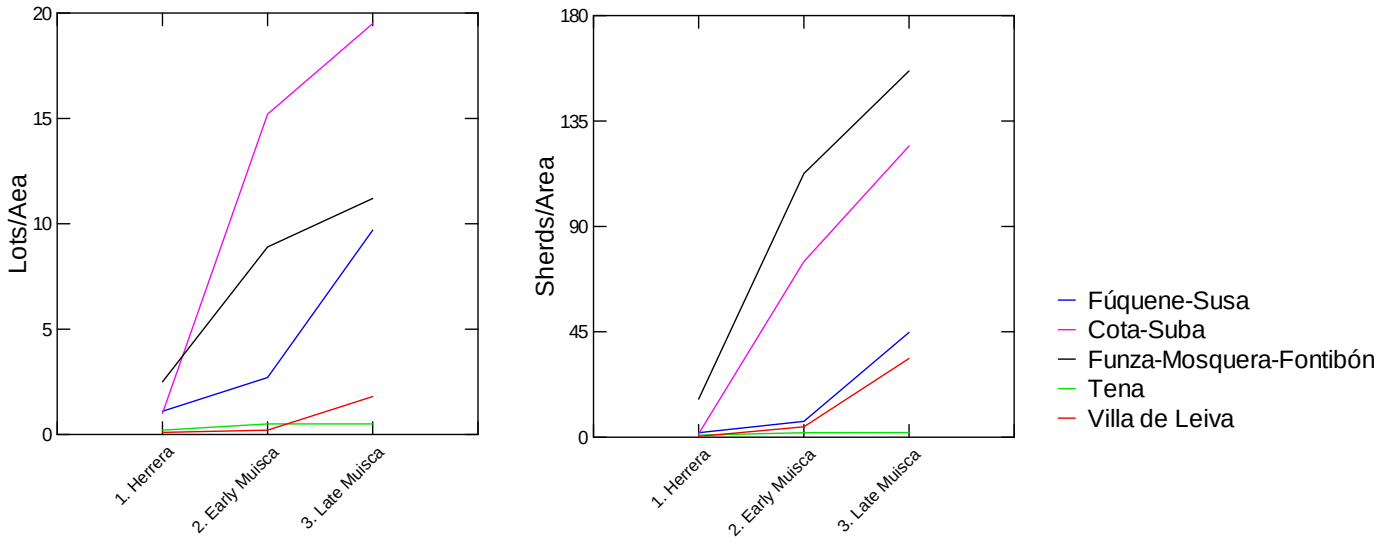


Figure 4.22 Relative population changes in five Muisca regions

Absolute population estimates can be arrived at by estimating a certain number of inhabitants per occupied area (Sanders, Parsons, and Santley 1979). These estimates are not very precise but they nonetheless provide a reliable way of comparing population figures. As has been repeatedly stated by Drennan, differences between populations of, say, 100, 1000, and 10,000 persons are broad but nonetheless useful when one is interested in reconstructing social dynamics. So any systematic approach to estimate population numbers is always better than a simple guess.

As mentioned previously, a considerable improvement in the methods established by Sanders, Parsons, and Santley (1979) has been made by Drennan and his collaborators. This is particularly the case for making absolute population estimates. The estimation of modern population figures for a portion of the Valle de la Plata using the Sanders, Parsons, and Santley (1979) methodology yielded almost the same average value as that based on a modern census carried out in the same area (Drennan and Boada 2006). This sort of analysis confirms that the Sanders, Parsons and Santley (1979) method is not only reasonable but actually very accurate.

Ceramic sherd scatters in the Tena region fall into the *scanty* to *light* category as defined by Sanders, Parsons, and Santley (1979). This corresponds to a range of between 2 and 10 persons per hectare. Thus, for the Herrera period the population estimate ranges from 23 to 111 persons. The Early Muisca population is estimated to have been between 36 and 178 persons, and between 34 and 168 persons for Late Muisca Times. The Modern period population is estimated to have been very similar, or between 23 and 114 persons. These figures reaffirm the existence of a very small population in the Tena region throughout the entire archaeological sequence.

If the absolute population figures for the Tena region are compared with those from the other four regions in the Altiplano Cundiboyacense, the overall scarcity of population in Tena is emphasized even more (Figure 4.23). It is interesting that, at the beginning of the archaeological sequence for which population estimates can be made (the Herrera period), the population numbers are not very different at all—except for the case of Funza-Mosquera-Fontibón. It is from the Early Muisca period on that differences in population figures become significant. And it is for the Late Muisca period that these differences are most pronounced.

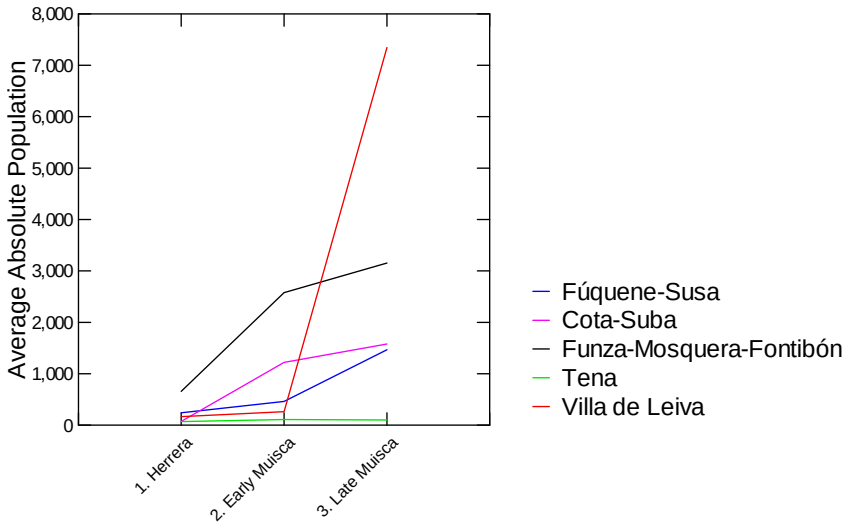


Figure 4.23 Absolute population changes in five Muisca regions

Except for the transition from the Early Muisca to the Late Muisca period in Villa de Leiva, in which population growth was very substantial, the figures of relative and absolute population are broadly similar for the entire archaeological sequence throughout the Altiplano Cundiboyacense and Tena regions. As with the relative population estimates, the figures for absolute estimates underscore the large populations in Funza-Mosquera-Fontibón and Cota-Suba. The Fúquene-Susa region stands in the middle of two relatively distinct groups, one formed by Funza-Mosquera-Fontibón and Cota-Suba, and another formed by Tena and Valle de Leiva (not taking into account the transition from the Early Muisca to the Late Muisca period in Valle de Leiva).

Langebaek (1995b) and Boada (2006) have claimed that the population estimates based on Sanders, Parsons, and Santley's (1979) framework are perhaps too conservative. According to Langebaek (1995b:77), since most of the sites are very small for the Herrera period in the Fúquene-Susa region (averaging 0.64 ha), "…it would be problematic to conclude that most isolated sites were occupied by less than one person, as the figures of Sanders, Parsons and Santley would imply...". This claim is also applicable to the Tena region, in which most of the sites are actually less than 0.5 ha (79% for the Herrera period, 84% for the Early Muisca period, and 87% for the Late Muisca period). Langebaek's (1995b: 77) solution to this problem was to assume that "…each isolated site corresponds to a household of between 5 and 7 individuals each… [with] …the same population density for both hamlets and isolated households". If this figure is applied to Tena, the population estimates would be as follows. For the Herrera period only one site was notably larger than 1 ha, so the remaining 23 sites would have had between 115 and 161 persons. Since these sites correspond to 62% of the occupied area, then the total population would be estimated between 186 and 260 persons. For the Early Muisca period, 51

sites corresponding to 72% of the occupied area had between 255 and 357 persons, with a total population ranging from 353 to 494 persons. 52 Late Muisca sites, corresponding to 66% of the occupied area, had between 260 and 364 persons, with a total population between 394 to 552 persons. Finally, 39 Modern sites corresponding to 70% of the occupied area, had a population between 195 and 273 persons, with a total population between 278 and 390 persons in the region.

A little more refinement could be introduced if Boada's (2006) average of 2.3 households per hectare in clustered areas is considered. This provides a way of adjusting the estimated population that was based on Langebaek's (1995b) approach, and provides a more accurate figure for larger sites. Given that in the Tena region only one or two such sites exists for each period, it is possible to multiply the area of each by 2.3 households per hectare, and add this number to the one previously obtained for the sites smaller than 1 ha, using Langebaek's (1995b) estimate of 5 to 7 individuals per household. For the Herrera period there is a site measuring 4.13 ha, which thus includes 8.79 households. This equates to a population of about 44 to 62 persons, which can then be added to the previously calculated number of persons living in isolated households (115 to 161), resulting in a total population between 159 and 223 persons for the Herrera period. For the Early Muisca period the 4.92 ha site equates to between 56 and 79 persons, for a total population between 311 and 436 persons. Two larger sites of the Late Muisca period equate to between 66 and 92 more persons, resulting in a total population between 326 and 456 persons. The Modern 3.39 ha site equates to 39 to 55 persons, for a total of 234 to 328 persons for this period.

The approaches to population estimates followed by Langebaek (1995b) and Boada (2006) do in fact increase those obtained on the basis of Sanders, Parsons, and Santley (1979). The approach of Sanders, Parsons, and Santley is a very good point of departure for making

regional population estimates, while those of Langebaek and Boada provide a way of improving it. Since all of these approaches are in fact complementary, and their integration provides a more accurate estimation of population figures, this was approach adopted here. In short, the population numbers obtained through the combination of approaches by Sanders, Parsons, and Santley (1979), Langebaek (1995b) and Boada (2006) are considered to be most accurate. Population numbers obtained through all three approaches, however, are provided so as to allow eventual comparisons like those undertaken in this study (Table 4.6).

Interestingly, though, even the more liberal population estimates obtained on the basis of Langebaek's and Boada's approaches for the Tena region do not overcome the estimates made for the four Altiplano Cundiboyacense regional surveys on the basis of Sanders, Parsons, and Santley's approach. In short, despite the liberal population estimates made for Tena, they still indicate very low population numbers for every single archaeological period. For instance, the population difference between Tena and the Altiplano Cundiboyacense for the Late Muisca period should be described as dramatic. If the claim made by Langebaek (1995b) and Boada (2006) is accurate, that population estimates made on the basis of the Sanders, Parsons, and Santley (1979) approach produces conservative numbers, then the differences between the Altiplano Cundiboyacense and Tena reaffirms the conclusion that the regional population in this latter region was particularly sparse.

Table 4.6 Different approaches to absolute population estimates for the Tena region

	Herrera	Early Muisca	Late Muisca	Modern
Sanders, Parson and Santley (1979)	23-111	36-178	34-168	23-114
Sanders, Parson and Santley (1979) + Langebaek (1995b)	186-260	353-494	260-364	278-390
Sanders, Parson and Santley (1979) + Langebaek (1995b) + Boada (2006)	159-223	311-436	326-456	234-328

5.0 PATTERNS OF LAND USE

5.1 LAND USE BY PERIOD

5.1.1 The Herrera Period

During the Herrera period most of the people preferred to live on the best agricultural soils. Half of the population was settled in soil category I, while most of the other half settled category II soils. A very small proportion of the people settled in the poorest agricultural soils in the region (Figure 5.1; Table 5.1). The preference by people to settle in the best available agricultural soils seems to be a tendency during the Herrera period that existed in the Altiplano Cundiboyacense as well. Langebaek (1995b, 2001) has documented people's preference for the best soils during the Herrera period in both Fúquene-Susa and Valle de Leiva. This was also the case in the Cota-Suba region, in which most of the Herrera sites were located on the most fertile soils, and all of the sites had easy access to the best agricultural lands (Boada 2006).

Table 5.1 Herrera occupation by soil categories

Soil Category	Ha	Percentage	Percentage of the Total Area
I	5.57	50.50	0.09
II	4.99	45.24	0.07
III	0.47	4.26	0.03

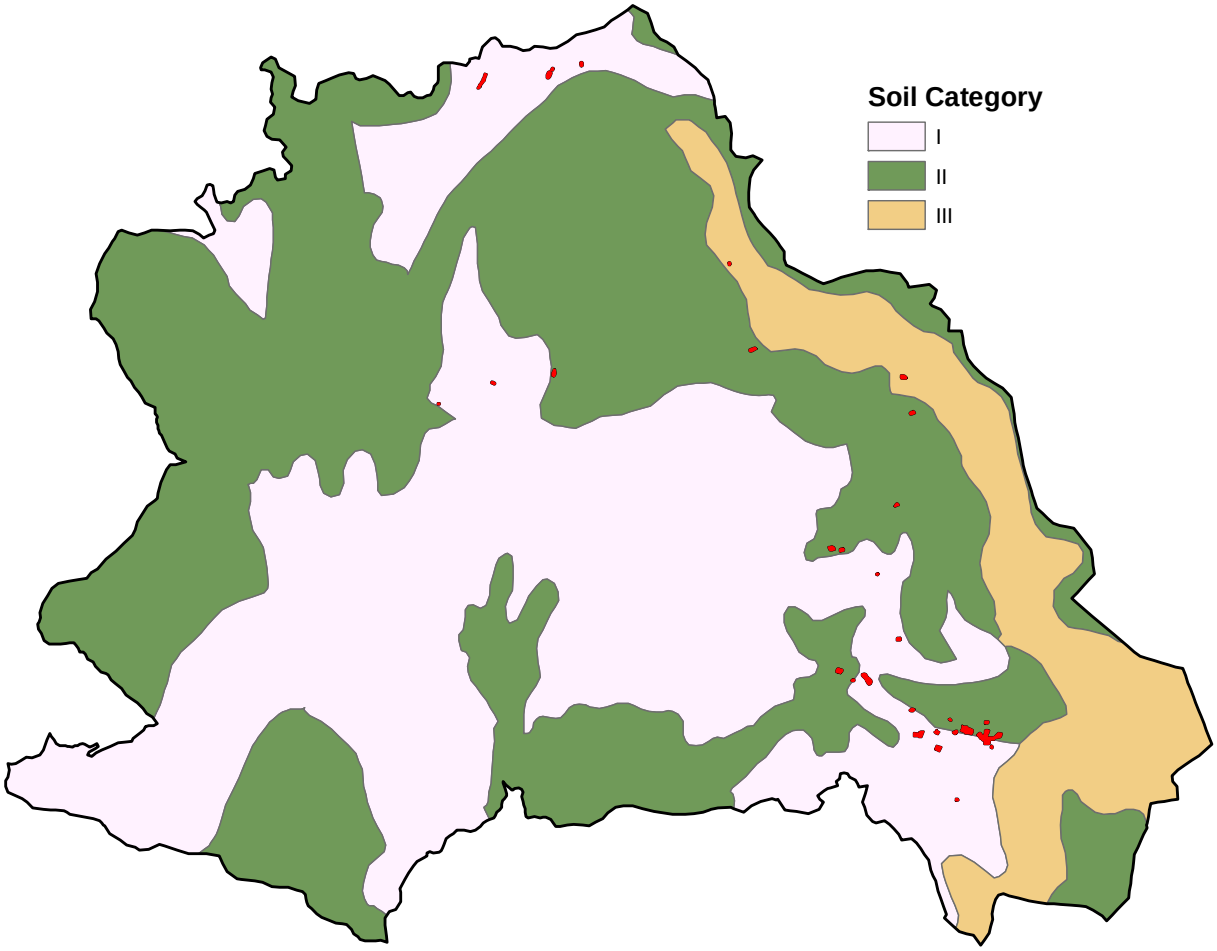


Figure 5.1 Herrera occupation by soil categories

These numbers indicate a preference by people to live on the best soils during the Herrera period. However, due to the very sparse population and the large amount of category I soils available, one wonders if such preference was in fact the result of a strong draw towards the best soils. Previous settlement pattern analysis in Chapter 4 has already shown that people were not evenly distributed throughout the land. For the Herrera period a population cluster was documented at Cubsio, along with dispersed farmsteads. The population cluster at Cubsio was located more or less on the border of category I and category II soils. The question thus rises as to whether such a settlement distribution was related to agricultural productivity. This question

can be evaluated through a comparison between the observed population and the expected population in each soil category. This analysis was carried out by means of a 500x500 m grid-square analysis, following the method presented in Drennan et al. (2006). One of the main advantages of this method is that it does not make any *a priori* assumptions about the agricultural productivity, but informs about the possible preference by people to settle in any kind of soil (no matter its productivity).

To carry out this analysis the percentage of occupied area for each period was calculated for each soil category. This percentage was obtained by dividing the total occupied area in a given soil category by the total area of that category in the region. For example, during the Herrera period 5.57 ha of category I soils were occupied; since this soil category makes up a total of 6094 ha of the surveyed area, the expected percentage of occupation within any given part of this soil zone during the Herrera period is 0.09%. This percentage was thus the basis for calculating the expected occupied area in each of the 500x500 m quadrats in which the survey area was divided. The area of each soil category was calculated for each quadrat, and was multiplied by the expected percentage of occupied area. For instance, if a single quadrat had a total of 10 ha of category I soils, then it was expected to contain a Herrera occupation of roughly 0.009 ha (0.09% of 10 ha is equivalent to 0.009 ha). The total expected occupied area for each quadrat was then the sum of the expected areas for each soil category. Finally, the total expected area was subtracted from the observed occupied area for each quadrat.

Thus, if the distribution of settlement was a function of the agricultural productivity of soils (no matter if they were good or bad), then the observed occupation should be the same as the expected occupation in each of the 500x500m quadrats. Alternatively, if the observed occupation is larger than the expected occupation in a given quadrat, then it is possible to

conclude that occupation in these areas is not a function of the agricultural productivity of the soils.

Figure 5.2 shows the same pattern of population distribution for the Herrera period, with the population aggregation at Cubsio. As mentioned earlier, this cluster (which is located in 6 different quadrats) was located on the boundary of soil categories I and II. In this zone the observed population is larger than expected, which indicates that population aggregation here cannot be explained by a desire to occupy any specific soil category. Moreover, a linear regression analysis between the observed and the expected populations for each 500x500m square indicates that distribution of soils categories explains very little of the population distribution in the Tena region ($r^2 = 0.011$, $p < 0.0005$). In short, soil categories only explain about 1% of the settlement distribution in Tena for the Herrera period.

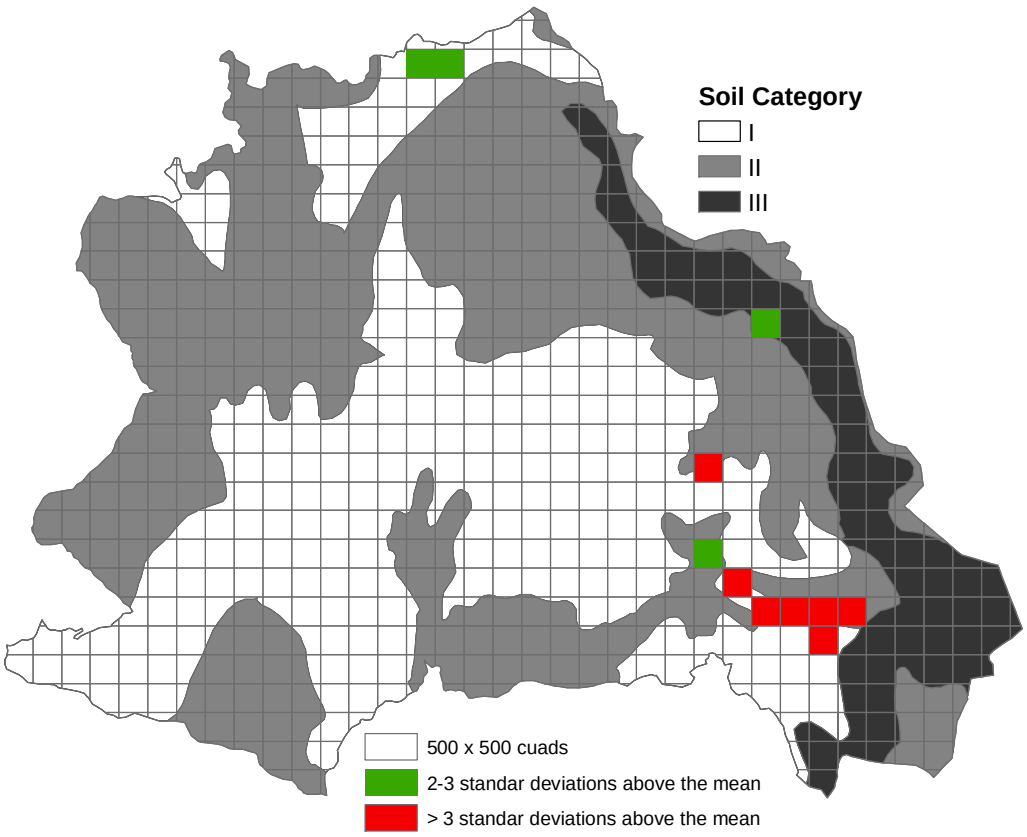


Figure 5.2 500 x 500m quadrats with unusually high observed occupied area for the Herrera period, according to soil category

Another way to observe the relationship between land and population distribution is to examine the settlement distribution of the Herrera period in relation to maize productivity zones. During this period half of the population lived in areas in which it was possible to yield one maize harvest per year. The other half lived in the "transitional zone", where it was possible to produce one to two maize harvests. Only a very small proportion of the population lived in the more productive zone in which it was possible to yield two maize harvests per year (Figure 5.3; Table 5.2).

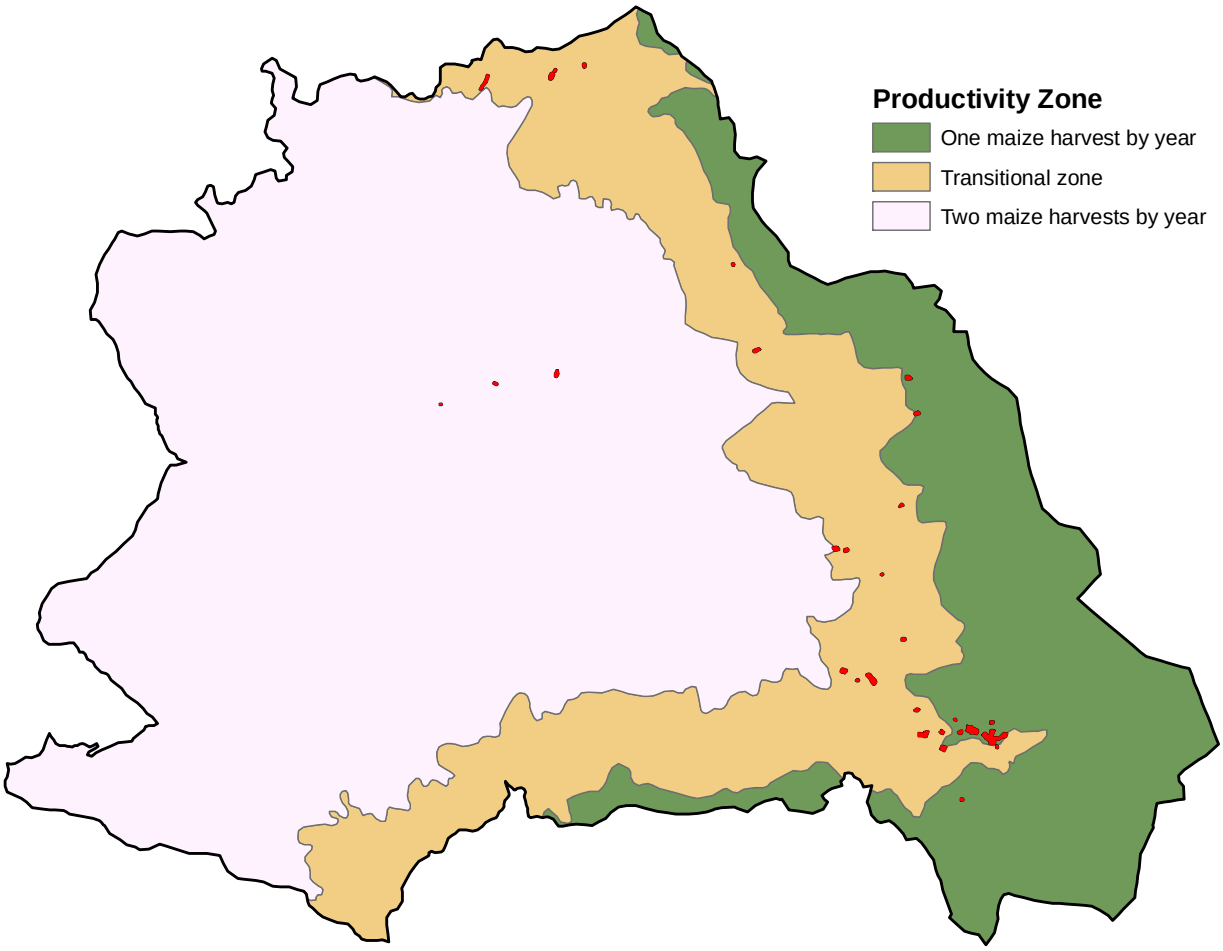


Figure 5.3 Herrera occupation by maize productivity zone

Table 5.2 Herrera occupation by maize productivity zone

Productivity Zone	ha	Percentage	Percentage of the Total Area
One maize harvest by year	5.34	48.46	0.19
Transitional zone	5.19	47.10	0.16
Two maize harvests by year	0.49	4.45	0.01

If the 500x500 m grid-square analysis is carried out on the basis of the maize productivity zones, the result is not very different from that obtained using the soil categories. Most of the squares with observed populations notably above the expected value, including the Cubsio population cluster, are located within the transitional zone and that in which it is possible to yield

one maize harvest per year (Figure 5.4). This means that the Cubsio population cluster cannot be explained by a preference to settle within a particular maize productivity zone. At the regional scale the population distribution for the Herrera period cannot be explained as a function of the distribution of maize productivity zones ($r^2 = 0.010$, $p < 0.0005$).

In sum, even though the Herrera population preferred to settle in the best agricultural soils, it is not possible to explain population distribution as a function of soil quality. Neither is it possible to explain this population distribution as a function of the distribution of maize productivity zones. The delineation of clusters of population well above the expected values for both soil categories and maize productivity zones argues against the possibility that population was distributed so as to maximize access to land resources. The very sparse population in the zone in which it is possible to produce two maize harvests per year further suggests that early settlement in the Tena region was not driven by the desire to maximize maize production either.

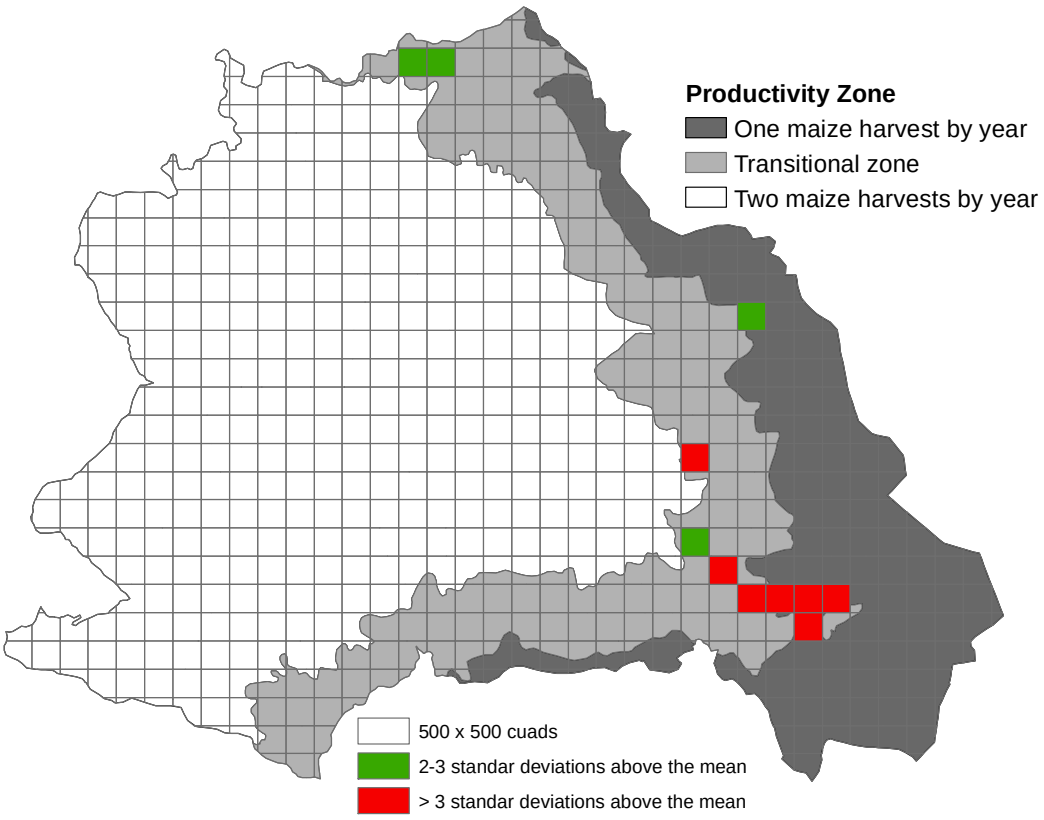


Figure 5.4 500 x 500m quadrats with unusually high observed occupied area for the Herrera period, according to maize productivity zone.

5.1.2 The Early Muisca Period

There was only a slight change in patterns of human settlement with respect to soil zones during the Early Muisca period. During this period most of the people lived on the second most productive soils, not in the most productive as was the case for the previous Herrera period. Nonetheless, a substantial portion of people continued living on the best agricultural soils, and only a very small portion of the population was settled in the poorest agricultural lands, as was also the case for the Herrera period (Figure 5.5; Table 5.3). The tendency for households to occupy the best agricultural lands during the Early Muisca period has been documented for the

Valle de Leiva and Cota-Suba regions (Boada 2006, Langebaek 2001), though this differs from patterns documented in Fúquene-Susa, where a notable proportion of people lived on the poorest soil of the region.

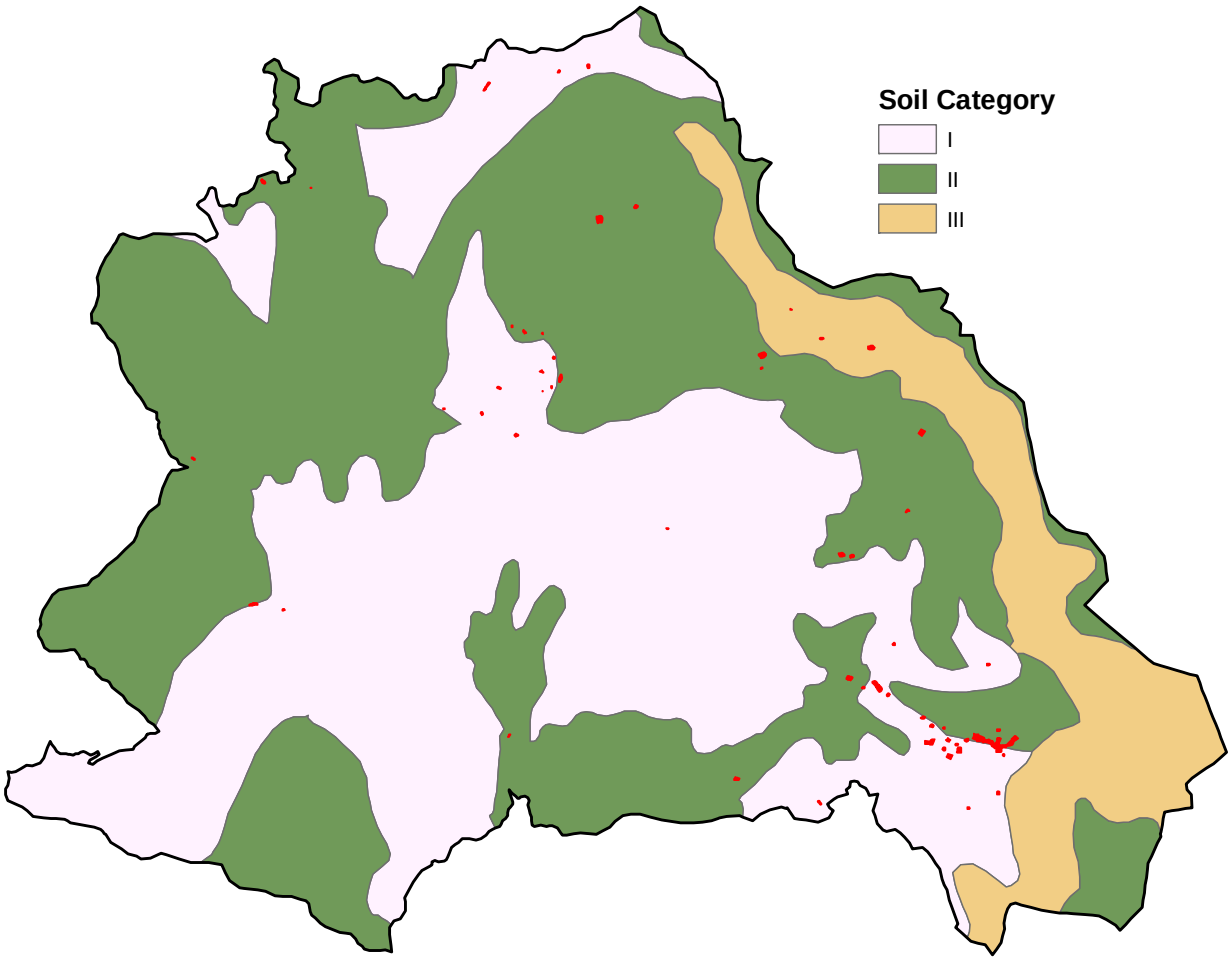


Figure 5.5 Early Muisca occupation by soil categories

Table 5.3 Early Muisca occupation by soil categories

Soil Category	ha	Percentage	Percentage of the Total Area
I	7.71	43.36	0.13
II	9.38	52.76	0.14
III	0.69	3.88	0.04

In the 500x500 m grid-square analysis carried out for the Early Muisca period it is possible to observe some squares in which the observed population is larger than expected (Figure 5.6). Most of these squares are located in the category II soil zone, while some others fall along the boundary between soil categories I and II. These squares correspond with those areas in which population clusters were identified in Chapter 4. This means that soil productivity is not a good predictor of population distribution in these areas. At the regional level the correlation between the observed and expected population among grid-squares is very poor (r^2= 0.012, p<0.0005), which means that the general population distribution of the Early Muisca period cannot be explained as a function of soil productivity.

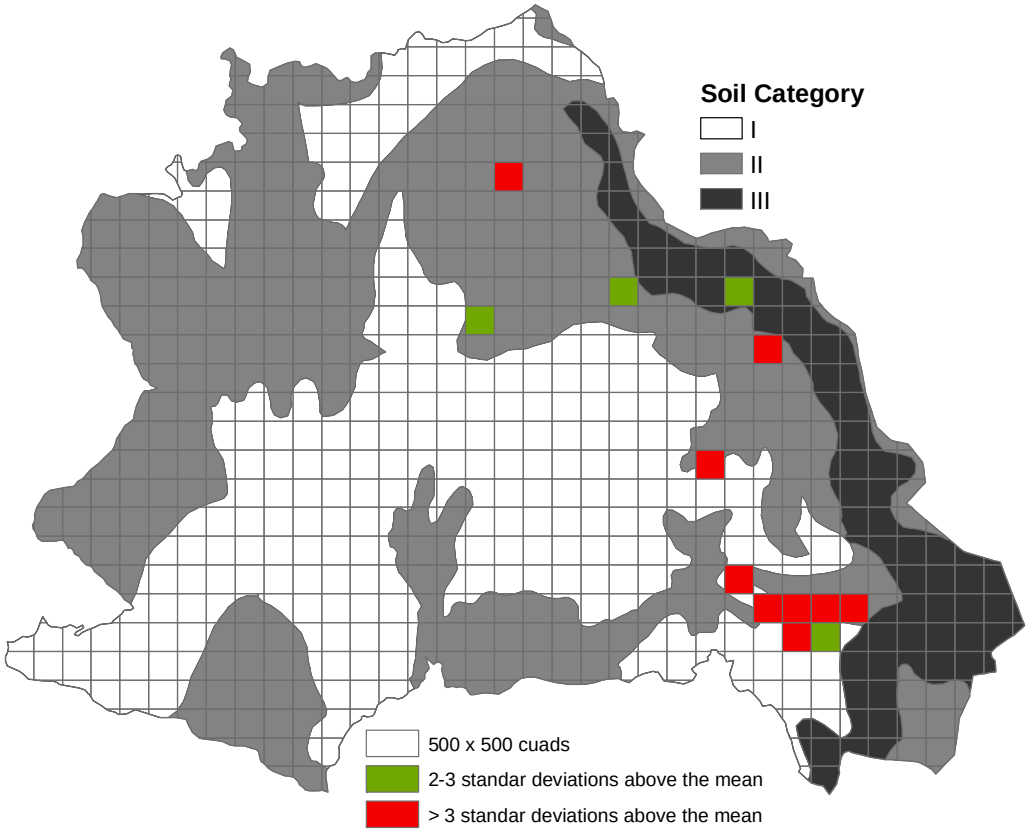


Figure 5.6 500 x 500m quadrats with unusually high observed occupied area for the Early Muisca period, according to soil category.

As for the Herrera period, most of the people during the Early Muisca period continued to live in the zone in which it is possible to yield one maize harvest per year (Figure 5.7; Table 5.4). However, a significant change can be observed during this period: a substantial amount of people now settled in the two-maize-harvest-per-year zone, which had previously been almost unoccupied. The growth of the population in this zone was at the expense of the transitional zone, but not at that of the zone in which one maize harvest could be produced per year. So the desire by people in Tena to live close to the cold lands of the Sabana de Bogotá persisted.

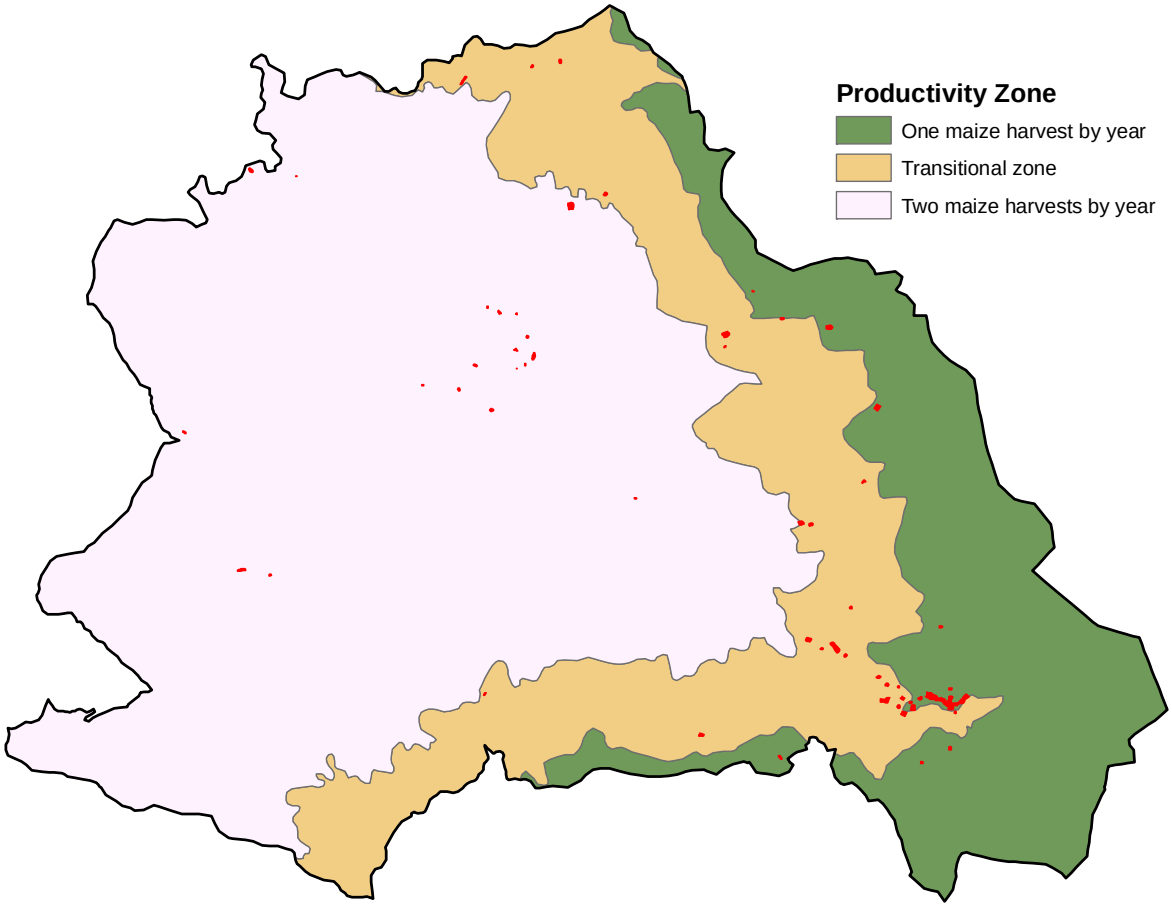


Figure 5.7 Early Muisca occupation by maize productivity zone

Table 5.4 Early Muisca occupation by maize productivity zone

Productivity Zone	ha	Percentage	Percentage of the Total Area
One maize harvest by year	7.65	43.03	0.28
Transitional zone	6.66	37.46	0.21
Two maize harvests by year	3.47	19.52	0.04

The Early Muisca population clusters can still be identified if the 500x500m grid-square analysis is carried out on the basis of the maize productivity zones. Most of the squares are still located in either the one-maize-harvest-per-year zone or in the transitional zone, and only one square has any area in the two-maize-harvests-per-year zone (Figure 5.8). The identification of these clusters in areas where the observed population is larger than expected suggests that these clusters are not a function of the maize productivity zones. At the regional level, the lack of correlation between the observed and the expected population among grid-squares (r^2=0.073, p<0.0005) indicates that settlement patterns cannot be predicted on the basis of maize productivity zones.

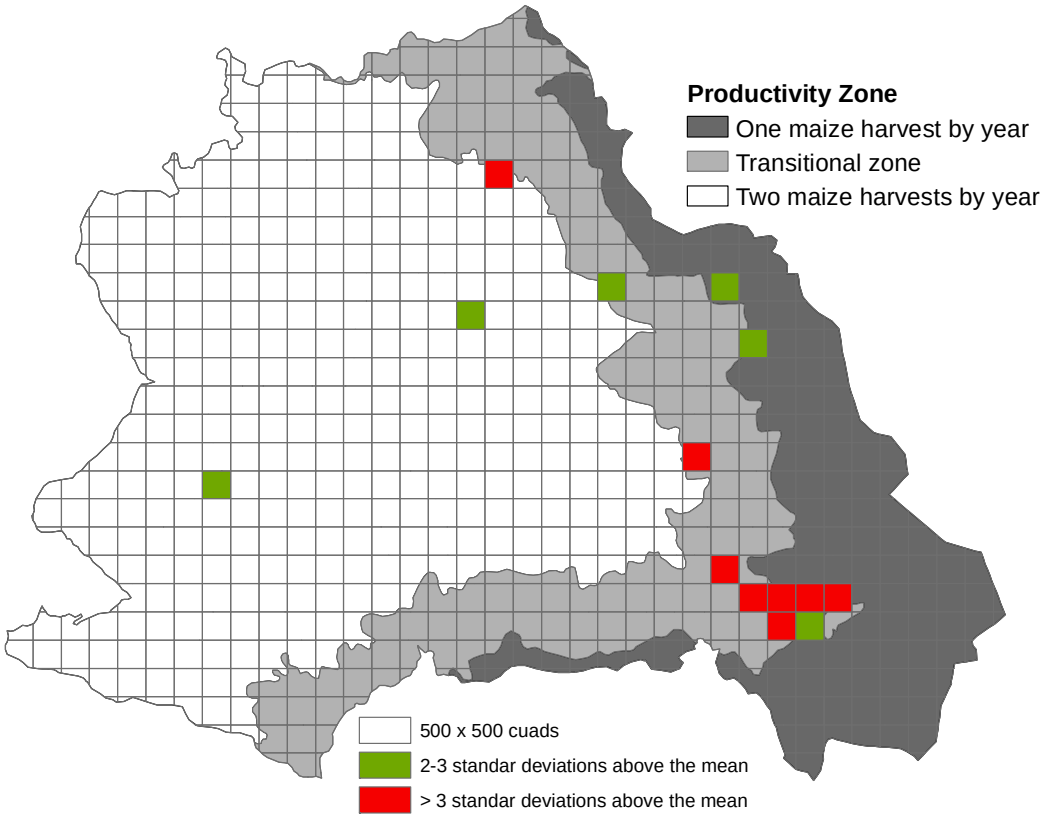


Figure 5.8 500 x 500m quadrats with unusually high observed occupied area for the Early Muisca period, according to maize productivity zone.

In sum, though most of the people continued living in the best agricultural soils during the Early Muisca period, it is not possible to argue that soil productivity was the primary force influencing settlement patterns. During this period an important change took place, which was the tendency for more people to settle in the zone in which it is possible to produce two maize harvests per year. However, despite this change, it is not possible to explain Early Muisca settlement patterns as a function of these maize productivity zones.

5.1.3 The Late Muisca Period

During the Late Muisca period the tendency for people to live in the best two soil zones persisted. The difference between the proportion of people living in category I and II soils was relatively small, and, as for the previous periods, almost all of the population was settled there; the proportion of people living in the poorest agricultural soils was again very small (Figure 5.9; Table 5.5). This figure contrasts with patterns documented in other archaeological sequences in the Altiplano Cundiboyacense. In Valle de Leiva population growth was accompanied by increased settlement on the poorest soils (Langebaek 2001), while in Tena settlement of the poorest soils progressively reduced. In the Fúquene-Susa region the tendency for people to settle in the best soils, which had decreased during the Early Muisca period, increased again during Late Muisca times (Langebaek 1995b). In Cota-Suba all the settlements were located in the best agricultural soils (Boada 2006).

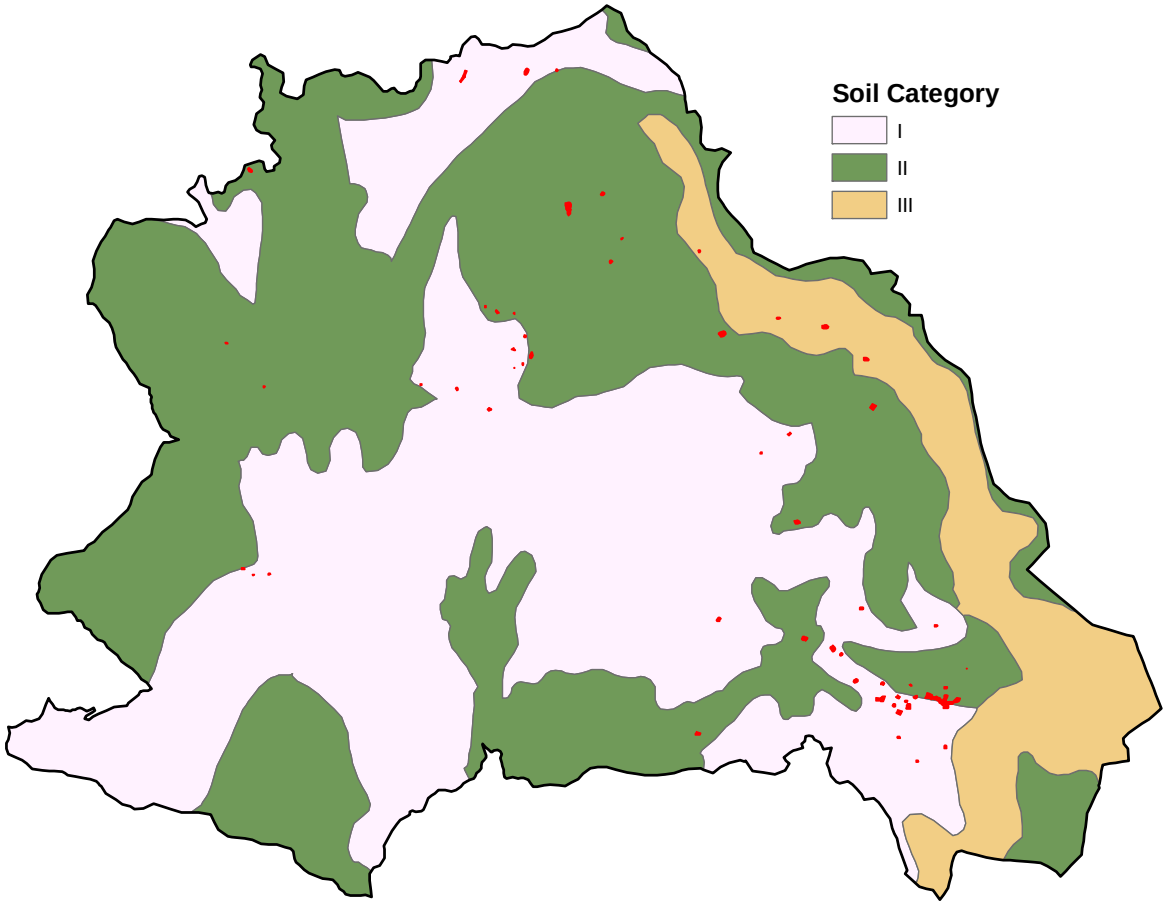


Figure 5.9 Late Muisca occupation by soil categories

Table 5.5 Late Muisca occupation by soil categories

Soil Category	ha	Percentage	Percentage of the Total Area
I	8.01	47.85	0.13
II	8.1	48.39	0.12
III	0.63	3.76	0.04

As with the previous periods, the 500x500m grid-square analysis for the Late Muisca period yielded some squares in which the observed population was larger than expected, and these correspond with the population clusters already identified in Chapter 4 (Figure 5.10). Most of these squares, in fact, correspond to the location of the Cubsio settlement cluster, while the

rest are located in the second supra-local community delineated for this period. As in previous periods the Cubsio settlement cluster falls along the boundary between category I and category II soils. As for the second cluster, two squares are located in soil category II, while another is located in soil category III. This figure reflects the lack of interest on the part of many people to cluster in the best soils during the Late Muisca period. The lack of correlation between the observed and expected populations among grid squares (r^2= 0.018, p<0.0005) indicates that soil productivity was not the primary force influencing settlement patterns for the Late Muisca period in the Tena region.

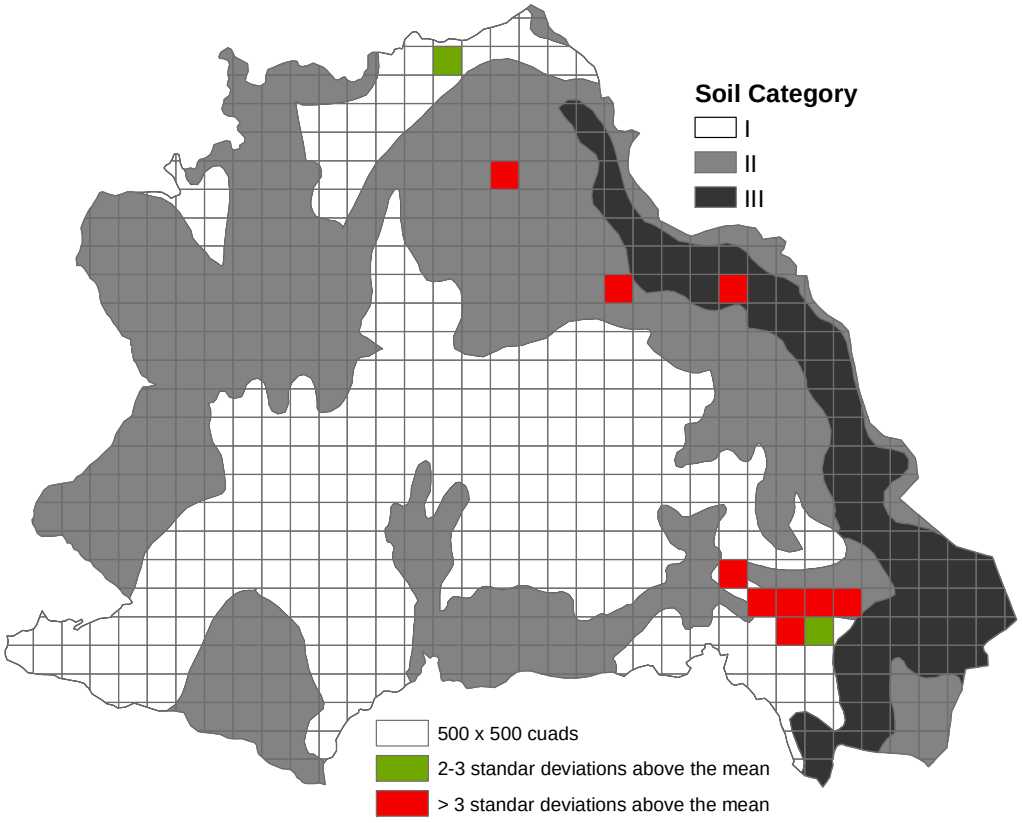


Figure 5.10 500 x 500m quadrats with unusually high observed occupied area for the Late Muisca period, according to soil category.

The increasing tendency to occupy the zone in which two maize harvests could be produced per year, which was initiated during the Early Muisca period, continued during the

Late Muisca period. A third of the Late Muisca population now lived in this zone (Figure 5.11; Table 5.6). In contrast to the Early Muisca period, this increase in the proportion of people living in the two-maize-harvests-per-year zone did not occur at the expense of the proportion of the population living in the transitional zone, but rather at the expense of the proportion of people living in the one-maize-harvest-per-year zone. The proportion of people living in this latter zone reduced to around 10%, while the proportion of people living in the transitional zone remained roughly the same.

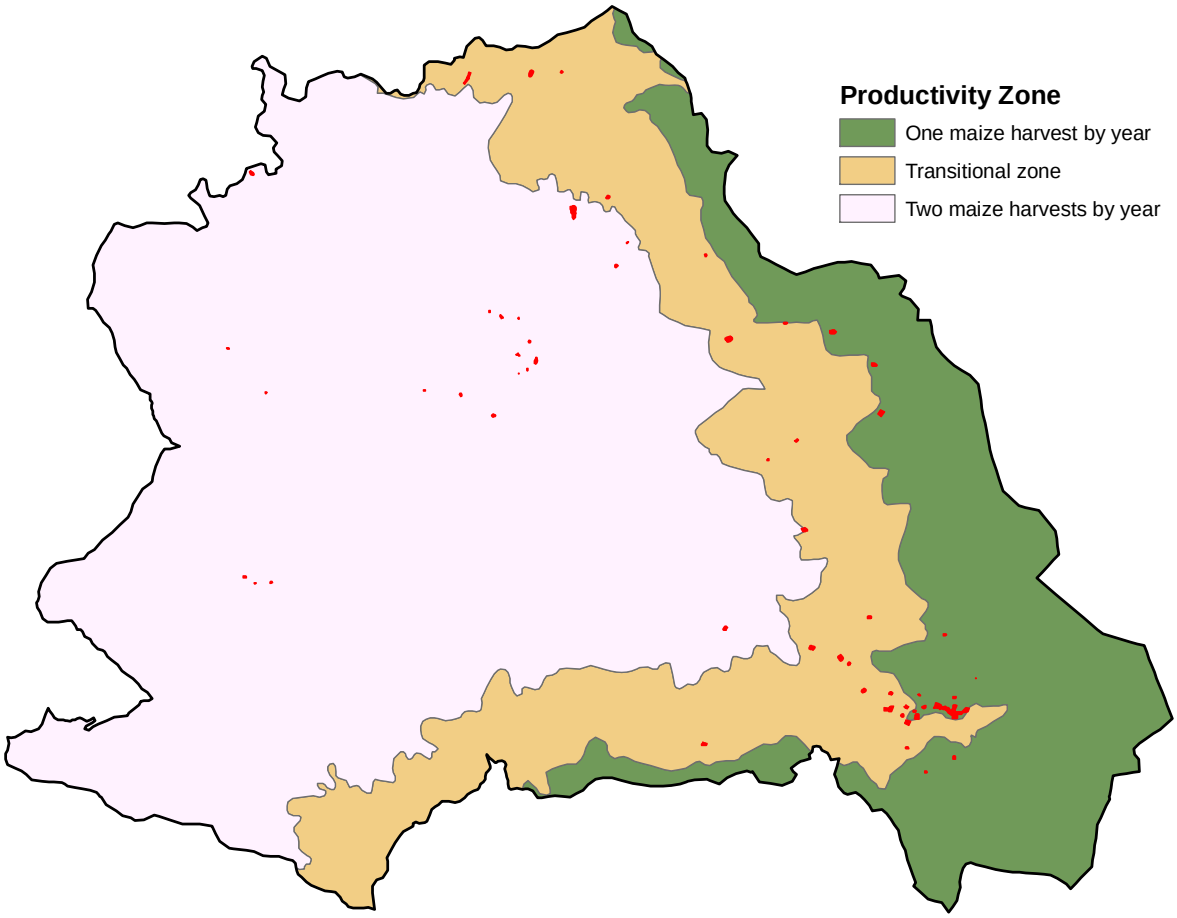


Figure 5.11 Late Muisca occupation by maize productivity zone

Table 5.6 Late Muisca occupation by maize productivity zone

Productivity Zone	ha	Percentage	Percentage of the Total Area
One maize harvest by year	5.8	34.67	0.21
Transitional zone	6.52	38.97	0.20
Two maize harvests by year	4.41	26.36	0.05

Despite the patterns previously mentioned, it is not possible to explain patterns of human occupation in Tena during the Late Muisca period as a function of the distribution of maize productivity zones. To begin with, the squares with observed populations far above the expected value are again in quite the same areas where population densities were greater, as already identified in Chapter 4 (Figure 5.12). This means that these population clusters cannot be explained on the basis of maize productivity zones. Most of the squares in which the observed population was well above the expected population are located in the transitional zone. At the regional level there is no correlation between the observed and expected populations of grid-squares (r^2= 0.056, p<0.0005), so maize productivity is a poor predictor of the Late Muisca settlement patterns in Tena.

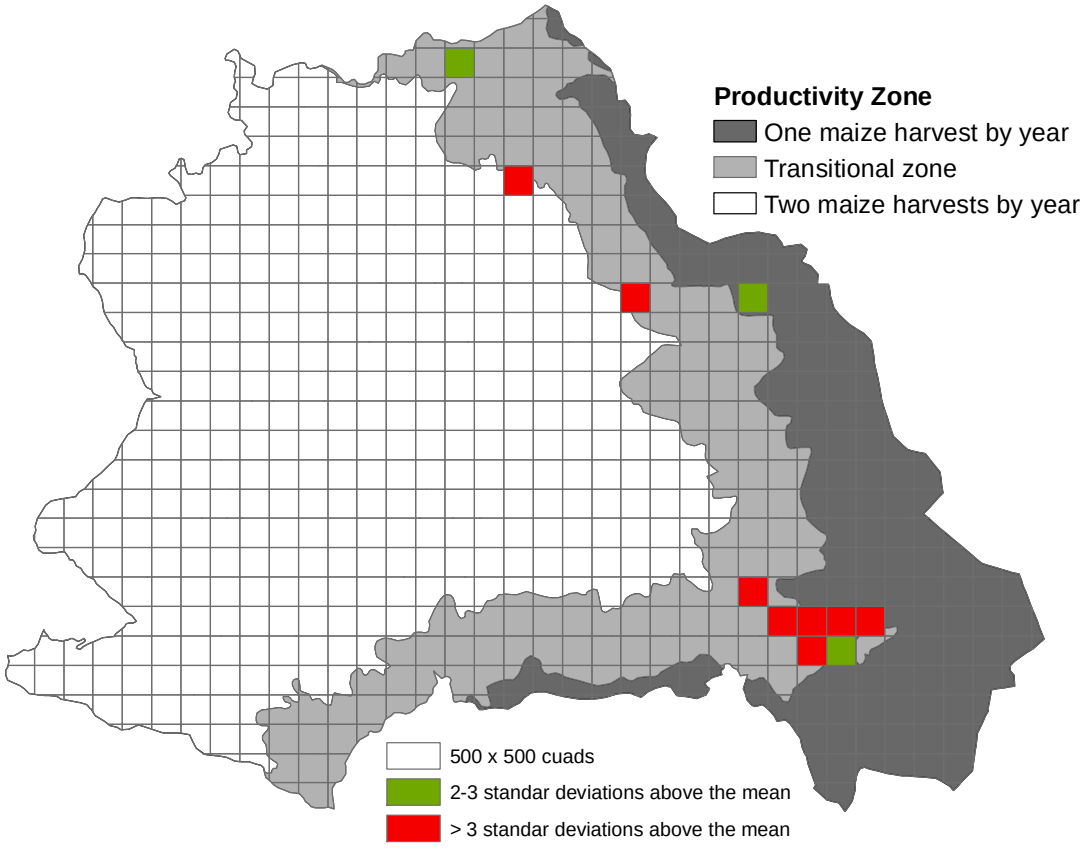


Figure 5.12 500 x 500m quadrats with unusually high observed occupied area for the Late Muisca period, according to maize productivity zone.

In sum, during the Late Muisca period people continued to prefer living in the best agricultural soils, although the agricultural productivity of the soils was not the force dictating settlement patterns. A third of the population was settled in the two-maize-harvests-per-year zone, which indicates the increased tendency of people to occupy the hotter parts of the region. Nonetheless, settlement patterns for the Late Muisca period cannot be explained as a function of maize productivity zones.

5.1.4 The Modern Period

There are not any important changes in settlement patterns in the Tena region during the Modern period, at least not in terms of their relation to zones of soil productivity. As in the previous prehispanic periods most of the people preferred to live on the best agricultural soils, while only a very small proportion lived within the least productive zone (Figure 5.13; Table 5.7). This pattern contrasts with those documented in some regions of the Altiplano Cundiboyacense. In both Fúquene-Susa and Valle de Leiva dramatic changes in settlement patterns took place after the Spanish invasion (Langebaek 1995b, 2001). In these regions there was a tendency for people to settle in the least productive agricultural zones. In Valle de Leiva, for instance, a third of the population settled among the poorest agricultural soils during the Modern period.

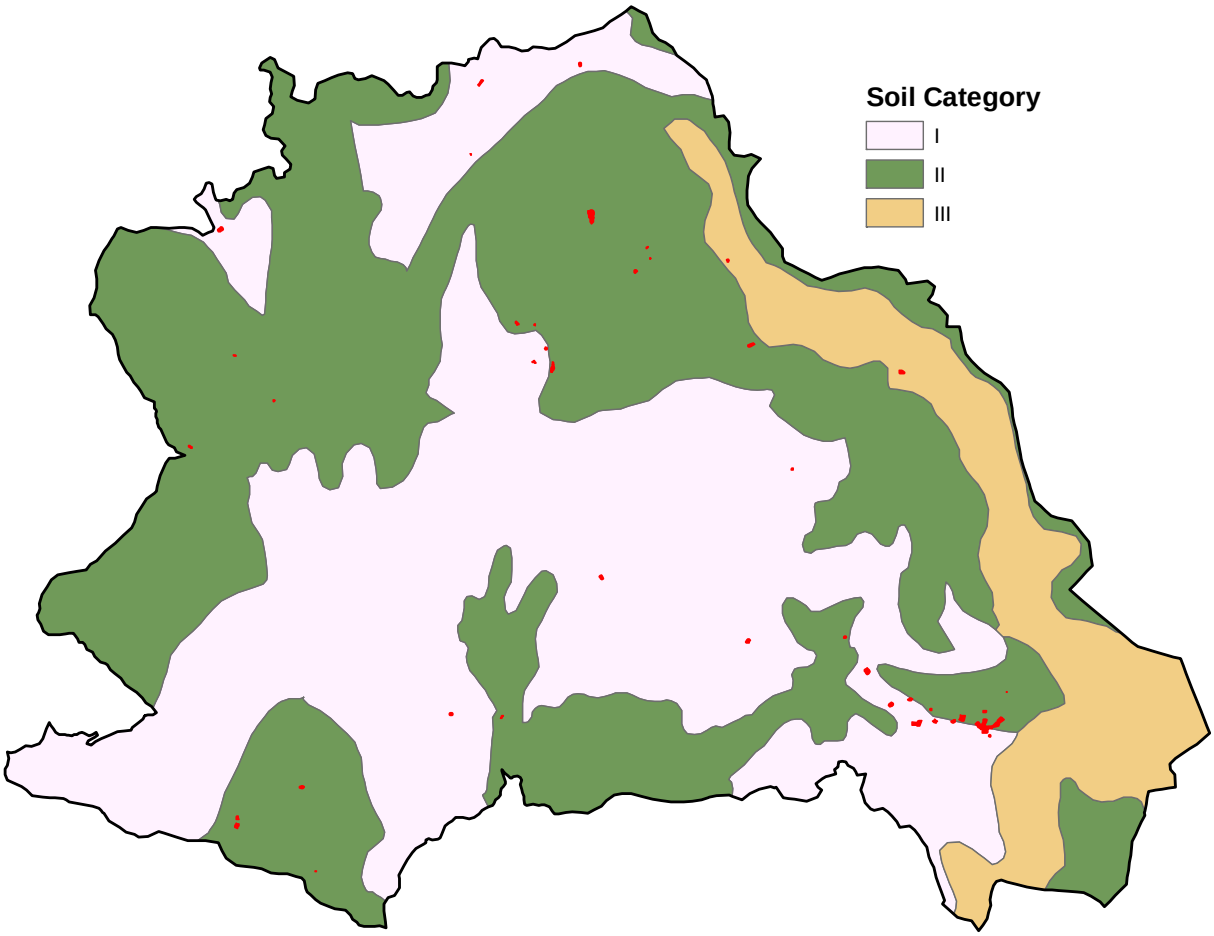


Figure 5.13 Modern occupation by soil categories

Table 5.7 Modern occupation by soil categories

Soil Category	ha	Percentage	Percentage of the Total Area
I	4.96	43.89	0.08
II	5.87	51.95	0.09
III	0.47	4.16	0.03

The Modern period is the only one in which the 500x500m grid-squares with observed populations far above their expected values do not correspond to the population clusters observed in Chapter 4. The only cluster of squares with observed populations far above their expected values is again at Cubsio, which was not the center of a supra-local community during

the Modern period. The other five grid squares with observed populations far above their expected values (more than three standard deviations) are dispersed throughout the region, located in each of the three soil categories (Figure 5.14). As was the case in previous periods, it is not possible to explain settlement patterns of the Modern period on the basis of their relation to different soil zones (r^2= 0.012, p<0.0005).

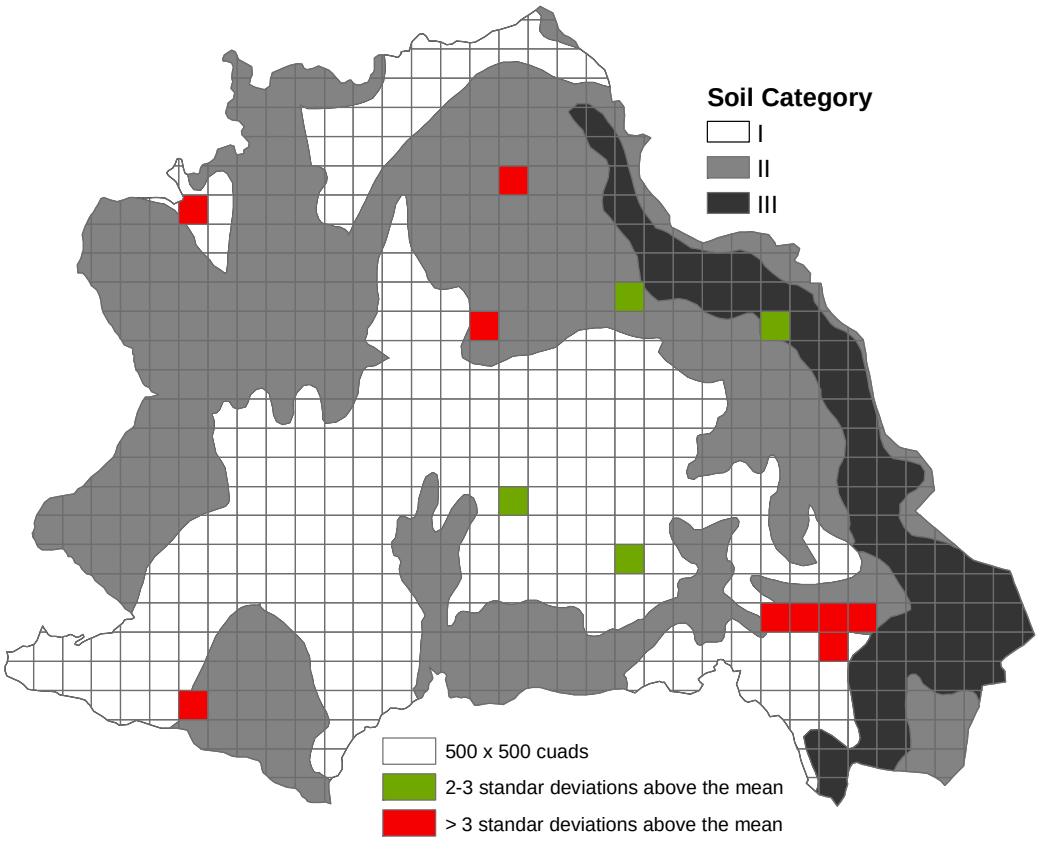


Figure 5.14 500 x 500m quadrats with unusually high observed occupied area for the Modern period, according to soil category.

During the Modern period a larger proportion of the population was settled in the two-maize-harvests-per-year zone. Although the area of each maize productivity zone is different, the population during this period was evenly distributed in each one of them (Figure 5.15; Table 5.8). For the first time there are grid-squares with observed populations far above their expected

values within the two-maize-harvests-per-year zone. As in all the previous periods the Cubsio cluster can again be identified, so it is not possible to explain this cluster as function of the maize productivity of this area (Figure 5.16). At the regional level maize productivity zones continue to been a poor predictor of settlement patterns during the Modern period, though it is important to note that it is for this period that the best correlation is observed for the entire archaeological sequence (r^2= 0.074, p<0.0005).

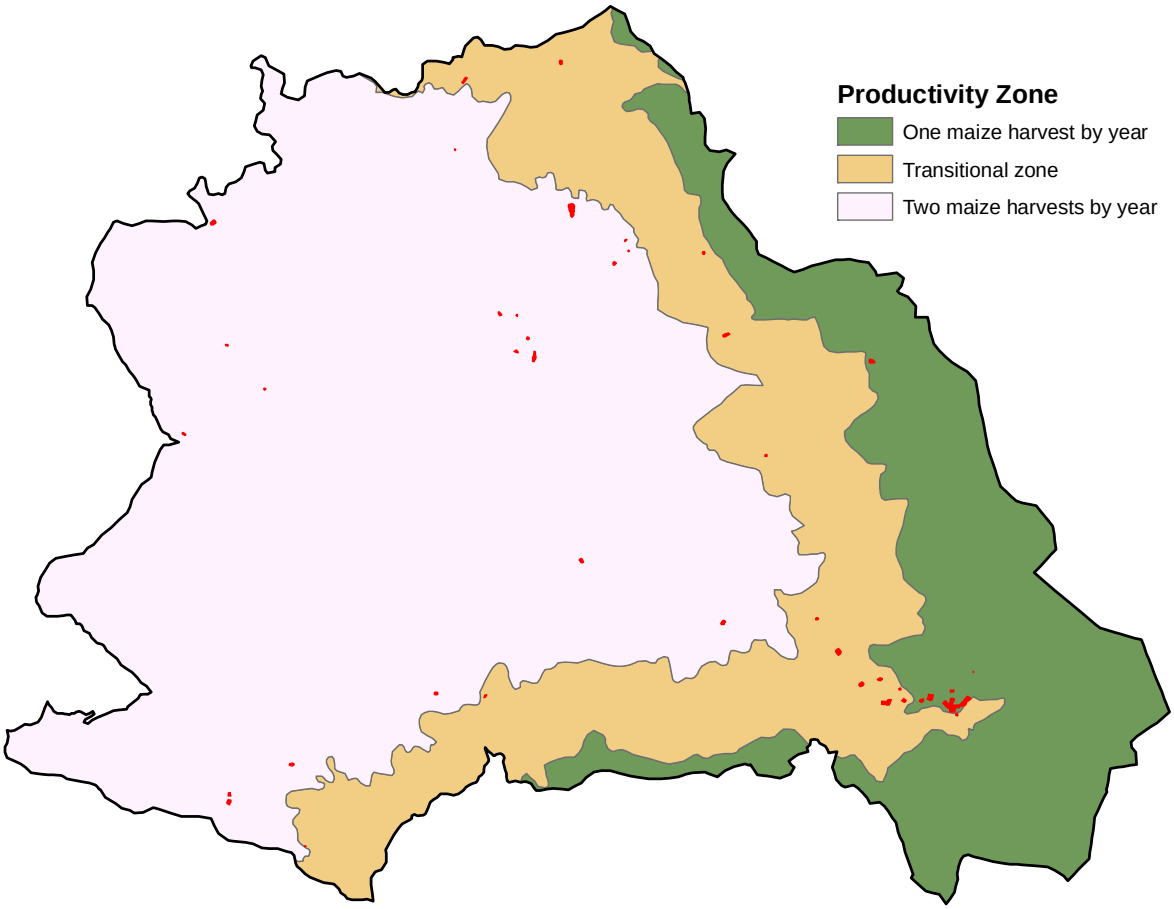


Figure 5.15 Modern occupation by maize productivity zone

Table 5.8 Modern occupation by maize productivity zone

Productivity Zone	ha	Percentage	Percentage of the Total Area
One maize harvest by year	4.05	35.84	0.15
Transitional zone	3.31	29.29	0.10
Two maize harvests by year	3.94	34.87	0.05

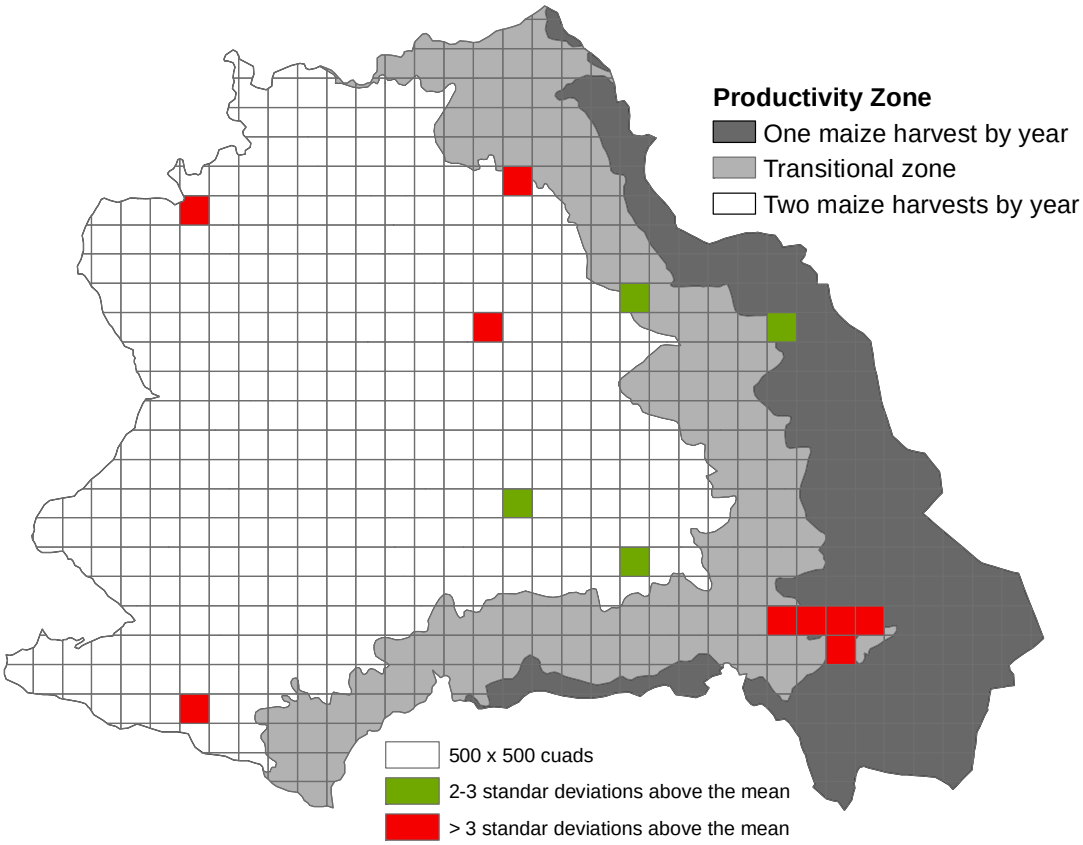


Figure 5.16 500 x 500m quadrats with unusually high observed occupied area for the Modern period, according to maize productivity zone.

In sum, during the Modern period people in Tena continued to settle in the prime agricultural soils, a clearly different pattern than that documented in some regions of the Altiplano Cundiboyacense. The tendency towards greater occupation of the two-maize-harvests-per-year zone persisted. Nonetheless, as for all of the archaeological periods in Tena, neither

soils categories nor maize productivity zones are good predictors of settlement patterns during the Modern period.

6.0 SUMMARY AND CONCLUSIONS

Archaeological research in the Valle de Tena sought to document patterns of human settlement and their relation to different agricultural zones. The main goal of this research was to explore this relationship in terms of its possible relevance to the emergence of Muisca chiefdoms in the Sabana de Bogotá. For many decades now it has been stated that control of productive lands could have been a vital factor in the emergence of chiefly societies (Earle 1997). For the Muisca case, it has been proposed that such control may have involved a traditional agricultural system known as "vertical management" (Langebaek 1987b, 1996; Lléras and Langebaek 1987). The agricultural exploitation of different ecological zones by a single group seems to have been, and still is, a common practice in the Andes. Even though there is much variety in vertical management practices throughout the Andes, it is possible to identify a common pattern in which communities make periodic movements to different zones so as to increase their access to a wider range of agricultural goods, which buffers against the risks associated of staying in only one agricultural zone (Brush 1977; Hastorf 1993; Landázuri 1995; Langebaek and Piazzini 2003; Mayer 2004; Murra 1972; Oberem 1981; Reichel-Dolmatoff 1977; Salomon 1986). Due to the extreme importance of this agricultural practice, it is not difficult to imagine that its control would have been the target of ambitious leaders and groups. After all, controlling subsistence production is perhaps the most straightforward way to control the life of people. At least for some cases in the northern Andes, it seems that the control of agricultural production at different

altitudinal zones was the key factor behind social differentiation (Landázuri 1995; Salomon 1986; Stanish 1992).

Based on ethnohistoric accounts, Carl Langebaek (1996) has argued that the products acquired through verticality were probably part of the finance system that supported Muisca chiefdoms. Perhaps the case that best exemplifies this is that of the Valle the Tena. According to ethnohistoric accounts, the Valle de Tena, located about 15 km away from Bogotá (one of the two main chiefly centers described by the Europeans in the sixteenth century), was an important economic region, providing warm-climate agricultural products and serving as a reserve zone in the case of flooding in the Sabana de Bogotá (see Langebaek 1987b for an extensive summary of the ethnohistoric information about this region). The western slopes of the Cordillera Oriental are so rough and steep that large altitudinal variability occurs across just few kilometers. The Sabana de Bogotá, located around 2550 masl, is cold and susceptible to flooding by the Bogotá River, which is something that frequently affected prehispanic populations (Simón 1627). There is, however, not much information about the recurrence and scale of such flooding. An image drawn in 1614, as part of a complaint about flooding in the Sabana de Bogotá, shows that the area in which Bogotá was settled was like a swamp in which agriculture was almost impossible (Figure 6.1). The flooding of the Bogotá River must have been a big concern since people invested labor into building raised fields (Boada 2006), and placed at the top of their deities Bochica, the god who dried the Sabana de Bogotá.

Figure 6.1 Pintura de las tierras pantanos y anegadizos del pueblo de Bogotá (Painting of the swamps and waterlogged lands of the Bogotá village). 1614. Archivo General de Indias. Courtesy of Jorge Gamboa.

The Tena region, on the other hand, ranges from 750 to 2600 masl, and exhibits important climatic variability and agricultural diversity. As was suggested by Langebaek (1987b) it is possible to get agricultural products of warmer climates, like fruits, from the lowest part of the Tena region, while it is also possible to get products that typically grow in colder zones, like potatoes, from the upper part of the region. The climate in the lower Tena region also allows for

two maize harvests per year, which differs from the Sabana the Bogotá, where only one maize harvest per year is possible. The close proximity of the Tena region would have made it easy for people of the Sabana de Bogotá to move back and forth between the two, and take care of agricultural plots in both regions (Langebaek 1987b).

In order to evaluate the relationship between settlement patterns and agricultural resources in the Tena region, along with how this relationship changed through time, a regional settlement pattern survey was carried out (Chapter 2). This survey covered an area of 144.7 km², including portions of the modern municipalities of San Antonio del Tequendama, Tena, El Colegio, and La Mesa. The central axis of this survey zone was the Bogotá River. As mentioned previously, this survey encompassed a wide range of altitudinal variability (from 750 to 2600 masl), allowing for the evaluation of settlement patterns across a wide range of ecological diversity.

One of the questions that needed to be answered in order to relate the social processes that took place in Tena with those of the Sabana de Bogotá is the cultural affiliation of the people that lived in the Tena region during prehispanic times. This is an important concern for the Tena region since ethnohistoric accounts report the presence of a different, non-Muisca group (the Panches), who are said to have engaged in warfare with Muisca people (Arango 1974; Diez 1982). A map based on ethnohistoric sources suggests that the Muisca-Panche frontier was actually located in the Tena region (Falchetti and Plazas 1973). Furthermore, previous archaeological research in an area adjacent to the regional survey zone claims the presence of Panche people there, based on ceramic affiliation (Rodríguez 2004). One of the most interesting results of the systematic survey carried out in Tena was, therefore, that there is no indication of Panche settlement in this region. No pottery sherds belonging to Panche people (according to the

currently accepted ceramic typologies) were found within the 144.7 km² survey zone. Instead, a consistent Muisca settlement trajectory was documented in the Tena region, as indicated by the presence of the same ceramic types that are usually found in the Sabana de Bogotá (Chapter 3).

The Muisca settlement of Tena was part of the prehispanic peopling process that began at least 2250 years ago. Even though some Preceramic and Archaic sites have been reported near the Tena region, no evidence of these early occupations was found within the survey zone. The first evidence for settlement in Tena comes during the initial period of ceramic use, commonly known as the Herrera period. The two most common Herrera ceramic types (Crushed Rock and Incised Red) were found throughout the entire Tena region, and stratigraphic excavation at Cubsio, along with radiocarbon dates, confirms their early position in the ceramic sequence. Additionally, the deep cultural deposit excavated at Cubsio does not support previous claims about the antiquity of the Herrera period, which has been proposed to have started around 800 B.C. (Peña 1991), but is rather more consistent an initial date of about 300 B.C.

The stratigraphic excavations at Cubsio also helped clarify the time of the transition between the Herrera and Early Muisca periods. Both ceramic seriation and radiocarbon dates suggest that this transition took place around 400 A.D. This is precisely the moment during which cultural processes in the Altiplano Cundiboyacense split from the more general process taking place across a wider area, from the Lower Bogotá River to the northern Altiplano Cundiboyacense. During the Herrera period this area maintained a sort of homogeneity that is evidenced by similarity in the ceramic types. From here onward the ceramic types of the Lower Bogotá River region and the Altiplano Cundiboyacense were different. In the Tena region the ceramic types following the Herrera period resemble those of the Sabana de Bogotá, and no

pottery sherds resembling the Lower Bogotá River types were found. This is why this period is called Early Muisca, which dates from 400 to 1000 A.D.

The last prehispanic period in Tena is the Late Muisca period, which dates from 1000 to 1550 A.D. As mentioned previously the same ceramic types typically found in the Sabana de Bogotá were found in this region, which confirms a relationship between the two regions. Finally, the regional survey in Tena took the opportunity to collect information related to the Modern period (which dates from 1550 to 1950 A.D.) so as to compare the sociocultural processes that occurred during prehispanic times with those triggered by the Spanish invasion during the sixtieth century (Chapter 3).

Perhaps one of the most important characteristics of the settlement evidence from Tena is the very low amount of population that existed there throughout the entire archaeological sequence. Whether relative or absolute population estimates are taken into account, the figures are very low for all of the archaeological periods. When these estimates are compared against those made for other regions in the Altiplano Cundiboyacense (Boada 2006, 2013; Langebaek 1995b, 2001) the differences are quite dramatic. The only period in which population numbers were similar to those in the Altiplano Cundiboyacense was the Herrera period, during which population figures were consistently low. For the Early Muisca period, during which dramatic population growth took place in some parts of the Altiplano Cundiboyacense, the population in Tena barely increased at all. And for the Late Muisca period, during which steady growth is observed in the Altiplano Cundiboyacense, the population in Tena seems to have decreased. This population decline continued after the Spanish invasion (Chapter 4).

One of the questions that must be addressed here is whether these low population figures are in fact the consequence of sparse population within the Tena region, or if, alternatively, they

are evidence of a particular type of Muisca settlement system. As has been previously mentioned, it has been suggested that human population in the Tena region, at least for the Late Muisca period, was temporary, due to the requirements of vertical management. Langebaek (1987b) called this system *microverticalidad*, so as to emphasize the daily movement between the Sabana de Bogotá and Tena (see also Oberem 1981). If people were commuting from the Sabana de Bogotá to Tena, such commutes should have entailed very few belongings. Such belongings, moreover, should have been specialized, when compared to a typical household assemblage. The transport of ceramic vessels would not have been very convenient since they are fragile and heavy, but in the case that they were transported daily, they should have been vessels for storing and serving food and liquids, not for cooking. In other words, a daily system of movement in which households lived in the Sabana de Bogotá and commuted to Tena should not have left household debris in the latter region, aside from perhaps a very small quantity of sherds produced by the occasional breaking of vessels used for transporting food and beverages to people during agricultural tasks. If pottery function and distribution is observed it can be concluded that this was not the case for Tena. This is because the pottery sherds collected in the Tena region resemble all of the vessel categories commonly found in a typical household, cooking vessels included (Chapter 4; Appendix A). Moreover, the presence of pottery sherds with traces of soot indicates that cooking activities were routinely carried out in Tena.

Carl Langebaek (1987b) also suggested another possibility, in which satellite communities and dispersed households were established so that people could move during one part of the year to cultivate in another region. These dispersed households should be located in areas like Tena, whereas nucleated villages, in which people would have lived during the rest of the year, should be located in the Sabana de Bogotá. Clearly the settlement patterns in Tena do

not fit this expectation during any archaeological period (see below). Such a settlement system should be visible archaeologically, since people living less time in one zone would have left less household debris, as was demonstrated by Osborn (1979). The comparison between sherd frequencies from the Altiplano Cundiboyacense and Tena do not yield important differences between the household assemblages from these two regions. In fact, the ceramic sherd frequencies for Tena are higher than in some parts of the Altiplano Cundiboyacense (Chapter 4). In short, it does not seem probable that the low population figures in Tena are the consequence of peoples' movement between this region and the Sabana de Bogotá.

The very low population numbers in Tena during the entire archaeological sequence were accompanied by the persistent tendency of people to live close to one another. In contrast to what has been documented for settlement patterns in the Altiplano Cundiboyacense, where, despite some population clusters, the first permanent settlement was largely dispersed (Boada 2006; 2013; Langebaek 1995b; 2001), in Tena the first permanent settlement was largely clustered. During the Herrera period most of the settlements (75%) were part of a single supra-local community, clustered around two larger sites (Chapter 4). This implies a starting point from which subsequent social change was based on an initial formation of early compact villages (Peterson and Drennan 2012). This differs from other Muisca trajectories in which village formation came from the aggregation of previously dispersed farmsteads.

The Cubsio supra-local community was located directly below the steep mountains that divide Tena from the Sabana de Bogotá. Even though this supra-local community was located in prime agricultural soils, it is clear that early sedentary settlement was not driven by the desire to occupy the best available agricultural lands in the region. Additionally, the close spacing of households makes it difficult to suggest that settlement patterns during the Herrera period were a

function of any attempt to maximize land use. There were large portions of more productive lands than those on which the Cubsio supra-local community was settled, yet they remained unoccupied. Clearly, then, the centripetal force pulling people in to live close to each other was not agricultural productivity. It seems that early settlement in Tena was not driven by a desire to intensively harvest warm-climate products or to intensively cultivate maize (Chapter 5). Warm-climate zones in Tena were almost unoccupied during the Herrera period, and the range of agricultural products able to be harvested in the areas where people settled is the same as that for the Sabana de Bogotá. In other words, early settlement in Tena was not influenced by the intention to widen the range of agricultural products available to the Sabana de Bogotá.

Regardless of what caused this transition, almost all scholars working in the Altiplano Cundiboyacense agree that the rise of stratified societies in this area took place from the end of the Herrera period through Early Muisca times (Boada 2006, 2007; Henderson and Ostler 2005; Kruschek 2003; Langebaek 1995b, 2001, 2008). Therefore, if any sort of control over agricultural resources was involved in the emergence of chiefdoms in the Altiplano Cundiboyacense, it is during the Early Muisca period that changes in patterns of land exploitation should be evident. The Early Muisca period witnessed a notable population growth in the Tena region. According to the data provided by other settlement pattern studies, significant population growth also occurred in virtually the entire Muisca area (Boada 2006, 2013; Langebaek 1995b; 2001). The increase in population in Tena, however, was not as steady as in the Altiplano Cundiboyacense. In some regions of the Altiplano Cundiboyacense previous Herrera population clusters grew during the Early Muisca period, whereas in others population concentrations emerged for the first time. In Tena a new supra-local community emerged that was larger than the one at Cubsio (Chapter 4). These two supra-local communities encompassed

almost all of the population during the Early Muisca period (about 90% of it), suggesting that people stilled preferred to live close to each other, regardless of which supra-local community they were part of. These two Early Muisca supra-local communities were located alongside the mountain belt dividing Tena and the Sabana de Bogotá. As in the previous Herrera period, people showed little interest in occupying the warmer climatic zones in the western Tena region.

Although a considerable amount of people continued to live on the best agricultural soils in Tena during the Early Muisca period, a slight tendency to occupy less productive soils emerged. However, due to the sparse regional population that existed it is difficult to suggest that this slight change was an effect of population growth and the need to claim rights to land. As in the previous Herrera period, the amount of land available made it perfectly possible for everyone to settle in the most productive soils, but it was not the decision made by the households.

As mentioned previously, there was a growing tendency for more people to live in supra-local communities during the Early Muisca period. This settlement pattern is contrary to a theoretical expectation in which people were trying to maximize agricultural production through greater access to land. As has been documented in other parts of the world, the balance between social requirements and subsistence requirements is a force regulating how close or how far people live to each other (Drennan 1988; Drennan and Haller 2007; Stone 1993). In the presence of a supra-local political authority, this force is accentuated according to polity requirements. Households living close to each other do not necessarily gain an advantage in agricultural productivity in areas where constant cooperation or public works are not required. This is the case of Tena, in which the natural productivity of the soils does not make public works necessary for the purpose of improving agricultural productivity, so the need to pool people was minimal since all agricultural tasks could be accomplished at the household level. Since there was not any

agricultural motivation for people to live in clustered settlements, it is possible to argue that settlement patterns in Tena during the Early Muisca period cannot be explained well as a function of agricultural productivity (Chapter 5).

When compared with the previous Herrera period it is possible to notice quite an important increase in Early Muisca settlement in areas where it is possible to produce two maize harvests per year. Around thirty percent of the sites are now located in this zone, though they were still located close to the belt dividing Tena from the Sabana de Bogotá. This suggests that people had become more interested in the warmer climate zones but wished to maintain their connection with the Sabana de Bogotá. However, since more sites were still located in cold areas it is not possible to explain Early Muisca settlement patterns as reflecting a tendency to occupy warmer zones, to extend the range of agricultural products, or to improve maize productivity. As is common in dozens of chiefdom trajectories around the world, the first indications of social inequality are often inconspicuous, and it is not until the point of chiefly consolidation that clear archaeological indicators of social stratification emerge. To some extent it would be possible to argue that the tendency for more people to live in the warmer areas of Tena is an indication that the Muisca were extending into these areas in order to cope with substantial population growth in the Sabana de Bogotá, and that such a movement could have in some way been directed by a central authority. If this were the case, then this process should be much clearer in the subsequent Late Muisca period, during which chiefdom consolidation took place (Boada 2006, 2007; Henderson and Ostler 2005; Kruschek 2003; Langebaek 1995b, 2000, 2001, 2008).

Perhaps the period for which settlement patterns in Tena are most different when compared to those of the Altiplano Cundiboyacense is the Late Muisca period. While in all the known trajectories of the Altiplano Cundiboyacense considerable population growth has been

documented, in Tena such growth was very minimal. It could even be argued that the amount of population in Tena during the Late Muisca period remained the same as during Early Muisca times, or perhaps even decreased slightly. Such stasis is also reflected in the settlement patterns of the region. Most people continued to live in the same supra-local communities that were documented for the Early Muisca period (Chapter 4), and the relationship between agricultural productivity and settlement patterns did not change much during this time. People continued to prefer some of the region's more productive agricultural soils, but did not show much interest in occupying the best available lands (Chapter 5). Neither was there an important increase in the occupation of the two-maize-harvests-per-year zone, which now contained 36% of the total collection lots.

The picture of Late Muisca settlement patterns in Tena and their relation to agricultural resources is far from the expectations based on the ethnohistoric accounts (Langebaek 1987b). To begin with, the Bogotá chief's "summer house" that was supposed to be in this region (Simón 1627) was not found. The larger Late Muisca sites in Tena all were located in cold climate zones, and not any site located in warmer areas showed any evidence of being of special function. The sites located in a truly different climate than the Sabana de Bogotá are all small and resemble dispersed commoner farmsteads, not chiefly households. Although a chiefly household has not yet been identified in the Altiplano Cundiboyacense, some features like decorated pots and imported vessels seem to be associated with such kinds of places (Boada 2007; Kruschek 2003). It is also expected on the basis of ethnohistory that the chief would have traveled with his cortege, and thus a chiefly compound composed of several households would have been built. None of these features were observed in the warmer zones of the Tena region. It remains

possible, of course, that the Bogotá chief's "summer house" was located in some place outside of the surveyed area.

The Muisca expansion into warmer zones, another observation coming from ethnohistoric accounts (Fernández 1688), can also be evaluated through the evidence provided by the regional survey in Tena. This statement can be evaluated at different scales. At the macro-regional level, if a certain degree of continuity between the Herrera people and the Late Muisca people is accepted, then the assertion stating that Muisca people were "new arrivals" into Tena is difficult to maintain. Both genetic and craneometric data suggest that both Herrera and Muisca people were basically the same human group evolving in the Northern Andes, without any important influence introduced through human migrations or invasions (Rodríguez 1999, 2011). Thus, since the continual occupation of the Tena region from the Herrera to the Late Muisca period was documented, it is not accurate to view the sixteenth century Muiscas as "new arrivals". At the regional level, it is possible to note a tendency toward the occupation of warmer zones from the Herrera to Late Muisca period. During the Herrera period just 4.5% of the settlements were located in the warm climatic zones in which two maize harvests per year are possible, which means that the first people were scarcely interested in such lands. During the subsequent Early Muisca period this percentage increased to 20%, and for the Late Muisca period it was close to 30%. Because the population did not grow much from the Early Muisca to Late Muisca period, the increased percentage of people living in these warmer zones suggest that they were becoming more popular among Muisca people.

This increasing interest for warmer zones, though, cannot be explained as a systematic attempt to maximize agricultural productivity. In fact, the changes that occurred throughout the archaeological sequence are so tenuous that it is difficult to argue they would have been driven

by a centralized political authority. No attempt to maximize agricultural productivity was documented in Tena during the two periods in which chiefdom development occurred in the Sabana de Bogotá (the Early Muisca and Late Muisca periods). The imbalance between substantial population growth in the Altiplano Cundiboyacense and the very limited population growth in Tena suggests that the sociopolitical dynamics taking place in the former region were not strong enough to affect population dynamics in the latter. In sum, whatever had been the nature of the political power in the Sabana de Bogotá, it was not so powerful so as to encompass the life of the Tena people. Consequently, ethnohistoric claims about the ownership of Tena lands by the Bogotá chiefdom cannot be upheld on the basis of the current data. In the same vein, the role of Tena as a supplier of food, in the form of tribute given by commoners, to finance the Bogotá chiefdom's political requirements cannot be supported by this regional settlement pattern study either. Clearly, population numbers in Tena were so low that its contribution to the chiefdom economy in the form of tribute, if such tribute in fact existed, must have been insignificant.

Since the possibility for temporary settlement in Tena has been ruled out, it is thus necessary to think about the Tena region as one with permanent settlement. As mentioned previously, this settlement was largely clustered throughout the entire archaeological sequence, which indicates the presence of some centripetal force acting on settlement from the very first settlement in the region. It is worth noticing that the large sites in Tena were almost as large as those in the Altiplano Cundiboyacense from the Herrera period through the Early Muisca period. For Instance, in Fúquene-Susa the largest site during the Herrera period was 5.7 ha, while in Tena it was 4.13 ha. For the Early Muisca period, the largest site in Tena (4.9 ha) was again similar to that in Fúquene-Susa (5-6 ha). This situation dramatically changed during the Late

Muisca period, during which the largest site in Tena was 4.4 ha while in Fúquene-Susa it was around 22 ha. Still, it is important to underscore that the largest Early Muisca sites in the Altiplano Cundiboyacense would be the centers of Late Muisca chiefdoms, as was also asserted by European accounts; this applies not only to Fúquene-Susa, but to the Valle de Leiva and probably the Sabana de Bogotá as well (Boada 2006, 2013; Langebaek 1995b, 2001). If one wants to extrapolate this pattern from the Altiplano Cundiboyacense to Tena, it would thus suggest that the Cubsio supra-local community was like a chiefly center, with its settlement roots in the Herrera period. During the Early Muisca period this center did not evolve like its counterparts in the Altiplano Cundiboyacense, in part because a new supra-local community arose. While the chiefdom centers of the Altiplano Cundiboyacense grew from the Early Muisca to the Late Muisca periods, in Tena the social dynamics (as evidenced by settlement patterns and population estimates) entered into a phase of relative inactivity. Interestingly, the supra-local community that appeared during the Early Muisca period and grew during Late Muisca times, at the expense of the Cubsio supra-local community, was located in the area of Tena that is closer to the Bogotá chiefdom. So it is possible that the social dynamics that were initiated in Tena during the Herrera period were slowed by the emergence of the Bogotá chiefdom in the Sabana de Bogotá during the Early Muisca period.

The tendency for the Tena population to cluster throughout the prehispanic sequence does not fit expectations about agricultural intensification based on the verticality model. Nor does it fit in terms of the expected patterns of social interaction. Either as daily or monthly movements it is expected (on the basis of this model) that people from the Sabana de Bogotá would travel to Tena mainly to cultivate. Because this task would not have required much communal work, it is possible that while people stayed in Tena they would not have had much social interaction,

which would rather have taken place in the villages of the Sabana de Bogotá. Settlement patterns in Tena strongly contradict this possibility. On one hand, the inability to delineate local communities in prehispanic times indicates that people were not very involved in patterns of daily face-to-face interaction (Peterson and Drennan 2005). On the other hand, however, settlement in Tena does not show a pattern characterized by dispersed households (but rather a clustered one), which would fit better with the verticality model expectation. Such population clusters allowed the effective delineation of supra-local communities (Chapter 4), indicating that people in Tena had high levels of social interaction throughout the entire archaeological sequence. It is difficult to square such high levels of social interaction with a pattern of human occupation driven solely by agricultural requirements. Therefore, the effective delineation of supra-local communities in Tena is yet another sort of evidence that suggests that settlement patterns there were driven by sociopolitical forces and not by agricultural requirements only.

To say that people in Tena were probably not "attached" to the Bogotá chiefdom (since their settlement pattern was not driven by the intention to maximize the agricultural productivity) does not mean that they were not involved in some kind of vertical agriculture system. In other words, to discard the role of the Tena region as a provider of agricultural products to the Bogotá chiefdom, and thus as a peripheral region in its polity, does not necessarily discredit the possibility for some kind of vertical management by the people living in Tena. The picture that can be extracted from the settlement pattern analysis in the Tena region is that this region should be observed as having its own social dynamic, not driven at all by an external force. This is not to say that the people living in Tena were not in contact with those living in the Sabana de Bogotá, but the archaeological evidence does not support the argument that such contact was

based on a subordinate relationship. The ethnohistoric claims about the Tena region being a part of the Bogotá chiefdom's territory are thus untenable.

Phytolith analysis from two sites located in the Cubsio supra-local community provide evidence that people there were consuming products from temperate and warm climates; these include *Annonaceae* (cherimoya, or soursop) and *Persea americana* (avocado) (Martínez 2011). This means that the people living in the cold zones of Tena were probably not transferring all of the temperate- and warm-climate products to the Sabana de Bogotá, but were rather themselves accessing a wide range of cultivars and consuming them. Regrettably, paleobotanical evidence from the Sabana de Bogotá is so scarce that it is not possible to carry out a systematic evaluation of the scale on which warm-climate products were transferred there. To date, a couple of avocado seeds (*Persea americana)* from the rock shelter of Zipacón (Correal and Pinto 1983) and a couple of cotton seeds (*Gossypium barbadense*) from the site of Las Delicias (Morcote 1996) constitute the only evidence of access to these warm-climate products by people settled in the Sabana de Bogotá.

When observed from this point of view, it is thus possible to suggest that people living at the base of the mountain belt dividing the Sabana de Bogotá from Tena had access to agricultural plots in the lower Tena region, the area in which only limited evidence for households was found through the different archaeological periods. The distance from settlements located in the upper part of Tena to the warmer lands below, in which both cherimoya and avocado would have grown, is so short that daily movements would have been very possible. In sum, both the settlement pattern analyses and the scarce paleobotanical evidence available may support the idea that people in Tena were living in supra-local communities located in cold zones, and practiced daily movements to warmer lands in order to access a wide variety of edible plants. It

is quite possible that some of these products were transferred to the Sabana de Bogotá, but not as a systematic enterprise driven by a central authority. This situation persisted throughout all of the prehispanic periods, and did not change in spite of the emergence of chiefdoms in the Sabana de Bogotá.

As mentioned previously, while ethnohistoric accounts state that the Tena region was part of the food supply on which the Muisca system relied, these accounts also indicate that this region witnesses permanent conflict between the Muiscas and Panches. Such contradictory accounts can be observed throughout the Spanish chronicles, and in later statements based on these documents. In some instances these warmer zones are described as Muisca lands, even having been owned by the Bogotá chief, whereas in others they are seen no-man's lands, as consequence of the Muisca-Panche conflict. Panches were described by sixteenth century Europeans as completely different groups when compared to the Muiscas. Unlike the Muiscas, Panches were fierce people seeking human flesh through warfare. Their physical appearance was perhaps their most distinctive feature. They were much more robust than Muiscas and used to deform their heads to underscore their distinctiveness. There were also cultural differences between Muiscas and Panches; they spoke different languages and had different customs. In contrast to the Muiscas, Panches were not permanently ruled by chiefs but temporarily by warriors, so in peaceful times they were without rulers. In short, the Panches were, according to Spanish accounts, barbarians (Aguado 1582; de Castellanos 1601; Fernández de Piedrahita 1688; Simón 1627; Zamora 1701).

Settlement patterns from Tena provide insight about this topic. First, it is clear that the warmer areas of Tena were the least occupied throughout the entire archaeological sequence. Early sedentary communities were clearly not interested in such lands, as only 8.7% of the

Herrera lots were located in the two-maize-harvests-per-year zone. The Early Muisca period, which witnessed considerable population growth, also witnessed an important increase in the percentage of settlements in this zone (30%), but this number is far from the majority. During the Late Muisca period the very minimal change in population levels was accompanied by only a slight increment in the amount occupation in the two-maize-harvests-per-year zone (36%). Therefore, if observed diachronically, the lack of any substantial occupation in the warmer zones of Tena was not late phenomena, but rather a constant feature of regional settlement.

Given both the lack of substantial occupation of warm zones and the persistent tendency of people in Tena to live clustered in the coldest lands, one wonder if such settlement patterns are indicative of a "buffer zone" produced by warfare between Panches and Muiscas. The picture of initial occupation in the Valle de Tena and the persistence of this image through prehispanic times does not seem to support statements about the emergence of a settlement pattern influenced by warfare. From the very beginning of settlement in the Valle de Tena (the Herrera period) people preferred to live clustered in the cold Cubsio area, and did not show much interest in the warmer zones. It is important to underscore here that for the Herrera period ceramic assemblages are quite similar across a large macro-region, stretching from the Sabana de Bogotá to the Magdalena River, following the course of the Bogotá River (Figure 3.2). So for this early period it is difficult to state that there were different groups living in this macro-region, and thus to explain early settlement patterns as a consequence of inter-group conflict. For the Early Muisca period, during which ceramic differentiation first appeared, the lack of interest in warmer lands and the clustered settlement pattern had already been established. Therefore, when possible differences and a potential antagonistic relationship between people from the Sabana de Bogotá

and the Western slopes did arise, it did not bring about a change in settlement patterns in the Valle de Tena.

The same is true for the Late Muisca period. As mentioned previously, even though there were some changes in settlement patterns in the Valle de Tena during this time, they were not dramatic enough to indicate a substantial increase in antagonistic relations between Muiscas and Panches, at least not to the scale described in European accounts. Some 15 km from the western border of the survey zone, downstream along the Bogotá River, it is possible to find consistent evidence of Panche habitation sites (Peña 1991). Documenting settlement patterns from the west of the Valle de Tena survey to this Panche area is an important direction for future research, as it will help clarify the nature of the relationship between these two groups.

Previous statements about the lack of interest in warmer lands need to be tempered. Even though most of the people preferred to live in coldest parts of the Tena region throughout the entire archaeological sequence, a progressive, though not overwhelming, peopling of warmer zones was documented for the Early Muisca and Late Muisca periods. This gradual colonization of warmer lands opens the door for a revaluation of the traditional image about Panche-Muisca conflict. Although it is possible to find accounts in which the Muiscas are identified as the group who invaded Panche lands, the aggressive nature often assigned to the Panches make it possible to see them the invader (compare de Castellanos 1601: 117-118 and Simón 1627 III: 209 with Fernández 1688: 53 and Zamora 1701: 346). Settlement pattern data collected in Tena seem contrary to the former possibility. It is clear that there were Muiscas who were progressively occupying lower and warmer zones, while there is no evidence of Panche settlement there. To some extent, it seems more like the Muisca people were colonizing previously unoccupied areas, instead of actually invading areas that were previously occupied by the Panche. It is possible that

the increased proximity of Muisca settlements to Panche settlements (located outside of the survey zone) made the Muiscas located in Tena, as opposed to those located in the Sabana de Bogotá, more vulnerable to Panche raids.

Once statements regarding the existence of vertical, or microvertical, management by people living in the Sabana de Bogotá, along with the possible establishment of a "buffer zone" as consequence of warfare between Muiscas and Panches, have been undermined by the evidence provided by the Tena survey, the question that remains is: What factors could have influenced settlement patterns in this region? Here I would like to propose two options than will merit further attention through future archaeological research. First, it is evidence that, even though people living in Tena had considerable amounts of warm lands available to settle, they preferred to live in the coldest zones of the region. If one examines the settlement pattern maps for the three prehispanic periods, it is apparent that people in Tena preferred to live in the belt that divides this region from the Sabana de Bogotá. In other words, they lived as close as possible to the Sabana de Bogotá. It has been mentioned that communication would have been rather easy between these two regions, since gully courses provide paths to cross the mountains dividing them. So it is possible that the continual settlement in this belt corresponds with an intention to maintain permanent contact with people in the Sabana de Bogotá. This contact, as mentioned previously, does not seem to have been regulated by a central political authority, and would thus likely have taken place at the inter-household level. It is thorough such family-scale interaction that people from the Sabana de Bogotá may have gained access to products from the warmer zones of the Tena region.

It is necessary to underscore that since sedentary settlement in Tena is as old as that in the Sabana de Bogotá, it is not possible to assign any kind of causality to the settlement patterns in

either region. It is thus not possible to state that early settlement patterns in Tena were a consequence of a particular configuration of previous settlement in the Sabana de Bogotá, or vice versa. If we look at the location of Preceramic and Archaic sites in the Sabana de Bogotá, we observe that they were located along the western border of this zone. This means that, as has been stated by scholars previously, initial populations were moving from the Sabana de Bogotá to the Valle de Tena, and even farther to the Valle del Magdalena, so the first sedentary settlement was driven by the desire to gain access to both regions. Therefore, some of the first sedentary settlement could have been located in the western border of the Sabana de Bogotá, whereas some could have been located in the coldest parts of the Valle de Tena.

The second option could help explain why people maintained an interest to locate themselves in either the western border of the Sabana de Bogotá or in the coldest zones of Tena. The recently discovered site of Nueva Esperanza, barely 2 km away from the eastern border of the Valle de Tena survey zone, has yielded the remains of supra-communal buildings not previously documented. The size of these buildings indicates that supra-communal labor would have been necessary to build them. Such buildings have not yet been dated, but it is clear that the site was occupied from the Herrera through Late Muisca periods. This suggests that the site, which is just around 1 km away from El Salto del Tequendama, was perhaps one of the most important places in the Muisca religion. It is tempting to think of Nueva Esperanza as a center in which supra-communal activities, such as rituals and exchange, took place. It has been widely documented that such kinds of places often create centripetal forces that integrate large populations. The role of Nueva Esperanza throughout the broader region is just beginning to be understood, but the scale of the buildings found there suggests that it integrated populations

several km away, including the supra-local communities found in the coldest parts of the Valle de Tena.

Although there are several issues regarding the typology and chronology of the Hispanic ceramics (Chapter 3), it is nonetheless possible to delineate some changes in settlement patterns that occurred in Tena after the Spanish invasion of the sixteenth century. Settlement pattern analysis provides a window through which to observe the extent to which the new colonial order changed the preexisting sociopolitical structure. In contrast to other sequences in the Altiplano Cundiboyacense, the new colonial order did not result in increased settlement of the worst soils in Tena. The primary change that occurred in this region, as can be observed from settlement pattern analysis, is the definitive dissolution of the Cubsio supra-local community that had persisted continually through prehispanic times. This process is very illustrative of the way that settlement patterns were altered as a consequence of the disruption in sociopolitical structures. In the absence of the centripetal forces integrated people for approximately 2,000 years, these communities simply split apart. Though the other supra-local community remained it did not encompass very many people, and around 70% of the lots existed outside of any supra-local community (Chapter 4). In addition to this process a relatively more intensive occupation of the warmer zones, despite of the low population figures, was documented.

As mentioned at the beginning of this chapter, it has been suggested that some degree of control over the verticality system was part of the way in which Muisca chiefdoms were financed (Langebaek 1996). Although not nearly at the scale of the vertical archipielago, Murra's model (1972) from which all subsequent vertically models stem, it has been argued that to some extent verticality provided an opportunity for elites to extract surplus from commoners and use this to finance their enterprises (e.g. Landázuri 1995; Stanish 1992). The Valle de Tena appears here as

a potentially ideal case in which the Bogotá chiefdom probably used warmer lands to produce more abundant and diverse products that were transferred to the Sabana de Bogotá, and used as part of the chiefdom's economic system. Some products could have been exchanged in the market-places held in the chief's compounds, while some others could have been used to feed attached specialists, while still others, like cotton, could have been transformed into exchange goods under the oversight of the chief (Langebaek 1987b; 1996).

It is necessary to emphasize that all these statements come from the analysis of ethnohistoric data. It is these same data from which the image of powerful Muisca chiefdoms was constructed, going as far as to propose that such chiefdoms were on the threshold of turning into states (Reichel-Dolmatoff 1986). Nevertheless, recent archaeological research has introduced serious doubts about the degree of power held by Muisca chiefs, as well as the degree of control over economic resources to finance them. Since the pioneering study carried out by Langebaek (1995b), more and more archaeological evidence confronting the traditional image of powerful Muisca chiefdoms has been collected (e,g, Henderson and Ostler 2005; Langebaek 2001, 2008). Even in those cases in which some economic control by Muisca elites has been claimed, it seems that such control was relatively weak (Boada 2006, 2007; Kruschek 2003). The strongest evidence for economic control by Muisca chiefs is the possible control of raised fields in the southern part of the Sabana de Bogotá. It has been suggested that this system, which started to be built long before the emergence of the Bogotá chiefdom, could have created the conditions for surplus extraction favoring just a few people, and thus to have been the seed of social differentiation (Boada 2006). Yet it is not clear how this process could have taken place, or the scale of surplus extraction from a system that was clearly based on household level production.

From the perspective of ethnohistory the situation seems not to be so different. According to some scholars who are revisiting the ethnohistoric sources (Gamboa 2010), the Muisca chiefdoms were more of a colonial construction than a historical reality, insofar as the image of powerful indigenous chiefs bolsters the prestige of invading Spanish conquerors. However, it is difficult to suggest that the Europeans just invented the Muisca chiefdoms with no basis from which to do so. Though they observed the American Indians through their own biases and imposed their own reality upon them, there were many features of organization which the Spanish had no prior notion of, and it is with such features that the originality of the indigenous structures can be explored. The system of verticality is one such feature. Such systems are specific to several South American societies, so it is difficult to sustain the idea that they are just European "constructs". Therefore the failure to identify archeologically what was documented by Europeans when archaeological research is done should not be an invitation to throw out ethnohistoric accounts, but rather to sharpen our readings of these accounts, and to improve the efficacy of archaeological research.

Archaeological research carried out in the Altiplano Cundiboyacense and in several other regions of northern South American has resulted in a large corpus of data about different chiefdom trajectories. In most of these cases it seems that such chiefdoms only achieved low levels of political integration, and that the emergence of supra-local authority took place without substantial economic control (e.g. Cuéllar 2009; Drennan 2000). In other cases it seems that chiefdom emergence did involve some degree of economic control, though such control was not very strong (e.g. Delgado 2009; Dever 2007; Gassón 1998). Archaeological research in the Tena region should thus be understood as another case in which the emergence of chiefdoms occurred without substantial control over economic resources, in this case agricultural production. The

extent of control of Muisca chiefs located in the Sabana de Bogotá was definitively not strong enough to have encompassed populations outside of their own chiefly centers, so the idea of a Muisca economic system in which there was a center and periphery cannot be supported.

While archaeological research in the Valle de Tena does not deny the existence of social differentiation in the Sabana de Bogotá, this study does suggest that such differentiation was not based on the control of vertical agriculture. In addition, the results of this research undermine traditional statements that vertical economies were the basis for redistribution. The classic idea of chiefdoms holds that they were redistributive societies, and one of the ways to provide goods for the redistributive system was to control production in different environments (Service 1962). To some extent the vertical models responded to such a premise and envisioned the control over a variety of ecological zones as a way of ensuring the provision of agricultural surplus (Van Buren 1996). Statements regarding Muisca agricultural intensification through the production of maize in zones in which two harvests per year were possible are nothing but the corollary of the view of chiefdoms as redistributive societies. Therefore, the results of this study contribute to dismantling such monolithic models of chiefdom emergence (e.g. Carneiro 1981), especially those in which economic control is seen as an essential factor (e.g. Service 1962), and demonstrate that, at least for this particular macro-region, the economy was not a pivotal source of social power (*sensu* Earle 1997). Additionally, this research reaffirms the broad variability that can be documented among these kinds of societies (Drennan 1996).

APPENDIX A

DESCRIPTION OF THE PREHISPANIC CERAMIC TYPES

1. HERRERA PERIOD CERAMIC TYPES

A. *Crushed Rock (Roca Triturada)*

Along with Incised Red, it is the most common Herrera ceramic type. Furthermore, it is the most easily distinguishable of all the Sabana de Bogotá ceramic types. Holes left by calcite combustion, cream color, and lightness make it a very distinctive ceramic type. This ceramic type is the best Herrera chronological indicator, since it usually appears in the lower levels of stratigraphic excavations, and tends to disappear when ceramic types from later periods become common. This ceramic type has largely been described since it was established by Broadbent (1971) as Mosquera Roca Triturada. The sherds collected in Tena have the same technological and stylistic characteristics as those collected both in the Sabana de Bogotá and the western slopes (Broadbent 1971, 1986; Cardale 1981; Peña 1991)

35 (2.6%) Crushed Rock sherds were collected in the systematic survey, and 186 (40.4 %) came from the stratigraphic excavation at Cubsio.

Paste: Most commonly cream (2.5 YR 6/3, Light Yellowish Brown; 2.5 YR 7/3 Pale Brown) and less frequently orange (5 YR 6/6 Reddish Yellow).

Core: Grainy and non-uniform texture. Most of the time gray; occasionally oxidizing atmosphere.

Temper: Calcite but not present. The evidence of temper is the holes left by the temper burned during firing. The holes suggest medium and angular (1-2 mm) grains of calcite. Some traces of yellowish particles covering the holes.

Surface: At first glance the appearance seems crude (due to the holes) but when touched it is smooth and even polished. Generally the color is the same for the paste and occasionally it has red slip (7.5 R 4/6 Red).

Thickness: 3-10 mm

Decoration: Mostly incised. Occasionally stripes of red (7.5 R 5/6 Red; 10 R 4/4 Weak Red) or black paint.

Forms: Globular and sub-globular vessels with wide mouth, short neck and out-turned rim flange. Hemispherical bowls with curved or angular shoulder.

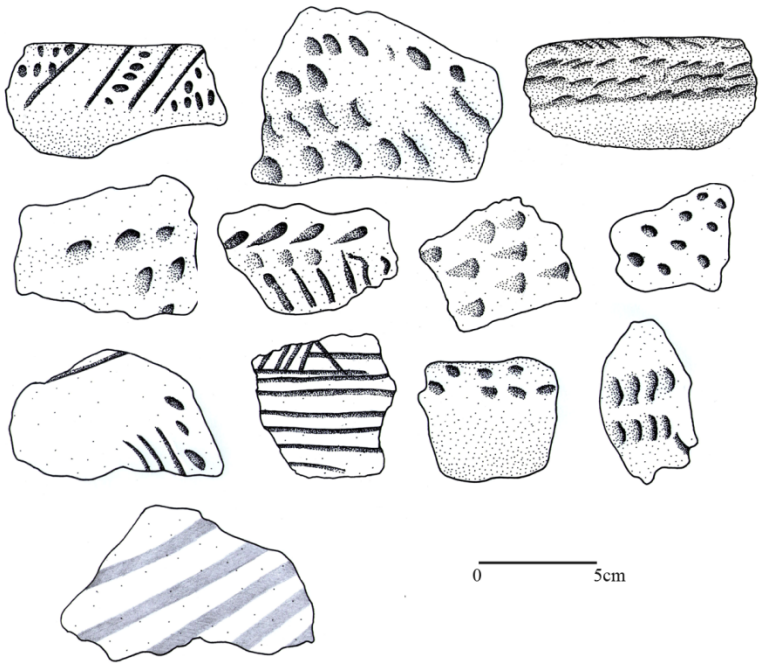


Figure A.1. Crushed Rock ceramic decoration

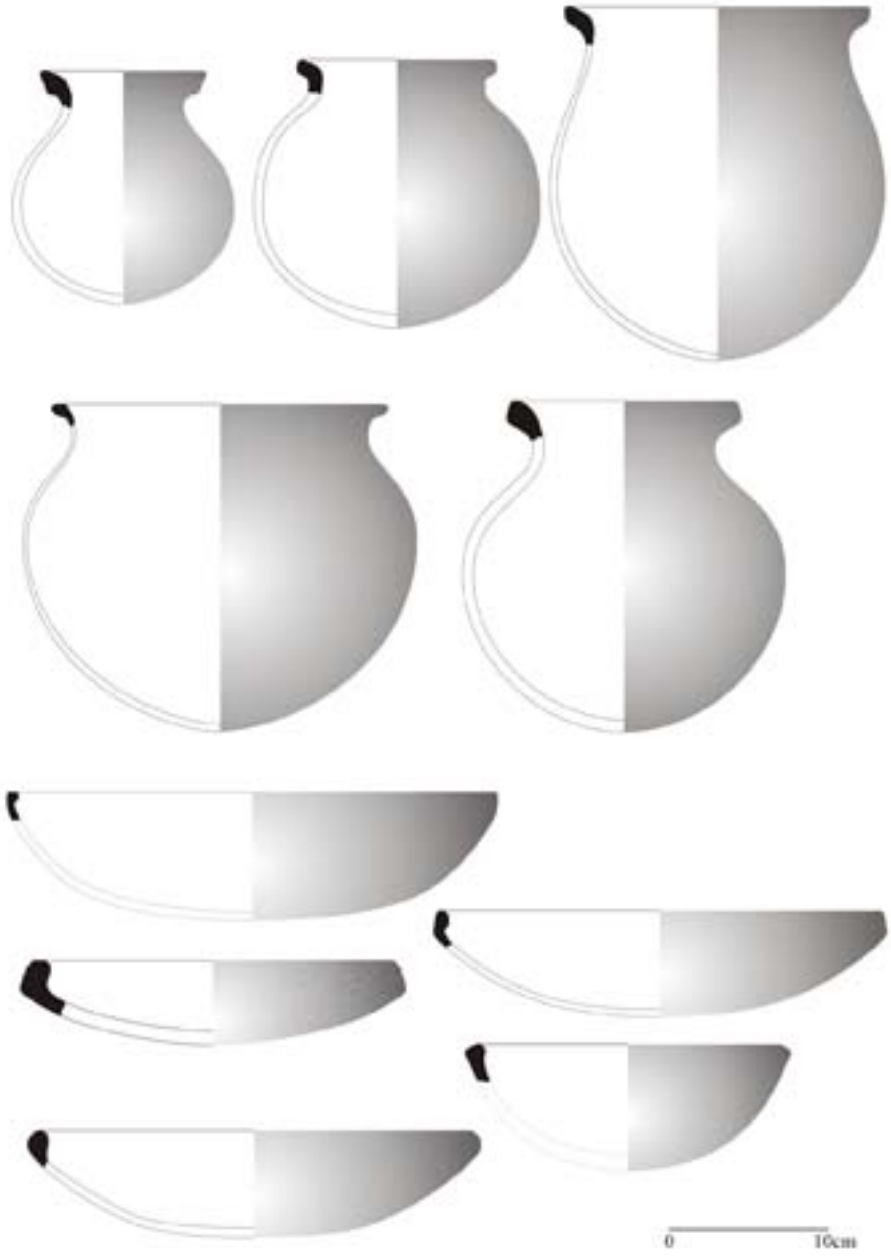


Figure A.2 Crushed Rock ceramic forms

B. *Incised Red (Rojo Inciso)*

As mentioned, it is one of the two most common Herrera ceramic types. However, Incised Red is not as good a chronological indicator as Crushed Rock. This is because even though Incised Red appears in the lower levels of the stratigraphic excavations, it

continues being popular along Early Muisca ceramic types. This type was also established by Broadbent (1971), under the label Mosquera Rojo Inciso, and consequently described by several archaeologists (the best available description is that made by Peña [1991]). It has been argued that Incised Red is an imported ceramic type from the Magdalena Valley to the Sabana de Bogotá (De Paepe and Cardale 1990), which would explain why it commonly appears in larger proportions in the western slopes (Argüello and Rodríguez 2013; Peña 1991) but in lower proportions in the Sabana de Bogotá (e.g. Cardale 1981).

122 (9.4%) Incised Red sherds were collected in the systematic survey, and 93 (20.2%) came from the stratigraphic excavation at Cubsio.

Paste: Orange (5 YR 5/6 Yellowish Red; 5YR 5/8 Yellowish Red) and Brown (5 YR 4/6 Yellowish Red; 5 YR 4/4 Reddish Brown)

Core: Compact and uniform texture. Generally reducing atmosphere (black) and less frequently gray.

Temper: As reported by Peña (1991) there are two sub-types. One has abundant quartz and mica, and a very shiny appearance. The other has little quartz and mica, and a pale appearance. In both cases quartz and mica are fine (< 1 mm) and medium (1-2 mm) size. Besides these minerals it is possible to find very small white particles.

Surface: Smooth. Except for the eroded sherds, they all have red slip, although the red tonality varies (10 R 3/4 Dusky Red; 7.5 R 4/6 Red; 10 R 4/4 Weak Red).

Thickness: 4-7 mm

Decoration: Incised

Forms: Globular and sub-globular vessels with wide mouth, short neck and out-turned rim flange. Mostly globular and sub-globular bowls, with curved or angular shoulder. Less frequently, hemispherical bowls.

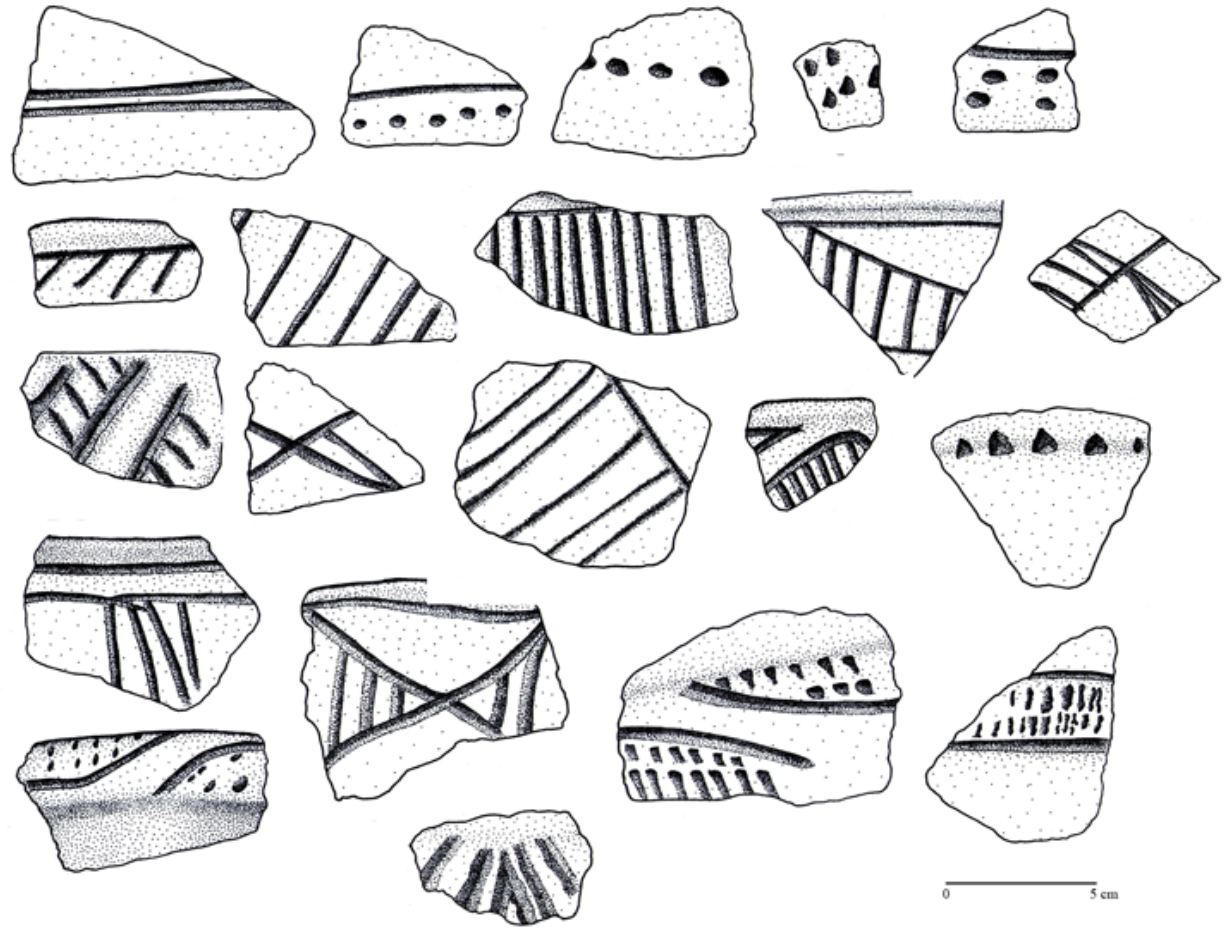


Figure A.3 Incised Red ceramic decoration

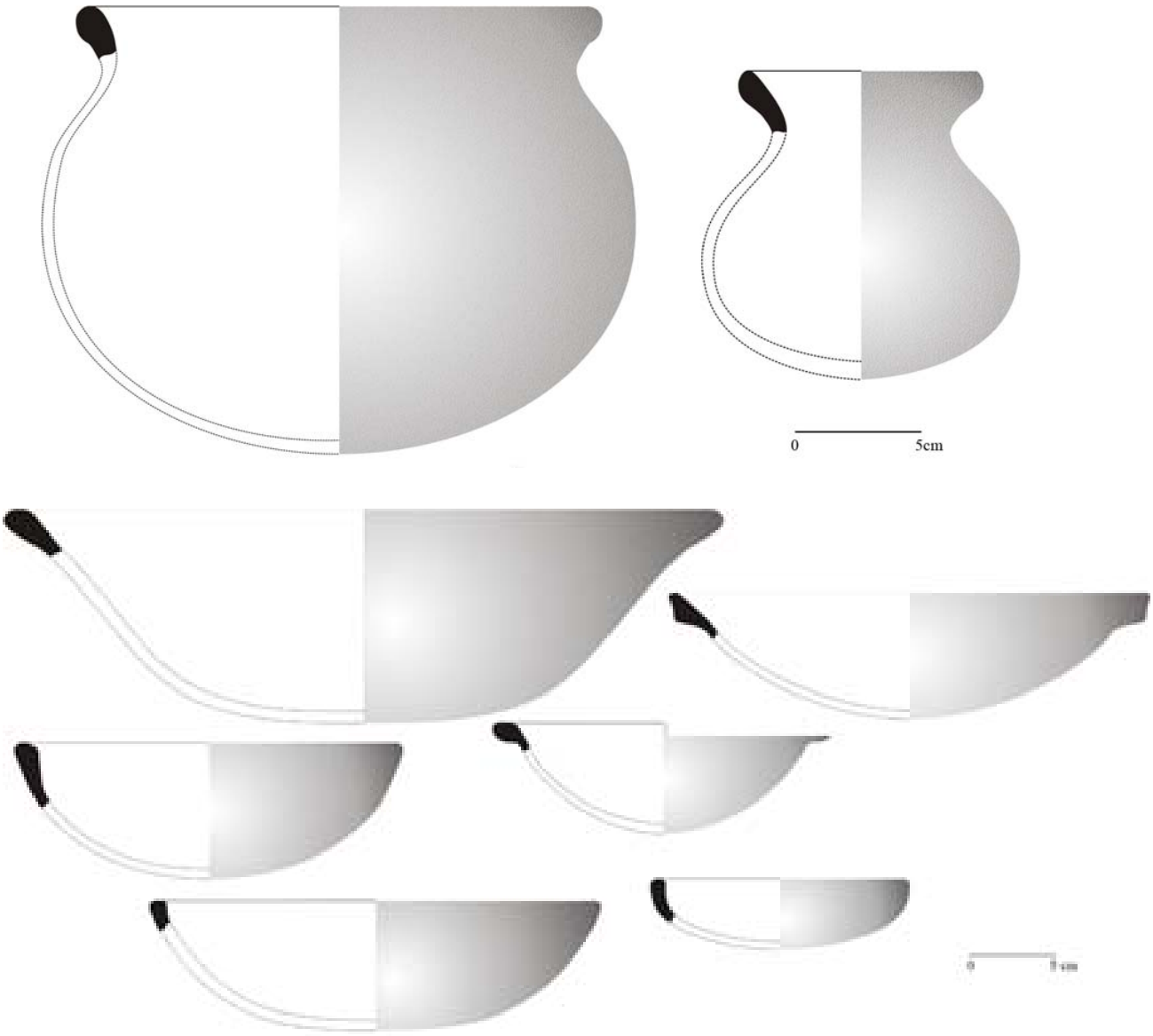


Figure A.4 Incised Red ceramic forms

C. *Red on Cream (Rojo sobre Crema)*

Although this ceramic type is rather uncommon both in the Sabana de Bogotá and the western slopes it is a good Herrera chronological indicator. In the cases in which Red on Cream does appear it generally does so in the lower levels of the stratigraphic excavations. This type was established by Cardale (1981) and labeled as Zipaquirá Rojo sobre Crema.

3 (0.2%) Red on Cream sherds were collected in the systematic survey, and (6.3%) came from the stratigraphic excavation at Cubsio.

Paste: Cream (10 YR 7/2 Light Gray; 10 YR 7/3 Very Pale Brown

Core: Compact and uniform texture. Gray

Temper: Fine (< 1 mm) and rounded white and gray particles.

Surface: Smooth and polished.

Thickness: 5-8 mm

Decoration: Incised

Forms: Globular vessels with wide mouth, short neck and out-turned rim flange. Hemispherical bowls.

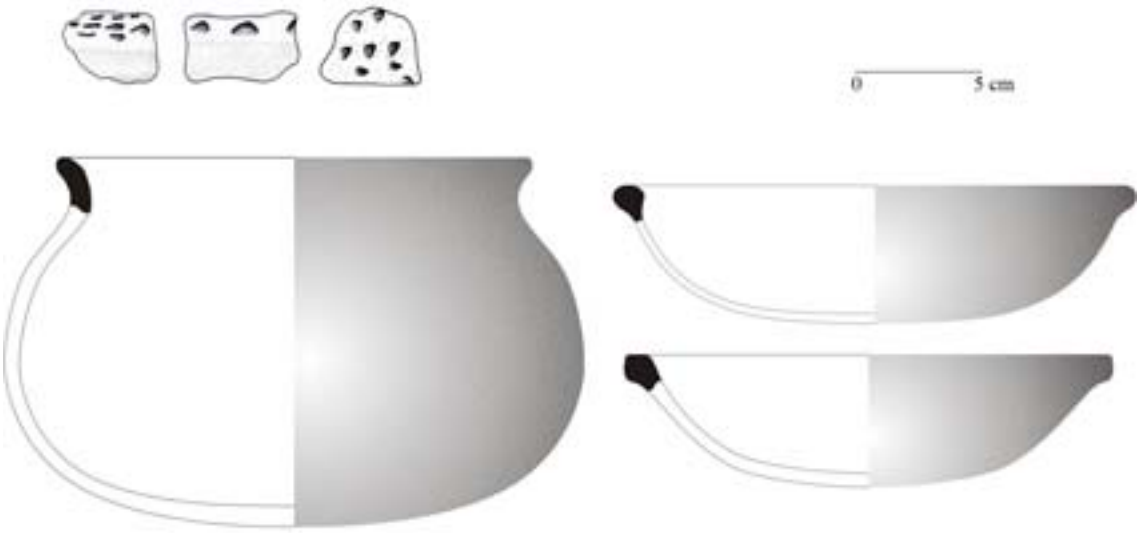


Figure A.5 Red on Cream ceramic decoration and forms

D. *Zipaquirá Sherd Temper (Zipaquirá Desgrasante Tiestos)*

This ceramic type is associated with the salt processing that took place in the Zipaquirá zone. It was established by Cardale (1981), who extensively described it. When it is found outside of the Zipaquirá area, generally in very low proportions, it is assumed to

indicate salt trade. Since the small sample collected in Tena is quite similar to that described in Zipaquirá I decided to keep the geographic indicator of the type to mean that the sherds collected in Tena probably came from Zipaquirá.

6 (0.4%) Zipaquirá Sherd Temper sherds were collected in the systematic survey. Not any at Cubsio.

Paste: Pink (10 R 6/6 Light Red; 10 R 7/8 Light Red).

Core: Granular and non-uniform texture. Gray

Temper: Medium (1-2 mm) sherd particles.

Surface: Coarse. Without slip, so the same color of the paste.

Thickness: 5-13 mm

Decoration: --

Forms:--

2. EARLY MUISCA PERIOD CERAMIC TYPES

A. *Abundant Quartz (Cuarzo Abundante)*

This ceramic type was established by Broadbent (1970) and labeled as Funza Cuarzo Abundante. It is the best chronological indicator for the Early Muisca period, since it generally appears above the Herrera ceramic types, but somewhat under the Late Muisca ceramic types, in the stratigraphic excavations (e.g. San Carlos [see Chapter 3]; Langebaek and Zea 1983; Cubsio in this study). It is quite similar to its counterpart Fine Quartz.

224 (17.2%) Abundant Quartz sherds were collected in the systematic survey, and 58 (12.6%) came from the stratigraphic excavation at Cubsio.

Paste: Most commonly cream (7.5 YR 5/2 Brown) and less frequently reddish (5 YR 4/6 Yellowish Red; 5YR 5/6 Yellowish Red).

Core: Grain and uniform texture. Gray and black.

Temper: Medium (1-2 mm) and rounded particles of white quartz, occasionally mica.

Surface: Smooth. Variety of red slips (10 R 5/8 Red; 10 R 5/4 Weak Red; 10 R 5/2 Weak Red)

Thickness: 5-8 mm

Decoration: Incised

Forms: Globular and sub-globular vessels with wide mouth, short neck and out-turned rim flange; some of them with handles. Sub-globular and hemispherical bowls.

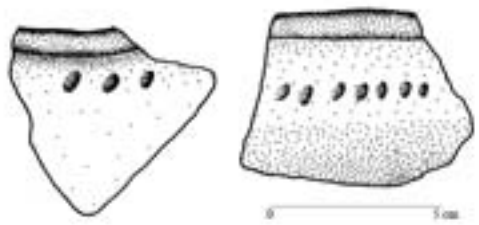


Figure A.6 Abundant Quartz ceramic decoration

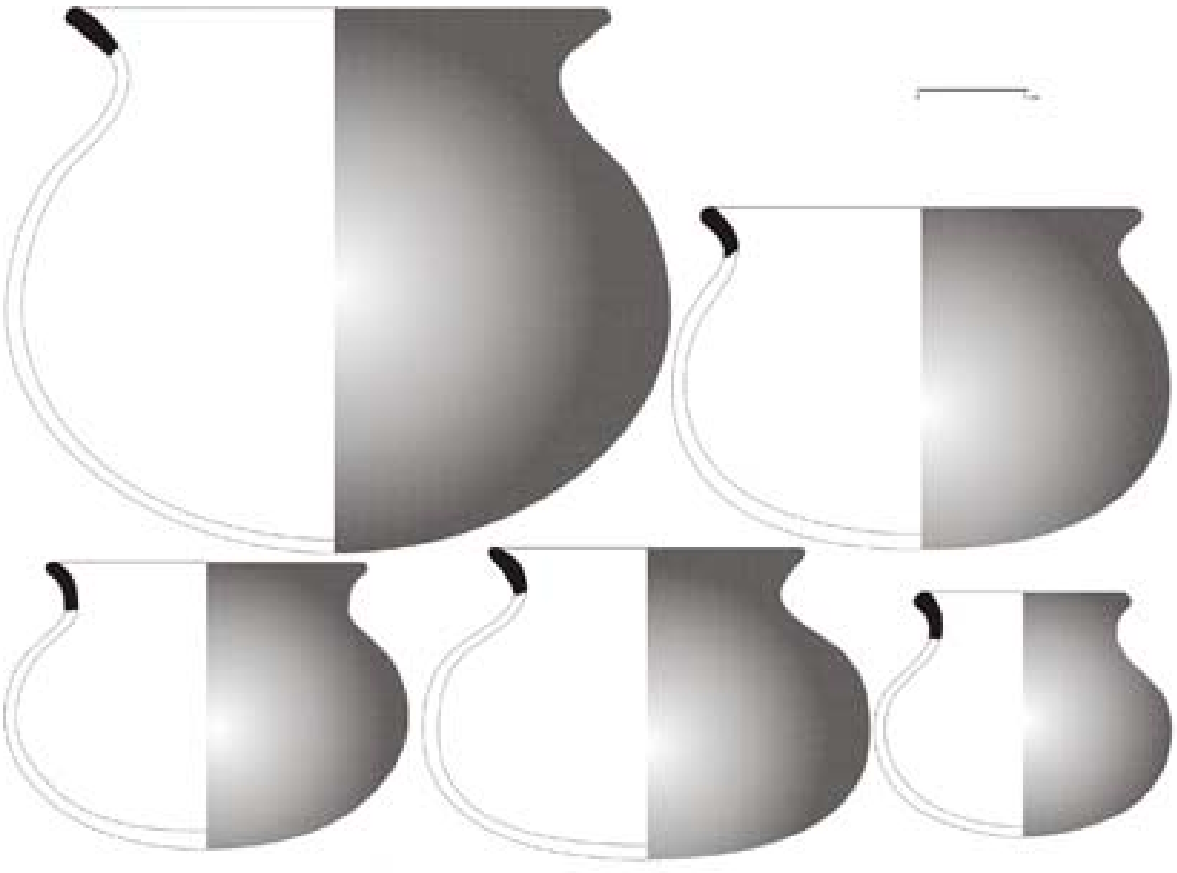


Figure A.7-A Abundant Quartz ceramic forms (*ollas*)

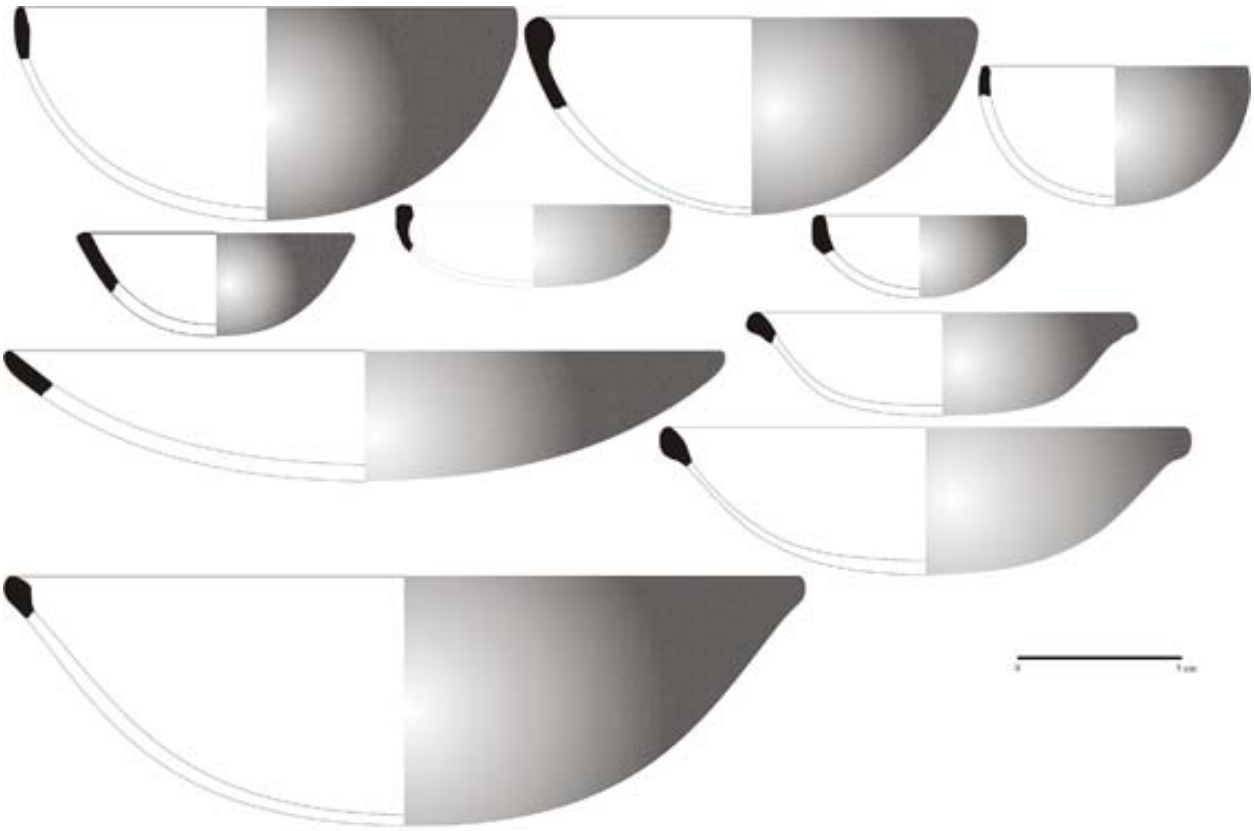


Figure A.7-B Abundant Quartz ceramic forms (*bowls*)

B. *Fine Quartz (Cuarzo Fino)*

This type was also established by Broadbent (1970) under the label of Funza Cuarzo Fino. It is a good chronological indicator for the Early Muisca period in some stratigraphic sequences like Tocarema (Peña 1991). In some other stratigraphic sequences like Cubsio and San Carlos (Chapter 3) this ceramic type appeared mixed with Herrera ceramic types.

127 (9.7%) Fine Quartz sherds were collected in the systematic survey, and 32 (6.9%) came from the stratigraphic excavation at Cubsio.

Paste: Most commonly cream (7.5 YR 5/2 Brown) and less frequently reddish (5 YR 4/6 Yellowish Red; 5YR 5/6 Yellowish Red).

Core: Compact and uniform texture. Gray and black.

Temper: Fine (< 1 mm) and rounded particles of white quartz, very occasionally mica.

Surface: Smooth. Variety of red slips (10 R 5/8 Red; 10 R 5/4 Weak Red; 10 R 5/2 Weak Red)

Thickness: 5-8 mm

Decoration: Incised

Forms: Globular vessels with wide mouth, short neck and out-turned rim flange; some of them with handles. Sub-globular and hemispherical bowls.

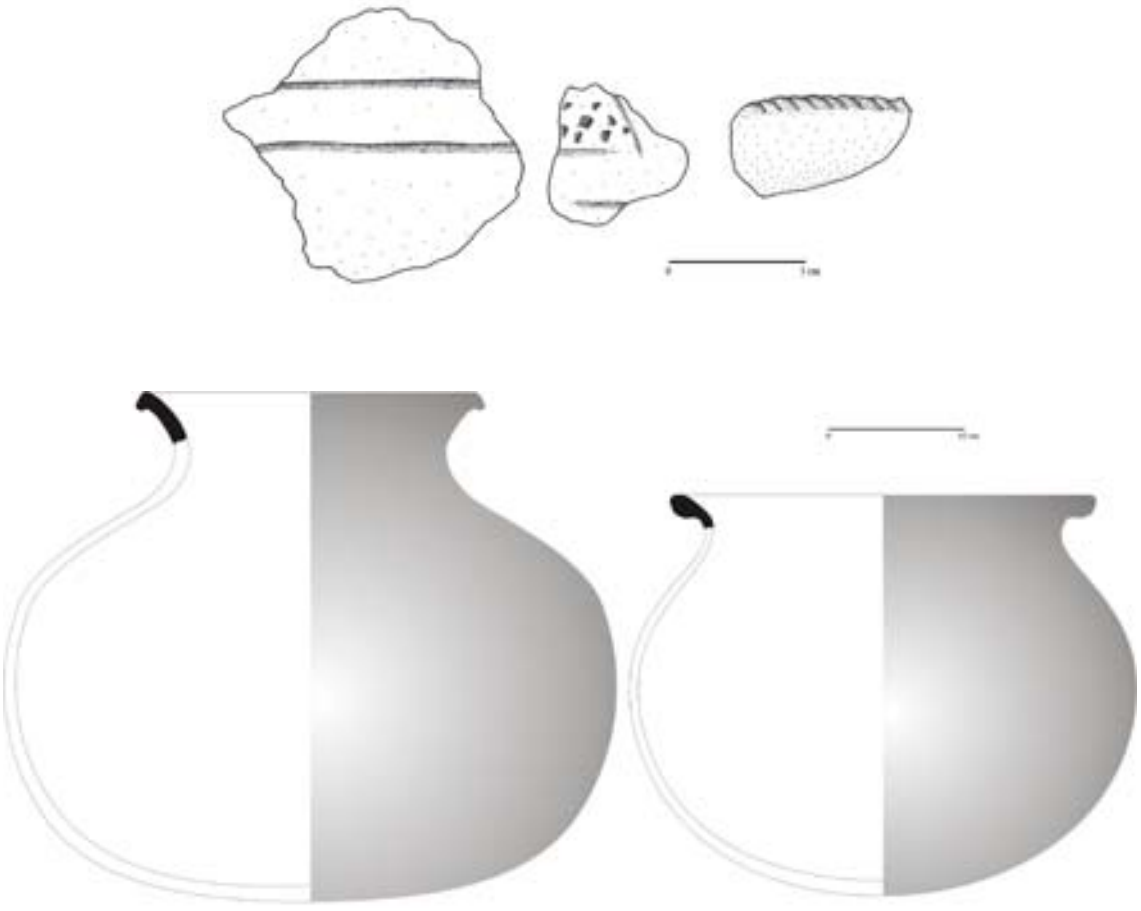


Figure A.8-A Fine Quartz ceramic decoration and forms (*ollas*)

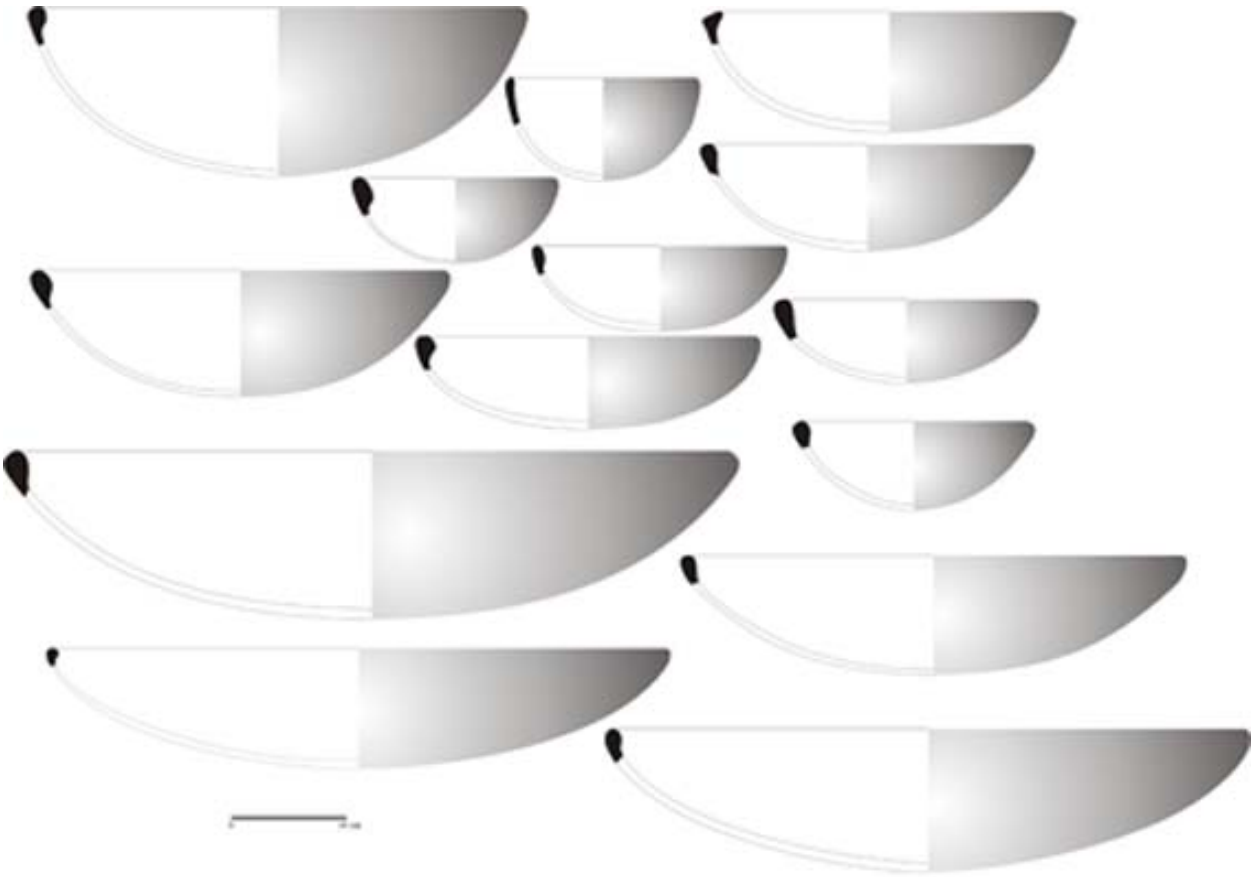


Figure A.8-B Fine Quartz ceramic forms (*bowls*)

3. LATE MUISCA TYPES

A. Gray Temper (Desgrasante Gris)

This is the most common Late Muisca ceramic type. It can be found along the Altiplano Cundiboyacense and the upper part of the western slopes. Regretably, it seems this ceramic type is a poor chronological indicator since it appears throughout the entire sequence in the stratigraphic excavations carried out in the Sabana de Bogotá and the western slopes (e.g. Peña 1991). However, in the stratigraphic excavation in Cubsio the Gray Temper ceramic type appeared in the upper levels, which confirms its later position into the archaeological sequence. Broadbent (1971) established this type as Guatavita Desgrasante Gris, emphasizing the gray argillite particles as its distinctive characteristic.

317 (24.4%) Gray temper sherds were collected in the systematic survey, and 38 (8.2%) came from the stratigraphic excavation at Cubsio.

Paste: Most commonly orange (7.5 YR 6/6 Reddish Yellow) and less frequently cream (7.5 YR 6/2 Pinkish Gray).

Core: Grain and non-uniform texture. Generally oxidizing atmosphere, and occasionally gray.

Temper: Fine (< 1 mm) and medium (1-2 mm) lenticular and sub-angular particles of gray argillite.

Surface: Smooth. Generally without slip. When slip, very pale red (7.5 YR 7/4 Pink; 7.5 YR 7/6 Reddish Yellow)

Thickness: 5-10 mm

Decoration: --

Forms: Globular vessels. Hemispherical bowls.

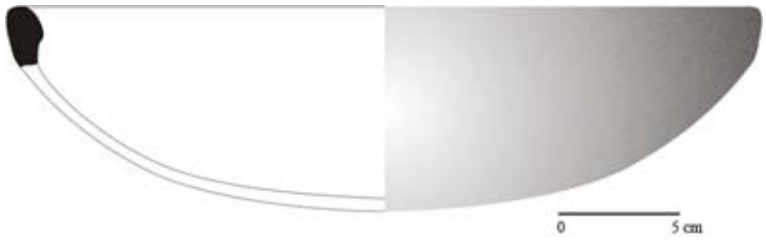


Figure A.9 Gray Temper ceramic bowl

B. Sherd Temper (Desgrasante Tiestos)

This ceramic type was first established by Broadbent (1971) as Guatavita Desgrasante Tiestos. This ceramic type seems to be a good chronological indicator for the Late Muisca period. However, because most of the time it appears in very low proportions, it is not possible to observe its stratigraphic position clearly. This is precisely the case for

the stratigraphic excavation at Cubsio, in which the Sherd Temper ceramic type was collected in very low proportions. Langebaek (1987) suggested that the scarcity of the Sherd Temper ceramic type outside of the Guatavita region, in the Sabana de Bogotá, is because its function was ceremonial, and closely related to the Guatavita chiefdom.

Only 15 (1.1%) Sherd Temper sherds were collected in the systematic survey, and 3 (1.7%) came from the stratigraphic excavation at Cubsio.

Paste: Most commonly orange (7.5 YR 6/6 Reddish Yellow) and less frequently cream (7.5 YR 6/2 Pinkish Gray).

Core: Grain and no-uniform texture. Generally oxidizing atmosphere and rarely gray.

Temper: Fine (< 1 mm) and medium (1-2 mm) particles of sherds.

Surface: Smooth. Generally without slip. When slip, very pale red (7.5 YR 7/4 Pink; 7.5 YR 7/6 Reddish Yellow)

Thickness: 5-10 mm

Decoration: --

Forms: --

APPENDIX B

SHERD FREQUENCIES FROM THE SYSTEMATIC SURVEY AND THE STRATIGRAPHIC EXCAVATION AT CUBSIO 1

B.1 SYSTEMATIC SURVEY

Table B.1 Sherd frequencies from the systematic survey

LOT	SITE	HERRERA				EARLY MUISCA		LATE MUISCA		MODERN	UN-CLASSIFIED
		Crushed Rock	Incised Red	Red on Cream	Zipaquira Sherd Temper	Fine Quartz	Abundant Quartz	Gray Temper	Sherd Temper		
1	11	0	0	0	0	0	0	0	0	0	2
2	12	0	0	0	0	0	0	0	0	10	0
3	1	0	0	0	0	0	1	0	0	0	0
4	2	0	0	0	0	0	1	0	0	0	3
5	3	0	1	0	0	1	0	1	0	0	0
6	3	1	0	0	0	1	0	0	0	1	0
7	3	3	3	0	0	0	0	2	0	0	0
8	9	0	0	0	0	0	0	1	0	0	0

9	8	0	1	0	0	0	0	0	0	0	0
10	9	0	0	0	0	1	0	0	0	0	0
11	10	0	0	0	0	1	0	2	0	1	0
12	56	0	0	1	0	0	2	2	0	1	0
13	5	0	0	0	0	0	0	4	0	1	5
14	6	0	0	0	0	0	0	0	0	0	1
15	7	0	1	0	0	2	0	2	0	0	0
17	13	0	0	0	0	0	0	0	0	31	0
18	14	0	0	0	0	0	0	1	0	1	0
19	15	0	0	0	0	0	0	0	0	35	0
20	16	0	0	0	0	0	0	16	0	4	0
21	16	0	0	0	0	1	5	18	1	1	0
22	17	0	0	0	0	0	2	3	0	0	0
23	18	0	0	0	0	0	0	2	0	10	0
24	19	0	1	0	0	1	1	0	0	1	0
25	20	0	0	0	0	2	1	0	0	0	0
26	21	0	1	0	0	0	5	1	0	0	0
27	22	0	1	0	0	0	12	5	0	4	1
28	67	0	0	0	0	0	2	4	0	0	0
29	68	0	5	1	0	5	3	3	1	7	1
30	68	1	6	0	0	1	6	4	0	11	0
31	69	0	0	0	0	0	0	1	0	0	0
32	70	0	1	0	0	0	0	0	0	1	0

33	71	0	0	0	0	0	0	2	0	0	0
34	72	0	0	0	0	0	0	0	0	1	0
36	74	0	0	0	0	9	11	3	0	2	0
37	23	0	0	0	0	1	0	10	0	55	0
38	24	0	0	0	0	0	0	0	0	2	1
39	25	0	0	0	0	0	2	3	0	0	0
40	26	0	0	0	0	0	0	0	0	10	0
41	27	0	0	0	0	0	0	1	0	1	4
42	28	0	0	0	0	0	0	0	0	4	0
43	29	0	3	0	0	2	0	0	0	0	0
44	30	0	4	0	0	0	1	1	0	0	1
45	31	0	0	0	0	0	0	0	0	5	0
46	32	0	0	0	0	2	0	3	0	2	0
47	59	0	0	0	0	0	0	0	0	1	0
48	60	2	8	0	0	3	7	9	1	9	4
49	32	0	7	0	0	3	0	4	0	4	1
50	32	1	5	0	0	4	7	6	0	2	1
51	32	0	0	0	0	1	1	2	0	0	0
52	32	0	1	0	0	0	3	2	0	0	0
53	32	1	1	0	0	1	0	4	0	14	1
54	61	0	1	0	0	0	0	0	0	0	0
55	62	7	5	0	3	11	11	10	1	5	3
56	63	0	0	0	0	0	4	4	0	0	0

57	43	0	2	0	0	0	6	7	0	0	1
58	44	0	0	0	0	0	3	4	0	1	0
59	41	0	0	0	0	0	3	6	1	0	0
60	42	0	0	0	0	5	16	33	1	44	1
62	33	0	0	0	0	0	1	1	0	8	0
63	34	0	0	0	0	0	4	3	1	5	0
65	35	0	0	0	0	2	2	2	0	0	0
66	36	0	3	0	0	3	1	1	0	3	0
67	37	0	0	0	0	0	0	0	0	10	0
68	37	0	1	0	0	1	0	0	0	19	0
69	38	0	0	0	0	0	4	6	0	0	0
70	32	0	10	0	0	10	7	11	0	8	1
71	32	1	7	0	0	6	5	2	0	6	0
72	32	1	10	0	0	0	1	1	0	1	0
73	37	0	0	0	0	0	1	2	0	6	0
74	39	0	0	0	0	0	1	0	0	0	0
75	40	0	0	0	0	2	0	2	0	0	0
76	32	0	3	0	0	2	0	2	0	4	0
77	45	0	0	0	1	9	11	17	0	1	2
78	45	0	0	0	0	0	5	9	0	0	0
79	46	0	0	0	0	11	5	20	0	0	0
80	47	0	1	0	0	0	0	0	0	1	0
81	48	0	0	0	0	0	0	3	0	0	0

82	97	0	0	0	0	0	1	0	0	0	0
83	49	0	0	0	0	1	0	0	0	0	0
84	50	0	0	0	0	0	0	0	1	0	0
85	57	0	0	0	0	0	1	0	0	0	0
86	58	0	0	0	0	1	9	3	0	0	0
87	75	0	0	0	0	0	0	0	1	0	0
88	76	0	0	0	0	0	3	4	0	0	0
89	76	0	0	0	0	0	4	0	0	0	2
90	77	0	0	0	0	0	0	1	0	0	0
91	79	0	0	0	0	0	0	0	0	2	0
97	92	0	0	0	0	0	0	0	0	0	0
98	93	0	0	0	0	0	0	0	1	0	0
99	81	0	0	0	0	0	0	0	0	1	0
100	82	0	0	0	0	0	0	0	0	3	0
101	94	0	0	0	0	0	0	0	0	2	0
102	95	0	0	0	0	0	0	0	0	9	0
113	99	0	0	0	0	0	0	0	0	4	0
114	100	0	0	0	0	0	2	0	0	3	0
115	101	0	0	0	0	0	0	0	0	0	0
116	102	0	0	0	0	1	8	0	0	0	0
125	51	0	0	0	0	0	0	0	0	2	0
126	52	2	1	0	1	0	0	4	0	0	0
128	53	1	2	0	0	1	1	1	1	0	0

129	54	1	0	0	0	0	1	0	0	1	0
130	55	0	0	0	0	0	0	0	0	1	0
153	64	0	0	0	0	1	3	4	0	3	0
154	65	0	0	0	0	0	1	0	0	0	0
155	66	0	2	0	0	6	2	7	1	9	4
156	83	0	0	0	0	0	1	0	0	0	0
157	84	1	7	0	0	5	12	14	2	2	1
158	84	1	0	1	0	0	4	7	1	0	0
159	85	0	0	0	0	0	1	0	0	0	0
160	86	0	0	0	1	0	0	1	0	0	0
161	87	0	0	0	0	0	1	2	0	2	0
162	88	10	11	0	0	5	5	0	0	2	6
163	89	1	2	0	0	2	0	1	0	0	0
164	90	0	0	0	0	0	0	0	0	1	0
165	91	0	4	0	0	0	0	0	0	0	0

B.2 CUBSIO 1

Table B.2 Sherd Frequencies from Cubsio 1

LEVEL	HERRERA			EARLY MUISCA		LATE MUISCA		UN-CLASSIFIED
	Crushed Rock	Incised Red	Red on Cream	Fine Quartz	Abundant Quartz	Gray Temper	Sherd Temper	
1	1	3	0	5	6	11	2	0
2	0	2	1	7	10	17	0	0
3	1	2	0	1	3	2	0	0
4	0	2	0	3	1	1	0	1
5	4	2	0	1	3	2	0	1
6	3	3	1	3	4	2	1	1
7	1	2	0	1	4	1	0	1
8	3	3	0	0	1	1	0	0
9	3	2	0	0	5	0	0	1
10	4	4	0	3	0	0	0	3
11	9	3	0	2	2	0	0	1
12	32	19	0	1	5	1	0	1
13	29	12	3	1	2	0	0	4
14	12	9	1	1	1	0	0	1
15	16	9	5	1	7	0	0	1
16	36	9	8	2	4	0	0	0
17	24	5	5	0	0	0	0	2
18	7	2	3	0	0	0	0	2
19	1	0	2	0	0	0	0	1

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