CHAPTER 4

THE ISAHUARA AND JACHAKALA PERIODS: INCIPIENT POLITICAL ECONOMY

The Isahuara Period at Jachakala is composed of cultural materials recovered from Levels ranging between 30 and 120 centimeters below the site surface. As mentioned in the chronological section of Chapter 2, the beginning and end of this occupation are marked by sharp changes in the proportions of lithics and faunal assemblages. This chronological scheme is not isomorphic with the ceramic sequence, as Tiwanaku IV-style sherds begin to appear partway through the Isahuara Period (ca. AD 500-800), while Tiwanaku V sherds are found primarily in the uppermost fifty centimeters of deposit.

The Jachakala Period (ca. AD 800-1200) includes the upper thirty centimeters of cultural deposits, as well as almost all of the architectural foundations either uncovered through excavations or partially visible on the site's surface. Once again, the beginning of this period is marked by changes in the lithic and faunal assemblages in each zone.

Jachakala During the Isahuara and Jachakala Periods

The site physically grew during the Isahuara Period to cover between four and five hectares, all in the central and southern zones. Although the structures in the northern zone date to the Jachakala Period, several burials in the cemetery there are in Isahuara Period levels. Both these burials and those recovered from Niñalupita levels indicate that

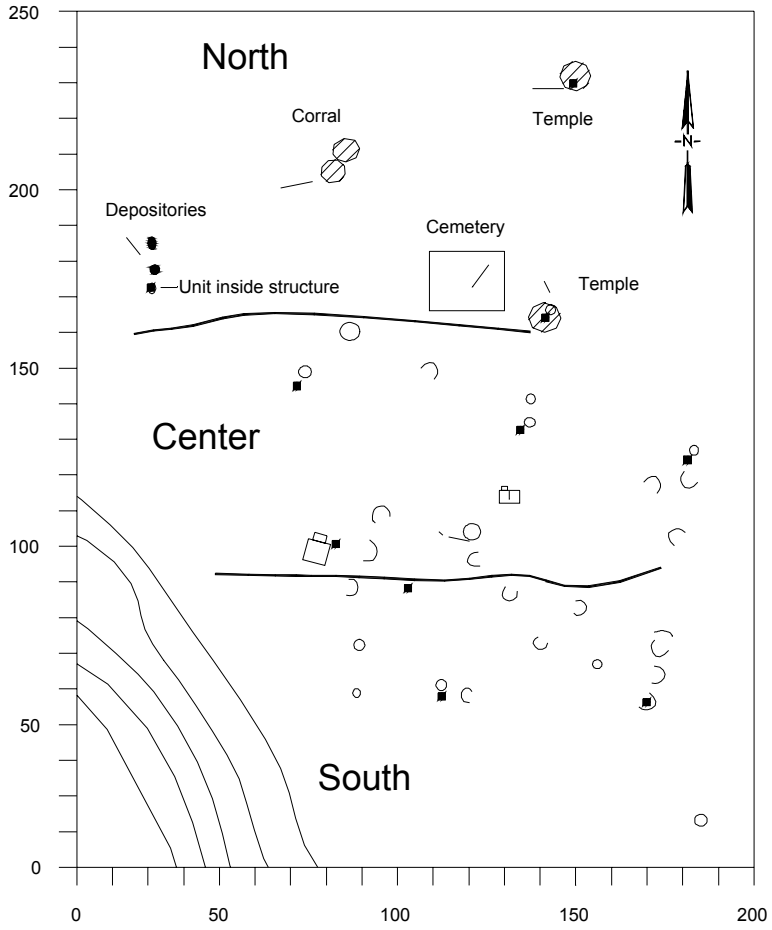

Figure 26. Location of excavation units (in relation to surface architectural remains) with Isahuara and Jachakala Period levels used in inter-zonal analyses of cultural materials.

this mortuary area was used during all three occupations of Jachakala. By the end of the Jachakala Period, the community had grown to its final size of 6.72 hectares. There are also isolated scatters of artifacts, including Tiwanaku-style sherds, in at least two locations within sight of the main community. These may have represented separate residences, activity areas, or simple refuse scatters, but I was unable to obtain permission to investigate them further. Jachakala's size of 6.7 hectares includes, therefore, only the main community, though the space used by its residents was certainly larger.

Excavation Units

Isahuara and Jachakala Period remains subjected to analysis were exposed in nine two-by-two meter units excavated down to culturally sterile levels. The Isahuara and Jachakala Period levels from the same seven central and southern zone units used in the Niñalupita Period lithic analysis in Chapter 3 are employed again in the lithic analyses below. To reiterate, five of these seven were placed next to house foundations to excavate deep middens adjacent to those structures, and the other two units were randomly placed at the site. Four are central zone units, and the remaining three are located in the southern zone (Figure 26).

The faunal and ceramic analyses utilized the same two southern zone units and three units in the center that were employed in the Niñalupita Period faunal and ceramic comparisons. Two additional units in the northern zone -- that did not have Niñalupita Period levels -- are part of the Isahuara and Jachakala Period analyses of faunal packets and ceramics. Because, however, one of the northern zone units (inside the storage depository in the site's northwestern corner) had only 20 cm of deposits, the Isahuara Period northern zone faunal assemblage consists of only the Isahuara Period levels from a single excavation unit.

As with the Niñalupita Period materials, the majority of the residential refuse from the Isahuara Period comes from fill contexts and small domestic features such as hearths, refuse and storage pits. However, two house foundations dating to the Isahuara were also uncovered, both in the southern area of the community. These are described in detail in Chapter 5.

DOMESTIC REMAINS

Domestic Architecture and Artifact Inventories

Since there was no Niñalupita Period architecture, we know much more about Isahuara and Jachakala Period household units because of the house remains that preserved. The typical Isahuara and Jachakala Period household unit consists of a circular foundation of a single or double row of fieldstones with a hearth or fire pit along the interior wall. Exceptions to this include one square-shaped and two rectangular

foundations. Adjacent to the southwestern corner of almost every structure we found a large, deep midden with many layers of domestic refuse. Some central zone households also had one or more large, wide-necked Inti Raymi storage jars set into the ground adjacent to the dwelling.

Artifacts from storage features, hearths, house floors, and middens are grouped together in the analysis of the individual household unit in Chapter 5. Those that were fully exposed by excavation are also illustrated in that chapter. However, the aim of the lithic, ceramic, faunal, and other artifact analyses below is to describe domestic processes, spatial and diachronic patterns, rather than static household remains. These analyses follow Hayden and Cannon's (1982) recommendations for comparing groups of households, or the southern, central, and northern zones of Jachakala. Because the long, straight walls used to divide the site into these three areas are readily visible on the site surface, these inter-zonal comparisons are not simply arbitrary. Jachakala's residents, at least during the Jachakala Period, divided themselves minimally into two groups of households.

Typical household activities during the Isahuara and Jachakala Period include the manufacture and refurbishment of basalt bifacial hoes, scrapers, projectile points, and other stone tools. Residents consumed camelid meat, made bone tools, hunted, and participated in rituals at the household and community scales. Some households, if not all, participated in long-distance exchange networks, and acquired a variety of imports ranging from Tiwanaku-style pottery and pyroengraved bone, to marine shell, obsidian, ópalo, and other semi-precious stones. Some residents made or used camelid mandible tools and a small number of copper ornaments. Together, these materials represent "typical" domestic activities during the Isahuara and Jachakala Periods.

Storage, Refuse Disposal, and Cooking Features

The small number of identifiable house foundations located in the southern zone, compared to those visible on the surface throughout the central zone, may be partially responsible for the discrepancies between the three zones in the numbers of storage pits, hearths, and large middens excavated in each. Even so, the numbers of excavated features

such as storage pits, hearths, and middens from the Isahuara and Jachakala Periods are too few to warrant statistical analysis.

Six large bell-shaped storage pits dating to the Isahuara Period included two in the south, three in the center, and one in the north. All five Jachakala Period storage pits were found in the center. These domestic features differ most in their contents. All of the Isahuara and Jachakala Period pits in the center had ash, bones, and sherds inside of large, wide-mouthed ollas or jars topped with flat stones. These large storage jars were not found in the south or north. The contents of the only northern zone storage pit are also distinctive, with various sherds of Tiwanaku IV vessels, ash, and several bone tools.

Sizeable household middens were exposed within or immediately next to dwellings in predictable patterns. They were uniformly located outside the southwest or southeast corner of the structures. Three excavated middens date to the Isahuara Period, with one in the south and two in the center. Five date to the Jachakala Period, including one in the south and four in the center. Typical Isahuara Period and Jachakala Period middens contained a mix of ash, burned earth and carbon fragments, bones, lithic debris, and sherds. Three central zone refuse pits also held small offerings of undecorated vessels, one nestled within a second bowl, with ash, carbon, and a few bone fragments.

Ten Isahuara Period hearths included seven in the center and three in the south. Twelve Jachakala Period hearths, on the other hand, included ten from the central zone and two from the south. No hearths were located in the northern zone. Most of the central zone hearths from both periods had certain additions that distinguished them from the hearths in the south. Central zone hearths usually had either a deliberate arrangement of smashed, burned ceramic sherds (in one case this arrangement was mirrored by a cache of unbroken basalt handaxes) in them or a large, flat stone placed on top of the ashy contents. Circles of small stones also surrounded the rims of two hearths. None of the southern zone hearths contained any of these structural elaborations.

NON-DOMESTIC FUNCTIONS

The Walls That Divided Them

Two large dividing walls were constructed during the Jachakala Period, segregating the community into three zones. Both have two parallel rows of large foundation stones running in an east-west direction across the site, most of which are visible on the surface of the site (see Figure 27 below). These were the lines used to divide Jachakala into a northern, central, and southern zone.

A portion of the wall dividing the central and northern zones was excavated. Very hard, compact and homogeneous silty clay on both sides of the foundation suggests that walls of adobe bricks were constructed on top of the stones. The base of the layer of wall melt was reached at 8 to 10 cm below the surface; this dates the dividing wall to the Jachakala Period. Construction of the second wall between the central and southern zones from one another is assumed to date to the same period.

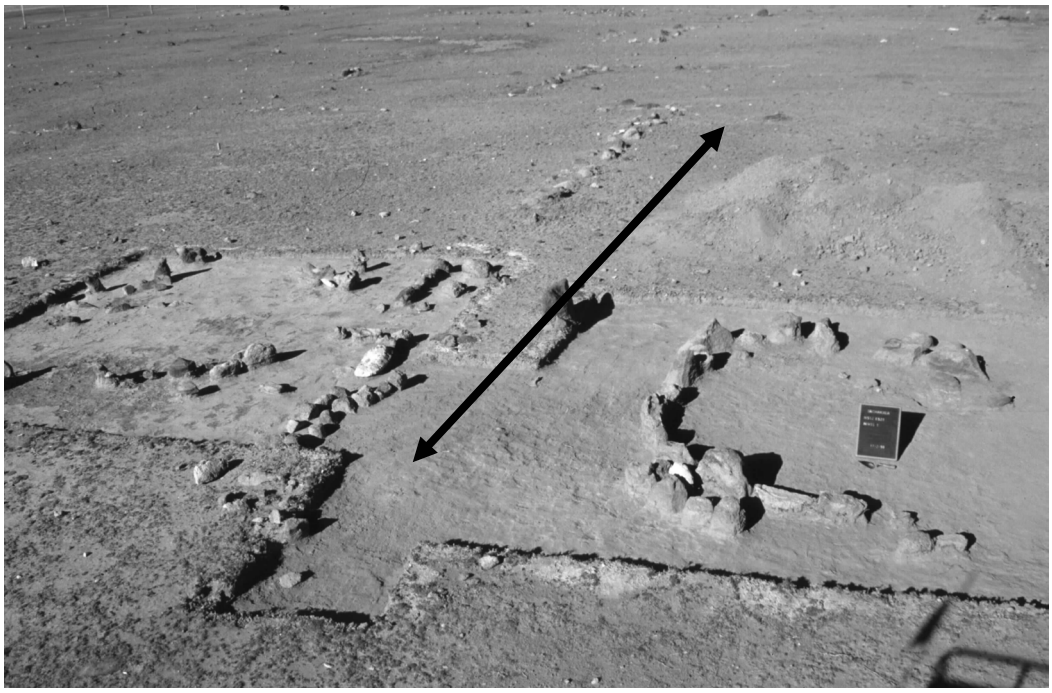

Figure 27. Portion of dividing wall between the central and northern zones excavated.

The wall dividing the center from the north has good evidence for the restriction of access to the northern zone in the form of two narrow passageways. Each of the doorways is approximately half a meter in width; the eastern entrance is 10 m or so to the west of one of the two possible temples (described below). The eastern end of the wall joins up with the foundation of that large circular structure, and stops. The western point of entry is near the western edge of the site, closer to the three possible depositories. No such entrances were visible along the length of the other wall.

The construction of one or both of these two walls at some time during the Jachakala Period was an important development in Jachakala's history. This small community of agro-pastoralists physically divided their residential space into at least three zones. In doing so, two distinct groups of households (that I have been able to identify) were created. Inter-zonal analyses of artifact patterns discussed in this chapter reveal that wealth differences between these two groups of households predate the construction of the walls that physically divided them. Although this approach (inter-zonal comparisons) might obscure differences within each zone, the dividing walls physically defined the sets of households that differed from each other as a group. This represents a definite change in Jachakala's social organization in that differences between the two groups of households at Jachakala were architecturally, and so publicly, recognized, defined, expressed and reinforced.

Furthermore, the wall dividing the center from the north, with its two narrow points of entrance into the northern zone, provides evidence that access to the north was restricted. Activities that took place there still might have been public in nature. However, southern zone residents had to cross two physical barriers to enter into the northern zone. This lends a bit more support to the hypothesis that central zone residents were more involved in northern zone activities than the people from the south.

Centralized Storage

Three small circular structures in the site's northwest corner may have served as community storage facilities, given their extremely small size, lack of residential association, and association with other structures of public functions. One of the three was fully excavated; the entire foundation was uncovered through a series of adjacent

Figure 28. One of three small, circular foundations in Jachakala's northern zone that might have served as storage structures.

1 x 4 m trenches (Figure 28). The interior floor area totals 2.35 m^2, and no domestic features were identified inside or around the structure. A small number of undecorated body sherds and faunal fragments were recovered from the level underneath the adobe wall melt, but no ash, carbon, or tools were found.

According to Santley (1993:82), the function of centralized storage is to underwrite group-wide ceremonies. If this was the case at Jachakala, it is possible that whatever was stored in those three small structures in the north was meant for consumption in the same zone. Their physical separation from the residential areas of the community implies that no single household or group of houses was directly in charge of storing, guarding, and/or controlling the outflow of resources tucked away inside them. The kinds of buildings in that part of Jachakala, as well as the absence of any features typical of living floors throughout the northern zone, suggest that all activities that took place there were non-residential (or possibly public) in nature.

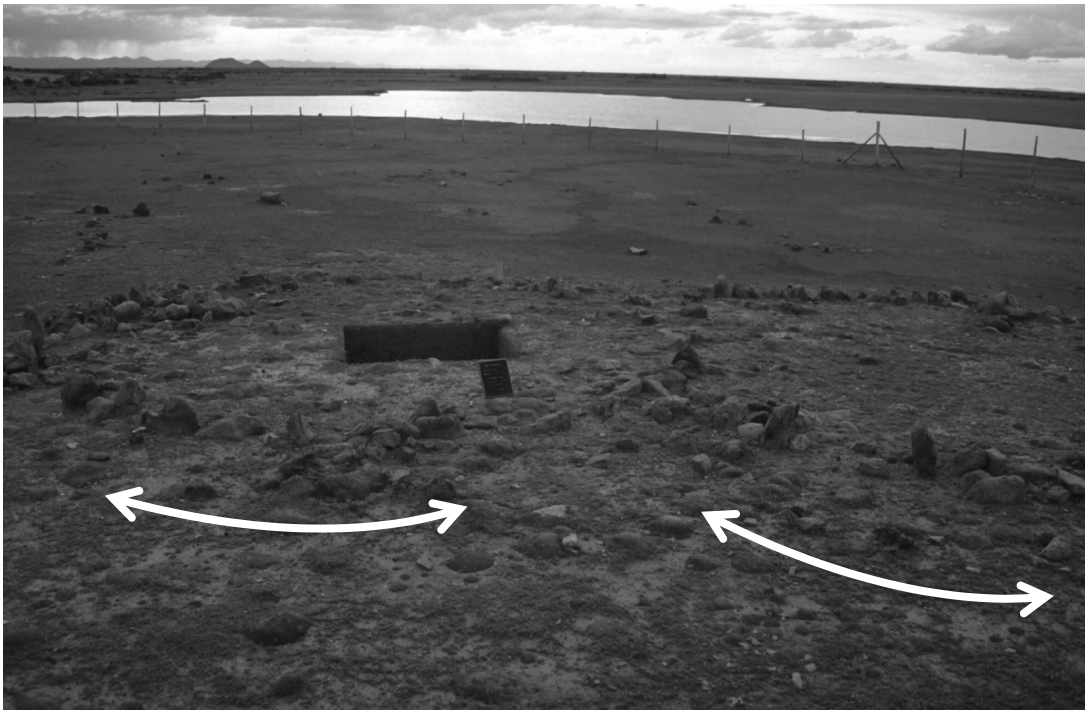

Figure 29. Photo of two conjoined circular foundations on the surface of Jachakala, which may have functioned as a camelid corral.

A Possible Corral

Also in the northern zone are two connected foundations, each one circular with roughly 50 m^2 of interior floor space (8 m in diameter) for a total of 100.53 m^2 (Figure 29). One possible interpretation of this double structure is as a camelid corral. This is based on the absence of residential features, as well as the high organic content of the first 40 cm or so of soil (possibly due to concentrated buildup of camelid dung) which contributed to the raised area under and within the foundation.

Unlike some ethnographically recorded corrals studied by Kuznar (1995) in southern Peru, thick, compact layers of dung might not be as archaeologically visible at Jachakala as they would be in a sandy soil context. This is because the dark organic stains made by the dung on the highland sands in Kuznar's study area are absent from the La Joya region. Instead, Jachakala's soil matrix is composed primarily of very hard and

compact silty clays ranging in color from light orange to a deep brown. However, the uppermost forty centimeters of deposits within one of the two circular foundations was dark brown (Munsell 7.5YR-4/4) loamy clay with high levels of organic content. This could conceivably be linked to camelid dung deposition, although use of the structure as a midden or other feature where organic materials were regularly disposed of could yield the same general soil types. In fact, Chang and Koster (1986:117) write that, "Basic research still needs to be done on processes of deposition and postdepositional geochemical changes of animal dung in both open air and cave sites." Furthermore, we know that animal dung was used on the altiplano as a source of agricultural fertilizer and fuel in hearths. This practice would entail removing dung deposits from animal enclosures. The detrimental effect this would have on the archaeologist's ability to correctly identify at least some corrals, pens, or temporary enclosures is something that has received little attention in the ethnoarchaeological literature on Andean pastoralism.

Archaeologists who study pastoralism differ in their predictions about the density of artifacts that one might find inside a corral. Kuznar recorded garbage, cooking and food preparation refuse, and roofing items from houses nearby inside Awatimarka corrals (1995:89), as well as a high incidence of bones gnawed by dogs (1995:87). However, Chang and Koster (1986) survey a number of works in which low artifact density within enclosures is used as evidence for the identification of animal pens. Post-abandonment use of pens as sleeping areas for dogs and/or refuse toss zones is responsible for this variability in artifact deposition. To return to Jachakala, the double circular structure in the northern zone that might have been a small corral contained small to moderate numbers of artifacts of all types in every ten centimeter level.

The size of the double circular structure at Jachakala is also somewhat troubling. Average herd sizes in ethnographic studies of camelid management vary with subsistence goals, and depend to a large extent on the social organization of herd management. Extended families of communities who herd their llamas and alpacas together maintain groups of about 230 animals, according to another study by Kuznar (1991). However, families in Ayacucho, Peru maintain groups with an average of fifteen to forty animals; ideology can contribute as much as economic strategies to determinations of ideal herd size (Flannery et al. 1989). Also, some might use animal pens, particularly those nearer to

human habitation structures, to protect young animals from predation and theft (Kuznar 1995:87). The particularly small size of the double circular structure at Jachakala (with each foundation providing some 50 m^2 of interior floor space) does not necessarily discount its possible function as a corral, if it was used by a single household or two, or strictly for young animals.

Two Temples

Two very large circular structures dating to Tiwanaku IV times were also investigated in the eastern section of the site's northern zone. Their size (each approximately 11 m in diameter, providing 95 m^2 of interior space) far exceeds the range of household floor areas, and their lack of residential features of any sort also suggests alternative, non-domestic functions. Five 1 x 4 m trenches were excavated within the foundation of one of them in order to search for identifying features. When none were

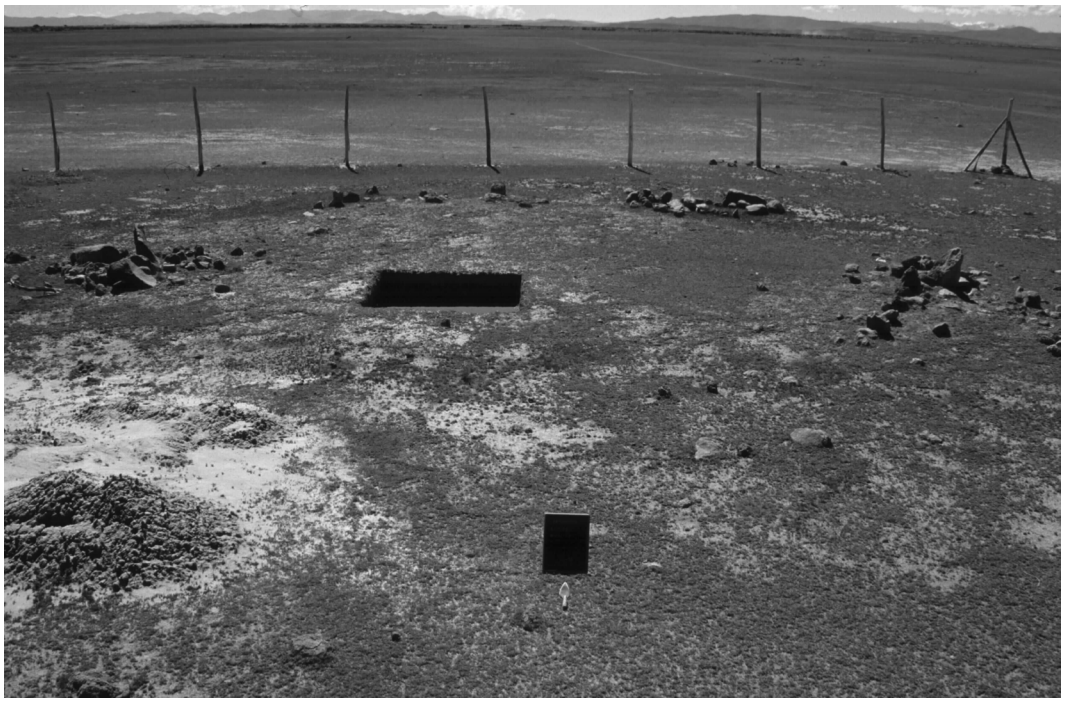

Figure 30. A large circular foundation in the northern zone of Jachakala; this structure may have been a temple or public gathering space.

found, a 2 x 2 m pit was placed in the center of the structure and taken down to sterile soil. This is the second northern zone unit whose faunal and ceramic remains were included in those respective analyses.

Excavations in this structure, pictured in Figure 30, yielded few artifacts and no features whatsoever. Sterile soil was reached at only 40 cm below the surface, and I never identified a floor. This structure's sheer size tends to place it in the same functional category as the other temple or public building slightly to its south. It is possible that this structure was used as a camelid corral instead. Artifact densities are moderate, but the soil throughout those 40 cm was a homogeneous, fine-grained light brown silty clay (Munsell 7.5YR 6/4) with no organic inclusions whatsoever. Unless all dung deposits were removed from the floor of the corral, it is unlikely that animals were enclosed within this structure.

In contrast, the artifact assemblage from fill contexts in the second large structure (Figure 31) is both diverse and dense. This collection is primarily dominated by non-utilitarian vessels (including decorated Tiwanaku-style ritual forms as well as undecorated serving or perhaps feasting wares) and fragmented faunal remains, possibly associated with activities that took place in this structure. Two poorly preserved burials of a woman and an infant were excavated in ashy contexts a meter or so below ground level. This structure yielded admittedly little evidence supporting designation as a temple, except a fairly sizeable collection of sherds from Tiwanaku-style ritual vessels, a small number of obsidian and ópalo artifacts, and eight camelid mandible tools. On the other hand, all classes of domestic refuse, from basalt debitage and tools to faunal remains and utilitarian vessel sherds were also recovered from this unit. This structure is called a temple because of this collection of non-utilitarian artifacts from fill contexts, the absence of domestic features such as a midden or hearth, and its large size. The first structure with much less of an artifact assemblage is grouped with this one because of its similar size. In fact, both structures could have served as public (though not necessarily ritual) gathering spaces, general activity areas, or camelid corrals. The lack of features, identified floors, or other clues to their original uses, prohibits functional designations with any degree of certainty.

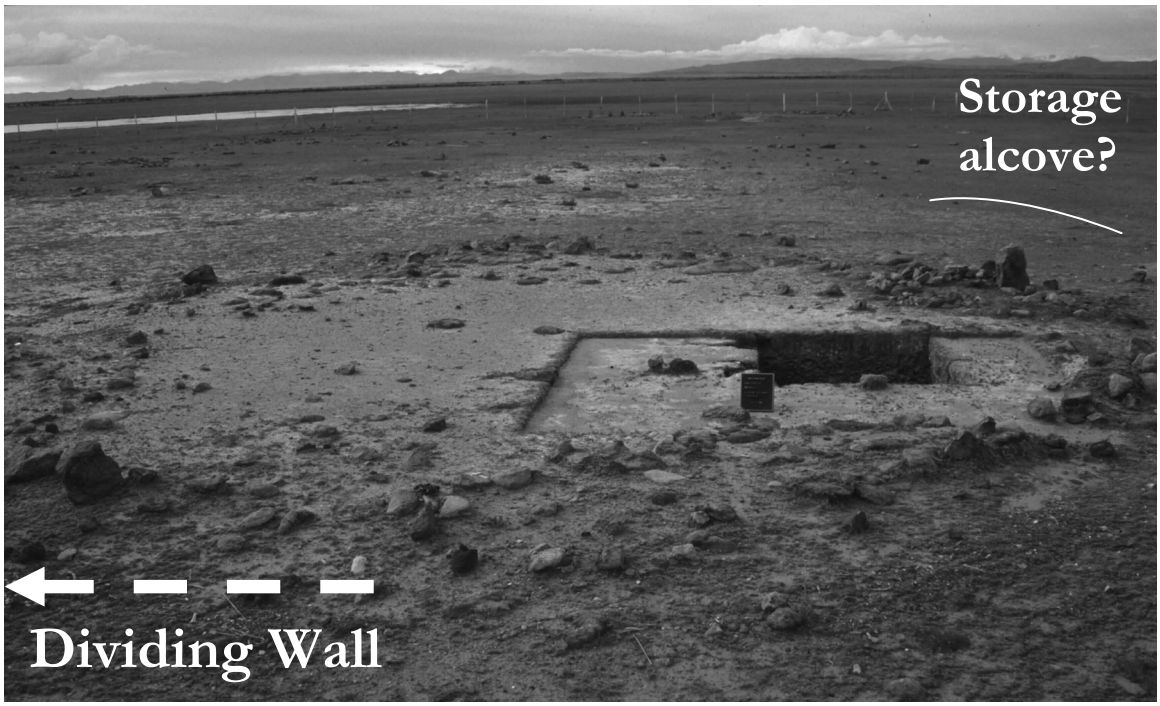

Figure 31. Large, circular foundation on the site surface and at the end of the wall separating the central and northern zones; this may have been a ritual structure.

The Northern Zone Household

Contrary to my initial expectations, the single, circular foundation of what might have been a house in the northern zone did not yield much material evidence that would distinguish it from households in the central zone. Its size (9.4 m^2 of interior space), construction on top of a single row of large field stones, and identifiable living floor all resemble those features of central and southern zone domestic foundations. No hearths, middens, or other domestic features were located; therefore, it could have been a storage structure rather than a house. Assuming it was a dwelling, its location directly alongside the dividing wall provided an opportunity to contrast its remains directly with houses from the central zone, because another house foundation was located directly on the other side of the same wall. The artifact and feature assemblages recovered from the two foundations did not reveal any marked differences between them, however. At first glance, therefore, this single house in the northern zone does not seem to have performed

any function or participated in any activities that would set its residents apart from their neighbors on the other side of the wall. Its unique location is a source of mystery, even though its occupants (if it had any) possibly performed some functions that explained their residence in this part of the community.

The Cemetery

A number of burials dating to the Isahuara and Jachakala occupations were recovered from a small area of the northern zone to the west of the second temple. This small area seemed to have served then as the community cemetery for Jachakala's entire history. Few artifacts were found in the soil matrix surrounding the mortuary remains. Like the two male Niñalupita Period burials discussed in Chapter 3, those recovered from the upper strata of the cemetery vary in position and treatment. No single burial contained any significant grave furniture suggesting an individual of higher personal social status.

Overall, the burial population of Jachakala exhibits a high degree of intra-assemblage diversity at the site. Some were extended, and others were buried in a fetal position. Some were secondary burials, and two women were deposited as bundle burials. Some, but not all, included associated evidence of ceremonial offerings involving small fires, smashed vessels, and in one case, a peculiar circular arrangement of bone fragments, sherds, and small stones. Grave furniture such as personal adornments or tool kits was absent from most burials excavated both within and outside of the cemetery proper. No evidence for personal wealth or status distinctions in the form of luxury goods or even moderately large collections of utilitarian goods was displayed in any single burial. Though inter-household wealth variability developed during the community's long history, it was not expressed in mortuary treatment.

Although the sample is quite limited, it appears that only males were buried in the communal cemetery in the northern zone, while the two female-infant pairs excavated at Jachakala were interred in 1) a southern zone midden, and 2) underneath one of the possible temples.

A dual burial (Figure 32, photo on the right) on the edge of a large midden on the southernmost edge of the central zone bore the greatest evidence for mortuary ritual, strikingly so, given its context. A circular arrangement of small stones placed just over

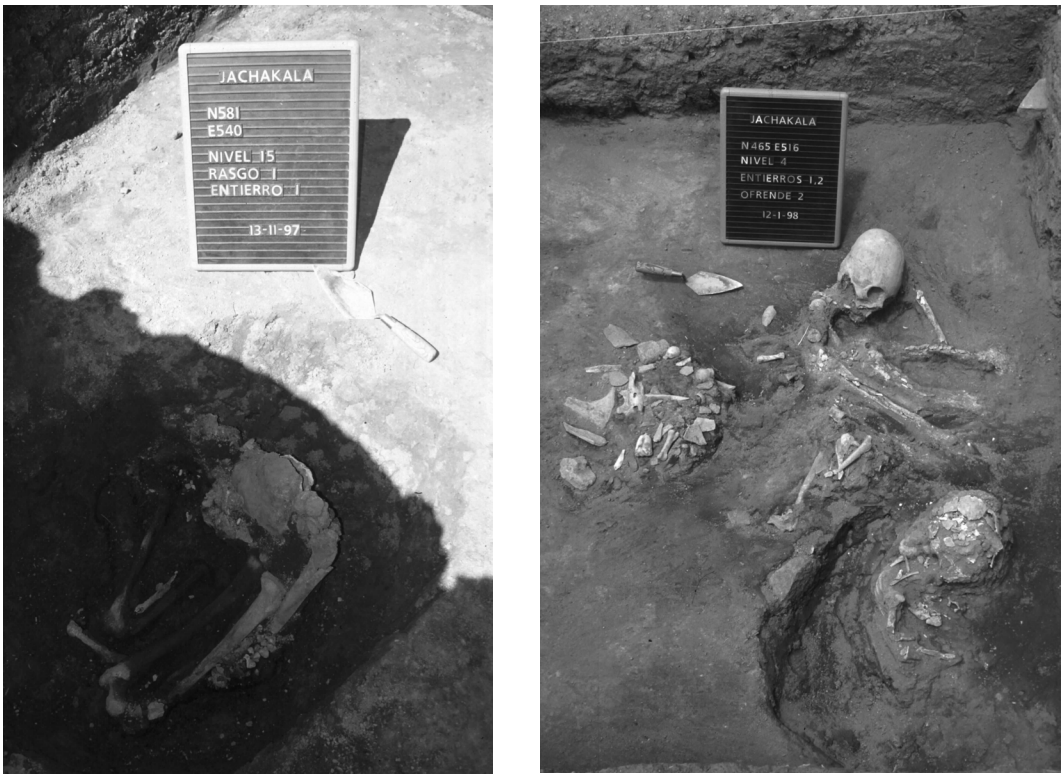

Figure 32. Photos of two mortuary features, each containing the skeletal remains of what appear to be one adult female, and one of which is accompanied by an infant of unknown gender.

the woman's cranium surrounded a smashed La Joya Orange bowl. Inside and next to these sherds, a large number of additional artifacts were recovered, including a broken camelid mandible tool, a small basalt side scraper, a small basalt projectile point, an incompletely perforated spindle-whorl disc, and a small quantity of carbon fragments and burned earth. A second offering just south of the accompanying infant's remains included a small circle of sherds, bone fragments, and stones. Atop two small lenses of burned earth, the woman's deformed cranium lay on its left side, with the left arm extending beneath a large rock. Several vertebrae, ribs, and the right humerus were placed in a

bundle perpendicular to and just in front of her face. The left humerus, both tibia, and several carpals were recovered four meters to the southwest of her body in the midden.

About a meter east of the woman's cranium were the remains of an infant of unknown gender. Its skull was crushed by a large stone on top, though the facial bones were partially preserved in situ. A few vertebral and rib fragments were also present. Clear impressions of paja (a coarse altiplano grass) visible in the clay matrix suggest that the bodies had been wrapped before being deposited. Figure 32 is a photo depicting the two excavated burials along with the second offering.

The second female-infant pair (Figure 32, photo on the left) was located at 90 cm below the surface in a large midden underneath the second northern zone temple. As with the infant described above, the remains were very poorly preserved, and consisted of only a few unfused long bone ends and part of the cranium. No grave furniture or offerings were associated with this burial. Other than several shallow stains of ash, 20 cm of loose clay separated the woman from the bottom of the midden, though the artifact density at that depth was still typical of a refuse dump. A single, large flat stone topped her body. Visible remains included a deformed cranium, partial pelvis, partial vertebral column, a single scapula, several rib fragments, and pieces of a humerus and the right femur. Virtually all cultural deposits in this unit stopped after this level.

Male burials in the communal cemetery to the west of this temple structure underwent a wide range of mortuary treatments. A total of three male skeletons were recovered from two adjacent 2 x 2 m units placed in this area. Preliminary excavations by Bermann and Estevez in 1991 had uncovered a burial here in profile, thus we suspected it was a cemetery. At 30 cm below the surface, excavations revealed three large tomb capstones, though the first male burial lay under an additional 40 cm of compact silty clay. This male individual was seated and flexed, and buried with no grave furniture. Paja impressions in the soil matrix around the bones indicate that mats were once wrapped around the body.

A pile of large capstones also topped the second male burial, at the same level and a meter to the north of the first. This body was laid on its right side in a partially extended/partially seated position. Forty-four small fragments of camelid bones, and the

base of a Tiwanaku V keru accompanied this individual. The small bones of the feet were never recovered from these two burials.

A third, older male burial (Appendix G, Figure 98) was found at a depth of 115 cm below the surface. In this case, the body was extended with the top of the head in a westerly direction. The arms were crossed over the chest originally, and the hands were missing. The fibulae and tibiae of both legs were also placed perpendicularly underneath the femurs. A stone between them was located where the bones of his feet should have been. The carpal bones of both the hands and feet were never recovered. A small lens of burned earth was found beneath the cervical vertebrae. No grave furniture accompanied this individual.

Again, the important point is that burial of the dead was not one of the ways in which inter-household wealth differences were expressed, or at least preserved in Jachakala's archaeological record. Grave furniture was not universal, and when included, consisted of small features rather than personal adornment or tool kits. Location within or outside of the cemetery did not correspond to mortuary treatment differences, but may have followed gender lines.

Stylistic Variation in Cranial Deformation

Cranial deformation had been typical of people in both the La Joya region and in the areas to the east and west of the Tiwanaku heartland (Blom et al. 1998) for many centuries preceding Jachakala's initial occupation. Formative Period Wankarani skeletons typically exhibit cranial deformation in which the skull is forced to grow upward, narrowing to a cone shape. Both Jachakala females showed the same style of deformation (see photo in Figure 100, Appendix G). All of the males, however, exhibited a style formerly unknown in the La Joya region, in which their skulls sloped dramatically backward, flattening out from their (lack of) foreheads (Figure 99, Appendix G). If such features are reasonably interpreted as markers of social identity, then this sample provides a small measure of support for gender-based changes in the social structure of the La Joya region. What is perhaps most interesting about these patterns is that they coincide with the founding of Jachakala, because the earliest male burial was found deep in Niñalupita Period levels. In other words, changes in the Jachakala people's cranial

deformation styles correspond to neither shifts in the domestic economy nor the introduction of pottery and ideas from the Tiwanaku State. However, the practice is widespread in the south-central Andes.

INTER-ZONAL DIFFERENCES AND POLITICAL ECONOMY

Labor, Land, and the Hirth Model

In the assemblage analyses that follow, I will explore inter-zonal economic differences. As in the previous chapter on the Niñalupita Period domestic economy, this analysis is organized according to the three sectors of Hirth's model, namely the production, service, and distribution sectors of the economy.

In situations of unrestricted rights to land and other natural resources, he predicts "considerable variation in the structure of domestic groups" (Hirth 1993a:28). On the other hand, households will be more homogeneous in both form and size when either access to land is highly structured or when there is insufficient land for unrestricted population growth. Furthermore, when "there are pronounced inequalities in the access to land and other resources, differences in household composition will often be the result of rank rather than economic adaptation" (Hirth 1993a:28).

Archaeological patterns related to the three sectors of the political economy will also vary with labor mobilization strategies. The difference in models of incipient political economies between surplus demands and labor extraction for supra-household activities (such as temple feasts and offerings, mortuary rituals, and so forth) is an important one in terms of the artifact patterns described below. Part of the interpretation of Tiwanaku's role in Jachakala's history in Chapter 6, for instance, relies on the notion of labor mobilization by some households for community-wide rituals. This is one hypothesis that diverges from the Hirth model. Labor (rather than resource) mobilization, in this case, might not result in personal wealth differences, but rather differences in the domestic economy of groups of households who variably participate in those activities. Variability in the structure of land access and labor assignments is difficult to archaeologically reconstruct, though aspects of both can be inferred from other economic patterns.

Craft Specialization

Mobilized labor might alternatively be used for the craft or service sectors of the developing political economy. If a household or group of households at Jachakala were, for instance, practicing increasingly specialized craft production of ceramics or basalt hoes, the products of their efforts might be traded within the community for work on that household's agricultural holdings. This possibility fits well with Hirth's model, in which increasingly specialized craft production provides external opportunities for economic differentiation between households, the crucial first step in the process by which some amass more wealth than others. In this case, such a strategy is indirectly evidenced by differential distributions of the tools and finished products of ceramic, lithic, and bone tool manufacturing, such as subsistence resources and storage features. The artifact analyses reported in this chapter will test for such differential distributions.

AGRICULTURAL PRODUCTION

Lithic debris from the Isahuara and Jachakala Period of the same seven analyzed units as the last chapter are used below. Three of those units are located in the central zone, three are from the south, and a seventh unit, though technically on the border of these two zones, is classified as a central zone unit (Figure 33). Five of the seven are large, ashy middens next to Tiwanaku IV and V Period house foundations; the sixth and seventh units were randomly placed, and not adjacent to any visible structure or sizeable feature. No lithics from the northern zone were analyzed, because I wanted to compare hoe production and use in residential areas as a window on domestic subsistence practices.

Objectives of Lithic Analysis

Two specific inquiries are undertaken with regard to the lithic remains to test for both qualitative and quantitative differences in the lithic assemblages of the center and south. The first is the proposition that central zone houses produced stone tools for distribution to either the wider community (i.e., the southern zone) or the broader La Joya region. This question was simply prompted by the extremely high densities of lithic

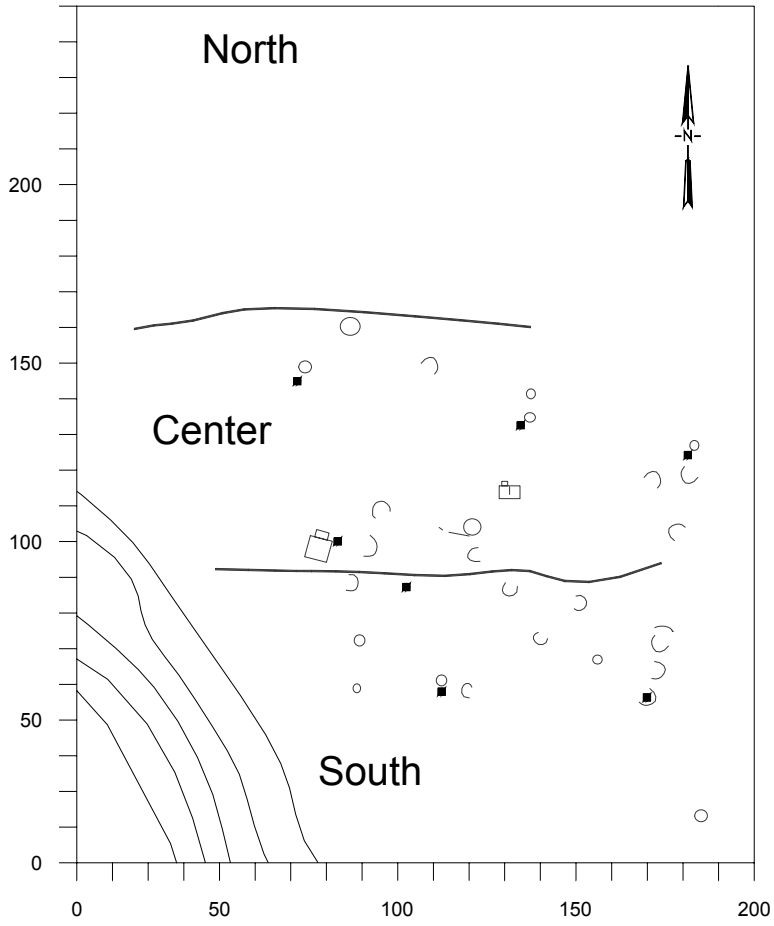

Figure 33. Location of excavation units (in relation to surface architectural remains) with Isahuara and Jachakala Period levels used in inter-zonal lithic analyses.

materials on the surface of the site, particularly in and around central zone households and their associated middens. If central zone residents produced basalt bifacial tools for exchange either within or outside of the community, this would indicate a kind of transformational change (Bermann 1994). As with the Niñalupita Period lithic analysis, the questions stemming from this approach include the following: do both residential zones have similar quantities of basalt? Does each have bifaces? Are there inter-zonal differences that indicate differential involvement in lithic production?

The relative proportions of all lithic categories for the Isahuara and Jachakala Periods are presented graphically in Figures 34 and 35. (The eight lithic categories are totaled, and the percentage of each is calculated over this sum so that the eight proportions add up to one-hundred percent.) Proportions are preferable in this approach to artifact counts or frequencies because any patterns observed between zones or periods should represent differences or similarities in the kinds of activities practiced by the relevant sectors of the population. In other words, if central zone residents produced tools for exchange (i.e. more than they consumed), then their assemblage should show relatively higher proportions of tool manufacturing debris than assemblages in the south.

The second question explored in this section is the hypothesis that the central and southern zones were differentially involved in the lithic economy (i.e. the intensity of their involvement), a kind of systemic change (Bermann 1994). This differs from the focus on proportions in the first question, which is designed to reveal patterns in lithic production activities. By contrast, significant differences in the lithic:ceramic ratios would suggest corresponding differences in the subsistence economy of the two areas.

Higher ratios of lithics in one area of the site, together with evidence for significantly more consumption debris, might indicate agricultural intensification. However, greater proportions of production debris suggest differences in craft production practices. Finally, if one area reveals greater involvement in the lithic economy, but not higher proportions of tool production debris, this can be simply explained by greater intensities of deposition or more dense occupation of one zone. In this way, these questions are good ways to test for inter-zonal differences in both agriculture and craft production practices. The rejection of both hypotheses (different proportions of production and consumption debris, and different levels of involvement in the lithic economy) would mean there were no significant differences in either the internal domestic organization of Isahuara and Jachakala Period households, or in the function of either group on a larger scale in terms of lithic production and consumption activities.

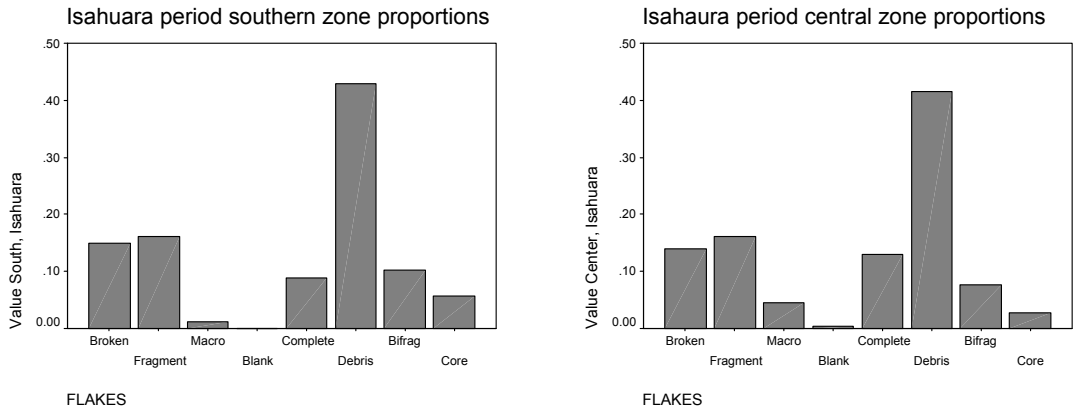

Figure 34. Proportions of lithic debris from the Isahuara Period in the southern (left) and central (right) zones.

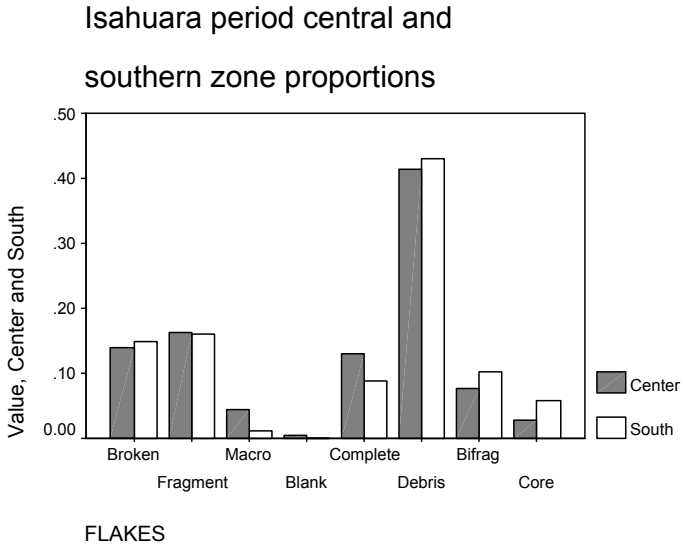

Figure 35. Proportions of lithic categories of debris from the Isahuara Period in the center and south.

Results of the Isahuara Period Lithic Analysis

Because the aim of this analysis is to compare proportions of categories of debris, chi square tests of those numbers are the most straightforward approach. Figure 34 presents the relative proportions of the eight categories of lithic debris from the Isahuara Period southern (left) and central (right) zones. Figure 35 presents the two sets of proportions from Figure 34 together for more direct visual comparison. Chi square tests are used below to put numbers onto observed differences (or similarities). Isahuara Period tests comparing the proportions of all eight kinds of debris reveal highly significant differences between the center and south (X^2=15.1943, df=7, .05>p>.02, V=0.15). There is only a five to eight percent chance that these two assemblages came from populations with the same proportions. Differences are more visible in Figure 35.

When the four co-occurring categories of production debris are extracted, there is only a two to five percent chance that these differences come from the vagaries of sampling (X^2=8.0859, df=3, .05>p>.02, V=0.20). Comparing these two areas strictly in terms of proportions of associated consumption debris produces more moderate results (X^2=6.3947, df=3, .20>p>.10, V=0.12). In this case, there is between a ten and twenty percent chance that the two assemblages come from populations with the same proportions, and that observed differences are explained by the vagaries of sampling. There are thus stronger differences in the Isahuara Period between the center and southern residential zones in their proportions of hoe production debris than in their proportions of consumption debris. The bar graph presented in Figure 35 shows that the central zone produced more basalt bifaces than the south during this phase, because the indicators of production, namely macroflakes and tool blanks, make up significantly higher relative proportions of the center's collection than of the south's. This observation is further supported by the results of a chi square test (numbers are provided in Appendix B, Table 48) of the significance of the proportion of macroflakes and tool blanks versus all other categories of lithics in the south and center (X^2=8.3667, df=1, .01>p>.001, V=0.11). Households in the south, on the other hand, consumed more tools, reducing broken hoe fragments into smaller tools, than those in the center. The indicators of consumption, cores and biface fragments, make up higher proportions of the southern zone assemblage than of the central zone one.

These chi-square results show that Isahuara Period central and southern zone households had begun to differ in their agricultural activities. Those in the center produced relatively more production debris than households in the south during this period. However, southern zone households continued to both produce and consume their own tools, so there is little reason to believe that differences between the two areas reflect production for exchange beyond the community. Together, the Isahuara Period findings suggest that central zone residents manufactured more tools, possibly for some of their neighbors. It may also indicate that residents of the center had greater access to incoming basalt.

Jachakala Period Comparisons

Figure 36 presents the relative proportions of the eight categories of lithic debris from the Isahuara Period southern (left) and central (right) zones. Figure 37 presents the two sets of proportions from Figure 36 together for more direct visual comparison. Chi-square tests (Appendix B, Table 49) comparing the Jachakala Period assemblages from both residential zones also show highly significant, though fairly weak, differences (X^2=12.2289, df=7, .10>p>.05, V=0.08). The chance that these two assemblages derive

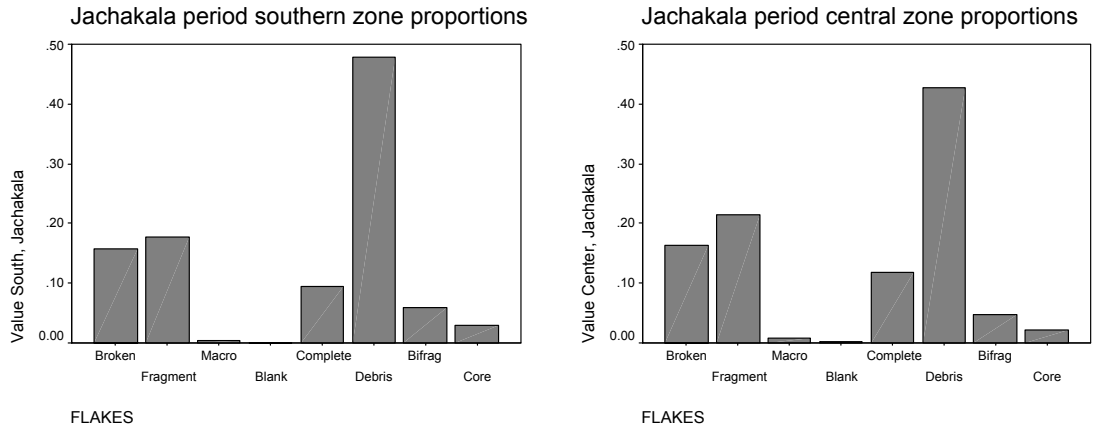

Figure 36. Proportions of lithic debris from the Jachakala Period in the southern (left) and central (right) zones.

from population with the same proportions of lithic debris is only five to ten percent. These results obscure patterns evident when production and consumption debris are separated, however. The relative proportions of the two indicators of production and the two associated flake types differed little between the two areas (X2=2.3713, df=3, .50>p>.20, V=0.06). To state it differently, there is between a twenty and fifty percent chance that these two assemblages from the Jachakala Period come from populations with the same proportions. A comparison of the proportions of two consumption indicators and two associated kinds of lithics shows more significant, though still moderate, variability (X^2=5.5693, df=3, .20>p>.10, V=0.07). In this case, we can speak at an eighty to ninety percent confidence level that the observed proportional differences are real.

Jachakala Period patterns are quite different from the Isahuara Period findings. Apparently, households in the center of Jachakala began to emphasize hoe refurbishing over biface production. Another way to interpret the results of these chi square tests is that southern zone residents focused more on tool production in the Jachakala Period than they had during the Isahuara Period. Alternatively, they increased hoe production to the extent that debris from it formed a proportion of their lithic assemblage more equal to

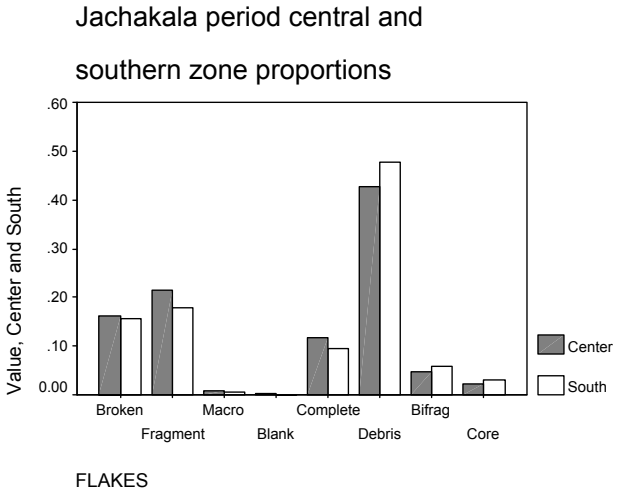

Figure 37. Proportions of lithic categories of debris from the Jachakala Period in the center and south.

that in the center. However, this latter possibility is mitigated by the results of a chi square test comparing proportions of the indicators of production (macroflakes and tool blanks) and all other categories of lithics (X^2=1.3216, df=1, .50>p>.20, V=0.03); these numbers show a twenty to fifty percent chance that the two assemblages came from populations with the same proportions. Regarding the moderately strong differences between Jachakala Period central and southern zone consumption debris proportions, this is likely due to the fact that houses in the center manufactured more small tools like projectile points and scrapers than those in the south. These non-agricultural implements are discussed in some detail later on in this chapter, in the section entitled "Other Domestic Activities."

Diachronic Lithic Analysis Results

To explore this further, it remains only to statistically test the hypothesis that Jachakala and Isahuara Period households in general intensified lithic production through time compared to their Niñalupita Period counterparts. This diachronic analysis will look at the lithic proportions from the three occupations of the southern zone, as well as data from the same periods in the central zone. The bar graph grouping the Niñalupita, Isahuara, and Jachakala Period data sets in Figure 38 suggests that households in the center focused increasing amounts of energy producing chipped stone tools, and less overall in refurbishing them, but only during the Isahuara Period. Figure 39 presents the same three sets of proportions as Figure 38, but in three separate graphs.

Proportions of cores, as well as macroflakes and tool blanks, the indicators of tool production, increase from the Niñalupita to the Isahuara Period. While the differences between the two Jachakala Period assemblages are still highly significant, shown by the chi-square results reported above, these differences are less so than those for the Isahuara Period. Perhaps, to some degree, the inter-zonal differences in lithic production in particular began to level off during the site's final occupation.

Figures 40 and 41 present the same comparisons for the southern zone, demonstrating less change in lithic proportions over the three periods. Proportions of the indicators of consumption, biface fragments and cores, peak during the Isahuara Period

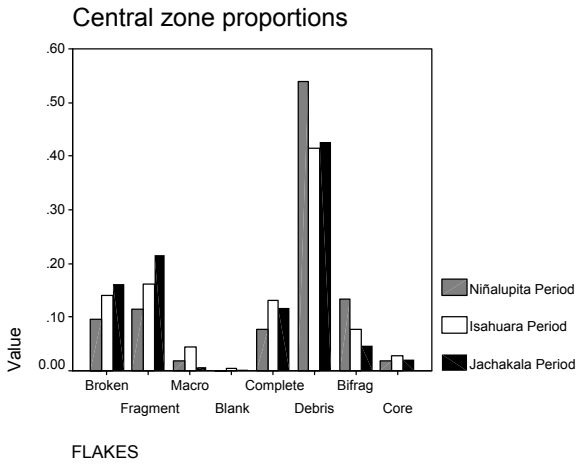

Figure 38. Diachronic comparison of lithic debris proportions from the central zone, including the Niñalupita, Isahuara, and Jachakala Periods.

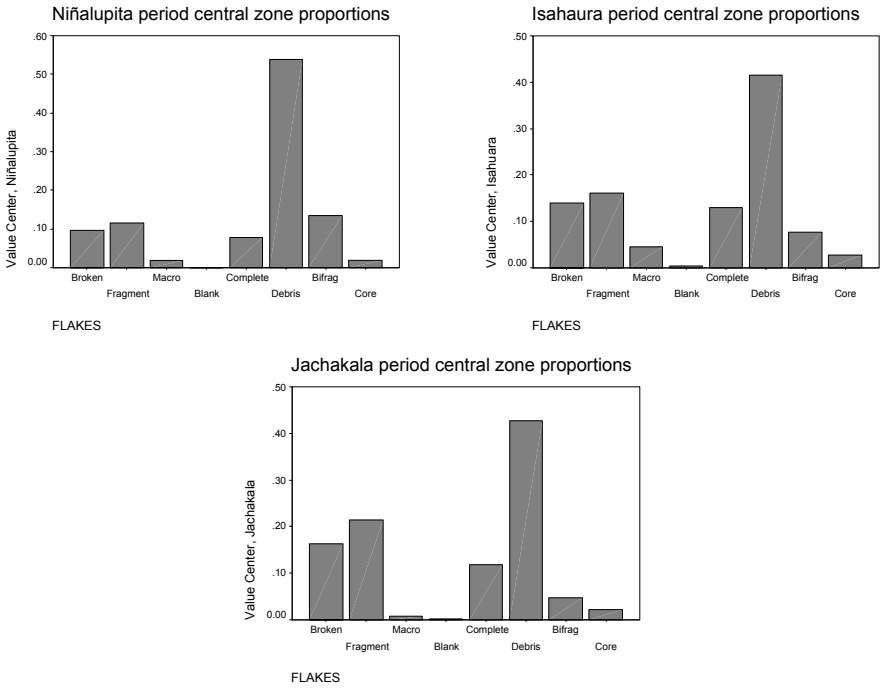

Figure 39. Niñalupita (top, left), Isahuara (top, right), and Jachakala (bottom) Period proportions of lithic debris in the central zone.

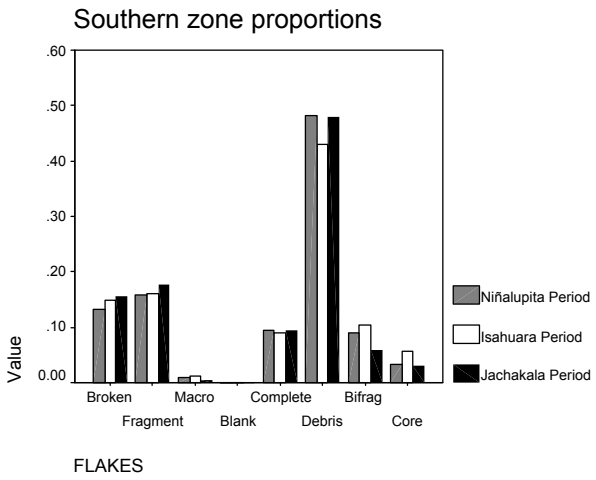

Figure 40. Diachronic comparison of lithic debris proportions from the southern zone, including the Niñalupita, Isahuara, and Jachakala Periods.

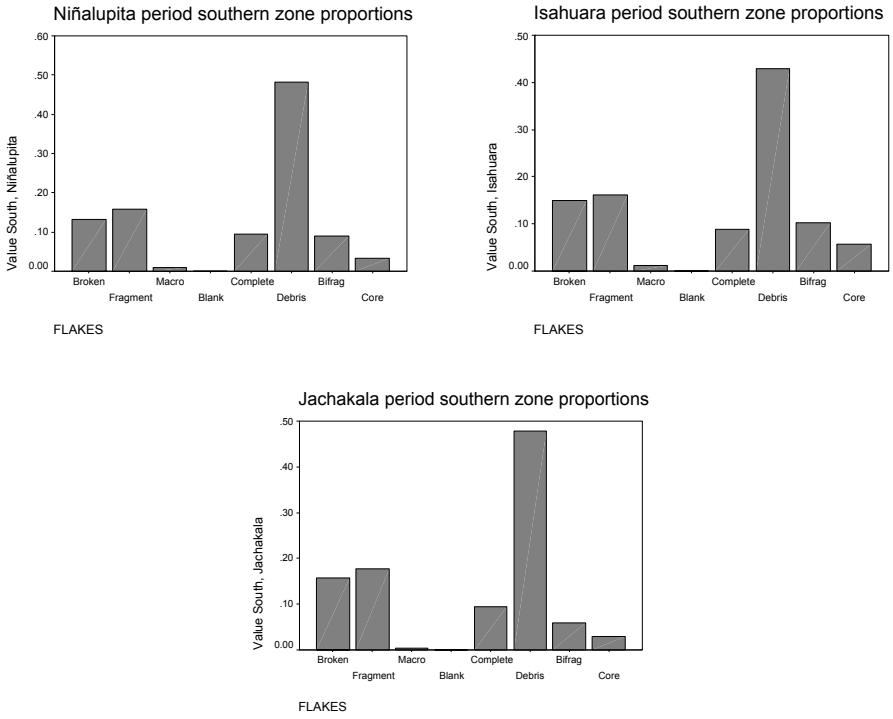

Figure 41. Niñalupita (top, left), Isahuara (top, right), and Jachakala (bottom) Period proportions of lithic debris in the southern zone.

and decrease during the Jachakala Period. Other categories of debris increase or decrease little in comparison to the patterns graphed for the central zone. Overall, it seems as though lithic patterns in the central zone changed more over time than did those in the southern zone.

Differential Intensity of Lithic Activities

Ratios of lithic debris over the number of sherds from each zone and each period are presented in Table 4. This is one way to measure comparable levels of involvement in the lithic economy, or the relative proportion of time or energy devoted to lithic activities (a general term including the production, use, and curation of tools) over time. Although the general proportions of tool debitage types are very similar over time (the shape of the graphs in Figures 38 and 40 is generally repeated for each period), the crucial diachronic difference between the two periods lies in the overall tendency of the center's residents to decrease lithic production and on-site consumption of tools relative to ceramics. Many more artifacts of all types are found in the Jachakala Period central zone than in any other area or time period of the site's history. The lithic:ceramic ratios presented in Table 4 directly negate any argument for intensification of lithic production over time in the central zone. In fact, the southern zone produced higher ratios than central zone pits in all three periods. From another perspective, the proportionally greater indicators of tool consumption in the south, coupled with that area's consistently higher lithic:ceramic ratios in all three periods, might indicate more agriculture or more intensive use of agricultural implements, especially during the Niñalupita Period. However, this difference decreases quite a bit by the Jachakala Period. (As I mentioned in Chapter 3, without agricultural features on the surrounding landscape to measure the expansion of fields, construction of canals or terraces, and so forth, it is difficult to take this statement any further.) The ratios in Table 4 further support the idea that the central and southern zones differed more in their lithic (and, by implication, agricultural) activities during the Isahuara than the Jachakala Period.

The third column in Table 4 includes the total number of lithic artifacts (i.e. from the entire site) over the total quantity of ceramics from each occupation. There is a big drop in the lithic:ceramic ratios from the Niñalupita Period to the Isahuara Period, from

Table 4. Ratios representing the number of lithic artifacts over the total number of ceramic sherds in the south and center, and the site overall, for all three occupations.

	Southern Zone	*Central Zone*	*Site Overall*
Niñalupita Period	1.76	0.06	0.26
Isahuara Period	0.14	0.05	0.08
Jachakala Period	0.16	0.10	0.11

0.26 to 0.08. Ratios of these two artifact types change drastically from about one lithic artifact for every four sherds to about one lithic artifact for every twelve sherds. Two diachronic changes, not mutually exclusive, can help explain this difference. Involvement in the lithic economy overall (not distinguished by zone) could have decreased, and/or involvement in the ceramic economy could have increased from the Niñalupita to the Isahuara Period. At least the first of these two changes did occur, because lithic:ceramic ratios in the southern zone demonstrate an even greater drop from the Niñalupita (1.76 lithic artifacts for every sherd) to the Isahuara (0.14 lithics for each sherd) Period than did the lithic:ceramic ratios for the site overall.

Conclusions

The chi square comparisons of Isahuara Period southern and central zone lithic assemblages reveal significant, though not very strong, proportional differences that, to some extent, decreased during the Jachakala Period. Production debris formed a greater proportion of the central zone assemblage than of the southern zone collection. Therefore, it is possible that one or more central zone households was manufacturing hoes for some households in the southern area of the site during the Isahuara Period.

On the other hand, the two areas of the site devoted different proportions of their time to the production and/or use of lithics during all three occupations, with the south exhibiting higher lithic:ceramic ratios than the center. Both areas continued to produce and exhaust hoes, but southern zone households may have been intensifying agricultural

production relative to the center in all three occupations. The south may have been more involved in agriculture, or households there might have had less access to fresh basalt tool blanks or macroflakes and so were refurbishing tools more.

The lithic analyses provide evidence for differences in craft production (of basalt hoes) practices between households in the center and south. There is no evidence to suggest the emergence of hoe production specialists, however, and the widespread distribution of lithic production debris directly negates specialization. In the Hirth model of political economy, craft production is one way in which inter-household wealth differentiation develops. However, differences in craft production under his model refer specifically to the emergence of craft specialists and the inter-household wealth differences that may accompany that phenomenon. The changes in Jachakala's lithic economies in the central and southern zones relate instead to different proportions of production and consumption indicators. Both areas of the site continue to produce and consume hoes, however; this is a situation not adequately explained by the Hirth model. Both groups of households also maintained access to incoming basalt tool blanks, although the center seems to have had greater access to this material than the south during the Isahuara Period. Because neither group developed exclusive access to this import, the Jachakala lithics data also does not support Hirth's hypothesis that exchange activities may provide the impetus for inter-household wealth differentiation.

The second research hypothesis is that the central and southern zones were differentially involved in the manufacture and use of bifacial stone tools. As I proposed at the beginning of this section on lithics, significant differences in the lithic:ceramic ratios would suggest corresponding differences in the subsistence economy of the two areas. The ratios presented in Table 4 do, in fact, indicate systemic changes in Jachakala households. Some portion of the southern group of residents was more heavily involved in the lithic economy during the Niñalupita, Isahuara, and Jachakala Periods, and may have been intensifying agriculture over time. All in all, the Isahuara and Jachakala Period lithics data indicate changes in the subsistence and craft production sectors of the domestic economy, beginning during the Isahuara Period. The next section will determine whether they also extend to camelid remains.

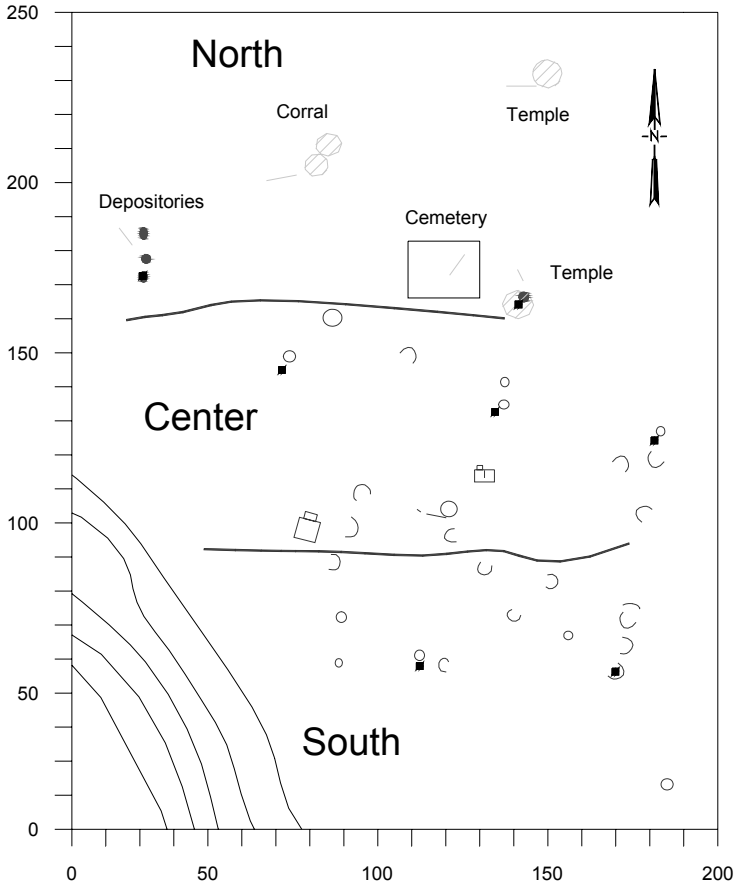

Figure 42. Location of excavation units (in relation to surface architectural remains) with Isahuara and Jachakala Period levels used in inter-zonal faunal analyses.

CAMELID UTILIZATION

The Faunal Data

The same five camelid packets and the same statistical approaches employed in Chapter 3 are used again in this analysis. Because the same seven units of excavation as the Niñalupita Period analysis will also be used (Figure 42), the six data sets compared below include artifacts from Levels four through eleven (Isahuara Period) and the site surface down to Level three (Jachakala Period) in each zone. Bar graphs again include, from left to right, the proportions of trunk, forelimb, hindlimb, rib, and head packets found in a specified collection. They are ordered in terms of descending meat utility

values for an easy visual comparison of generally high (downward sloping) versus low (upward sloping) utility assemblages.

Results of the Isahuara Period Faunal Analysis

Because the objective of the faunal analyses is to compare proportions of packets of camelid remains, chi square tests are used (see Tables 61, 63, 65, and 67 in Appendix C for the data). Figures 43 and 44 are derived from the packet proportions in each of Jachakala's three zones during the Isahuara Period. Figure 43 presents each zone's assemblage proportions, while Figure 44 combines the three for easier comparison. The Isahuara Period central zone proportions most closely resemble the generally high (downward sloping) utility assemblage mentioned above, with the greatest proportion of skeletal elements coming from the trunk packet.

A chi square test comparing the packet proportions from each of the three zones indicates highly significant differences between them (X^2=78.5687, df=8, p<.001, V=0.15). There is less than a 0.1% chance that observed differences come from the vagaries of sampling rather than representing populations with significantly different packet proportions. Similarly, chi square results for the five packet proportions comparing only the two residential areas of the site show highly significant inter-zonal differences during the Isahuara Period (X^2=21.7005, df=4, p<.001, V=0.13).

Results of the Jachakala Period Faunal Analysis

The proportions of faunal packets from the Jachakala Period southern, central, and northern zone are graphed in Figure 45 by zone, and grouped together in Figure 46. The data on which these graphs and the following statistical analyses are based are given in Tables 61, 63, 65, and 68 in Appendix C. The chi square test completed on the Jachakala Period packet proportions from the south, center, and north, indicates highly significant differences (X^2=34.0111, df=8, p<.001, V=0.19). Once again, the chance that differential proportions are due to the vagaries of sampling populations with similar proportions is negligible. These results suggest that the differences between zones that are visually apparent in Figure 46 are, in fact, real. Differences between just the south's

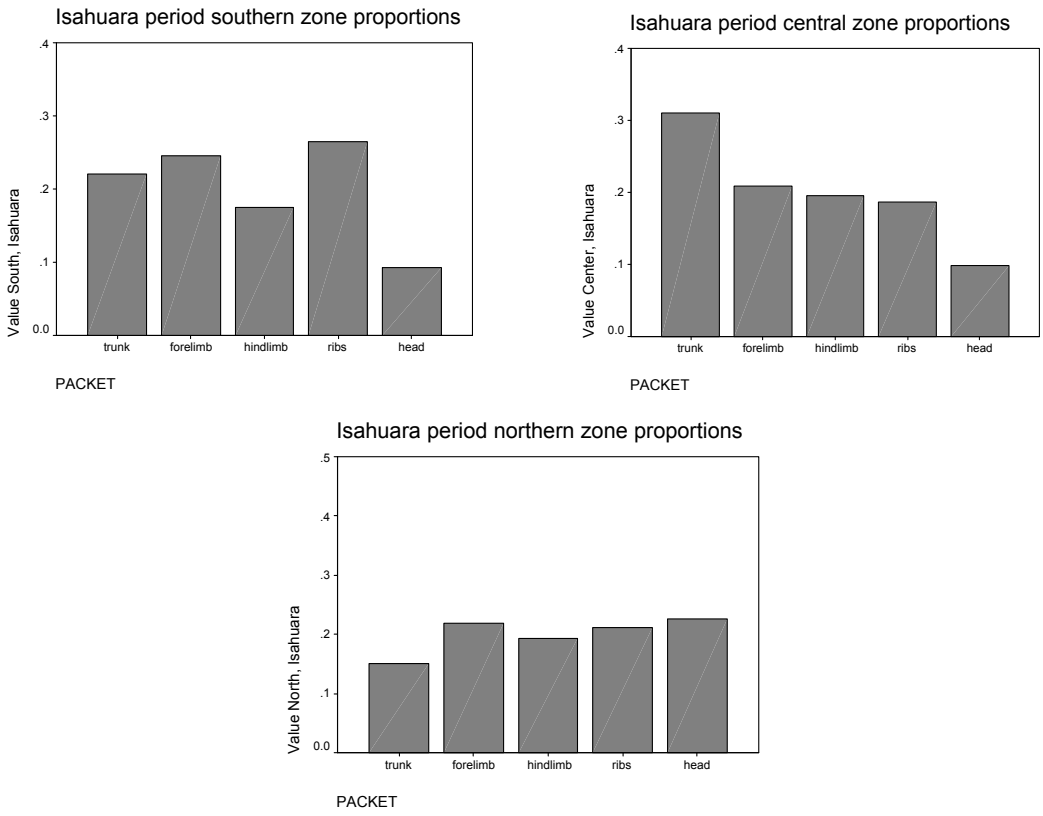

Figure 43. Isahuara Period southern (top, left), central (top, right), and northern (bottom) zone faunal packet proportions.

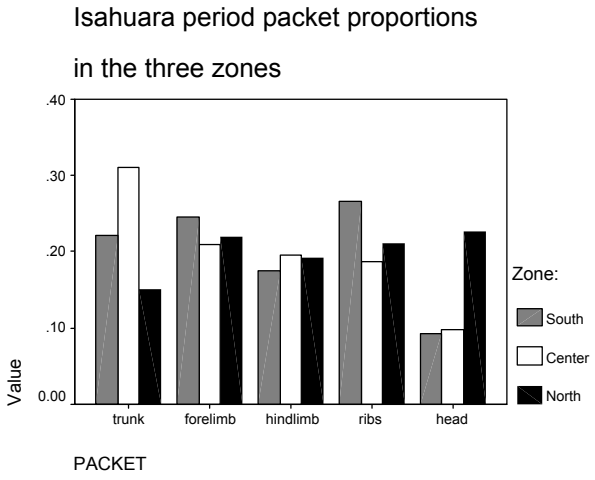

Figure 44. Isahuara Period faunal packet proportions in the southern, central, and northern zones.

and center's faunal packet proportions are also highly significant (X^2=11.1097, df=4, .05>p>.02, V=0.23).

Because the meat utility value of the trunk packet is so much greater than the others, I ran another set of tests on the number of skeletal elements in the trunk packet and non-trunk packet totals (equaling the sum of the forelimb, hindlimb, ribs, and head packets) in the south and center. The observed and expected values for all three periods are presented in Tables 69 to 71 in Appendix C. The results of the Isahuara Period comparison are highly significant (X^2=13.774, df=1, p<.001, V=0.10). In other words, the chance that the differences in numbers of trunk and non-trunk elements in the two residential zones of Jachakala are caused by random variation is less than one percent. However, a Cramer's V test of the strength reveals that the actual difference between the observed and expected values is only about ten percent (V=0.10). The two Jachakala Period assemblages were also significantly different in their proportions of trunk and non-trunk packets (X^2=4.8084, df=1, .05>p>.02). A Cramer's test of strength reveals fifteen percent differentiation in this case (V=0.15).

Sum of Synchronic Faunal Differences

The differences in relative proportions of Niñalupita Period faunal packets that were outlined in Chapter 3 continued during the Isahuara and Jachakala Periods. This aspect of Jachakala's inter-zonal differences is especially important when one considers the large difference in meat utility values between the trunk packet and all other groups of camelid skeletal elements. In all three periods, the central zone assemblage yielded significantly higher proportions of trunk packets than the southern and northern zone collections. These results were supported through a number of statistical tests, including chi square analyses measuring the degree to which faunal proportions differed in all three areas of Jachakala, as well as just the south and center. An additional set of chi-square tests comparing trunk and non-trunk groups of elements also support these results. Inter-zonal differences in the proportional distribution of the most valuable meat packet appeared during the Niñalupita Period, and continued throughout the site's history.

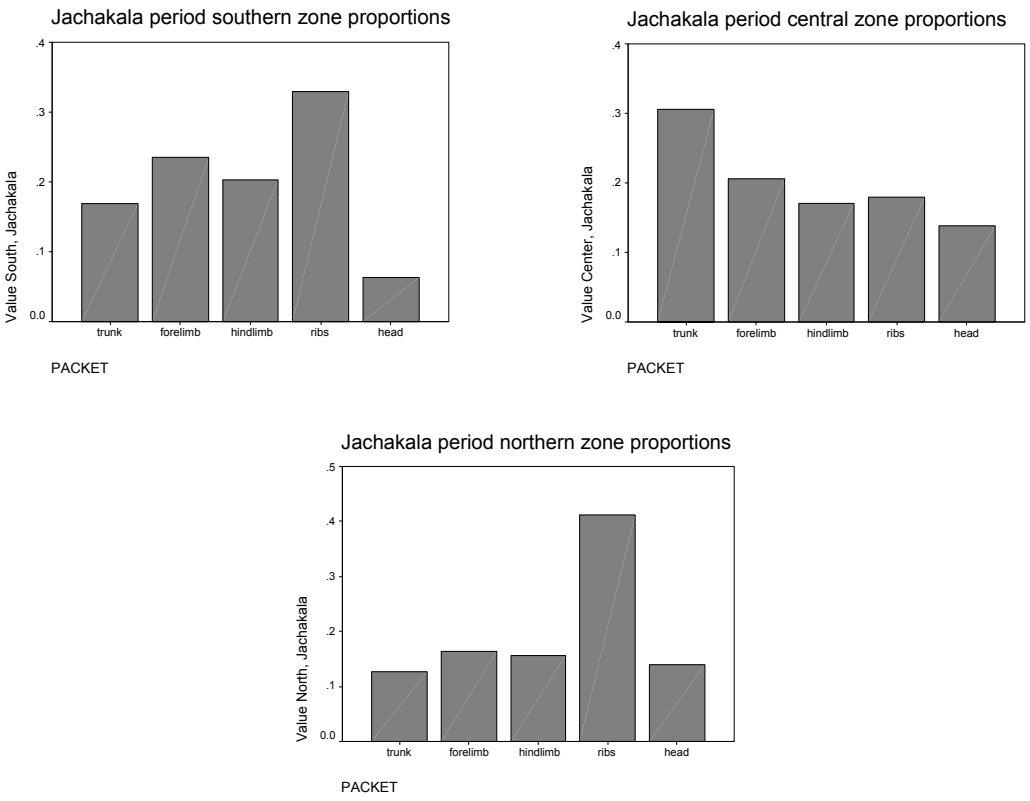

Figure 45. Jachakala Period southern (top, left), central (top, right), and northern (bottom) zone faunal packet proportions.

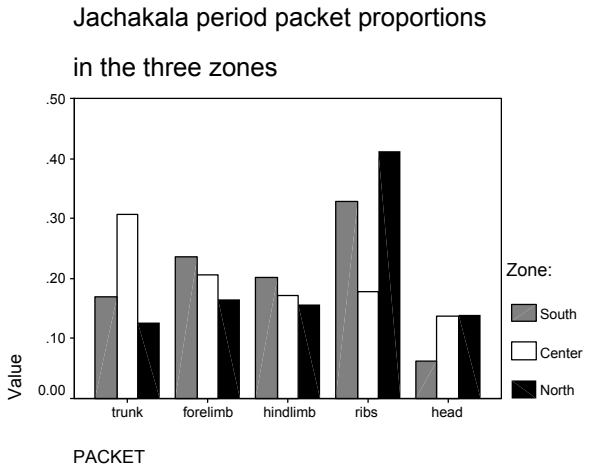

Figure 46. Jachakala Period faunal packet proportions in the southern, central, and northern zones.

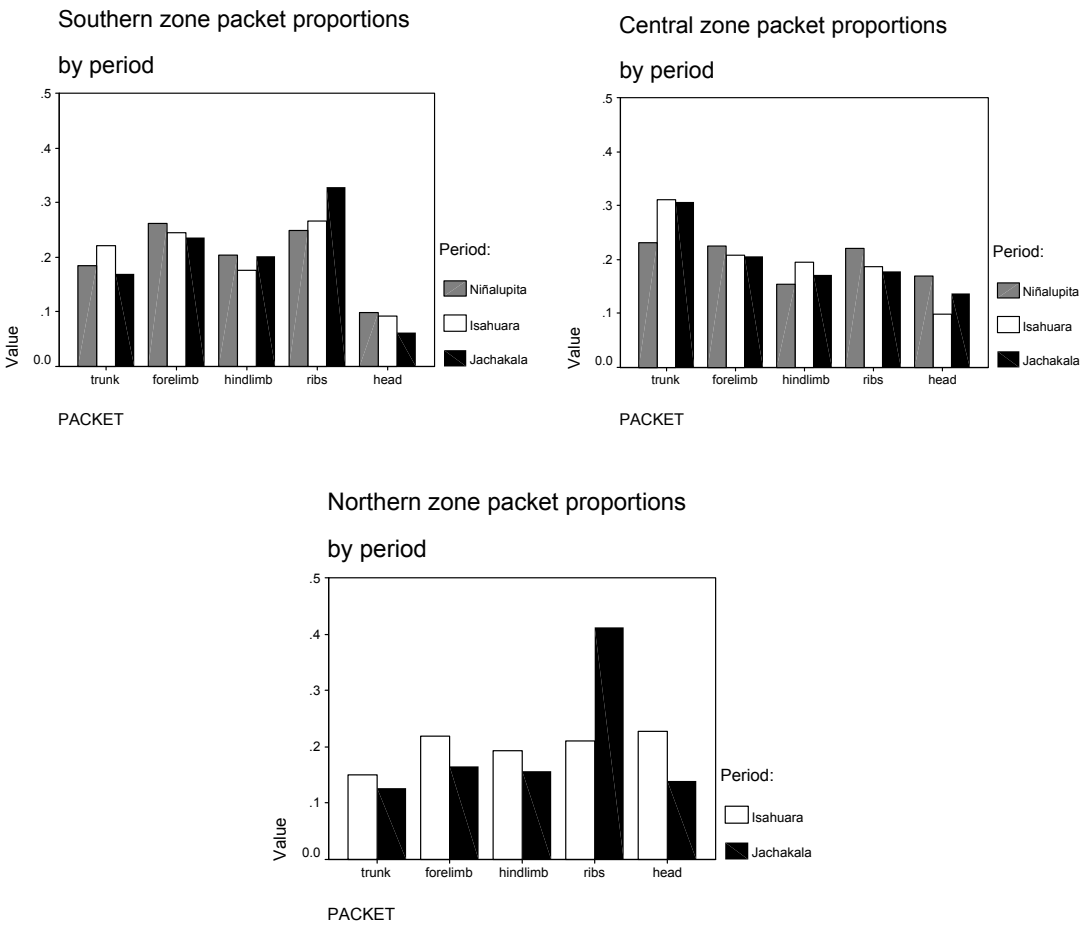

Figure 47. Faunal packet proportions in the southern (top, left), central (top, right), and northern (bottom) zones for all three periods.

Diachronic Faunal Comparisons

Diachronic comparisons reveal several general patterns. These are evident in the graphs in Figure 47, which combine the graphs from Figures 21, 43 and 45 to make changes through time clearer. The first graph suggests that units from the southern zone exhibit a decline in the most valuable meat packets and a slight increase in those of moderate meat utility values. However, a chi square test of the significance of the differences in southern zone faunal assemblages from each of Jachakala's three occupations reveals an almost fifty percent chance that differences derive from the

vagaries of sampling (X^2=7.5039, df=8, 0.50>p>0.20). Overall, the three assemblages differ by only five percent (V=0.05).

Assemblages from the Isahuara and Jachakala Periods in the central zone seem at first glance to have changed relatively little. However, differences between the three central zone faunal collections are highly significant (X^2=16.4708, df=8, 0.05>p>0.02, V=0.09). The central zone graph in Figure 47 suggests that the biggest diachronic changes in that area of the site are the increase in the proportion of trunk packet elements from the Niñalupita to the Isahuara Period, as well as changes in the proportion of cranial packet elements through time. The proportional increase in trunk remains is well supported by the Isahuara and Jachakala Period synchronic patterns discussed above.

The northern zone assemblages from the three periods saw the biggest decreases in all meat packets except ribs. However, the results of a chi square analysis indicate the most significant (X^2=28.8089, df=4, 0.001>p) diachronic change in faunal assemblages in this area of Jachakala. The Isahuara and Jachakala Period collections from the north differ, moreover, by twenty-two percent (V=0.22). The large increase in the proportion of camelid ribs from the Isahuara and Jachakala Periods is the most visibly significant contributor to these results.

Overall, these chi square tests of the significance of faunal assemblage differences over time in each of Jachakala's three zones indicate two points. First, the faunal collections from the southern zone changed the least over time compared to those from the other two areas. Second, the changes in the central zone are primarily derived from an increase in the most valuable faunal packet. Differences in the northern zone, however, follow neither of these patterns, depending instead on a decrease in the proportion of all packets except ribs.

Involvement with Camelids

When ratios of the number of faunal fragments over the number of sherds are calculated, ratios in the southern zone are considerably higher than those from the central and northern zones. Table 5 below presents the figures for each zone and time period, as well as the total number of camelid bone fragments over sherds for each period. This last calculation, recorded in the table under "Site Overall," demonstrates a notable increase in

Table 5. Ratios representing the number of faunal fragments over the total number of ceramic sherds in each zone, and the site overall, for all three occupations.

	Southern Zone	*Central Zone*	*Northern Zone*	*Site Overall*
Niñalupita Period	0.20	0.03	---	0.08
Isahuara Period	0.34	0.16	0.11	0.19
Jachakala Period	0.91	0.20	0.05	0.08

the community's involvement with camelids relative to ceramics from the Niñalupita to the Isahuara Period, followed by a drop during the Jachakala Period back down to Niñalupita Period levels.

Compared to the other two zones of the site, the southern zone was most heavily involved with some aspect of these animals (ratios of bones over sherds cannot tell us whether that involvement was with herding, exchange, butchery, or consumption of camelids) during all three occupational phases. This result is surprising because the most valuable butchery packets formed a significantly greater proportion of the faunal assemblages of the central zone, not the south. Moreover, the discrepancy in the center's and south's involvement in the faunal economy is greatest in the Jachakala Period, even though statistically significant (albeit not very strong) chi square results support the conclusion that the center maintained consistently greater access to the best cuts of meat throughout the site's history.

In conclusion, relatively greater involvement in this aspect of the domestic economy did not afford residents of the south access to the trunk more often than their neighbors. One implication is that the basis for this facet (different cuts of meat) of the increasing inter-zonal wealth differentiation at Jachakala did not derive from differential involvement in the faunal economy. Other, alternative explanations for the particular form that wealth differences took at Jachakala are presented in the final chapter.

Similarities Between the Center and North

Parallel changes in distributions of the two faunal packets with the lowest meat utility values, camelid ribs and heads, indicate a possible connection between the central and northern zones. Compared to the south, the northern zone units had much higher proportions of rib during the Jachakala Period. The center also had correspondingly high access to rib sections of camelids. The high proportion of rib elements in northern and central zone units during the Jachakala Period (Figures 45 and 47) is different from the Isahuara distribution, in which the south had the greatest proportion of ribs.

Also, a comparison of proportions of cranial packets among the three zones reveals a change over time similar to the rib packet. During the Isahuara Period, units in the north had the most cranial elements, while the south and center had more or less equal amounts (Figure 44). However, the center and north were equal in their cranial packet elements in the Jachakala Period, with much less in the south (Figure 46).

These two distributions suggest that similar activities occurred in the central and northern zones involving elements from the head and rib faunal packets. The similarities between the two areas in proportions of camelid ribs cannot be explained with the available data. However, one possibility that may have contributed to the similar distributions of cranial packet elements relates to the appearance of camelid mandible tools during the Isahuara Period. These tools made from the broken mandibles of camelids are found at Tiwanaku-contemporary occupations of sites throughout the south-central Andes, including Jachakala. They are described in more detail in the "Other Domestic Activities" section below. However, it should be noted here that of the eighteen camelid mandible tools found in Isahuara Period levels of the site, eleven come from the center and seven were found in the north. Fifteen were recovered from the Jachakala Period, with fourteen of those in the center, and a single example from the north. While there is no evidence that these tools were even manufactured at Jachakala, their presence (and especially their association with Tiwanaku) may help explain the parallel increase in camelid cranial packets in the center and northern zone. A second possibility is that these two cranial packets were more highly valued by Jachakala's residents than their low meat utility values suggest. If camelid tongue or brains were valuable delicacies, for instance,

than these factors might help to explain their relatively high proportions in central and northern zone faunal assemblages.

Overall, the northern zone faunal collection might be the result of specialized activities of some sort rather than domestic refuse, because it differs so much from the southern and central zone assemblages. Given the kinds of features found in the north, these specialized activities could have included community functions or gatherings. However, there is no evidence to suggest the kinds of feasting or elite-sponsored ceremonies often mentioned in traditional models of political economy; the best meat would predictably be consumed in ceremonial settings. Community gatherings not sponsored by one or more ambitious households or butchery events might leave the least valuable parts of the animal behind, like the northern zone faunal remains.

Alternatively, the faunal patterns might suggest that animals were butchered in the north, where the least valuable parts were left behind while the rest was divided up and distributed to the south and center. Miller (1979), for instance, focused on the butchery practices of modern Peruvian camelid herders. He notes that faunal elements with little attached meat were left behind at butchery sites, resulting in higher than expected frequencies. Meatier parts such as the upper limbs were laid out in the dry, cold nighttime air to freeze-dry. The resulting charqui (meat jerky on the bone) was commonly used for trade (Miller 1979:99). While I did not set out to answer questions about meat processing and exchange, Miller's observations could be relevant to interpretations of Jachakala's faunal assemblages. His and others' ethnographic works on Andean herding and butchery practices suggest that camelids might have been butchered in the northern zone, while the meatier sections of the animal were distributed to the south and center.

Conclusions

To summarize, central zone households maintained preferential access to the trunk during all three periods at Jachakala, and this seems to have occurred at the expense of southern zone households. This trend also appears to have intensified through time. While some differences emerge in the proportions of intermediate packets between the center and the south, the south's relative packet proportions change considerably less from the Niñalupita to Jachakala Period than do those in the center and north.

Southern residents did maintain regular access to all packets except that of the highest meat utility, which indicates their continued access to meat as part of domestic subsistence. Both the faunal and lithic analyses then support the argument that the southern zone households continued to emphasize basic subsistence in terms of both agricultural and pastoral pursuits, while the central zone expanded their domestic economy to incorporate additional functions or activities, maybe tying those households to the northern structures. Hence, the southern zone units generally conform to a model of continued domestic economy, while the central zone's corresponding artifact collections indicate an expansion or restructuring of household activities associated with the emergence of modest subsistence differentiation.

During the Jachakala occupation, moreover, the center and north both had greater proportions and mean numbers of the trunk, ribs, and cranium than the south. Southern zone households had higher numbers and proportions of forelimb and hindlimb packets instead. These differences in subsistence practices might relate to the center's stronger ties to activities taking place in the northern zone. That these community-oriented functions include perhaps the construction and/or maintenance of a possible llama corral may have something to do with the central zone's general preferential access to the trunk. Also, the higher proportions of cranial and mandible fragments in the central and northern zones might be partially explained by the production of camelid mandible tools in those areas.

Faunal remains from the northern zone revealed several interesting patterns as well. The temple and excavated depository contained more ribs than the other zones during the final occupation of Jachakala, though they had yielded considerably smaller proportions of ribs during the previous period. There was likely then some sort of relationship between camelid ribs and ritual activities. Also, the northern zone structures' higher concentrations of head packet elements in the Isahuara Period essentially disappeared during the Jachakala Period. The center's slightly higher access to cranial elements correspondingly increased. This is also the time during which the deposition of camelid mandible tools was concentrated in the central zone.

The results of the faunal analysis indicate general differences between zones in terms of access to camelid skeletal elements of varying meat utility. Given the wide range

of meat utility values attached to the skeletal packets, these findings serve as another line of evidential support for the broader argument that inter-zonal differences at Jachakala represent the local origins of complexity in the region.

Two important patterns have been presented. First, faunal differences demonstrate emergent wealth differences, which are more comprehensive than just unequal levels of participation in ritual activities, trade, or the production and consumption of luxury goods, in that households' access to subsistence resources varied by zone. Evidence also suggests that the higher overall utility of the meat packets preferred in the central and northern zone structures is directly related to those residents' increased participation in the community's non-subsistence activities, such as the maintenance of trade caravans or ritual feasting. This second point is further supported by the overall consistency in the southern zone assemblages through time. In this case, subsistence differences might reflect the increasing status or expanded activities of an emerging leadership segment. It is also possible that the south was just more involved in pastoralism, an interpretation supported by the faunal:ceramic artifact ratios testing for the relative involvement of each zone in the faunal economy.

However, camelid herds are wealth in the Andes, and so the center's consistently greater access to the most valuable meat packets indicates their greater wealth. The key is to separate meat consumption from pastoralist activities, even though the same class of artifacts is used to explore both aspects of the political economy. The center may have been more involved in trading, if not herding; this possibility is tested later in the craft production and exchange section of this chapter. Regardless of how (or even if) the different activities associated with camelids were divided up among Jachakala's residents, the inter-zonal differences described above show how wealth differences can emerge in agro-pastoral societies. This is one case study in which early wealth differentiation is not related to differential control over or access to agricultural resources, but rather faunal subsistence (and transportation, wool, bone, hide, sinews, and so on) resources.

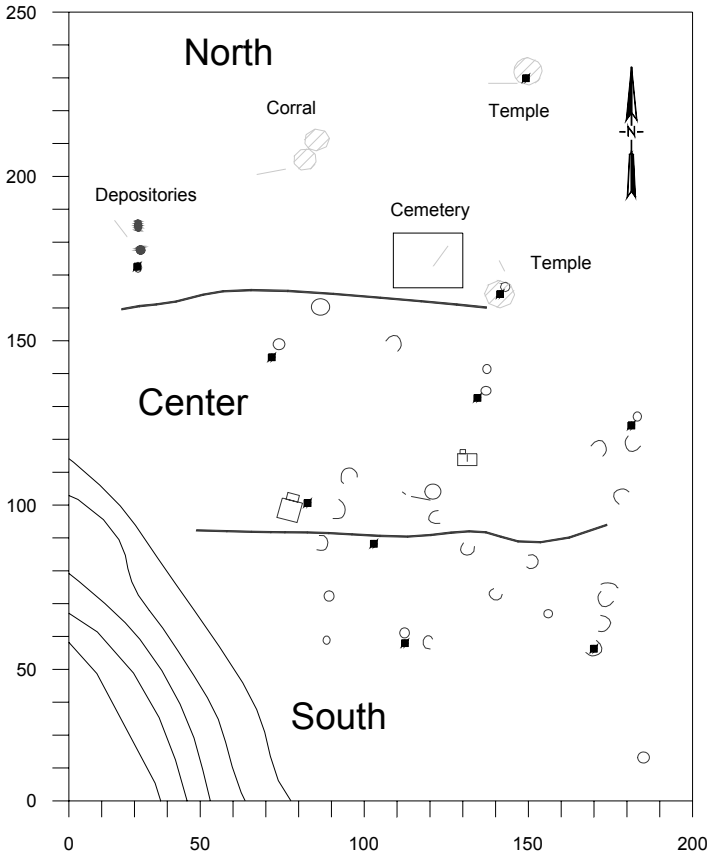

Figure 48. Location of excavation units (in relation to surface architectural remains) with Isahuara and Jachakala Period levels used in inter-zonal analyses of ceramics.

CRAFT AND EXCHANGE GOODS

Aims of Ceramic Analysis

The ceramic analysis reported in this section deals with the Isahuara and Jachakala Period materials. Inter-zonal synchronic and diachronic comparisons are approached through chi square tests run on proportions of two broad categories of wares. These include storage and cooking vessels, and decorated and/or imported wares. Brief descriptions of both follow.

Analyzed sherds come from the same four central zone and three southern zone units used in the lithic and faunal analyses, as well as three northern zone units (Figure 48). The units in the northern area of Jachakala include one inside each of the two possible temples, as well as a third two-by-two meter pit not associated with any particular structure.

The Utilitarian Inventory

The typical household ceramic inventory during the Isahuara and Jachakala Periods include large Inti Raymi Mica storage jars, smaller La Joya Orange, Smooth brown, Niñalupita Yellow, and Nonwash Yellow storage jars. Cooking pots were generally La Joya Orange or Inti Raymi Mica. Small, undecorated La Joya Orange bowls, pitchers, spoons, and other utilitarian tools were also identified in a number of domestic contexts such as domestic middens and other features. Reconstructed and illustrated examples of several of these vessel forms are included in Figures 65 to 67 (Appendix A). Although the majority of the ceramics of these four types were utilitarian vessels, small, La Joya Orange and Smooth Brown open-mouth bowls were also identified in a number of household ritual features. These offerings were found either next to house foundations or inside of associated middens. Sometimes they consisted of one small, undecorated bowl placed inside a slightly larger one, with ash, carbon fragments, and the occasional camelid bone fragment or piece of lithic debris inside of the inner vessel. Other examples were associated with burials such as the female-infant pair in the southern zone.

The Decorated and/or Imported Wares

This second category of ceramic types includes Tiwanaku IV and Tiwanaku V style vessels, as well as Desaguadero Orange and Redwash wares, two commonly co-occurring types. Sherds from these four ceramic types are usually found in household offerings, burials, temple middens, burials, and other northern zone features, as well as domestic refuse pits in both the center and south. Because Desaguadero Orange and Redwash sherds co-occur with Tiwanaku-style sherds, they are grouped together as a separate broad category, tentatively labeled imported wares.

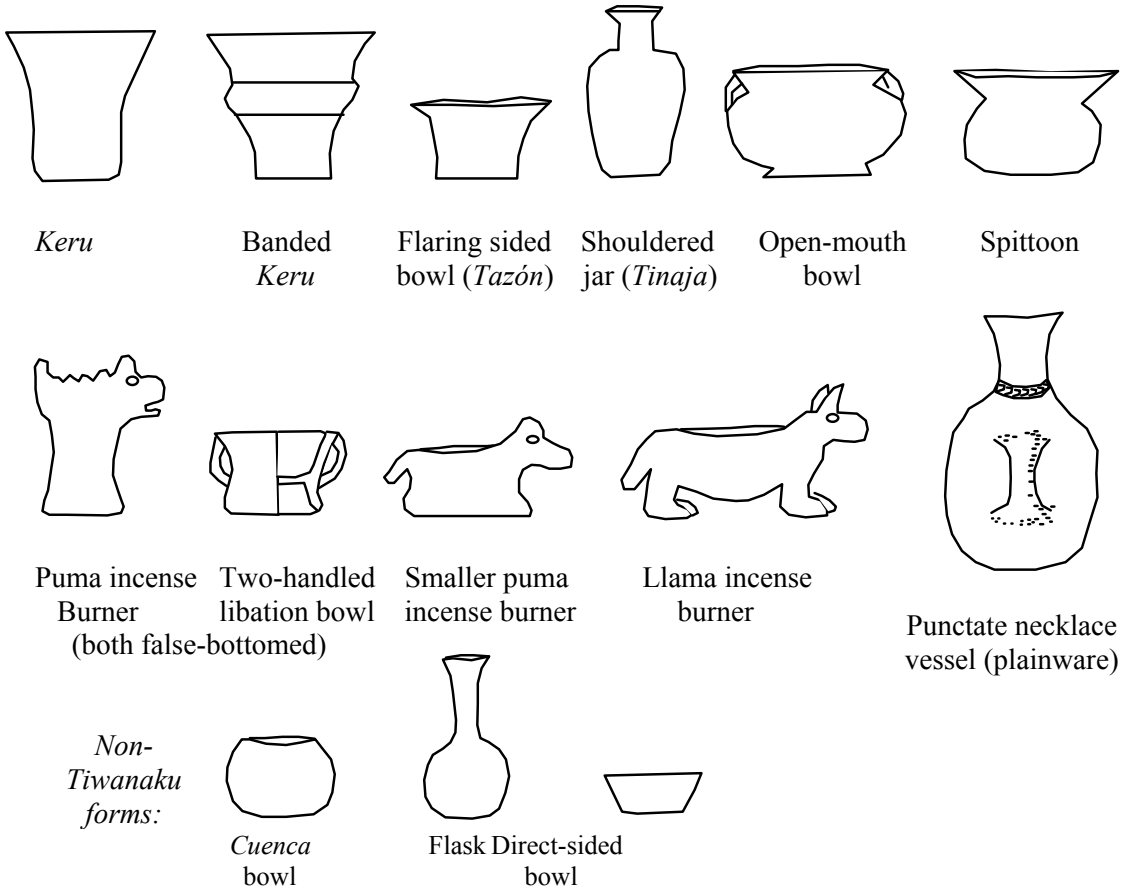

Figure 49. Range of Tiwanaku-style vessel forms, and three non-Tiwanaku wares, identified at Jachakala (illustrations by Marc Bermann).

The collection of Tiwanaku IV and V ceramics from Jachakala includes local vessel forms with slips and polychrome painted decorative elements, as well as Tiwanaku-derived vessel forms. Many examples in the non-local, non-Tiwanaku category have Mojocoya-style decorations indicating that some pottery was likely imported from the Cochabamba region to the east (see Bermann 1994:213). Examples of Mojocoya decorative elements include stylized condors and certain geometric motifs. Figures 89 to 92 in Appendix F include photos of a few sherds.

Tiwanaku-style vessel forms (Figure 49), on the other hand, include kerus and banded kerus (both are small cups used in ritual chicha or maize beer consumption at

Tiwanaku-contemporary sites), flaring-sided bowls, tinajas (shouldered jars), false-bottomed libation bowls, and spittoons. Incense-burner vessels include small puma or llama-shaped vessels as well as false-bottomed, taller pumas; sherds from Jachakala from puma or llama incense-burners include fragments of undecorated false-bottomed as well as unpainted, incised paws and ears. Additionally, a common plainware jar form called a punctate-necklace vessel (after the band of incised or twisted rope-like feature around the neck) is represented at Jachakala. Finally, three non-Tiwanaku, non-local (or local imitations of non-local) vessel forms are part of the Jachakala inventory: a small, round cuenca bowl, a narrow-necked flask, and a direct sided bowl (Figure 49). Some sherds from these last three vessel forms were nevertheless slipped with the characteristic Tiwanaku IV red or Tiwanaku V orange slip.

Isahuara Period Ceramic Comparisons

Paired bar graphs in Figure 50 compare proportions of the five utilitarian (left) and four non-utilitarian (right) ceramic types from Isahuara Period levels in the south, center, and north. Note that proportions of all nine types add up to one-hundred percent of each zone's assemblage. These graphs demonstrate that all three areas of Jachakala had sherds of every ceramic type. Some vessel forms, particularly Tiwanaku-style ritual vessels, were restricted to the central zone (see Chapter 6 for a full discussion), but Tiwanaku IV and V sherds, along with the other seven types, are found in all three zones. A chi square test reveals that the differences among the proportions of the five types of storage and cooking wares from the north, center, and south are not very significant (X^2=3.6079, df=8, p>.50) and not strong at all (Cramer's V=0.08). There is an over fifty percent chance that observed differences between the three assemblages' relative proportions are due to random variations among population samples. Comparing non-utilitarian wares with another chi square test does, however, give us a high level of confidence that the data reflect populations with different proportions of these four ceramic types (X^2=14.8012, df=6, .05>p>.02). In this case, the three assemblages differ by sixteen percent (Cramer's V=0.16). Though this test indicates highly significant differences in decorated and/or imported wares between the three areas of the site, the proportional differences are not very strong.

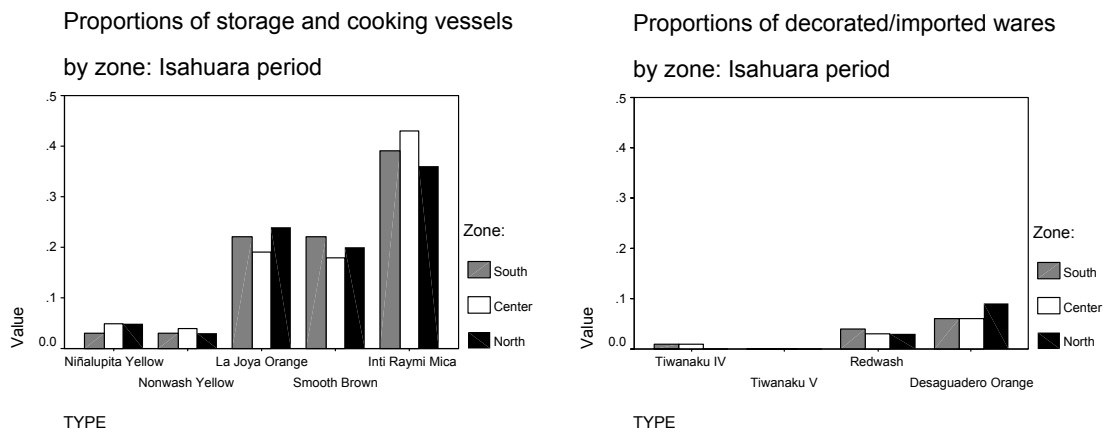

Figure 50. Proportions of storage and cooking vessels (left), and decorated/imported wares (right) from the Isahuara Period.

The Niñalupita Period chi squares comparing the two sets of ceramic types in the southern and central zones yielded highly significant differences in the storage and cooking category of types, and highly significant differences in their proportions of Desaguadero Orange and Redwash sherds. Differential proportions of storage and cooking vessels seem to have virtually disappeared during the Isahuara Period. Those related to the non-utilitarian category date to the initial occupation of the community, and continue through this second occupation. However, because quantities are so small, particularly of decorated sherds, these chi square results are not meaningful enough to support a hypothesis of corresponding differences in activities. Overall then, there are no strong inter-zonal differences to speak of during the Isahuara Period.

Jachakala Period Ceramic Comparisons

Figure 51 presents proportions of both categories of ceramic types for the Jachakala Period southern, central, and northern zones. Once more, proportions of all nine types add up to one hundred percent of each zone's analyzed collection. Differences in those proportions were again tested by chi squares.

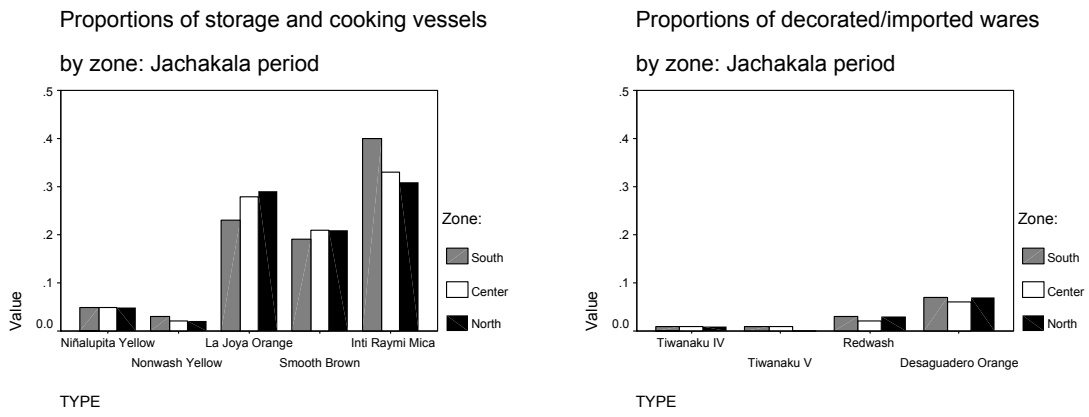

Figure 51. Proportions of storage and cooking vessels (left), and decorated/imported wares (right) from the Jachakala Period.

Like with the Isahuara Period assemblages, a chi square test reveals that the differences among the proportions of the five types of storage and cooking wares from the Jachakala Period are not very significant (X^2=2.4673, df=8, p>.50) and not strong at all (Cramer's V=0.06). The chance that proportional differences stem from the vagaries of sampling is again over fifty percent. The highly significant differences in proportions of Tiwanaku and the two associated ceramic types among the Isahuara Period do not continue during the Jachakala Period. Differences between the three zones are not very significant at all (X^2=3.2816, df=6, p>.50); nor are they strong (Cramer's V=0.07). There are no real inter-zonal differences in these two categories of ceramic types during the Isahuara or Jachakala Period.

Diachronic Patterns

The results of two sets of chi square tests support the contention that relative proportions of both categories of ceramic types change fairly little through time. The pair of bar graphs in Figure 52 illustrates the proportions of ceramic types by period. Just likein Figures 50 and 51, the sum of the proportions of all nine categories is one-hundred percent. A test comparing proportional differences among the storage and cooking types by period shows that they are not very significant (X^2=9.3132, df=8, .50>p>.20, V=0.13).

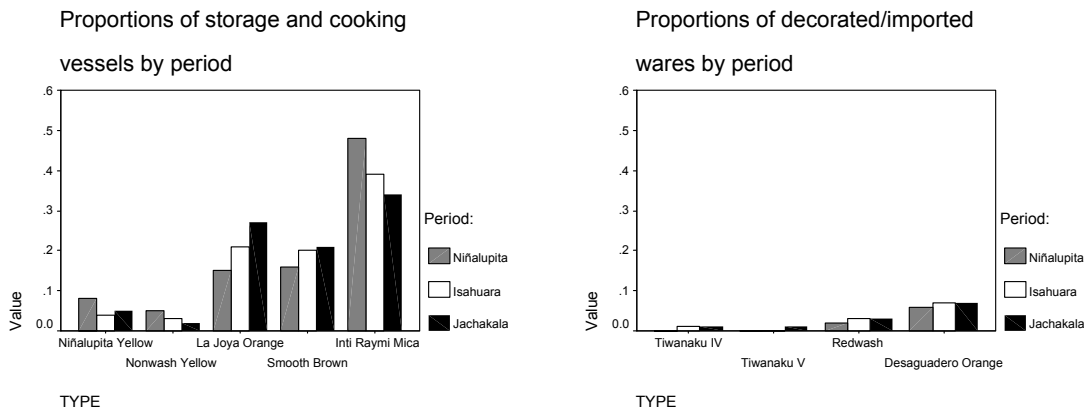

Figure 52. Proportions of storage and cooking vessels (left), and decorated/imported wares (right) for the Niñalupita, Isahuara, and Jachakala Periods.

Similarly, proportional differences between each period's set of imported wares are insignificant (X^2=1.3023, df=6, p>.50, V=0.15).

Proportions were also recalculated so that the Niñalupita, Isahuara, and Jachakala Period sets of storage and cooking ceramic types alone added up to one hundred percent. Another chi square test (on the counts) reveals that there is close to a thirty percent chance that differences among the three assemblages stem from random variation due to sampling (X^2=10.2311, df=8, .50>p>.20, V=0.13). The proportions of Tiwanaku, Desaguadero Orange and Redwash were also recalculated so that each period's assemblage totaled one hundred percent. The chance that differences among them reflect populations with real proportional differences is between ninety-eight and ninety-nine percent (X^2=16.3634, df=6, .02>p>.01, V=0.17).

Conclusions About Ceramic Patterns

While the tests of the significance and strength of storage and cooking ceramic types revealed real differences dating to the Niñalupita Period, these had disappeared by the next phase. As I mentioned in Chapter 3, these early proportional differences could be explained by stylistic preferences, or they might represent different functions performed by these two groups of households. Because differences do not continue during the last

two phases, the former explanation now seems more likely. The synchronic tests therefore revealed statistically insignificant changes in the three periods' relative proportions of utilitarian ceramic types.

The only significant differences between the proportions of ceramic types in the southern, central, and northern zones of Jachakala are in the Tiwanaku IV and V, Desaguadero Orange and Redwash categories, although the Niñalupita and Isahuara Period differences in those proportions do not continue during the Jachakala Period. Diachronically, these proportional differences are highly significant, but only in terms of proportions representing percentages of types over the total number of sherds from non-utilitarian categories.

Although differences in the Isahuara Period proportions of decorated wares are highly significant, these might simply reflect inter-zonal variation in stylistic preferences, because the two assemblages differ by only sixteen percent. Because this ceramic analysis assumes (rather than demonstrates) associations between activities such as storage and identified ceramic types at the site, these findings are preliminary ones at best, suggesting patterns that bear further testing. Broadly speaking then, each zone at Jachakala had a similar inventory of pottery.

However, the noted correlation between the Tiwanaku IV and V wares with Desaguadero Orange and Redwash sherds might suggest some kind of difference in activities between the south and center, simply because the Tiwanaku wares have known ritual and/or feasting functions at other Tiwanaku-contemporary sites. Given differences between the center and south in other imports, some categories of tools, and faunal resources, for instance, the Isahuara Period differences in proportions of these four types could indicate differential access to imports, rather than feasting activities. Even though proportions of imported ceramics are not that different in each zone, particularly during the Jachakala Period, the kinds of Tiwanaku ceramics found in each area are very different. These are broken down more and explored in Chapter 6.

Semi-Precious Stone Imports

In addition to black basalt tool blanks imported from, possibly, the quarry site of Quirimita some one-hundred kilometers to the south of La Joya, a number of other types

of stone materials are found in small quantities at Jachakala. Scholars differ in their estimations of where the obsidian that circulated throughout central Bolivia may have been quarried, but this material "was imported into the Oruro region in the form of small cobbles" (Aoyama 1995:11). Regardless of its origins, the small quantities of black obsidian projectile points, flakes, and cores found at Jachakala were more common in Jachakala Period central zone households than elsewhere at the site (Table 6).

Comparing ratios of obsidian artifacts over the number of sherds from each zone and period is one way to clearly demonstrate a marked inter-zonal difference in distributions of obsidian projectile points, flakes, and cores at Jachakala. No obsidian artifacts were recovered from the Niñalupita Period. Isahuara Period artifacts are confined to the northern zone, where I recovered 0.36 obsidian flakes for every sherd there. For every Jachakala Period sherd in the south, on the other hand, only 0.60 obsidian flakes were found, compared to 4.57 flakes, 0.12 projectile points, and 1.29 cores in the center. The highest ratio of obsidian projectile points in particular was identified in the northern zone assemblage, with 0.21 points for every sherd. These ratios demonstrate a clear difference in access to obsidian between groups of households in different areas of the community, which is sharpest, moreover, in the final period of Jachakala's history.

Ópalo, a second imported stone at Jachakala, is a deep red, highly polished volcanic glass, the nearest source of which is in the mountains surrounding La Paz, some one hundred kilometers to the north (Paul McLeod, Inti Raymi S.A. mine geologist, personal communication). Like obsidian, ratios over ceramics of ópalo flakes, cores, and small rounded and polished artifacts are highest in Jachakala Period central zone domestic contexts. However, ratios of ópalo projectile points are higher in the south and north than in the central zone. As with other long-distance exchange goods and labor-intensive items described previously, frequencies are too small for statistical analysis. These preliminary results indicate a hypothesis for future research because distributionsof ópalo production debitage (flakes of undistinguished types and cores) and finished products (projectile points in particular) do not correlate.

A bright purple carved bead of sodalite (Figure 85, Appendix E), found in Isahuara Period levels of a central zone household midden, is another imported stone. It

Table 6. Ratios (over number of sherds) and frequencies (in parentheses) of imported semi-precious worked stones across the site during the Niñalupita, Isahuara, and Jachakala Period.

	Southern zone:			*Central zone:*			*Northern zone:*		
	Nina	*Isah*	*Jach*	*Nina*	*Isah*	*Jach*	*Nina*	*Isah*	*Jach*
Obsidian projectile points	0	0	0	0	0	.12 (1)	--	0	.21 (1)
Obsidian flakes	0	0	.60 (2)	0	0	4.57 (39)	--	.36 (1)	0
Obsidian cores	0	0	0	0	0	1.29 (11)	--	0	.62 (3)
Ópalo projectile points	0	.45 (1)	.30 (1)	0	0	.12 (1)	--	0	.21 (1)
Ópalo flakes	0	0	0	0	0	1.76 (15)	--	0	0
Ópalo cores	0	0	0	0	.59 (2)	0	--	0	0
Ópalo polished, rounded stones	0	0	0	0	0	.23 (2)	--	0	0
Total #	0	.46 (1)	.91 (3)	0	.59 (2)	8.08 (69)	0	.36 (1)	1.04 (5)
No. of sherds	87	2186	3307	628	3406	8543	0	2813	4810

derives from the same household midden associated with the single square-shaped residence at the site; this midden held an unusually large proportion of the imported stones, marine shell, and Tiwanaku-style ritual vessels.

Regardless of whether this pattern in ópalo artifacts holds up to further scrutiny, the disproportionate proportions of obsidian and ópalo in the central zone during the Jachakala Period represent inter-zonal differences of wealth and differential participation in long-distance trade networks. Central zone households only really became part of the trade networks in obsidian and ópalo during the Jachakala Period, and the evidence suggests that they completely dominated access to those imported materials when they did so.

Craft Production, Exchange, and Political Economy

One of the hypotheses derived from the Hirth model of political economy is that differential participation in the craft production or exchange sectors of the domestic economy of communities would allow some households to begin to accumulate wealth. Mobilized labor on the supra-household level will be used in the craft production or service sectors of the economy, which provide external opportunities for inter-household wealth differentiation. The simple inter-zonal comparisons in the preceding sections of this chapter tested this proposed link between such externally-derived opportunities for economic differentiation and nascent social stratification. Several different lines of material evidence for craft production and exchange were explored to this end.

While there is no evidence for the production of ceramics at Jachakala, decorated and imported pottery categories do form significantly different proportions of the ceramic inventories of the south, center, and north. These are explored in detail in the next chapter. Other imports such as obsidian, ópalo, marine shell, and so forth are found almost exclusively in central zone contexts during the Isahuara and Jachakala Periods. The imported stone materials were subject to modification, and are thus one line of evidence for differential participation in this aspect of Jachakala's craft production activities. However, ratios and frequencies of artifacts are too small to warrant in-depth statistical analysis of the strength and significance of observed differences.

Craft production activities are better explored by revisiting the results of the synchronic and diachronic lithic analyses presented earlier. Because basalt was both imported and worked, it forms one important line of evidence that can be used to simultaneously explore the craft production (of bifacial tools) and exchange (of basalt tools blanks or macroflakes) sectors of the domestic economy.

The Isahuara Period lithic evidence suggests that central zone households could have produced basalt bifaces for exchange within or beyond the community, because proportions of the indicators of production are significantly higher in the center than in the southern zone. Although the Jachakala Period lithic patterns show decreasing inter-zonal differentiation in the proportions of the indicators of hoe production and consumption, those patterns still weakly support such craft production differences.

This line of evidence related to Jachakala's participation in exchange networks in highland Bolivia therefore provides some support for the increasing participation of central zone households, beginning during the Isahuara Period. Faunal evidence, especially the differences in trunk packet proportions, demonstrates that wealth differentiation between the two groups of households extended to subsistence resources. Although there is no evidence for either elite households or formalized political leadership at the site, Isahuara and Jachakala Period patterns showing nascent wealth differentiation do indicate socioeconomic differentiation.

The data indicate corresponding patterns of inter-zonal household differentiation in both subsistence and exchange activities (and, to a lesser extent, craft production) at Jachakala. However, as Drennan writes (1996:30), "Instead of seeking to demonstrate the centrality of one prime mover to the development of all complex societies and instead of seeking to show the operation of multiple factors in all complex society trajectories, we should seek to model the precise interrelationships of varying factors that lead to specific variations on the theme of complex society development."

In the Jachakala case, exchange was not a cause of emergent differences in the domestic economy of groups of households, which were already well-established through faunal differences. Rather, it was the center's greater wealth in camelids that led or allowed them to dominate or participate more in inter-regional exchange activities. Households in the central zone had access to better cuts of meat, certain classes of ritual goods, and some categories of long-distance exchange goods. The important point to remember, however, is that craft production and/or exchange activities did not provide the impetus for the changes at Jachakala.

OTHER DOMESTIC ACTIVITIES

Textile Production

Evidence for the production of cloth consists of three artifact classes, including ceramic spindle-whorl discs (Figure 81, Appendix D), worked bone awls and needles (Figures 76 and 77, Appendix D). Ratios of spindle-whorl discs over typed ceramic sherds in each subassemblage, given in Table 7, reveal a marked decrease over time in all

three zones. This is also true for both bone awls and needles. The decrease in ratios of textile production tools is especially sharp in the southern zone, where .04598 tools are expected for every Niñalupita Period sherd. This ratio drops to .0073 tools in the Isahuara Period. During all three periods, moreover, the ratios of textile production tools of all three categories are higher in the southern zone than in the center or north.

Although samples are limited, the following general patterns emerged from calculating ratios of textile production tools over the number of sherds both across Jachakala and through time. First, textile production was a more important activity in the domestic economy of southern zone households than elsewhere at the site. Secondly, the biggest shift in ratios of these tools occurred between the Niñalupita and Isahuara Periods. This shift in the domestic economy of all Jachakala households occurred at the same time as many of the changes in subsistence pursuits described in the lithic and faunal sections of this chapter.

Hunting Tools and Faunal Remains

Evidence for hunting activities also exhibits marked differences between the three zones (Table 8). This evidence consists of small projectile points manufactured of basalt, quartzite, obsidian, and ópalo (Figure 75, Appendix D; Figure 83, Appendix E). Again, ratios are calculated by dividing the numbers of points recovered from each area of the site and occupational phase by the numbers of sherds found in the same assemblage.

During the Niñalupita Period, ratios of projectile points over sherds are much higher in the south (.0345) than in the center (.0048). The southern zone's Isahuara Period ratio of projectile points (.0050) is also higher than the center's ratio (.0012) of the same. However, this pattern reverses between the Isahuara and Jachakala Periods. In Jachakala's final occupation, the center yielded a higher ratio of projectile points (.0034) than the south (.0009). In fact, the northern zone's ratio of points (.0010) was also slightly higher than that in the south.

This last set of figures likely represents an intensity of hunting activities by central zone households (and, possibly, for northern zone functions) during the Jachakala Period, perhaps to supplement their diet with small mammals, birds, and fish. The reasoning behind this latter interpretation of the differences in projectile point

Table 7. Ratios (over number of sherds) and frequencies (in parentheses) of spinning and weaving implements across the site during the Niñalupita, Isahuara, and Jachakala Period.

	Southern zone:			*Central zone:*			*Northern zone:*		
	Nina	*Isah*	*Jach*	*Nina*	*Isah*	*Jach*	*Nina*	*Isah*	*Jach*
Spindle-whorl discs	.0115 (1)	.0050 (11)	.0045 (15)	.0032 (2)	.0018 (6)	.0014 (12)	--	.0014 (4)	.0004 (2)
Bone awls	0	.0005 (1)	.0003 (1)	.0032 (2)	.0021 (7)	.0004 (3)	--	0	0
Bone needles	.0345 (3)	.0014 (3)	.0003 (1)	0	.0003 (1)	0	--	.0004 (1)	0
Total # of textile tools	.04598 (4)	.0069 (15)	.0051 (17)	.0064 (4)	.0041 (14)	.0018 (15)	0	.0018 (5)	.0004 (2)
Number of sherds	87	2186	3307	628	3406	8543	0	2813	4810

distributions mirrors that presented earlier in this chapter for diachronic patterns in basalt hoe manufacturing. First, debris from the reduction of broken hoe fragments into smaller tools such as scrapers and projectile points is found in all three zones and periods. Secondly, the stylistic variability in the sizes and forms of points is great enough to negate the notion that any one household or group of individuals specialized in point production. It seems reasonable to assert rather that stone tools of all forms were manufactured and used by many households scattered throughout the community. However, the reversal of differences in projectile point distributions from the Isahuara to Jachakala Period is another kind of domestic heterogeneity that emerged over time.

Or, these patterns could simply indicate increased manufacturing of projectile points. This might not signify changes in the non-camelid component of residents' diets or in the frequency with which groups of households hunted. Instead, reversals and differences in the ratios of projectile points found in the different zones and time periods at Jachakala might simply signify differences in households' projectile point manufacturing activities. One way to test which of these two interpretations better fits the data is to look at what Jachakalans might have been hunting.

Table 8. Ratios (over number of sherds) and frequencies (in parentheses) of hunting implements across the site during the Niñalupita, Isahuara, and Jachakala Period.

	Southern zone:			*Central zone:*			*Northern zone:*		
	Nina	*Isah*	*Jach*	*Nina*	*Isah*	*Jach*	*Nina*	*Isah*	*Jach*
Basalt projectile points	.0345 (3)	.0046 (10)	.0006 (2)	.0016 (1)	.0009 (3)	.0020 (17)	--	.0004 (1)	.0008 (4)
Quartzite projectile points	0	0	0	.0032 (2)	.0003 (1)	.0012 (10)	--	0	0
Obsidian projectile points	0	0	0	0	0	.0001 (1)	--	0	0
Ópalo projectile points	0	.0005 (1)	.0003 (1)	0	0	.0001 (1)	--	0	.0002 (1)
Total # of hunting tools	.0345 (3)	.0050 (11)	.0009 (3)	.0048 (3)	.0012 (4)	.0034 (29)	0	.0004 (1)	.0010 (5)
Number of sherds	87	2186	3307	628	3406	8543	0	2813	4810

Non-camelid faunal remains present a second line of evidence related to the intensity of hunting activities across the site and through time. The remains of non-camelid fauna identified at Jachakala include infrequent examples from unknown species of snake, dog, rodent, and birds. Numbers of elements from these alternative meat sources are presented in Table 9 as proportions of the faunal subassemblage of each zone and period. (The numbers in parentheses indicate the total number of non-camelid faunal elements over the number of identified faunal elements in each collection.) As these results make clear, the same patterns noted for projectile points apply to these faunal remains as well. The proportion of the southern zone faunal assemblage made up of non-camelid remains is much higher in the south (8.86%) than the center, where no non-camelid remains were identified. Although there is a drop between the Niñalupita and Isahuara Periods in the proportion of the south's fauna made up of non-camelid remains (from 8.86% to 1.72%), it is still higher than the proportions of non-camelid remains in the center (0.17%) or north (0.85%). Like the projectile point ratios, this pattern reverses between the Isahuara and Jachakala Periods. During the last phase, the center's

Table 9. Non-camelid faunal remains presented as proportions of the total number of identified faunal remains in each zone and period.

	Niñalupita	*Isahuara*	*Jachakala*	*Total*
Southern zone	8.86% (7/79)	1.72% (13/754)	0.75% (5/666)	1.67% (25/1499)
Central zone	0 (0/123)	0.17% (1/589)	1.66% (5/302)	0.59% (6/1014)
Northern zone	--	0.85% (4/473)	2.48% (7/282)	1.46% (11/755)
Total	3.47% (7/202)	0.99% (18/1816)	1.36% (17/1250)	1.29% (42/3268)

proportion of non-camelid bones (1.66%) is higher than the south's proportion (0.75%) of the same, although the northern zone has a still higher proportion (2.48%).

In fact, the results of two chi-square tests run on the number of non-camelid faunal elements recovered from each zone and time period (see Appendix C, Table 75) reveal highly significant diachronic differences (X^2=13.076, df=4, .02>p>.01). The Cramer's V test of the strength of those differences indicates strong differences between the three occupations of Jachakala. Comparing the non-camelid faunal remains from only the south and center also yields both highly significant (X^2=8.9989, df=2, .02>p>.01) and very strong (V=0.54) differences between these two residential areas. Because patterns in both projectile points and non-camelid faunal resources change together, these represent changes in each group of households' diet rather than (or in addition to) projectile point manufacturing practices.

Camelid Mandible Tools and Other Bone Implements

Other bone tool categories include large polished long bone scoops (Appendix D, Figure 78), worked (deer?) antlers used as digging implements (Figure 79), and a single are not grouped with the snuff trays discussed below. In each of these three cases, artifact frequencies are too small to discuss general patterns (Table 10), although both antler hoes

Figure 53. Three examples of camelid mandible tools found at Jachakala.

and bone scoops are more common in the south during the first two periods than other areas of the community.

Camelid mandible tools (Figure 53 above; Appendix D, Figure 80), on the other hand, provide important evidence for a change in the domestic economy at Jachakala. These domestic tools are manufactured from the camelid mandible ramus. As Goldstein writes (1993:31), "The working edge of this tool type was the rounded and polished section of solid, dense bone left by snapping the toothed section off from the mandible." The result is a rounded bone tool some ten to fifteen centimeters in length (Bermann 1994:186).

Camelid mandible tools are directly associated with the Tiwanaku polity though archaeologists continue to disagree about their function. Mandible tools were produced in large numbers at the central site of Tiwanaku itself, as well as at secondary centers such as Lukurmata (Bermann 1993, 1994:188), Omo M12 in Moquegua, Peru (Goldstein 1993:31), and at sites throughout central Bolivia and northern Chile where Tiwanaku-

style ceramic wares have been identified. Goldstein found a single hafted segment of a mandible tool at Omo M12 (1993:34, Figure 3.7), though this does not mean that all such tools were similarly equipped with handles. Bermann puts forth the possibility that they were used for scraping (1994:188), in an unknown household-based activity restricted to Tiwanaku-contemporary sites such as Lukurmata and Omo. Ryden (1947:34), on the other hand, suggests that they were used for smoothing the interior walls of pottery vessels. One intriguing analogy comes from LaBarre's (1948:80) report that some Aymara agriculturalists used hoes made of a llama scapula hafted with rawhide to break up larger clods of dirt in their fields.

Regardless of their function, camelid mandible tools are only found at sites with Tiwanaku IV and V pottery in domestic contexts. At Lukurmata, Omo M12, and Tiwanaku itself, the manufacture of these implements was apparently a household activity (Goldstein 1993:31). While I cannot say for certain whether camelid mandible

Table 10. Ratios (over number of sherds) and frequencies (in parentheses) of various bone tools, including camelid mandible tools, during the Niñalupita, Isahuara, and Jachakala Period.

	Southern zone:			*Central zone:*			*Northern zone:*		
	Nina	*Isah*	*Jach*	*Nina*	*Isah*	*Jach*	*Nina*	*Isah*	*Jach*
Long bone scoops	0	.0027 (6)	0	.0016 (1)	.0009 (3)	0	--	.0007 (2)	.0002 (1)
Antler hoes	0	.0009 (2)	0	0	.0003 (1)	.0001 (1)	--	0	0
Knife	0	0	0	0	0	0	--	.0004 (1)	0
Camelid mandible tools	0	0	0	0	.0032 (11)	.0016 (14)	--	.0025 (7)	.0002 (1)
Total # of bone tools	0	.0037 (8)	0	.0016 (1)	.0044 (15)	.0018 (15)	0	.0036 (10)	.0004 (2)
Number of sherds	87	2186	3307	628	3406	8543	0	2813	4810

tools were manufactured at or imported into Jachakala's domestic inventory (because small camelid bone fragments are ubiquitous at Jachakala), all mandible tools recovered during the Isahuara and Jachakala Period were found in either the central or northern zone. In two domestic contexts in the former area, mandible tools with no sign of edge wear polish were deposited in caches inside or next to buried pots filled with ash and/or other bone fragments. In at least two cases, therefore, the context of their discovery suggests an additional ritual element or ideological import to these bone tools.

Referring to Table 10, it should be noted, finally, that the ratios of mandible tools over the number of sherds in both the center and north decreased dramatically from the Isahuara to the Jachakala Period. This suggests a similar decrease in the importance attached to whatever activities were associated with these tools during the Jachakala Period. In both periods, camelid mandible tools provide good evidence that Jachakala central zone households were doing something different than the southern zone residents. Residents of the center had a domestic task that was not conducted at all in the south. Such a transformational change in the domestic economy of the central zone's households is more significant than just differences in the kinds of materials (such as obsidian versus basalt projectile points) used by groups of people in their domestic activities.

Decorated Bone and Drug Ingestion Items

Additionally, excavations revealed a number of decorated fragments of bone flutes or snuff tubes, and other unknown objects. Central zone examples from the Isahuara Period include two fire-engraved and one painted fragment (Appendix E, Figure 88), while a finely-incised piece from the large midden underlying the camelid corral in the north looks like it may be part of a flute or snuff tube (Chapter 3, Figure 25). The pyroengraved bone in particular warrants mention because they can be considered ritual items. Like camelid mandible tools, they are directly associated with Tiwanaku, occurring at most Tiwanaku-related sites in domestic contexts. They are widely believed to have been part of a Tiwanaku-derived hallucinogenic cult (Bermann 1994:143).

Worked camelid long bone fragments strongly resembling the snuff trays from Lukurmata (Bermann 1994:143) were also recovered from middens in all three zones at

Jachakala. Two possible snuff trays (Appendix F, Figure 96) were recovered from the Niñalupita Period occupation of the central zone. In terms of ratios of snuff trays over sherds, they are almost twice as common in the south as in the center or north during the Isahuara Period. I recovered just one example dating to the Jachakala Period in the north. If these artifacts were in fact part of a hallucinogenic drug complex of local or exotic origin, then the activities associated with snuff tubes and trays were adopted in the household ritual tradition in all three areas of Jachakala during the Isahuara Period. Browman (1978b:336-337) argues that stone mortars and pestles, snuff trays, spoons and tubes, and incense burners (see below) are markers of Tiwanaku's influence. The presence of artifacts of identical shape and modification in pre-Tiwanaku levels at Jachakala might suggest a hallucinogenic complex of greater time depth than Browman recognizes.

Metallurgy

The practice of metallurgy at Jachakala is suggested by the slag left over from the production, presumably, of the copper artifacts found at the site. Copper production evidenced by slag dates back to ca. 1200 BC at Wankarani sites throughout the La Joya region. Although no features associated with smelting were identified at Jachakala, large pieces of slag were found in every zone and period. The ratios of pieces of slag over sherds are given in Table 11 below. As these numbers show, metallurgical activity was highest in the southern zone during the Niñalupita and Isahuara Period. During the Jachakala Period, on the other hand, the northern zone yielded 0.0035 pieces of slag for every sherd, as opposed to 0.0006 in the south and 0.0007 pieces in the center. Although the numbers are exceedingly small, either the activities associated with metallurgy moved from the southern to the northern zone, or the place where waste from copper production was dumped was moved.

Wherever they were produced, locally or otherwise, the only one of the copper ornaments (see Appendix E, Figures 86 and 87 for illustrated examples) dating to the Isahuara Period came from the central zone. During the Jachakala Period, such artifacts are three times more common (0.0009 artifacts for every sherd) in the center than they are in the south (0.0003). None of these ornaments were recovered from northern zone units.

Table 11. Ratios (over number of sherds) and frequencies (in parentheses) of slag from metallurgy, and copper ornaments, during the Niñalupita, Isahuara, and Jachakala Period.

	Southern zone:			*Central zone:*			*Northern zone:*		
	Nina	*Isah*	*Jach*	*Nina*	*Isah*	*Jach*	*Nina*	*Isah*	*Jach*
Slag	.1839 (16)	.0096 (21)	.0006 (2)	.0016 (1)	.0015 (5)	.0007 (6)	--	.0014 (4)	.0035 (17)
Copper ornaments	0	0	.0003 (1)	0	.0003 (1)	.0009 (8)	--	0	0
Total # of metal artifacts	.1839 (16)	.0096 (21)	.0009 (3)	.0016 (1)	.0018 (6)	.0017 (14)	0	.0014 (4)	.0035 (17)
Number of sherds	87	2186	3307	628	3406	8543	0	2813	4810

The exact function of some of these artifacts is unknown, but at least two were copper tupu pins; these ethnohistorically known artifacts, often made of silver among the Inca, were used to close shawls. These were most likely items of personal adornment, and the prestige associated with their almost-exclusive consumption by central zone households lends itself well to Hirth's model of complexity. This concentration is particularly notable because the little evidence for smelting found at Jachakala is more common in the northern zone during the site's final occupation.

Conclusions

Though sample sizes are limited, multiple lines of evidence presented above provide limited support for Hirth's model of political economy. Projectile points for hunting, proportions of non-camelid faunal remains, and some categories of bone tools exhibit similar patterns over time. Artifacts associated with textile production, hunting, and copper smelting are all more prevalent in the southern zone during the Niñalupita and Isahuara Periods. However, ratios of each class of these artifacts also drop significantly between the Niñalupita and Isahuara Period. These shifts correspond with, and may be related to, some of the other changes in the domestic economy of Jachakalan households demonstrative of emergent wealth differentiation (especially in camelid remains).

Other ritual items associated with the Tiwanaku State to the north reveal different patterns. Camelid mandible tools are found exclusively in the central and northern zones, but ratios drop dramatically between the Isahuara and Jachakala Periods. Items that may have been part of a (Tiwanaku-derived?) drug ingestion inventory, including bone snuff trays and tubes, were more common in the south than elsewhere at the site. They are confined to the north, however, during the last period. Ceramic vessels that are also part of this imported set of practices (and possibly beliefs) are addressed in the next section, and in greater detail in Chapter 6.

Whether or not some of the additional non-utilitarian items discussed above also served ritual functions, their primary presence in these same central houses suggests that group's increased prestige or status. Some camelid mandible tools, for instance, were located in ritual caches of unused tools. Marine shell fragments, imported from the Pacific coast of Peru or Chile, follow the same pattern; these are addressed in Chapter 6. Central zone households also consumed almost all of Jachakala's personal adornments. These various categories of artifacts indicate that central zone households were doing some different things than those in the south during both the Isahuara and Jachakala Period. However, artifact frequencies are low and their functions are, in some cases, unclear; these inter-zonal patterns in non-utilitarian goods might suggest incipient social differences, or simply, differential participation in these activities.

COMPLEXITY AT THE CENTER

Labor Mobilization or Resource Control

Archaeological correlates of the three sectors of the political economy, according to Hirth's model, are variably defined in terms of labor mobilization strategies. The distinction between labor mobilization and resource expropriation is an important one. If some households were able to direct or manage supra-household labor pools (for community-wide rituals, the acquisition of exchange goods, or craft production tasks on the order of part-time specialization), this phenomenon should not produce personal wealth differences, but rather differences in the domestic economy of groups of households who variably participate in those activities. However, the inter-zonal

approach does not allow me to argue whether this might have developed on the household or supra-household level.

The artifact patterns related to the production, service, and distribution sectors of the Isahuara and Jachakala Period economies were used to test Hirth's predictions that differences in craft production and exchange activities would be the basis for the political economy. Resource mobilization strategies by an emerging elite would produce markedly different patterns than labor mobilization. Evidence that all Jachakala households maintained access to imported basalt and camelid meat, for example, suggests that neither group of residents had exclusive access to any subsistence resources. Emergent wealth differences dating to the Isahuara Period were likely not derivative of resource control strategies (a broad heading meant to subsume a number of prime mover arguments about complex society development). Of course, central zone households' differential access to some classes of exchange goods also constitute resource control, but such a pathway to complexity most often refers to control over fundamental aspects of subsistence production, rather than non-utilitarian resources such as camelid mandible tools and obsidian cores.

Subsistence Differences

A complex picture of incipient sociopolitical differentiation emerges from the data presented in this chapter. Many models of complexity focused on restricted access to the productive means or products of intensified agriculture predict that lower status sectors of a population will lose direct access to basic resources. Differential subsistence resource distributions emerged during the Isahuara Period, yet nothing in the data suggests that central zone households controlled this aspect of the economy. This interpretation of the lithic and faunal patterns as constituting inter-zonal wealth differences is not the same as saying that subsistence resource control strategies were in play.

In the Jachakala case, there is no evidence for agricultural intensification by central zone households. On the other hand, faunal packet proportions demonstrate the gradual emergence of differences in this zone's access to packets of camelid meat. Given that central zone households did not intensify agriculture, yet did maintain preferential

access to the best cuts of meat, it is difficult to subsume these lines of evidence under a single model of subsistence resource control. Differences in the quality and quantity of resources consumed by households in each zone do not automatically imply that one group held sufficient power over the other to justify tribute extraction, for example. Rather, these differential subsistence practices reflect an expansion of central zone units' domestic economy.

The Local Origins of Changes in Economic Organization

In general, the Isahuara and Jachakala Period data from Jachakala document the local, gradual emergence of differences in the domestic economy of groups of households. The diachronic trajectory developed in this dissertation suggests that emerging wealth differences articulate with differential participation by some individuals or households in northern zone functions. The preponderance of ritual offerings in the center, their different ways of storing food (i.e., in ollas), the straight wall sections off the two largest houses mimicking those off the temple, figurines, snuff tubes or flutes, and so forth, all evidence greater ceremonial activities in those participating households. Relative to household remains in the southern zone, these additional central zone domestic features tie them more closely to the emergent set of changes in the community's ideology.

That these inter-zonal differences in the household economy are also loosely reflected in domestic architecture implies a concurrent change through time in the economic ideology of Jachakala society. Ideological justification for the accumulation of surplus resources is related, again, to the expansion of the central zone's domestic economy to fund community-oriented rituals and inter-regional exchange connections. These are service-oriented activities, but not in the sense usually employed by Hirth and other researchers of complexity. Inter-zonal differences at Jachakala do not suggest payments of any sort to an emerging elite; after all, there is nothing to suggest political hierarchy. An interpretation based on the expansion of non-subsistence activities and the associated accumulation of resources (including camelid meat) expended through them by slightly wealthier households fits the data better.

One problem with the Hirth model brought to light by these conclusions is that it does not provide a role for ideological or ceremonial changes over time. It does not help to explain the link at Jachakala between wealth (economic) differences and new ways of expressing or spending those wealth differences through activities in the northern zone. The connections drawn occasionally in this dissertation between changes in the domestic economy of the central zone households through time and the incorporation of activities perhaps tied to northern zone functions suggest that the relationship between the center and northern zone should be tested.

The gradual nature of the changes at Jachakala is also important. Significant differences in proportions of faunal packet elements date back to the Niñalupita Period, and the marked shift in proportional differences in faunal remains are the basis for the chronological division between the Niñalupita and Isahuara Period. Because of this, wealth differences pre-date the appearance of Tiwanaku-style artifacts in Jachakala's archaeological record. Therefore, the development of a political economy also pre-dates contact with the Tiwanaku state. This last point is important. Developments at Jachakala cannot be wholly attributed to contact with the Tiwanaku State. This argument will be explored in greater depth in Chapter 6, which addresses the more subtle and complex role of Tiwanaku-style goods in local affairs. For now, suffice it to say that the gradual development of the political economy most evident in the Jachakala Period occupation can trace its roots to the Niñalupita Period because of the faunal differences between the south and center in that period.

The Role of Craft Production and Exchange

The development of socioeconomic differences between groups of Jachakala households was not caused by differential participation in craft production or exchange activities, because faunal differences predate them. Therefore, this site's history does not follow the same developmental trajectory as Hirth's Mesoamerican case. Some differences in households' access to luxury, imported, and labor-intensive goods are documented above. A few of these materials, such as the semi-precious stones, might be interpreted as prestige goods reflecting the status of their owners. Personal adornments like copper pieces and beads are labor-intensive to produce, and could have served the

same social function. Status differences, however, refer to more comprehensive, regular restriction of access by some households to some items associated with political power or ideological prowess. These kinds of differences in distributions of prestige goods are not evident at Jachakala to the extent necessary for the archaeological demarcation of social classes of people.

Interpreting differences in imported goods, subsistence resources, architecture, ritual ceramics, and so on is the most difficult part of the project, however, because both the Hirth model and my application of it thus far fail to distinguish between wealth and status differences. While artifact patterns at Jachakala certainly demonstrate inter-zonal differences in the domestic economy, it is much more difficult to use them to definitively distinguish between social ranking, wealth differences, or both. Changes in the socioeconomic structure of Jachakala related to incipient wealth differentiation are nevertheless suggested by the kinds of transformations demonstrated in this chapter. These changes were not caused though by differential participation in either craft production or exchange activities.