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Maintaining Homeland Identities in a Tiwanaku Colony (A.D. 600-1100): Archaeobotanical Findings from the Tiwanaku Site of Cerro San Antonio in the Locumba Valley, Perú

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Maintaining Homeland Identities in a Tiwanaku Colony (A.D. 600-1100): Archaeobotanical Findings from the Tiwanaku Site of Cerro San Antonio in the Locumba Valley, Perú

A Thesis submitted in partial satisfaction of the requirements for the degree Master of Arts

in

Anthropology

by

Arianna Christina Garvin

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Professor Isabel Rivera-Collazo

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ABSTRACT OF THE THESIS

Maintaining Homeland Identities in a Tiwanaku Colony (A.D. 600-1100): Archaeobotanical Findings from the Tiwanaku Site of Cerro San Antonio in the Locumba Valley, Perú

by

Arianna Christina Garvin

University of California San Diego, 2020

Professor Paul Goldstein, Chair

This thesis explores how food remains provide insight into ancient culinary and agrarian practices and how these food-related practices reflect ancient identities and migration histories. I present preliminary paleoethnobotanical findings from samples excavated from multiple household units at the large Tiwanaku residential site of Cerro San Antonio (L1), Locumba, Perú. The Tiwanaku civilization (ca. A.D. 500-1100) originated in the Bolivian Altiplano of the south-central Andes and expanded into Peruvian coastal valleys from A.D. 600-1100, which are areas suitable for growing lowland crops that cannot be grown in the Bolivian Altiplano. In this paper, I discuss the implications of local, lowland cultivars and nonlocal, highland cultivars at the coastal-valley site of L1. I ask how the food remains might be telling of whether Locumba-Tiwanaku colonists traveled to L1 directly from the Tiwanaku core of the Bolivian Altiplano and are primary Tiwanaku colonists or traveled to L1 from the known primary Tiwanaku colony of

the Moquegua Valley and are secondary Tiwanaku colonists (Sitek 2018; Sitek n.d.). In conclusion, I argue that the macrobotanical assemblage suggests that L1 is a primary Tiwanaku colony because 1) highland-associated domestic and industrial cultivars and animals at L1 reflect efforts to maintain homeland identities (Goldstein 2005), 2) evidence of specialization and culinary differences at L1 are characteristic of the Tiwanaku homeland social structure (Goldstein 2005), and 3) the proportions of local and nonlocal foods at L1 resemble the proportions of local and nonlocal foods at a primary Tiwanaku colony, the Rio Muerto site of M43.

Chapter 1: Introduction

1.1 The Biological, Social, and Ecological Aspects of Food: A Tiwanaku Case Study

You learn that Andean potatoes have veins as you slice into them and that Andean quinoa seeds breathe as you boil them. Cultivars like potatoes and quinoa contain calories and nutrients that people need to survive. Quinoa seeds, for example, are comprised of wonderfully unique proportions of oil, protein, and fat and hold nutritious minerals, vitamins, fatty acids, and antioxidants with cell-membrane protective qualities (Vega-Gálvez 2010). In addition to partly creating the biological person, food partly creates the social person (Atalay and Hastorf 2006: 284 [Barthes 1979; Farb and Armelagos 1980; Massara 1997]). Food-related practices, such as production and procurement, processing, cooking, presentation, and eating, form society and the individual. These practices are shared experiences, become memories, and shape identities (Atalay and Hastorf 2006). Moreover, alcoholic beverages, such as *chicha* made from maize, have social, spiritual, political, and economic qualities (Goldstein 2003; Goldstein 2005; Hastorf and Johannessen 1993).

Food crops are culture and ecology bundled tightly together. Humans have domesticated wild plants into the foods we eat, have grown cultivars suitable to the environment, and have selected for plant varieties that endure periods of climate instability. Food crops have origins and histories, and finally, these crops share stories of our ancestors.

This thesis explores how food remains provide insight into ancient culinary and agrarian practices and how these food-related practices reflect ancient identities and migration histories. More specifically, this study focuses on the ancient Tiwanaku (ca. A.D. 500-1100) and the role of homeland foods throughout state expansion (A.D. 600-1100). To explore food and identity, focusing on Tiwanaku is particularly informative for a few reasons. First, the Tiwanaku homeland—or the highest ancient urban center (Goldstein 2005)—is found in the Bolivian Altiplano, where frost-resistant crops, such as potatoes (*Solanum tuberosum*) and quinoa (*Chenopodium quinoa*), were domesticated and could grow. Second, the desire for nonlocal cultivars, such as maize (*Zea mays*), largely drove Tiwanaku colonization into the Peruvian coastal valleys (Goldstein 2005). Finally, the distinct ecological environments of the highland Tiwanaku homeland and lowland Tiwanaku colonies present an opportunity to explore complementary resource zones and to understand how foodways capture these distinct environments and reflect identities that are intimately associated with the environment.

1.2 Structure of the Thesis

The origins of the ancient Tiwanaku civilization (ca. A.D. 500-1100) are in the Bolivian Altiplano of the south-central Andes (Figure 1) (Janusek 2003 [Posnansky 1914, 1945; Bennett 1934; 1950]; Stanish 2003). The Bolivian Altiplano is found 3800 meters above sea level (masl) (Kolata 1986; Marsh 2016; Stanish 2003), and at this high elevation, Altiplano farmers grow frost-resistant crops, such as quinoa (*Chenopodium quinoa*), kiwicha (*Amaranthus caudatus*), potatoes (*Solanum tuberosum*), and other tuber crops oca (*Oxalis tuberosus*), olluco (*Ullucus tuberosa*), isanu (*Trapeolum tuberosum*), and mashua (*Tropaeolum tuberosum*) (Bermann 1997; Berryman 2010 [Carter 1976; Bruno 2008; Johnsson 1986]; Bruno and Hastorf 2016; Goldstein 2005 [Browman 1984b; Towles 1961; Weberbauer 1936]; Kolata 1986; Langlie 2018 [Hastorf et al. 2006; Wright et al. 2003]; Lennstrom et al. 1991).

Throughout the Middle Horizon from A.D. 600-1100, the Tiwanaku civilization expanded into the coastal valleys (900 to 2500 masl), such as the Moquegua and the Locumba valleys (Figure 1), to acquire lowland crops that cannot be grown in the Tiwanaku core region (Goldstein 2005). Lowland cultivars include tropical fruits, such as cherimoya (*Annona* *cherimola)* and avocado (*Persea americana)*, psychotropic plants, coca (*Erythroxylum* sp.), cotton (*Gossypium* sp.), *molle* pepper (*Schinus molle)*, peanuts (*Arachis sp.*), beans (*Phaseolus* spp.), chili peppers (*Capsicum* spp.), and maize (*Zea mays*) (Berryman 2010; Biwer 2019 [Pulgar Vidal 1996: 66-71]). The Tiwanaku colonists particularly valued maize because maize could be brewed into *chicha*, an alcoholic beverage that was particularly significant in ritual activities and feasts (Biwer and VanDerwarker 2015; Goldstein 2005).

Altiplano Tiwanaku Homeland Site and Coastal-Valley Tiwanaku Colonial Sites

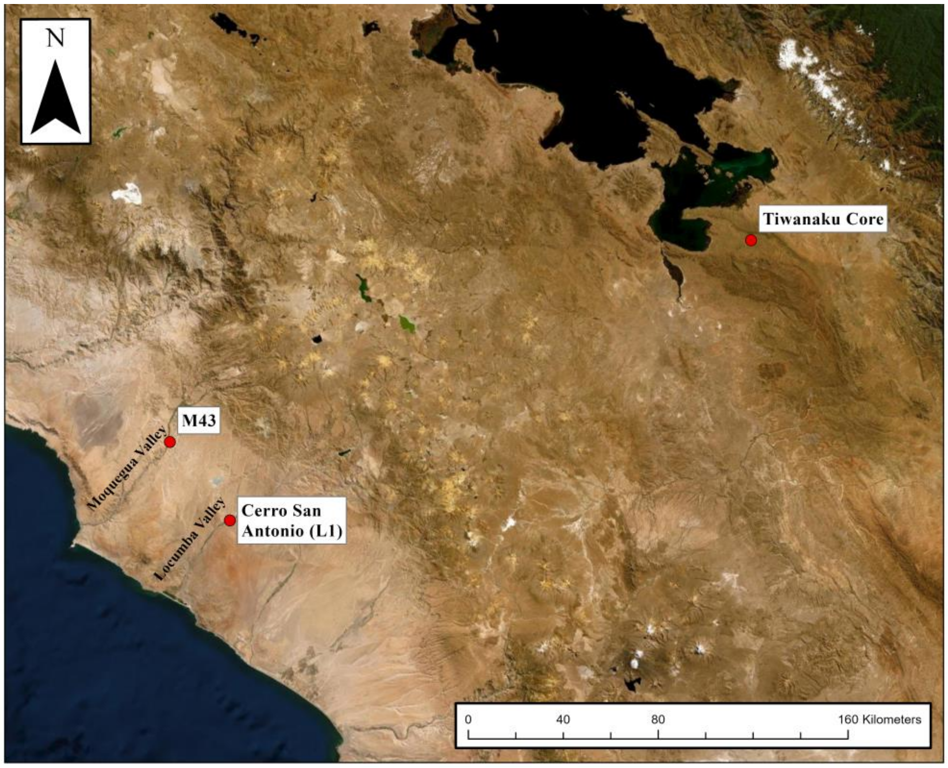

Figure 1: The Tiwanaku homeland and Tiwanaku colonial sites discussed in the thesis.

This paper compares food remains from different domestic sectors and units of Cerro San Antonio (L1), a Tiwanaku colonial site located in the Locumba Valley of the southern Peruvian coastal region, and asks whether or not the food remains reflect forms of Tiwanaku identity in this colony. More specifically, I conduct a paleoethnobotanical analysis of macrobotanical remains recovered from 36 sediment samples from multiple excavated household units of Cerro San Antonio. I explore whether the paleoethnobotanical findings suggest that Locumba Tiwanaku colonists traveled here directly from Tiwanaku and are, therefore, “primary Tiwanaku colonists,” or traveled here from the known primary Tiwanaku colony of the Moquegua Valley, and are, therefore, “secondary Tiwanaku colonists.” I will focus particularly on the presence and distribution of highland cultivars *Amaranthus* sp. and *Chenopodium* spp. as well as the presence and distribution of a lowland cultivar that grows readily in the valley, *Zea mays*.

To consider how their culinary and agrarian practices may reflect their Tiwanaku identity and migration histories, I discuss the presence of highland-associated Amaranthaceae cultivars at Cerro San Antonio and consider how the Locumba-Valley residents might have imported the cultivar in exchange for lowland resources or grew Amaranthaceae cultivars locally. To explore these possibilities, I present the ecological histories of Andean cultivars to understand the ranges in elevation that lowland and highland cultivars may grow at. Second, I compare intra-site and inter-site variability in macrobotanical assemblages and ask: what are the implications of varying highland- and lowland-cultivar proportions, and how might these relative proportions reflect ways that Tiwanaku colonists maintained their highland identities within the valley?

In conclusion, I argue that the L1 macrobotanical assemblage suggests that L1 is a primary Tiwanaku colony. More specifically, I argue that evidence of highland-associated Amaranthaceae cultivars and *cuys* (guinea pigs) and camelids reveal ways that colonists maintained their highland identities. I also suggest that proportions of lowland-originating cultivars and highland-originating cultivars are evidence for culinary differences and specialization characteristic of the Tiwanaku homeland social structure and of the primary Tiwanaku colony of the Moquegua Valley, the Rio Muerto site of M43.

1.3 Locumba Settlement History and the Site Context

To explain the Tiwanaku expansion (A.D. 600 – 1100) into the Moquegua Valley, Paul Goldstein (2005) proposes the "diasporic archipelago" model. The diasporic archipelago model is an agency-orientated alternative to globalist paradigms that is based on 1) the Andean concept of the *ayllu*, 2) diasporic movements, and 3) John Murra's (1964, 1968, 1972, 1985) vertical archipelago model. In his diasporic archipelago model, Goldstein imagines *ayllus* as "forms of 'ethnicity' in motion" and uses the term "diaspora" to capture this idea (2005: 32-3). Goldstein incorporates Murra's vertical archipelago model (1964, 1968, 1972, 1985) to argue that diasporic communities moved across the vertically complex Andean ecological landscape. After dispersing across geographic space, an expatriate *ayllu* community inhabited an ecological zone, engaged in economic activities appropriate to that zone, and acquired resources from other ecological zones through systems of exchange (Goldstein 2005; Murra 1972).

According to Goldstein, this form of diasporic colonization is detectable in the archaeological record through the following features:

1) "Permanent or long-term *residence* in complementary zones,
2) explicit manifestation of a maintained *identity* with the homeland nucleus,
3) *structural reproduction* of the social structure of the homeland,
4) *multiethnicity*—the distribution of immigrant colonies interspersed with colonies of other ethnic groups" (Goldstein 2005: 42).

The purpose of my paleoethnobotanical analysis is to test Goldstein's Andean diasporic model in the Locumba Valley and ask if food remains at the site reflect an explicit manifestation of maintained identity with the Tiwanaku homeland nucleus. The Locumba Valley is found in the present-day department of Tacna, south of the Moquegua Valley and north of Sama, Caplina, and the Chilean Azapa valleys. Tiwanaku colonization of the Moquegua and Azapa[1] valleys has been explored, which suggests that the Locumba Valley is a critical area to further our understandings of the Tiwanaku frontier (Sitek and Goldstein 2016). Like Moquegua, the Locumba Valley is located no higher than 1000 masl in the Peruvian-desert region that is suitable for growing lowland crops, including tropical fruits, coca, maize, *molle*, peanuts, carob beans, beans, and chili peppers.

Goldstein began directing the Proyecto Arqueológico Locumba (PAL) in 2015, which started with initial survey work at the site of Cerro San Antonio (L1) in the middle Locumba Valley (Sitek and Goldstein 2016). L1 is more specifically located 35 kilometers (km) from the coast and 600 masl and covers an area of 166 hectares (ha). The regional survey work has continued since 2015, and as of today, PAL has located 25 sectors (a total of 34.48 ha) from the Formative Period (ca. 1500 BC - AD 500), Middle Horizon (ca. AD 500 - 1100), Late Intermediate Period (ca. AD 1100 – 1350), Late Horizon (ca. 1350 – 1450), and the early Colonial-Republican (ca. 1450 – 1850) periods. Thirteen of these sectors, covering a total area of 22.4 ha, are associated with the Middle Horizon. Three of the 13 Middle Horizon sectors, or sectors A, L, and U, are domestic sectors, while the remaining 10 are mortuary sectors (Figure 2) (Goldstein and Oquiche H. 2015; Goldstein and Oquiche H. 2016; Goldstein and Oquiche H. 2019; Sitek 2018; Sitek n.d.; Sitek and Goldstein 2016).

PhD candidate Matthew Sitek of the University of California, San Diego has been investigating the Tiwanaku presence at Cerro San Antonio under PAL (Sitek n.d.). Along with

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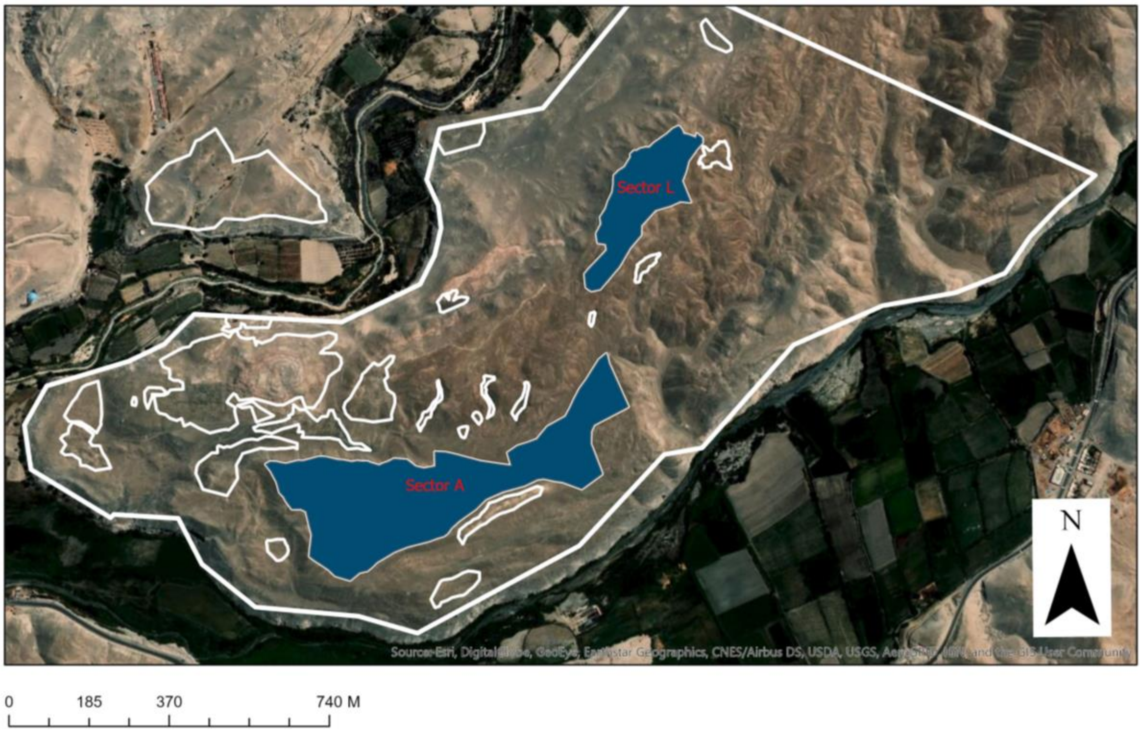
[1] Evidence suggests that Azapa Valley people interacted with highland people. There is also evidence of minor Tiwanaku occupation within the valley. In comparison to what Moquegua-Valley findings suggest, however, the relations between the Tiwanaku core and the Azapa Valley were limited (Sitek 2018 [Goldstein 1995]; Sitek and Goldstein 2016). In the Azapa Valley, for example, most diagnostic Tiwanaku material is found in exclusively Tiwanaku cemeteries, and Tiwanaku ceramics are strictly located to high-status mortuary contexts of local people (Sitek and Goldstein 2016 [Korpisaari et al. 2014: 412]).

Goldstein, Sitek is testing whether the Middle Horizon domestic sectors at Cerro San Antonio reflect one or a combination of the following: 1) primary Tiwanaku colonial enclaves comprised of highland people (hypothesis 1), 2) secondary Tiwanaku colonial enclaves comprised of people from Moquegua (hypothesis 2), or 3) mostly local populations that acquired Tiwanaku material through trade or through other interregional relations (hypothesis 3) (Goldstein and Oquiche H. 2015; Goldstein and Oquiche H. 2016; Goldstein and Oquiche H. 2019; Sitek 2018: 5-6; Sitek n.d.). Building on Goldstein and Sitek's general hypotheses, I will use paleoethnobotanical (PEB) data to test to what degree the Middle Horizon sectors A and L (Figure 2) reflect one of these three hypotheses.



Tiwanaku Residential Sector A and Sector L of Cerro San Antonio (L1)

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 2: Map of Cerro San Antonio (L1). Sediment samples for the PAL 2019 PEB Analysis are from Middle Horizon residential sectors A and L.

1.4 PAL 2019 PEB Hypotheses

1. 4. 1 PAL 2019 PEB Hypothesis 1

If the Middle Horizon domestic sectors at Cerro San Antonio (L1) reflect primary Tiwanaku enclaves (hypothesis 1), then Goldstein's diasporic model (2005) may be used as a model to explain Tiwanaku expansion into the Locumba Valley. To support hypothesis 1, the archaeological assemblage should consist largely of highland Tiwanaku-style ceramics, textiles, projectile points, household utensils, and tools and should contain few ceramics of the local style. There should also be a presence of highland foodstuffs. Finally, dense midden deposits and superimposed house floors would suggest long-term occupations (Sitek 2018).

First, I argue that the macrobotanical and faunal remains in the L1 samples should reflect Goldstein's "explicit manifestation of the maintained *identity* with the homeland nucleus" (2005: 42) through highland-associated domestic and industrial cultivars and animals if Cerro San Antonio is a primary Tiwanaku enclave. More specifically, there should be high densities of highland cultivars, such as kiwicha, quinoa, and potatoes, equal to or greater than the densities of local cultivars, such as maize, beans, peanuts, and chili peppers in the domestic-context samples. Of the lowland cultivars, maize should be particularly significant because the Tiwanaku valued this nonlocal cultivar because it could be brewed into the alcoholic beverage, *chicha* (Biwer and Vanderwarker 2015; Reilly 2017). Faunal remains should include highland-associated *cuy* (guinea pig) and camelid bones. Moreover, *cuy* and camelid droppings should be present in the household contexts, indicating that Tiwanaku colonists continued to raise *cuys* in their homes and use camelid dung as fuel for cooking. Tiwanaku identity is associated with wool textiles, so there should be a greater dependence on camelids for industrial purposes rather than the local, industrial cotton crop.

Second, I argue that L1 sample findings should reflect Goldstein's "*structural reproduction* of the social structure of the homeland (2005:42)," or the Andean *ayllu*. The Andean *ayllu* is defined as "a corporate body of ascriptive identity held together by shared conceptions of behavior, history, and common ancestry" (Goldstein 2005: 29), and structural definitions stress the structural oppositions inherent of the *ayllu* (Goldstein 2005: 30 [Duviols 1974; Platt 1986], the reflexivity of the *ayllu* (Goldstein 2005: 30 [Urton 1993], and the *ayllu* tendency to structure into "nested hierarchies of moieties" (Goldstein 2005: 30 [Albarracin Jordan 1996a,b]). Comparing findings between sectors and/or units should show culinary differences and evidence of specialization that are characteristic of *ayllu* structures. For example, one sector might contain more lowland-originating cultivars while the other sector might contain more highland-originating cultivars. These structures might also be reflected within sectors, and there may be evidence, for example, of a "lowland home" versus a "highland home." In addition, the complementary oppositional structures might be asymmetrical through evidence of an elite group within L1.

Finally, if L1 is a primary Tiwanaku colony like Moquegua Tiwanaku sites, then comparing the macrobotanical assemblage of L1 to the macrobotanical assemblage of a domestic Tiwanaku colonial site in the Moquegua Valley should produce similar proportions of highland and lowland cultivars.

1. 4. 2 PAL 2019 PEB Hypothesis 2

Throughout the Middle Horizon (A.D. 500 to 1100), somewhere between 10,000 to 20,0000 Tiwanaku people colonized the Osmore Drainage of the Moquegua Valley (Somerville et al. 2015), so it is possible that Tiwanaku Moquegua-Valley residents then colonized the Locumba Valley, making Moquegua a primary Tiwanaku colony and L1 a secondary Tiwanaku colony. In other words, if the Middle Horizon domestic sectors at Cerro San Antonio reflect Tiwanaku culture occupation, or some part of it, as a secondary colony comprised of residents from Moquegua (hypothesis 2) then we may interpret Moquegua as a Tiwanaku provincial center and Cerro San Antonio as an offshoot of the Moquegua Tiwanaku province. If this is true, activities, household structures, and larger residential patterning should be the same as those of the Moquegua colonies as seen at Omo and Chen Chen. At Cerro San Antonio, ceramic findings should be of Moquegua-Tiwanaku styles or sub-styles (Sitek 2018 [Goldstein 1985; 2009]). Finally, Cerro San Antonio's duration as a Tiwanaku colony should be shorter but temporally overlap with Moquegua's duration as a Tiwanaku colony. Denser midden deposits should be found at Moquegua than at Cerro San Antonio (Sitek 2018).

To confirm hypothesis 2, I would expect that the L1 samples should show greater dependence on lowland-originating cultivars than highland-originating cultivars. More specifically, there should be higher concentrations of maize and lower concentrations of highland cultivars, such as Amaranthaceae crops and potatoes, in the L1 samples than at Tiwanaku Moquegua-Valley sites. Preliminary PEB investigations at domestic and funerary contexts at Rio Muerto (Somerville et al. 2015 [Vergel and León 2009]), from the domestic contexts at Omo M10 (Somerville et al. 2015 [Muñoz Rojas et al. 2009]), and at the Omo Temple (Gaggio 2014; Somerville et al. 2015 [Gaggio 2014; Gaggio and Goldstein 2015]) show high ubiquity and concentrations of maize, indicating a surplus of maize in the Moquegua Valley that was partly exported to the Tiwanaku core region (Somerville et al. 2015 [Hastorf et al. 2006]). I argue that if L1 is secondary colonization from Moquegua, there should be a greater concentration of maize in the L1 samples than at Moquegua. As a secondary colony, there should be less effort to maintain highland identities at L1, which would be reflected in the samples through minimal presence of highland cultivars, *cuys*, and camelids.

1. 4. 3 PAL 2019 PEB Hypothesis 3

One might argue that mostly local, Locumba-Valley residents occupied the Middle Horizon domestic sectors at Cerro San Antonio, which means the Tiwanaku materials recovered from the site arrived through two possibilities. First, limited numbers of Tiwanaku elites might have resided at the site, and if this is true, then there should be evidence of small, distinct Tiwanaku residential communities accompanying larger local communities. On the other hand, perhaps no Tiwanaku people occupied the site. Instead, local, Locumba-Valley people might have acquired Tiwanaku materials through trade or through other interregional relations. If this second possibility is true, then there should be evidence of mostly lowland-valley, non-Tiwanaku customs or a hybrid of customs. In particular, the utilitarian ceramic findings should be local, non-Tiwanaku styles and forms (Sitek 2018 [Dauelsberg 1972; Uriber Rodríguez 1999]), but the presence of Tiwanaku serving and ceremonial vessels might indicate that the Locumba-Valley residents acquired the prestige goods through systems of exchange (Sitek 2018).

If largely local, Locumba-Valley people lived at Cerro San Antonio, I would expect there to be a presence of local cultivars, such as maize, beans, peanuts, and chili peppers, and an absence of both highland cultivars and animals, such as quinoa, potatoes, *cuys* and camelids, in the L1 samples. If the L1 residents acquired the highland cultivars through trade or through other interregional mechanisms, however, then the presence of highland macrobotanical and/or faunal remains should be restricted to samples from an elite sector and/or elite homes. There should be no evidence of weedy Altiplano plants in the L1 samples, since weedy plants would indicate local cultivation and processing of Altiplano cultivars.

Chapter 2: Background

The Proyecto Arqueológico Locumba (PAL) 2019 Paleoethnobotanical (PEB) Analysis of the Cerro San Antonio (L1) samples first requires reviewing the socio-ecological history of Tiwanaku culture that began in the Andean Altiplano and considering the histories of cultivars that originated in the high-altitudinal environment of the Tiwanaku homeland. I also present a background on the Peruvian coastal-valley ecology and the histories of cultivars that originated in these low-altitudinal zones. The ecological understandings presented in this chapter are used in the PAL 2019 PEB study to distinguish highland-associated (nonlocal/Tiwanaku) cultivars from lowland-associated (local/Locumba) cultivars and to determine whether the highland-associated cultivars were locally grown or imported into the Locumba Valley.

The background chapter concludes with Goldstein's Andean Diaspora Model (2005), which contextualizes the hypotheses tested in the PAL 2019 PEB study. More specifically, this study asks if the 2019 PEB findings reflect one or a combination of the following: 1) primary Tiwanaku colonial enclaves comprised of highland people, 2) secondary Tiwanaku colonial enclaves comprised of people from Moquegua, or 3) mostly local populations that acquired Tiwanaku material through trade or through other interregional relations (Goldstein and Oquiche H. 2016, Goldstein and Oquiche H. 2019, Sitek 2018: 5-6; Sitek n.d.).

2.1 Hydrology and Climatology of the Andean Altiplano

The Altiplano of the south-central Andes expands over an area of ~205,000 km^2 at an elevation that averages to ~3700 m (Baucom and Rigsby 1999 [Wirrman and de Oliveira Almeida 1987]; Thompson et al. 1998 [Kessler 1963]). The northern portion of the Altiplano is home to Lake Titicaca (Figure 3). Lake Titicaca reaches ~3810 masl (Cross et al. 2001; Fritz et al. 2012; Kolata 1986; Marsh 2016; Stanish 2003) and includes two basins that are connected by the 1-km-wide and ~25-m-deep Strait of Tiquina (Cross et al. 2001; Fritz et al. 2012). The larger basin, Lago Grande, has an area of 7131 km^2, a max depth of ~284 m, and a mean depth of ~125 m, while the smaller basin, Lago Huiñaimarca, has an area of 1428 km^2, a max depth of ~42 m, and mean depth of ~9 m (Cross et al. 2001; Fritz et al. 2012).

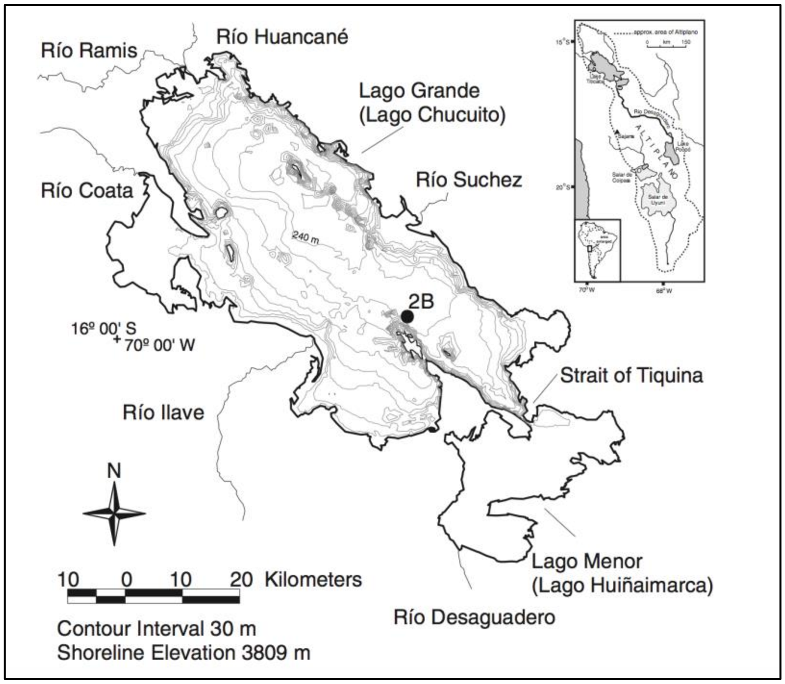


Figure 3: Map of Lake Titicaca (Fritz et al. 2012: 94)

Precipitation mostly affects Lake Titicaca's water level and enters both directly as rainwater and indirectly as river-water. Rainwater comprises ~47 percent of the lake's water, while river-water comprises ~53 percent of the Lake Titicaca's water (Fritz et al. 2012; Cross et al. 2001 [Roche et al. 1992]). The six major rivers, known as the *Rios* Ramis, Ilave, Coata, Catari, Huancane and Suchez, flow glacial water and snowmelt from the eastern Cordillera Real and the northern Cordillera Apolobamba into Lake Titicaca (Baucom and Rigsby 1999, Roche et al. 1992), and if lake levels are high enough, water will overflow into the Río Desaguadero (Roche et al. 1992). Río Desaguado is responsible for 9 percent of lake water loss, while evaporation is responsible for ~91 percent of lake water loss (Baucom and Rigsby 1999; Cross et al. 2001; Fritz et al. 2012 [Roche et al. 2011]). Each year, water levels fluctuate ~75 cm between the dry and wet season (Baucom and Rigsby 1999). The lake levels are highest towards the end of the rainy season in April and are lowest in December just before it begins to rain again (Roche et al. 1992). It should also be noted that El Niño Southern Oscillation (ENSO) events lead to drought (Paduano et al. 2003 [Roche et al. 2003]), or longer dry seasons and lower lake levels than usual years (Baucom and Rigsby 1999 [Martin et al. 1993]).

Lake-water evaporation and precipitation mainly influence the Lake Titicaca's water level (Fritz et al. 2012 [Baker et al. 2001a]; Paduano et al. 2003; Roche et al. 1992). In the Altiplano, there is an obvious contrast in precipitation levels throughout the year. The rainy, summer season occurs from December to March and is associated with humid, easterly trade winds from the Amazon[2], and a cold, dry season occurs from June to September (Marsh 2016; Stanish 2003; Roche et al. 1992) and is associated with cool, westerly winds from the Pacific (Bruno 2008 [Garreaud 1999; Vuille 1999: 1597]). On average, the area receives 880 mm of rain per year (Cross et al. 2001), and 80 percent of this rainfall occurs during the summer months (Cross et al. 2001; Thompson et al. 1998). More specifically, rainfall and humidity peak in January or February and are lowest in July (Roche et al. 1992).

Spatial differences in precipitation across the Altiplano have to do with air circulation, orography, and lake-water (Roche et al. 1992). During the summer months, the easterly trade winds transport warm, humid air from the Amazon to the Altiplano (Binford and Kolata 1996; Roche et al. 1992). The humid Amazonian air is often trapped behind the highest peaks of the Eastern Cordillera, resulting in a rain shadow effect. Air does, however, escape over the lower

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[2] The hydrological history of Lake Titicaca shows differences in water balance over thousands of years, and these fluctuations are likely related to climatic changes occurring in the Amazon (Cross et al. 2001).

peaks around the basin (Roche et al. 1992). The air that moves over the peaks and that lowers in elevation towards the lake increases in pressure and becomes warmer and less humid. As a result, less rain falls over the basin than over the summits of the Eastern Cordillera, but rainfall does increase approaching the lake (Binford and Kolata 1996; Marsh 2016 [Roche et al. 1992]; Roche et al. 1992). Rainfall increases over the lake because the lake's large surface area and volume trap solar radiation that causes the water temperature to be warmer than the surrounding air and land. In short, the lake releases heat to its local environment, and air becomes warmer and wetter as it passes over the lake (Roche et al. 1992).

The snow-capped Cordillera Real and Cordillera Blanca mountain ranges that reach 6000 masl form the perimeter of the basin (Kolata 1986; Marsh 2016; Stanish 2003). At the high peaks, the mean annual temperature is below 0 °C. Slope, shelter, and distance from the lake are factors that affect temperature, so temperature varies between 3800 and 4000 masl. The mean annual temperatures range within 7 to 10 °C in basin-areas found below 4000 masl (Roche et al. 1992). Although the lake is 3800 masl, temperatures stay above 8 °C in the area surrounding the lake (Roche et al. 1992) because the body of water warms the surrounding environment (Roche et al. 1992 [Boulangé and Aquize 1981]).

July has the lowest mean minimum monthly temperature for the entire basin area. In July, temperatures are 1.8 °C on the lakeshore at the Copacabana station (3810 masl) and -11.8 °C more distant from the lake at the Charaña station (4069 masl). December to March is the summer period when daily temperatures are highest. The mean maximum monthly temperatures of 15.3 °C at Capacabana and 3.6 °C at Charaña, however, are in October or November because there is less cloud coverage during these months in contrast to the rainy, summer months (Roche et al. 1992).

2.2. The Agroecological Zones of the Andean Altiplano

The ecological zones of the Altiplano are marked by differences in elevation (Aguilar and Jacobsen 2003 [Pulgar Vidal 1987; Tapia 1997]; Bruno 2008 [Troll, 1968; Weberbauer 1945; Vidal 1972]). According to Vidal (1972; 1987), the *suni zone* is the area closest to the lake and reaches 3500-4000 masl, while the *puna zone* is the highest and most distant area from the lake (Aguilar and Jacobsen 2003; Bruno 2008). Areas of the s*uni* and *puna* zones may be classified into physiographic zones, such as "upper part of hill, slope, hill, foot, crest, plain and lakeshore" (Aguilar and Jacobsen 2003 [PIWA 1994]). The mountaintops and hilltops are the coldest and present little opportunity for agricultural production. On the other hand, the slope is warmer and better suited for agriculture. For example, the slope is the only arable land within the *puna* zone, and here, only bitter potato (*Solanum jucepzuikii)*, cañiwa (*Chenopodium pallidicaule*), and quinoa kcoitos grow. In the lower ecological zone of the Altiplano, modern farmers may grow potatoes (*Solanum tuberosum*), oca (*Oxalis tuberosus*), olluco (*Ullucus tuberosa*), mashua (*Tropaeolum tuberosum*), and white-grain quinoa (*Chenopodium quinoa*) varieties that are less resistant to frost (Aguilar and Jacobsen 2003: 32). The area nearest the lake has the greatest species diversity (Garcia et al. 2007 [Vavilov 1926]), and here is one of the only places where *Zea mays* (maize) may be grown in the Altiplano (Bruno 2008 [Ramírez et al. 1960]).

Limited rainfall, high rate of evapotranspiration, low soil water retention, high risk of frost, and saline soils are agroclimatic constraints for farming in the Altiplano (Garcia et al 2007; Hastorf 2006). The characteristically sunny days but freezing temperatures of the high-altitudinal environment during the winter nights make crops particularly susceptible to frost. Moreover, the lack of rainfall during the winter makes practicing rain-fed agriculture impossible. As a result, agriculture is practiced during the warmer, humid summer months from December to March, when there is more cloud coverage during the day that reduces frost risk and rain that allows for rain-fed agriculture. Rain-fed agriculture during the rainy season, however, is not simple partly because of the high rates of evapotranspiration and the spatial distribution of rainfall throughout the Altiplano (Garcia et al. 2007). Furthermore, the Garcia et al. 2007 study comparing four central agricultural locations of the Bolivian Altiplano—Belen at 3820 masl and Viacha at 3830 masl in the north and Patacamaya at 3789 masl and Oruro at 3708 masl in the south—demonstrate that climatic conditions in the northern Altiplano area are better suited for agriculture than they are in the southern Altiplano area. Their data shows how minimum temperatures and the onset and duration of the rainy season decreases from north to south, which suggests that "climate-wise crop production" in the northern Altiplano lasts for 5 months and crop production in the southern Altiplano lasts for 4 months (Garcia et al. 2007: 109).

2.3 A Socio-Ecological History of the Andean Altiplano Cultures

Chilean or Peruvian coastal people first occupied the Lake Titicaca Basin around 11,000 to 10,000 years ago (Bruno 2008: 14 [Aldenderfer 1998: 138]; Marsh 2016 [Aldenderfer 1998] Stanish 2003), after the Pleistocene glaciers had retreated (Bruno 2008). The Early Archaic (8050 B.C. to 6050 B.C.) people of the basin were nomadic hunters, gatherers, and foragers who traveled with herds of guanacos and vicuñas (Marsh 2016; Stanish 2003) and who set up their temporary settlements (roughly 0.60 ha in size) in the high *puna* grasslands, where their wild camelids could graze (Bruno 2008: 14 [Klink 2005: 19-22]). Throughout the Middle Archaic period (6050 B.C. to 4050 B.C.), populations increased in size, but settlement-size decreased, suggesting people joined smaller mobile bands to acquire various resources dispersed throughout the Altiplano (Bruno 2008: 15 [Klink 2005: 18]). By the Late Archaic period (4050 B.C. to 2450 B.C.), Altiplano lifestyle became more sedentary, and the use of wild-plant resources intensified

(Bruno 2008: 15 [Aldenderfer 1989: 134; 1998: 261]). Wild plant foods likely comprised of totora reeds (*Schoenoplectus californicus*), cacti, *Polygnoum* sp. seeds and *Portulaca* sp. seeds and greens[3] (Bruno 2008: 24), Poaceae grasses, Amaranthaceae seeds, and woody plant, *Discaria chacaye* (G. Don) Tortusa (Ortíz 2019: 70-1).

Lake core data suggests that the ecology of the Lake Titicaca Basin became extremely dry, or "desert-like," in the mid-Holocene (ca. 5750 – 1550 B.C.). During this dry period, precipitation was infrequent, and Lake Titicaca was the lowest[4] it had ever been throughout the Holocene, somewhere between 50 to 100 meters lower than its present level (Kolata 2003; Marsh 2015; Marsh 2016: 126 [Wirrmann and Oliveira Almeida 1987; Wirrmann and Mourguiart 1995; Seltzer et al. 1998; Cross et al. 2000; D'Agostino et al. 2002]). There is little archaeological evidence that sheds light on how the Lake Titicaca people adapted to the aridity, but surveys suggest that the foragers left the drier Altiplano area for the wetter highlands found west and north of the lake (Marsh 2015; Marsh 2016 [Marsh 2015: 19-20]).

Around 1600 B.C., precipitation increased in both quantity and frequency (Marsh 2016 [Abbott et al. 1997a, 1997b; Mourguiart et al. 1998; Seltzer et al. 1998; Cross et al. 2000; Paduano et al. 2003; Tapia et al. 2003; Baker et al. 2005]), and lake levels overflowed, streaming water south for the first time in thousands of years (Marsh 2016 [Rigsby et al. 2005). Marsh (2016) argues for an "emergent episode" (1590 B.C. to 1170 B.C.) into settled life (2016: 123, 131), or a causal relationship between the ecological processes that mark the end of the mid-

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[3] Bruno cites Eisentraut (1998:177-178) and Whitehead (2006: 272) to note the presence and higher density—compared to later periods—of these wild plants during the Early Formative (2008: 24). I have had a difficult time finding sources that list the wild plants gathered in the Altiplano throughout the Archaic Period, but I believe these wild plants found in Early Formative samples were the wild plants consumed earlier.

[4] Kolata (2003) claims that the lake was about 50 meters below its present level, while others (Marsh 2016: 126 [Wirrmann and Oliveira Almeida 1987; Wirrmann and Mourguiart 1995; Seltzer et al. 1998; Cross et al. 2000; D'Agostino et al. 2002]) claim that the lake was 100 meters lower than its modern levels.

Holocene dry period and the cultural shifts from hunter-gatherer communities to settled herding and farming cultures. According to Marsh, the people who had abandoned the mid-Holocene desert quickly resettled once the environmental conditions became more hospitable (2016: 123).

Stanish (2003), on the other hand, argues for a more gradual transition into settled life. He notes that although sedentary villages characterize the Early Formative period (2000 to 1300 B.C.) of the Titicaca Basin, this does not mean that people had given up the hunting, gathering and fishing that they had practiced throughout the Late Archaic in exchange for agriculture (2003). In other words, the Early Formative is characterized by mixed subsistence strategies (Bruno 2008: 21 [Bandy 2001: 296; Bandy 2006:206; Stanish 2003:106; Stanish 2006:380]; Stanish 2003)]. By 1550 B.C. (Marsh 2016 [Kent 1982; Warwick 2012]), guanacos and vicuñas are respectively domesticated into llamas and alpacas (Marsh 2016 [Rick 1980; Browman 1989b; Kuznar 1990; Bonavia 1999; Mengoni Goñalons and Yacobaccio 2006]). There is evidence of small-scale agriculture of tubers (Bruno 2008) and domesticated quinoa (*Chenopodium quinoa*) (Bruno 2008 [Bruno and Whitehead 2003: 350; Whitehead 1999:18]), and there are also particularly high densities of wild plant foods Poaceae, *Polygnum* sp., and *Portulaca* sp. in Early Formative samples (Bruno 2008 [Whitehead 2006: 272]). Finally, Stanish emphasizes the importance of lacustrine resources, such as fish, fowl, and totora reeds, and he uses Mosley's maritime hypothesis (1975, 1992) as a framework to suggest that the rich resources from Lake Titicaca and the fresh-water riverine environments permitted sedentary lifestyles and contributed to the origins of social complexity in the Lake Titicaca Basin (2003: 99-100, 108).

The Early-Formative origins of the economic triad of pastoralism, agriculture, and lacustrine exploitation characterize the cultures of the Formative period (Stanish 2003: 101), and the Altiplano's first ranked societies develop in the Middle Formative period. The formation of complex labor systems becomes obvious in architectural remains and evidence for specialized stone and ceramic practices. Moreover, evidence gathered from the Island of the Sun shows that terraced agriculture was practiced (Stanish 2003: 109) and that the development of the raised-field system also occurred during this time (Marsh 2015; Marsh 2016: 128 [Erikson 2000; Stanish 2003; Bandy 2005]; Stanish 2003: 109).

By the late Middle Formative period, starting around 500 B.C, there were several autonomous polities in the region, and two in particular, the Tiwanaku[5] and the Pucara, grew in size and complexity. The Tiwanaku and the Pucara became the top governing polities by the end of the Upper Formative period, and evidence suggests that there was much conflict between them (Stanish 2003: 5). Eventually, the Pukara polity fell around A.D. 200-300, while the Tiwanaku culture further developed in the Altiplano, its core region (Stanish 2003: 7-8).

2.4 Tiwanaku Culture and Agricultural Resources of the Altiplano

The Tiwanaku civilization inherited the Formative highland agricultural tradition. Tiwanaku controlled the south-central Andean region from A.D. 500 to A.D. 1000. The type site of the Tiwanaku culture is located 3800 masl and 20 km south of Lake Titicaca (Goldstein 2005). Dense populations existed in the Altiplano. It has been estimated that the urban area of the Tiwanaku type site extended over an area of 4 km^2 and held between 25,000 to 40,000 people (Bermann 1997 [Kolata 1993; Ponce Sanginés 1980]; Goldstein 2005 [Browman 1978, 1984b: 124; Kolata 1993: 30; Ponce 1972]). Mathews' 1989 survey, however, suggests that the core area was 8-9 km^2 and may have held over 40,000 people. Kolata (1993: 205)—including the Catari-, Tiwanaku-, and Machaca-Desaguadero-drainage settlements in his regional estimate—argues for

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[5] The origins of the Tiwanaku culture have not been clearly determined. The earliest Tiwanaku pottery, a "coarsely polished, deeply incised brown ware and a well burnished polychrome painted ware," were recovered from Ponce's excavations in the Kalasasaya precinct that he dated to 400 B.C. – A.D. 100 (Goldstein 2005: 69).

a centralized population of 115,000 and a supporting rural population of 250,000 (Goldstein 2005).

The Tiwanaku people inhabiting the “core” region relied on a “triad” of resources that involved pastoralism, the exploitation of lacustrine resources, and agriculture (Bermann 1997 [Albarracin-Jordan 1992]; Goldstein 2005; Stanish 2003). Domesticated llamas and alpacas were beasts of burden and also sources of wool and food for the people (Goldstein 2005 [Bermann 1994, 1997; Browman 1974, 1980b, 1984b, 1993; Lynch 1983; Webster 1993]). Moreover, people living in the Taraco Peninsula and at Tiwanaku relied heavily on camelid dung to fuel their hearths (Bruno and Hastorf 2016). Other mammals that inhabit the Altiplano include deer, vicuña, guanaco, wild cats, foxes, and *cuys* (Binford and Kolata 1996: 45), and people used snares, bow and arrows, darts, slings, and bolas to hunt these animals (Goldstein 2005).

Vast beds of totora, which is a sedge plant of the family Cyperaceae, characterize the lake and are habitats and food for lake organisms. The species *Schoenoplectus totora* and *Scirpus totora* have been essential resources to people of the Altiplano, serving as a “source of food, fodder, fiber for clothing, building material for houses, boats, and even islands” (Binford and Kolata 1996: 41). On small totora-reed boats, people caught fish, birds, and amphibians from the lake and the lake edge (Goldstein 2005; Stanish 2003).

The Altiplano’s extreme solar radiation throughout the day and freezing temperatures at night lead to frost, which is a great barrier to farming (see *2.2 The Agroecological Zones of the Andean Altiplano* for more details). Tiwanaku farmers worked with a dry season and a rainy season (Stanish 2003) and created a raised-field system that covered an area of about 120,000 ha (Goldstein 2005 [Kolata 1986, 1989, 1993, 1996a, Denevan 1970, 1980; Erickson 1984, 1987, 1999; Graffam 1988; Kolata 1982, 1983, 1986, 1991; Lennon 1982; Mathews 1989]; Kolata

1986), with a larger concentration of raised fields bordering the lake (Stanish 2003). To create a raised field, farmers excavated sediment and built a large mound of earth above the water level that served as moist planting platform (Erickson 1988; Kolata 1986; Stanish 2003). The system protected against frost because the water canals between the raised fields would store solar energy radiated throughout the day, and the heated water would then warm the surrounding soil after sunset (Binford et al. 1996; Goldstein 2005 [Kolata and Ortloff 1989]). Moreover, to preserve the canals, farmers collected the high-nutrient, organic sediment that accumulated in the canals that could then be used as fertilizer (Binford et al. 1996; Goldstein 2005 [Carney et al. 1993]). Finally, the raised-field system extended the habitat of the fish, birds, and amphibians, since the drainage ditches and canals formed “artificial wetlands” (Goldstein 2005: 78-9 [Kolata 1993: 221]).

Throughout the Middle Horizon (400-1100 AD), Tiwanaku farmers inhabited the valley surrounding the core (Langlie 2018 [Albarracin-Jordan and Mathews 1990]), engaged in agricultural practices suitable to the environment, and could in turn productively grow crops such as quinoa (*Chenopodium quinoa*), kiwicha (*Amaranthus caudatus*), potatoes (*Solanum tuberosum*), and other tuber crops oca (*Oxalis tuberosus*), olluco (*Ullucus tuberosa*), isanu (*Trapeolum tuberosum*), and mashua (*Tropaeolum tuberosum*) (Bermann 1997; Berryman 2010 [Carter 1976; Bruno 2008; Johnsson 1986]; Bruno and Hastorf 2016; Goldstein 2005 [Browman 1984b; Towles 1961; Weberbauer 1936]; Kolata 1986; Langlie 2018 [Hastorf et al. 2006; Wright et al. 2003]; Lennstrom et al. 1991). It is useful to consider Amaranthaceae cultivars and *Solanum tuberosum* in detail because these were staple foods to the Tiwanaku people.

2.5 Highland Cultivars

2.5.1 Amaranthaceae: Chenopodium quinoa (Quinoa)

Chenopodium quinoa is an Altiplano-originating cultivar that may grow as high as 3500-4000 masl (Aguilar and Jacobsen 2003). There is evidence of Chenopodiaceae in Altiplano pollen column samples dating as far back as 9,050 – 7,050 B.C. (Ortiz 2019 [Heusser 1983; Villagrán and Varela 1990; Rojas 1991; Villa-Martínez et al. 2003; Maldonado and Villagran 2002, 2006]). Archaeobotanical studies have uncovered charred *Chenopodium* seeds with morphological characteristics that show emerging human manipulation, suggesting that people did not simply gather chenopods from 3000 to 300 B.C. (Ortíz 2019 [Cornejo et al. 1998; Planella et al. 2005, Planella et al. 2011; Planella et al. 2014a]) but cultivated the plant, enhancing its survival (Langlie 2018 [Harris and Hillman 1989]).

Interestingly, *Chenopodium quinoa* (quinoa) was domesticated during the dry mid-Holocene period just before precipitation increased around 1600 B.C. (Marsh 2016). Evidence of domestication—or morphological change (Langlie 2018 [Harris and Hillman 1989]) of the seed—in the western highlands dates to 1740 B.C., and evidence of domestication near the lakeshore dates to 1720 B.C. (Marsh 2016:126 [Murray 2008: 83, Table 3]). Following the marked period of increased precipitation in 1600 B.C., domesticated quinoa rapidly diffused to the southern shore around 1480 B.C. and further moved hundreds of kilometers south by 1270 B.C. (Marsh 2016 [Browman 1989a; Eisentraut 1998; Bruno and Whitehead 2003; Whitehead 2007; Langlie et al. 2011]). Marsh notes how the diffusion of quinoa occurred with the development of ceramic technology around 1490 B.C. (Marsh 2016 [Marsh 2015]) and how the technology seems to spread to already-occupied areas surrounding the lake and in the southern portion of the basin within 160 years (Marsh 2016).

Evidence shows that Early Formative Altiplano people harvested quinoa on a small scale. Bruno's (2001: 96-98) findings of the weedy variety, *quinoa negra*, in equal or greater proportions to quinoa in Early Formative samples has led Bruno and Whitehead (2003) to argue that people consumed both varieties during this time (Bruno 2008: 22 [Bruno and Whitehead 2003: 351]; Bruno and Whitehead 2003). Throughout the Middle Formative, people more carefully selected seeds (Berryman 2010 [Bruno and Whitehead 2003]) and separated the weedy counterpart, *quinoa negra* (Bruno 2008 [Bruno and Whitehead 2003: 351]; Langlie 2018). Quinoa agriculture grew, and the cultivar became a staple food by the Late Formative. Wright et al. (2003) argue that quinoa become the most important food source to the Tiwanaku residents of the southern basin (Berryman 2010: 88 [Wright et al. 2003]). People used quinoa to thicken soups and grounded the seeds to make *chicha* and flour (Biwer 2019 [Towle 2007: 36]). In the Wright et al. (2003) studies, chenopod densities and ubiquities were greatest throughout the Late Formative and Tiwanaku sites. More specifically, they propose that the raised fields at the site of Lukurmata were created for the cultivation of quinoa, and although quinoa was found in every home, they suggest that lower-status residents at the site of Tiwanaku more commonly consumed quinoa—in addition to potatoes—than higher-status residents did (Wright et al. 2003).

2.5.2 Amaranthaceae: Amaranthus caudatus (Kiwicha)

Amaranthus sp. was originally grown in the high-altitudinal zones (2000-4000 masl) with frost-resistant crops (Pearsall 2008: 107). Along with tubers, Middle-Horizon Altiplano famers grew quinoa and *Amaranthus* sp. in the valleys surrounding the Tiwanaku urban center (Langlie 2018: 170 [Hastorf et al. 2006; Wright et al. 2003]). *Amaranthus caudatus* (kiwicha) is one of 60 species of *Amaranthus* and one of few that has been domesticated. Kiwicha is grown in the Peruvian, Bolivian, and northwestern Argentinian Andes (Towle 1961). Sauer (1967) describes how kiwicha is often categorized with quinoa in the chronicles (1967: 127). Although both are consumed as grain crops, kiwicha grows better in water-scarce environments than quinoa does because *Chenopodium* seeds contain bitter saponins that must be drained from the seeds (Sauer 1967: 128).

Amaranthus sp. is similar to *Chenopodium* sp. because they may enter the archaeological record in various ways. Each taxon may be thought of as a field weed (Biwer 2019; Bruno 2014: 7; Lennstrom et al. 1991) that is found in “canal fed small holdings” between 1400 and 2500 masl (Biwer 2019:125) and in “disturbed habitats” (Lennstrom et al. 1991: 6). In addition, *Amaranthus* sp. and *Chenopodium* sp. may act as food for people or livestock (Biwer 2019: 125 [Brack and Egg 1999]). Both *Amaranthus* sp. seeds and leaves may be eaten or used medicinally to treat diarrhea, sore throat, cramps and rashes (Biwer 2019: 126 [Brack and Egg 1999: 27]). Sauer (1967) writes, “Any amaranth seeds, so far as is known, are quite edible when simply toasted and milled, tasting much like true cereals” (Sauer 1967: 104).

2.5.3 Solanaceae: Solanum tuberosum (Potato)

Solanum tuberosum (potato) was first domesticated at about the same time as when quinoa was domesticated (Marsh 2016 [Rumold 2010]; Rumold and Aldenderfer 2016). The origin of the potato—along with the origin of other tuber crop, oca—has been located to the south-central Andean region (Emshwiller and Doyle 2002; Rumold and Aldenderfer 2016 [Emshwiller and Doyle 2002; Spooner et al. 2005; Wilson 1990]). Like quinoa, potatoes grow well in the upper elevation zones that reach 2000 and 4000 masl (Biwer 2019; Pearsall 2008 [Hawkes 1990]), and potatoes—some varieties better than others—may grow as low as sea level.

Wild *Solanum* finds date as far back as the last glaciation, around 10,000 years ago (Rumold and Aldenderfer 2016 [Hawkes 1990]), and although the tuber had evolved in cold and high-altitude environments, it began to adapt to other areas. For example, ancestral species, *S. candolleanum*, is found throughout southern Perú and northwestern Bolivia (Rumold and

Aldenderfer 2016 [Hawkes 1990]). In their study, Rumold and Aldenderfer (2016) analyzed 141 starch microremains from 14 ground-stone tools found at the site of Jiskairumoko of the western Titicaca Basin. Dating to the Late Archaic and to the Early Formative periods (around 3400 cal y BC to 1600 cal y BC), the site reflects the beginning of camelid pastoralism and chenopod cultivation, the shift to a sedentary lifestyle and the production of food, and the rise of socioeconomic differentiation. These factors, along with the distribution of *S. candolleanum*, make the Jiskairumoko an appropriate place to investigate inquiries related to potato domestication and early cultivation (Rumold and Aldenderfer 2016: 1). Interestingly, 35 percent of the 141 starch grains analyzed here were identified as cultivated potato, enough to argue for the exploitation of potatoes shortly following the exploitation of quinoa (Rumold and Aldenderfer 2016: 3-4).

Today, the southern Titicaca Basin diet consists largely of tubers, and people rely most heavily on potatoes (Berryman 2010). The diversity of potatoes is greatest in the central Andes (Pearsall 2008). More than 200 potato varieties have been recognized in the Altiplano (Berryman 2010 [Carter 1976; Le Barre 1947]), and the variation might reflect people's experimentation with high-altitude cultivation (Berryman 2010 [Murra 1980]).

It is certain that tubers were cultivated in the Early Formative period (Berryman 2010 [Browman 1989; Erickson 1976; Whitehead 2006]; Rumold and Aldenderfer 2016). Potatoes were often freeze-dried, or made into *chuños*, that could be stored as surplus (Berryman 2010 [Carter 1976]; Goldstein 2005: 78). There is conflicting evidence to help explain the importance of tubers to the Tiwanaku people (Berryman 2010), but part of this might have to do with the fact that tubers are not preserved as well as seed plants in the archaeological record (Berryman 2010; Bruno 2008: 23 [Wright et al. 2003: 388]). Tubers are often boiled (Berryman 2010), while seeds, such as chenopod seeds, are often toasted and become carbonized (Bruno 2008). Moreover, the thin-walled storage tissues of tubers easily decompose in fires (Bruno 2008), and although some tubers have tougher skin layers, many skin peelings that are sometimes leftover are thin and quickly decay or become fragile when charred (Pearsall 2019).

In relation to her studies at the Taraco peninsula, Bruno (2008) interprets the decline in presence and density of quinoa and the increase in *Solanum* sp. from Middle-Formative samples to Late-Formative samples to indicate a shift in production, where tubers increased in importance and diets were comprised of mixed grains and tubers[6] (Berryman 2010: 86 [Bruno 2008]; Bruno 2008:480). On the other hand, from their studies at the Tiwanaku core, Lukurmata, and Tiwanaku valley sites, Wright et al. (2003) argue that quinoa was more important to Late Formative and Tiwanaku period populations because of the low tuber ubiquity at most sites and the decrease in tubers following the Late Formative period and into the Tiwanaku period (Berryman: 86 [Wright et al. 2003]; Wright et al. 2003). Findings at Tiwanaku suggest that low-status people consumed more tubers than high-status residents did (Berryman 2010 [Wright et al. 2003]).

2.6 The Agrarian Ecology of the Coastal Valleys

Throughout the Middle Horizon from A.D. 600-1100, Tiwanaku culture expanded west into the lower-elevation coastal valleys of southern Perú and northern Chile. This region, an extension of the Atacama Desert, is one of the world's driest deserts. Rivers that originate in the Andean foothills and that flow west toward the Peruvian coastal region create productive oases in the hyper-arid neighboring valleys that are suitable for growing lowland crops that cannot be

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[6] Bruno also found a few small maize-kernel fragments in Late Formative samples, and although "maize did not become a local crop at this time," she argues that Late Formative crop production became more diverse as people adopted maize agriculture during this time (Bruno 2008: 480).

grown in the Tiwanaku core region (Goldstein 2005). The Tiwanaku established colonies in these valleys, such as the Osmore drainage site of Omo (900 to 2000 masl) and the Rio Muerto site of M43 (900 masl) of the Moquegua Valley and the site of Cerro San Antonio (600 masl) of the Locumba Valley. I will now discuss the agrarian ecology of the coastal valleys to understand the environment of the Tiwanaku colonial site of Cerro San Antonio (L1), and this ecological understanding will be used in the PAL 2019 PEB Analysis to help distinguish highland-associated (nonlocal/Tiwanaku) cultivars from lowland-associated (local/Locumba) cultivars.

The primary environmental limit in coastal Peru (western region roughly below 2500 masl) is the rain shadow effect caused by the cold Peruvian Humboldt Current. The current is largely responsible for turning the Peruvian coastal zone into one of the world’s driest deserts (McEwan 2006; Sandweiss 2003). The Humboldt Current that begins in Antarctica and flows north along the Chilean and Peruvian coasts in combination with the southeast trade winds causes cold-water upwelling to occur in the Peruvian coastal waters (McEwan 2006).

The upwelling results in a constant vertical flow of water that rises somewhere between 1 to 3 meters per day depending on the surrounding ecological conditions. The cold Peruvian ocean waters cause the overlying air to cool, and little evaporation occurs since the cold air is incapable of holding very much moisture (McEwan 2006; Moseley 1975). The cold air warms as it moves inland. The air’s ability to hold moisture increases, and this causes the air to retain the small amount of moisture that it carries. This results in nearly no precipitation over the coastal region. Clouds form as the air increases in elevation and reaches the colder, higher altitudes. The skies are overcast from June to November when these cold clouds become trapped beneath a mass of warmer, high-altitude air. The warm air above the clouds cools from December to May, and the cooling events allow the clouds to increase in elevation above 2500 meters and precipitate as rain over the Andes (McEwan 2006; Moseley 1975). In short, the Andes are in a dry season during the Peruvian coastal foggy period, while the Andes are in a rainy season during the Peruvian sunny period (Moseley 1975).

The cold-water upwelling that occurs from the Humboldt Current and trade winds also creates a highly productive maritime environment. The rising abyssal ocean waters contain high chemical nutrients such as phosphates and nitrates that enhance primary maritime productivity in the shallower coastal zone. Ultimately, these processes create an environment with rich marine biodiversity (Moseley 1975), and marine resources were likely useful to Tiwanaku residents of Cerro San Antonio, a coastal-valley site located 35 km from the Pacific Ocean waters.

Peruvian coastal people depend heavily on maritime resources and have relied on these resources since the origins of Andean civilizations on the Peruvian coastal region 5000 years ago (Moseley 1975; Quilter & Stocker 1983). Phytoplankton and zooplankton flourish because of the coastal upwelling effects and become the foundation of the coastal food chain. Small fish such as anchovies and sardines prey on plankton, while larger fish and oceanic birds feed on these smaller fish (Moseley 1975). Large Peruvian fish include grunts, drums, mullet, bonito, flounder, catfish, bennies, sharks, and rays, and smaller fish including anchovies and sardines were dried and shipped to inland agricultural communities via llama caravans throughout both pre-Inka and Inka periods (Glowacki 2005 [Marcus et al. 1999]; Marcus et al. 1999; Quilter and Stocker 1983). Marine algae was also dried and sent to the highlands for consumption (Quilter and Stocker 1983 [Masuda 1981 182-187; Horkheimer 1973: 105]). Mollusks, notably *Choromytilus chorus* (mussels), and crustaceans were valuable sources of protein to both coastal and more inland people (Quilter and Stocker 1983). Colonial records mention how salt, fish, shellfish, *cochayuyu* (edible algae), and guano were transported on llama caravans from the coast to the highlands through the Moquegua Valley (Goldstein 2005: 117).

Because it rarely rains, all agriculture in the coastal region—such as at Omo (900 to 2000 masl), at Rio Muerto (900 masl), and at Cerro San Antonio (600 masl)—depends on runoff from the Andean zone that is located roughly 50 kilometers inland from the coastal zone. Most of the rivers that originate in the Andean highlands stream east into the Amazon River. Rivers, however, do flow west towards the coastal desert and form productive oases and patchy riverbanks that are located at around 1000 masl (Goldstein 2005; McEwan 2006: 21; Salomon and Urioste 1991: 46). These valleys have proved substantial for the development of irrigation systems and are an adequate environment for growing coca leaves, avocados, peanuts, beans, squash, gourds, maize, peppers, maniac, sweet potatoes, and cotton (McEwan 2006; Goldstein 2005; Salomon and Urioste 1991). Guavas, pineapples, cherimoyas, and lúcumas are amongst the various fruits that are grown in the coastal valleys (McEwan 2006).

It is useful to consider maize, peanuts, beans, carob beans, chili peppers, and cotton in detail because these are lowland cultivars that appear in PAL 2019 PEB samples. In general, the lowland crops discussed in the next section, *2.7 Lowland Cultivars*, grow between 0 to ~2000 masl, and this is represented in Figure 4 below. Although Figure 4 is an oversimplification, it is meant to show that lowland cultivars do not generally grow higher than 2000 masl because frost is an agroclimatic constraint for these crops. On the other hand, Amaranthaceae cultivars and potatoes introduced earlier in this paper are associated with the highlands because they originated here and are tolerant to frost and may grow as high as 4000 masl. It should also be noted that highland crops—some varieties better than others—can grow at lower elevations.

A Topographic Map of the Locumba Valley and Neighboring Andean Region

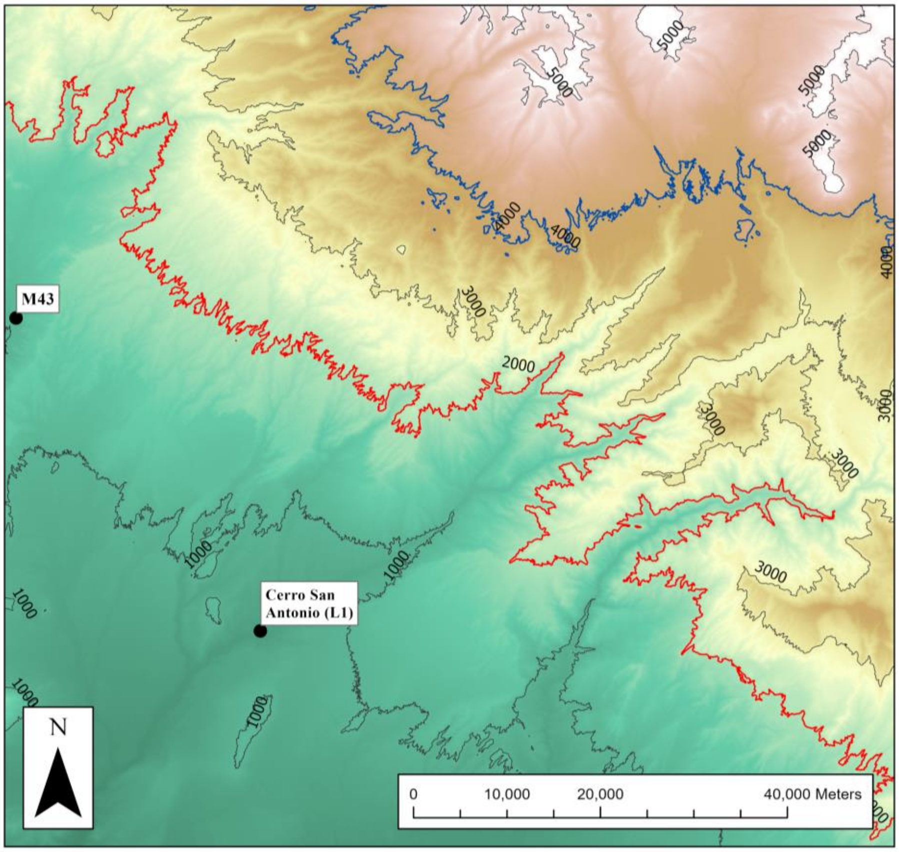

Figure 4: The upper elevation limit of lowland crops is represented as the red contour line, while the upper elevation limit of highland crops is represented as the blue contour line.

2.7 Lowland Cultivars

2.7.1 Poaceae: Zea mays (maize)

Evidence at the Central Balsas Valley, Mexico suggests that *Zea mays* (maize) was domesticated from its wild progenitor, *Zea mays* ssp. *Parviglumis* (teosinte), as early as 6750 B.C. (Biwer 2019 [Piperno et al. 2009]; Piperno et al. 2009). The cultivar's migrations south are traced in the Columbian northern Andes around 6000 B.C. and in the Ecuadorian coastal zone around 5000 BC (Biwer 2019 [Pearsall 2008]). In Perú, the earliest findings of maize date to 3000-1800 B.C. in Norte Chico (Biwer 2019 [Haas et al. 2013]) and to 2300-2200 B.C. at Caral, where it arrived via long-distance exchange (Biwer 2019 [Shady Solis 2006]; Shady 2006: 381), which are both sites in the coastal region. According to Shady, the cultivar's low count at Caral and its late arrival to the site indicate that maize was insignificant to people's daily diet and to the development of the economy. Nevertheless, maize was valued and associated with ritual contexts at Caral (Shady 2006).

By the Initial Period (1800 to 800 B.C.) and throughout the Early Horizon (800 to 400 B.C.), Peruvian coastal people widely grew maize (Biwer 2019 [Pearsall 2008]). At Moquegua, the beginnings of maize agriculture likely date to around 920 to 530 B.C (Biwer 2019 [Owen 2009: 137; Owen 2009), and maize became a larger part of the Moquegua diet by the Early Ceramic period, sometime between 920 B.C. to A.D. 220 (Owen 2009: 137; 140). According to Goldstein (2003; 2005), however, maize was not a significant part of the Moquegua-resident diet until Tiwanaku colonization. The first agriculturalists in the Moquegua Valley—associated with the Huaracane tradition—were coastal people whose diets comprised of little maize and C4 plants (3 to 18 percent) but comprised largely (23 to 50 percent) of marine foods, such as fish, shellfish, and maybe algae (Goldstein 2003). To describe the dietary contribution of maize to the Huaracane people, Goldstein writes, "Maize was probably little more than a supplemental food in a diversified one-pot cuisine of neckless *olla* stews" (2003).

Maize readily grows in the Peruvian coastal valleys, and scholars argue that the Tiwanaku expansion into these valleys —especially the Moquegua Valley—was largely driven by the desire to acquire maize (Goldstein 1989; Goldstein 2003; Goldstein 2005; Hastorf et al. 2006 [Kolata 1993; Sangines 1980; Rodriguez 1998; Rodriguez 2001; Goldstein 1989; Goldstein 1990; Goldstein (Ed.) 1993; Goldstein 1993; Janusek 2002; Kolata 1986; Torres 2001; Knobloch 2000]; Langlie 2018 [Goldstein 2000, 2003; Hastorf et al. 2006]). High ubiquity and concentrations of maize have been recovered from Tiwanaku colonial sites in the Moquegua

Valley, or more specifically, from domestic and funerary contexts at Rio Muerto (Somerville et al. 2015 [Vergel and León 2009]), from the domestic contexts at Omo M10 (Somerville et al. 2015 [Muñoz Rojas et al. 2009]), and from the Omo Temple (Gaggio 2014; Somerville et al. 2015 [Gaggio 2014; Gaggio and Goldstein 2015]). Moreover, the Sandness 1992 study suggests that maize and C4 plants comprised somewhere between 46 to 76 percent of the Tiwanaku colonial diet (Goldstein 2003 [Sandness 1992: 49]). Finally, there seems to have been a surplus of maize within the Moquegua Valley, and maize-cupule analysis suggests that much of this surplus was exported to the Tiwanaku core region (Somerville et al. 2015 [Hastorf et al. 2006]).

The Tiwanaku particularly valued maize because the cultivar could be brewed into the alcoholic beverage *chicha*, and in addition to importing the cultivar, the Tiwanaku core learned to grow the crop in the "microclimatic pockets" found in close proximity to the lake (Bruno 2008 [Ramírez et al. 1960]; Langlie 2018). *Chicha* has been socially, spiritually, and politically significant to Andean people (Goldstein 2003; Goldstein 2005; Hastorf and Johannessen 1993). *Chicha* is supplied and consumed during labor parties, planting and harvesting ceremonies, and feasts (Hastorf and Johanessen1993 [Cavero Carrasco 186; Skar 1981; Wagner 1978]). Hastorf and Johannessen cite Allen (1988) to describe *chicha* as a "prime mediating substance," and to elaborate on this, they write, "It is a symbolic seal to contracts—spiritual (e.g., asking for fertility of the herds and land), economic (e.g., work and exchange of goods), and social (e.g., marriage)" (Hastorf and Johannessen 1993: 118).

Goldstein (2003) emphasizes the economic role of *chicha* and how the tradition of sponsored work-party feasting in which *chicha* was consumed was a way for the Tiwanaku polity to control production: the surplus of maize led to the consumption of *chicha*, the consumption of *chicha* promoted labor, and finally, controlling production meant prestige

(Goldstein 2003: 145 [Dietler 1998: 368]). The beginning of social inequality through an asymmetrical exchange of labor for *chicha* began with the Tiwanaku, and the political value of maize further developed during Inca state-level feasts (Goldstein 2003: 148). According to Goldstein (2003), this Tiwanaku "exploitation beneath a mask of reciprocity" (Goldstein 2003: 146 [Platt 1986: 257]) is detectable in the archaeological record through the development and diffusion of an archaeological assemblage comprised of vessels made for *chicha*-making and -drinking, such as the *kero*. The development of this functional assemblage occurred in the Tiwanaku core sometime between A.D. 350 to A.D. 600, just before Tiwanaku expanded into the maize-producing valleys (Goldstein 2003: 148).

Although the Tiwanaku people valued maize the most, residents in the Moquegua and Locumba valleys would have had access to other lowland crops (Biwer 2019 [Biwer 2012; Biwer and Nash 2017; Whitehead and Biwer 2012; Goldstein et al. 2009; Moseley et al. 2005; Nash 2011, 2012a]; Goldstein 2005). The lowland food crops *Schinus molle* (*molle* pepper), *Arachis hypogea* (peanut), *Phaseolus* spp. (bean), *Prosopis* sp. (algarrobo/ carob bean), *Capsicum* spp. (*ají*/ chili pepper), and the lowland industrial crop, *Gossypium* spp. (cotton) are presented below because they are largely part of the focus of the results and the analysis of this paper.

2.7.2 Anacardiaceae: Schinus molle (molle/ Peruvian pepper)

The woody *Schinus molle* (*molle*) tree originated in the Andes (Goldstein and Coleman 2004 [Record and Hess 1972(1943)]) and grows from the Peruvian coastal region to the Amazonian lowlands. The plant grows in the Andes at elevations as high as 3600 masl, but larger *molle* plants are limited to ecological zones no higher than 2800 masl (Goldstein and Coleman 2004). The *molle* plant serves various purposes. The trunk of the plant may be used as fuel or as a building material (Biwer 2019 [Brack Egg 1999; Yacovleff and Herrara 1935]; Goldstein and

Coleman 2004 [Breck Egg 1999; Yacovleff and Herrara 1935] especially in tree-barren areas (Biwer 2019). The resin of the plant may act as an insect repellent for humans to rub on their bodies or to plant near fields, and the leaves, branches, and fruits have been purposefully placed in and around middens to ward off invertebrates (Biwer 2019 [Brack Egg 1999: 450-451]; Goldstein and Coleman 2004 [Brack Egg 1999]). Medicinally, the volatile oil in *molle* leaves may act as an antiseptic or used to treat ophthalmia and rehematism (Biwer 2019 [Brack Egg 1999: 450-451; Goldstein and Coleman 2004 [Brack Egg 1999]); the plant's "white fragrant resin" may be molded into plasters to help heal fractures and ulcers (Goldstein and Coleman 2004 [Yacovleff and Herrera 1935]); and the milky sap within *molle* bark may heal swollen limbs and sores when used externally and act as a purgative or a diuretic if ingested (Goldstein and Coleman 2004 [Brack Egg 1999]). The ashes of burnt wood form an alkali that are used to purify sugar or for dye. The leaves produce a yellow textile dye, and ethnographic accounts suggest that *molle* leaves have been used as a catalytic fertilizer notably in highland maize farming (Goldstein and Coleman 2004 [Yacovleff and Herrera 1935]).

Finally, the sugar from *molle* fruits may be extracted through "soaking" or boiling (Biwer 2019 [Goldstein and Coleman 2004; Jennings and Valdez 2018; Valdez 2012]; Goldstein and Coleman 2004) and then "squeezing" techniques (Biwer 2019 [Kramer 1957: 322]) to create the alcoholic beverage referred to as *chicha de molle* (Biwer 2019; Goldstein and Coleman 2004). The brewing processes change the morphology of *molle* fruits from a "spherical" shape to an "oblong-lobed shape," which Biwer refers to as "processed" *molle*. *Chicha de molle* is associated with Wari culture because the processed fruits have been recovered from many Wari and Wari-related sites (Biwer 2019). Goldstein and Coleman note how the end product of *chicha* production, or the deposit of thousands of seeds, likely mitigated the "festering of garbage middens in populated areas.” The seeds, too, may have possibly been used as a condiment, resembling black or white pepper (Goldstein and Coleman 2004 [Brack Egg 1999).

2.7.3 Fabaceae: Arachis hypogaea (peanut)

The origin of the genus *Arachis* is presumed to be in the southwestern Mato Grosso do Sul, Brazil or northeast Paraguay because the genus’ most-ancient wild progenitors, *A. guaranitica* Chodat. and Hassl. and *A. tuberosa* Bong. ex Benth., inhabit the area today (Simpson et al. 2001). According to Simpson et al. (2001), the peanut adapted to a range of habitats from sea level to ~2000 masl, such as the northeastern Brazilian desert, the floodplains of Pantanal, and the lower Andean slopes (2001: 78). It remains uncertain where *Arachis hypogaea* (peanut) was first domesticated, but archaeological evidence of peanut shells similar to those of ancestral species’ shells that date to 1800 to 1500 B.C. were found at two Peruvian coastal sites near Casma and Bermejo. No maize was found with the more ancient-appearing shells, but interestingly, the strata above this layer contained maize and cultivated peanut shells that look similar to modern shells (Simpson et al. 2001 [Simpson, unpubl. data]). Archaeological evidence in the high Andes of northwest Argentina (A. Krapovickas, unpubl. data) suggests peanuts were first domesticated here or might indicate a “two-event” origin of *A. hypogaea* (Simpson et al. 2001: 79). Others support the northwestern-Argentinian origin of the peanut (see Pearsall 2008: 108; Dillehay et al. 2007 [Olsen et al. 2001; Jarvis et al. 2002, and Ferguson et al. 2005]).

Peanuts grow best in “sandy, well-drained loam soils” with warm temperatures and moderate quantities of water (Masur 2010 [Woodroof 1966:29]), so for highest yields, peanuts are usually grow between 46 to 1000 masl in Perú (Masur 2010 [Moseley 2001: 31]). Peanuts have long served as a high-protein complement to people’s diet. In pre-Hispanic Perú, peanuts were toasted, roasted, fried, salted, boiled, ground, mashed, added to sauces, and fermented into *chicha de mani* (Masur 2010 [Bonavia 1991: 131; Estrella 1990: 113; Fernández y Rodríguez 2007: 107; Gillian 1945: 53; Nicholson 1960). The oil and "milk" extracted from the nuts and the "juice" extracted from the leaves were used for their medicinal benefits (Masur 2010: 16 [Cobo 1890: 359-360]). As shown on Moche pottery and in burials, peanuts were particularly valued and associated with the elite in the north coast of Perú, and findings at burial contexts at the site of Amato and at Chaviña (Nasca cemetery) in the Acarí Valley and at the Paracas Necropolis site suggest that southern Peruvian cultures also associated peanuts with prestige (Masur 2010: 19-30).

2.7.4 Fabaceae: Phaseolus spp. (bean)

Throughout the Preceramic period (6000 to 4200 B.C.), beans were a staple food to Peruvian coastal people (Biwer 2019 [Hastorf 1999: 45-51]), and by the Middle Horizon (600 to 1000 A.D.), Peruvian people regularly grew beans in the temperate coastal and middle valleys (Biwer 2019; Towle 1961). *Phaseolus lunatus* (lima bean) and *Phaseolus vulgaris* (common bean) are 2 out of 170 species in the genus.

The likely origin of the lima bean has been located in Guatemala because of the distribution of wild progenitors found here (Towle 1961). The lima bean contributed largely to Peruvian coastal people's diet and had artistic and symbolic value as shown in depictions of the Nazca, Paracas, and Moche cultures (Towle 1961: 53 [Yacovleff and Herrera 1934: 287-288; O'Neale and Whitaker 1947: 320]). According to Larco Hoyle (1946), the lima bean inspired the ideographic system that was used throughout Perú and was found on Paracas, Nazca, Tiwanaku, and Lambayeque ceramics and textiles (Towle 1961 [Larco Hoyle 1946: 175]). "Beans were indented with straight, curved, broken, and parallel lines, points, circles, crosses, etc. in kidney-shaped spaces" (Larco Hoyle 1946: 175).

The common bean was separately domesticated in the Mesoamerica and in the Andes (Biwer 2009 [Bitocchi et al. 2013; Chacón et al. 2005]), and this is supported by the presence of wild progenitors in dry areas from 500 to 2000 masl from northern Mexico to northwestern Argentina (Biwer 2019). Varieties of common beans may be grown in various tropical and temperate environments but sprout quickly in temperatures above 18° C (Biwer 2019 [Brack and Egg 2009: 383]). Bean- and maize-based agriculture was established in the coastal valleys throughout the Formative Period (1000 BC to AD 500) (Hillson 2003). It is good to plant and eat maize and beans together. Interestingly, beans are a nitrogen-fixing plant and are good to plant with maize because continuously planting maize removes nitrogen from the soils. Moreover, beans are high in protein and in the amino acids lysine and isoleucine, while maize has little nutritional value and is deficient in these amino acids. Therefore, beans may be thought of as a "nutritional complement to maize" (Biwer 2019: 114 [see Mt. Pleasant 2016]).

2.7.5 Fabaceae: Prosopis sp. (algarrobo/ carob bean)

Prosopis sp. (*algarrobo*/ carob bean) readily grows in the Peruvian coastal region and in the Andean valleys (Towle 1961) and is a fundamental plant to Peruvian central and southern coastal ecosystems because it contributes to soil fertility and prevents erosion (Biwer 2019 [Beresford-Jones et al. 2009; Beresford-Jones 2011]). The *algarrobo* plant has many uses. Its pods and ground beans are used as livestock fodder, and historical records indicate that pre-Columbian people consumed the plant's seeds (Biwer 2019 [Towle 2007: 56]; Towle 1961). The tree secretes a black gum, which may have been used to restore broken ceramic vessels (Towle 1961 [Yacovleff and Herrera 1934: 292]). Finally, *algarrobo* wood may be used as fuel (Biwer 2019 [Towle 2007: 56]; Towle 1961) or for construction (Towle 1961 [Strong and Evans 1952]).

2.7.6 Solanaceae: Capsicum spp. (ají /chili pepper)

Commonly referred to as chili peppers or *ají*, domesticated *Capsicum* spp. have largely contributed to the flavors of Andean cuisine (Pearsall 2008). It is generally agreed that the origin of the genus *Capsicum* is in the eastern slopes of the Bolivian highlands. Birds likely dispersed *Capsicum* seeds throughout the Americas before humans arrived, who then intentionally domesticated the wild forms and further spread them (Chiou et al. 2017 [Andres 1984; Eshbaugh et al. 1983; Pickersgill 1977, 2009]). Five of the 25 *Capsicum* species are domesticated versions: *C. baccatum* was likely domesticated in a low-elevation area somewhere between coastal Perú and Brazil; *C. chinense* and *C. frutescens* likely originated in the northeastern Amazonian area (Chiou et al. 2017 [Moses and Umaharan 2012; Pickersgill 1972; Aguilar-Meléndez 2006; Hernández-Vedugo et al. 1999; Perry and Flannery 2007)]; *C. pubescens* has highland origins, likely in the Andes; and *C. annum* is from Mexico (Chiou et al. 2007 [Aguilar-Meléndez 2006; Pickersgill 1972]).

In Perú, the earliest archaeological evidence of the chili pepper dates to roughly 8000 B.C., at the Guitarrero Cave of the Callejón de Huaylas (~2500 masl) (Chiou et al. 2017 [compare Kaplan and Lynch 1999; Mosely 2001; Pearsall 2008]). The chili pepper arrived to the Peruvian coastal regions early via systems of exchange (Chiou et al. 2017), and for example, there is evidence of *Capsicum frutescens* during the Caral occupation from 3000 to 1800 B.C. (Shady 2006: 387). In the central Andean region, people grew chili peppers by ~3000 B.C. (Chiou et al. 2017 [Grieder et al. 1988; Pickersgill 1969]). Starch data further confirms these claims, revealing that three domesticated species of chili pepper were being grown in the Peruvian coastal and highland regions by 2050 B.C. (Perry et al. 2007: 987).

2.7.7 Malvaceae: Gossypium spp. (cotton)

Gossypium is a genus of flowering plants that produces seed fibers, which people commonly refer to as cotton. The genus includes 15 species and several wild and cultivated varieties (Towle 1961). Four domesticated species of *Gossypium* arose independently (Bouchard et al. 2011). Two diploid species, *G. arboreum* and *G. herbaceum*, were first cultivated in the Old World, and two allopolyploid species, *Gossypium hirsutum* and *G. barbadense*, were primarily domesticated in the New World. Prehistoric *G. barbadense*, or *algodon*, is found throughout the western South American coastal region, where it was most likely domesticated (Towle 1961; Wendel et al. 2010).

The earliest archaeobotanical evidence of this species was unearthed from the central Peruvian coastal region dating to 3550 B.C. and included seeds, fibers, fruit, yarn, fishing nets, and fabrics (Wendel et al. 2010 [Vreeland, pers. comm]). The usefulness of the seeds' epidermal hairs for yarn and textile production likely motivated the independent domestication of the four *Gossypium* species throughout the globe. The earliest archaeological indications of cotton textiles date to 3000 B.C. in the Indus River Valley and to 2500 B.C. in Perú (Rost 1998). Interestingly, Peruvian people have grown cotton of colored fibers since 2500 B.C, as indicated at the Huaca Prieta site (Paulo de Carvalho et al. 2014).

2.8 Goldstein's Andean Diaspora Model (2005) to Explain Tiwanaku Expansion

In the opening chapter of *Andean Diaspora: The Tiwanaku Colonies and the Origins of South American Empire* (2005), Paul Goldstein reviews various paradigms, ranging from "globalist" models to "agency-oriented" interpretations that are used in archaeology to explain the expansion of ancient states. Goldstein (2005) acknowledges that a globalist paradigm framed his earlier 1980s-1990 findings in the Moquegua Valley involving household archaeology at

Tiwanaku colonial sites of Omo and the Tiwanaku temple at Omo. In other words, Tiwanaku was imagined as a powerful state core that conquered and dominated distant regions (Goldstein 2005: 1-2). The MAS survey work from 1993 to 1995 in combination with excavation projects led Goldstein (2005) to reconsider his earlier interpretations of Tiwanaku expansion (Goldstein 2005: 2). To explain the Tiwanaku expansion (A.D. 600-1100) into the western valleys such as Moquegua, Goldstein (2005) proposes an agency-oriented alternative to globalist paradigms, referred to as the "diasporic archipelago" model (2005: 49).

Goldstein's diasporic archipelago model is based on 1) the Andean concept of the *ayllu*, 2) diasporic movements, and 3) John Murra's (1964, 1968, 1972, 1985) archipelago model. The Andean *ayllu* is defined as "a corporate body of ascriptive identity held together by shared conceptions of behavior, history, and common ancestry" (Goldstein 2005: 29). Goldstein likens the *ayllu* to the simpler concept of ethnicity (2005: 29) and notes that functional definitions of the term imagine the *ayllu* as a "land-holding collective" (Goldstein 2005: 30 [Brush 1977:41; Rowe 1946:255]. The structural definitions stress the structural oppositions inherent of the *ayllu* (Goldstein 2005: 30 [Duviols 1974; Platt 1986], the reflexivity of the *ayllu* (Goldstein 2005: 30 [Urton 1993], and the *ayllu* tendency to structure into "nested hierarchies of moieties" (Goldstein 2005: 30 [Albarracin Jordan 1996a,b]). Goldstein also discusses how individuals within an *ayllu* participate in labor parties, ritual battles, feasts, and ritual ceremonies that strengthen the member's affiliation to the *ayllu* and the relationships between members (Goldstein 2005) and that symbolically reunite complementary oppositional structures, such as "highland and lowland" and "living and dead" (Goldstein 2005 [Bastien 1978:121]). Finally, Goldstein notes that *ayllu* identities are associated to ecological features, such as mountains and lakes, which hold ancestral associations (2005: 31-2).

James Clifford (1994) is one of the first to use the term “diaspora” to describe “expatriate minority communities” that are spatially displaced from their core region but that hold on to their ancestral home through memory and cultural practices, imagining it as a “place of eventual return” (Goldstein 2005: 32 [304]). Although more modern uses of the term depend on broader definitions, Goldstein recognizes the value in Clifford’s “diaspora” and incorporates aspects of the term into his model. Goldstein writes, “Nonetheless, as Clifford implies, the salient usage of the term ‘diaspora’ is limited to transnational communities with strong shared identities, expectation of return, and unwillingness, difficultly or inability to assimilate in host societies. Using ‘diaspora’ to refer to a specific form of identity-based community represents a general trend away from spatial definitions of community” (Goldstein 2005: 33). In short, Goldstein imagines *ayllus* as “forms of ‘ethnicity in motion’” and uses the term “diaspora” to capture this (2005: 32-3).

After describing how diasporic communities exist in motion, Goldstein notes how one might suppose that these communities should be difficult to detect through archaeological research that so heavily relies on the spatial dimension. To overcome this challenge, Goldstein suggests that if one assumes that ancient diasporic communities structured themselves in opposition to each other, then the distinctions in cultural practices, ethnicities, and spatial dimensions become obvious in the archaeological record (Goldstein 2005: 33).

Murra’s “vertical archipelago model” is the final feature incorporated into Goldstein’s diasporic model (Goldstein 2005: 39). Murra’s model (1964, 1968, 1972, 1985) explains how the Andean nonmarket system of production and exchange developed from small groups of people inhabiting opposing ecological zones of the vertically-complex ecological landscape, engaging in economic activities suitable to the zones (i.e. farming specific crops according to the elevation), and acquiring resources from the different zones through exchange (Goldstein 2005; Murra 1972). Goldstein uses the "archipelago" to imagine "expatriate ayllu communities that disperse across geographic space, yet remain tightly knit by shared identity," and in summary, he writes, "archipelagos are *ayllus* in diaspora" (Goldstein 2005: 42).

In conclusion, Goldstein argues that the Tiwanaku expanded into the Pacific coastal valleys through diasporic colonization, and he lists several features that should be detected in the archaeological record if the model holds true. The features include: (1) "permanent or long-term *residence* in complementary resource zones, (2) explicit manifestation of a maintained *identity* with the homeland nucleus, (3) *structural reproduction* of the social structure of the homeland, and (4) *multiethnicity*—the distribution of immigrant colonies interspersed with colonies of other ethnic groups" (Goldstein 2005: 42).

As mentioned (see *1.3 Locumba Settlement History and the Site Context*), Sitek and Goldstein have been investigating the Tiwanaku presence at Cerro San Antonio (L1), a site located in the Locumba Valley of the Peruvian coastal region. They are interested in learning whether or not the Middle Horizon domestic sectors at L1 reflect one or a combination of the following: 1) primary Tiwanaku colonial enclaves comprised of highland people (hypothesis 1), 2) secondary Tiwanaku colonial enclaves comprised of people from Moquegua (hypothesis 2), or 3) mostly local populations that acquired Tiwanaku material through trade or through other interregional relations (hypothesis 3) (Goldstein and Oquiche H. 2015; Goldstein and Oquiche H. 2016; Goldstein and Oquiche H. 2019; Sitek 2018: 5-6; Sitek n.d.).

As discussed in later chapters, findings from the PAL 2016 and 2019 excavations suggest that L1 is a primary Tiwanaku colony, which means that Goldstein's diasporic model (2005) may be used to explain Tiwanaku expansion into the Locumba Valley. In 2019, 36 samples from

L1 were presented to me for paleoethnobotanical analysis, and in the analysis of this thesis, I argue that the macrobotanical assemblage at L1 supports hypothesis 1 because it reflects 1) Goldstein's "explicit manifestation of the maintained *identity* with the homeland nucleus" (2005: 42) through highland-associated cultivars, such as *Chenopodium* spp. and *Amaranthus* sp., and highland-associated animals, such as *cuys* and camelids; 2) Goldstein's "*structural reproduction* of the social structure of the homeland" (2005:42), or the Andean *ayllu*, through evidence of specialization (i.e. highland versus lowland homes) and culinary differences; and 3) a similar macrobotanical assemblage to the assemblages of domestic primary Tiwanaku colonial sites at Moquegua, such as the Rio Muerto site of M43.

Chapter 3: Methodology

People are constantly interacting with their ecological environment. Ecological resources help shape the way people live, and people affect ecological systems by manipulating their surrounding landscapes, domesticating plants, and extracting resources for fuel. The constant yet dynamic relationships that exist between human beings and their plant world and that shape both culture and ecology may be referred to as "human-plant" interactions (Popper and Hastorf 1988). Paleoethnobotany,[7] also known as archaeobotany, is the study of human-plant interactions of the past (Ford 1979; Pearsall 1989; Popper and Hastorf 1988).

3.1 Macrobotanical Analysis

The 2019 paleoethnobotanical (PEB) study informs the larger Proyecto Arqueológico Locumba (PAL) directed by UCSD archaeologist, Dr. Paul Goldstein, and PhD candidate, Matthew Sitek. The PAL 2019 PEB study examined macrobotanical remains, which refers to the wide-range of plant remains, such as roots, stems, wood, fibers, sap, leaves, spines, flowers, fruits, nuts, and seeds (Gallagher 2014), that are observable with the naked eye and that may be identified using a low-power microscope (Gallagher 2014 [Ford 1979:301; Pearsall 2000: 11]; Pearsall 1989; Popper and Hastorf 1988). Macrobotanical remains are introduced to a site through anthropogenic and non-anthropogenic processes. Anthropogenic processes that purposely introduce plants to a site, such as gathering, cultivating, crop processing, and cooking, may be classified as "direct" mechanisms, and anthropogenic processes that inadvertently

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[7] In the introductory chapter of *Current Paleoethnobotany* (1988), Popper and Hastorf recognize that archaeological plant remains do not always provide insight on human activity and note a distinction between paleoethnobotany and archaeobotany based on how Renfrew (1973) and Ford (1973) define these terms. Paleoethnobotany includes the human aspect (Popper and Hastorf 1988 [Renfrew 1973: 1]), while archaeobotany is independent from the human element and has to do with the recovery and identification of plants from archaeological contexts (Popper and Hastorf 1988 [Ford 1973:1]). There is, however, little consensus on the differences between "paleoethnobotany" and "archaeobotany," and scholars use the terms differently and often interchangeably (Popper and Hastorf 1988).

introduce plants to a site, such as collecting weedy plants along with the harvest or burning dung as fuel, may be classified as “indirect” mechanisms (Gallagher 2014). Non-anthropogenic processes that introduce plants to a site might involve wind, water, insects, and/or seed-consuming or see-transporting animals (Gallagher 2014 [Cappers 1993; Minnis 1981]).

Prior to beginning the paleoethnobotanical work in Locumba from August to September of 2019, I received training from UCSD paleoethnobotanist Dr. Jade d’Alpoim Guedes. After taking Dr. d’Alpoim Guedes course, I began to familiarize myself with the botanical environment of the Locumba Valley and created a reference guide with images of charred and desiccated macrobotanical remains based on the photographic type collection that Cindy Vergel had begun for the Rio Muerto project in 2009 and that UCSD-graduate-student Giacomo Gaggio had expanded for the paleoethnobotanical analysis (2014) of the site of Omo M10A, a Tiwanaku Temple in Moquegua, Perú.

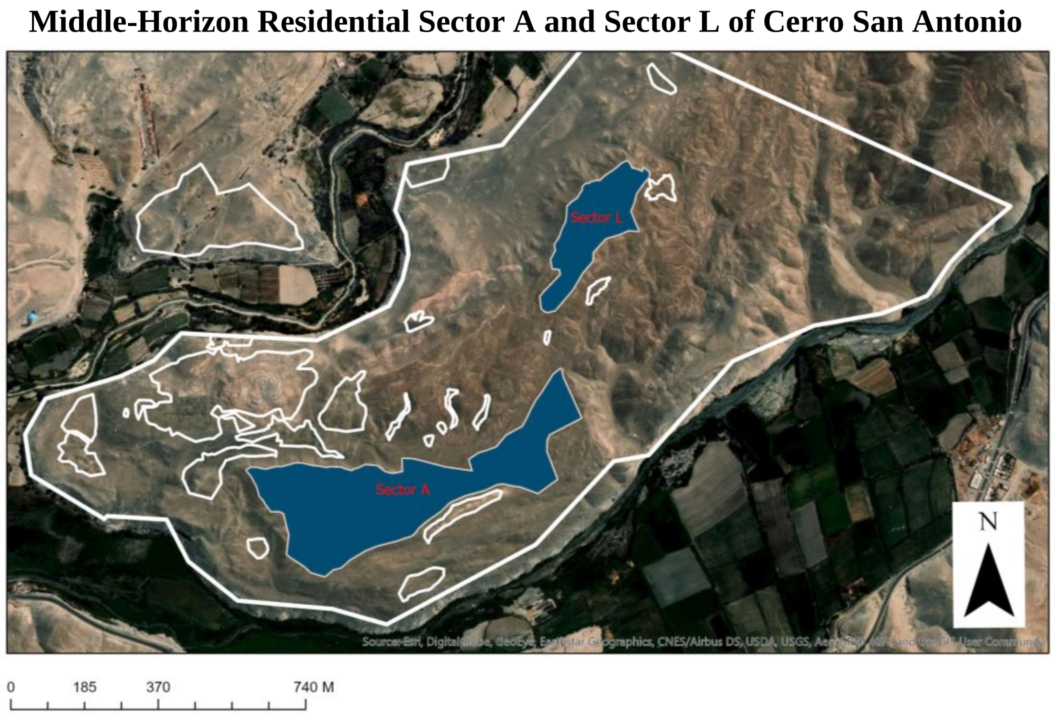
3.2 Sampling Strategy

In 2016 and 2019, the PAL project conducted domestic area or household archaeology in three Middle Horizon (A.D. 600 – A.D. 1100) residential sectors (sectors A, L, and U) at the site of Cerro San Antonio (L1) of the Locumba Valley, Perú. In 2016, PAL excavated 5 2x2m test excavation units in Sector A, from which 18 1-liter soil samples were collected. The units for excavation were chosen based on previous survey data and satellite imagery, which were then located using a GPS. The excavations were focused in the primary domestic occupation area, indicated by dense household debris. In 2019, Sitek excavated 2 additional units in Sector A, 2 units in Sector L, and one unit in Sector U, and he collected a total of 116 samples from floor deposits and from domestic features within these three sectors (Goldstein and Oquiche H. 2019).

The Middle Horizon sectors are organized in a "North Group" and a "South Group." The North Group contains sectors L and U and three mortuary sectors. Sector L expands over an area of 3.93 ha and is found on a prominent blufftop with an up-down view of the valley (Figure 5). The arable floodplain of the Cinto and Salado branches would have been accessible to Sector L residents. Found east of Sector L, Sector U covers an area of 3.28 ha, and PAL found less domestic material on the surface here than on the surface of Sector L (Goldstein and Oquiche H. 2016; Goldstein and Oquiche H. 2019; Sitek 2018).

The South Group contains 7 mortuary sectors and Sector A, the largest domestic sector of 13.17 ha. Sector A is located closer to the valley on an expansive, flat blufftop (Figure 5), and Sector A residents would have had access to the Cinto and Salado floodplain found below it (Goldstein and Oquiche H. 2016; Goldstein and Oquiche H. 2019; Sitek 2018). Although some ceramic findings resemble later Tiwanaku styles or non-Tiwanaku types, sectors A, L, and U contain mostly diagnostic Tiwanaku ceramics and midden deposits that reflect Tiwanaku behaviors that are similar to findings at Moquegua (Goldstein and Oquiche H. 2016; Goldstein and Oquiche H. 2019; Sitek 2018 [Goldstein 1989, 1993a]).

Due to time constraints, 36 sediment samples of interest were selected for PEB analysis in August of 2019. The sediment samples are from 8 units within two of L1's residential sectors, Sector A (in The North Group) and Sector L (in The South Group). Fifteen of these samples are from Sector A: 1 sample from L1A-2016-Unit 1, 3 samples from L1A-2016-Unit 2, 2 samples from L1A-2016-Unit 3, 2 samples from L1A-2016-Unit 5, 4 samples from L1A-2019-Unit 2, and 3 samples from L1A-2019-Unit 3. Twenty-one of the 36 samples are from Sector L: 12 samples from L1L-2019-Unit 1 and 9 samples from L1L-2019-Unit 3. The Sector A and Sector L unit descriptions are below, and a table with sample descriptions is in Appendix IV: List of Sector, Unit, and Sample Descriptions.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 5: Map of Cerro San Antonio (L1). Sediment samples for the PAL 2019 PEB Analysis are from Middle-Horizon sectors A and L.

3.3 Sector A Unit Descriptions

L1A-2016-Unit 1 (domestic unit; 2x2 m) is located in the center of the western portion of Sector A. The unit seems to be located in a corner space of a domestic clearing. The unit contained a significant number of stone materials and a notable storage pit with botanical remains, including maize and beans (Goldstein and Oquiche H. 2016). One sample from this unit was selected for the PAL 2019 PEB analysis (Figure 6).

L1A-2016-Unit 2 (domestic unit; 2x2 m) is located in the eastern end of the primary domestic occupation within Sector A, approximately 75 meters east of Unit 1. This unit is also found in the center of three small domestic stone mounds found on the surface layer: one in the northwest corner with a semicircular depression (Area B), one in the southwest corner (Area A), and one in the southeast corner (Area C) (Goldstein and Oquiche H. 2016). Three samples from this unit were selected for the PAL 2019 PEB analysis (Figure 6).

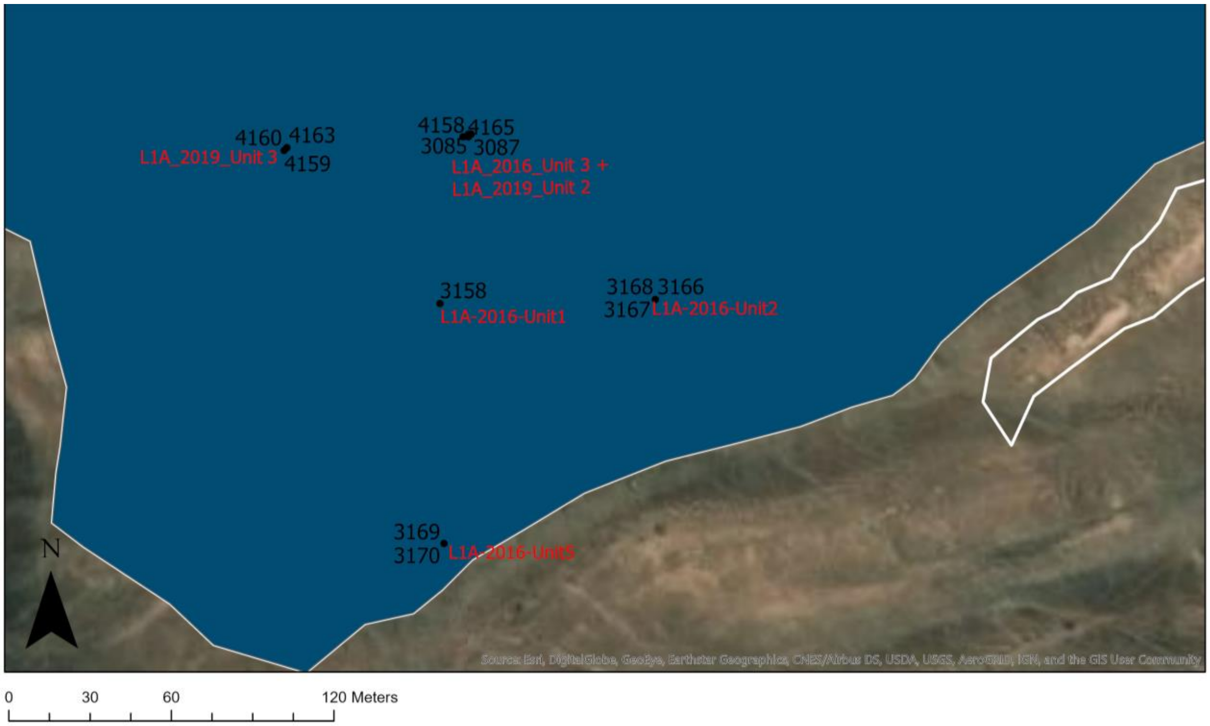
L1A-2016-Unit 3 (plaza unit; 2x2 m) is located a little over 60 meters north of Unit 1 and slightly north of the central plaza of Sector A. This unit crossed a large mound found directly south, which is likely a structure associated with the central plaza. Adobe bricks were found eroding off of this mound (Goldstein and Oquiche H. 2016). Two samples from this unit were selected for the PAL 2019 PEB Analysis (Figure 6).

L1A-2016-Unit 5 (ritual unit; 2x2 m) is located in the most southern portion of Sector A, approximately 80 m south of Unit 1. A surface feature within the unit shows evidence of looting. The feature resembles the surface storage structures found in Tiwanaku contexts in Moquegua. The unit includes a structure that resembles a ritual structure in Moquegua and that contains fragments of copper artifacts and miniature ceramic vessels (Goldstein and Oquiche H. 2016). Two samples from this unit were selected for the PAL 2019 PEB Analysis (Figure 6).

L1A-2019-Unit 2 (plaza unit; 22 m^2) is found in the center of the domestic Sector A, directly adjacent to the central plaza. It is an expansion of L1A-2016-Unit 3. (In the results and the analysis, L1A-2019-Unit 2 findings are combined with L1A-2016-Unit 3 findings.) This unit exposed the remains of a ritual structure—likely a platform—made of adobes. The structure, however, was damaged during Prehispanic times, making it difficult to interpret today. Various types of material culture were recovered from this unit. The cultural material includes pottery, metals, and lithic findings. All diagnostic ceramic findings and decorated textiles are Tiwanaku, although some ceramic motifs resemble Tuilaca styles of post Tiwanaku. Organic material includes faunal remains, seashells, botanicals, textiles, and wooden artifacts. Notable findings in this unit include a Tiwanaku 4-cornered hat, a large basket with human hair, and large quantities of high-quality Tiwanaku ceramics (Goldstein and Oquiche H. 2019). Four samples from this unit were selected for the PAL 2019 PEB Analysis (Figure 6).

L1A-2019-Unit 3 (domestic unit; 8 m^2) is found in the western part of the domestic Sector A. Three Tiwanaku storage pits were uncovered here, and it was clear that one storage pit was deliberately made, lined with stones and plaster. All 3 pits likely stored Tiwanaku household goods and then later became garbage pits. Various types of material culture were recovered from this unit. The cultural material includes pottery, metals, and lithic findings. All diagnostic ceramic findings and decorated textiles are Tiwanaku, although some ceramic motifs resemble Tuilaca styles of post Tiwanaku. Organic material includes faunal remains, seashells, botanicals, textiles, and wooden artifacts (Goldstein and Oquiche H. 2019). Three samples from this unit were selected for the PAL 2019 PEB Analysis (Figure 6).

L1 Sector A Units and Sediment Samples Selected for PAL 2019 PEB Analysis



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 6: Location of Sector A units (name labeled in red) and the location of sediment samples (specimen number labeled in black) selected for the PAL 2019 PEB Analysis.

3.4 Sector L Unit Descriptions

L1L-2019-Unit 1 (domestic and industrial unit; 60 m^2) is found in the north end of the domestic Sector L, adjacent to a quincha wall. All diagnostic ceramic findings and decorated textiles are Tiwanaku, although some ceramic motifs resemble Tuilaca styles of post Tiwanaku. There are distinguished areas of specialized activities within this unit. Evidence of plant remains, ceramic *llana*, and a hearth marks a domestic area, and evidence of textiles, numerous needles, raw textile material, and stone of lapis lazuli marks an industrial area (Goldstein and Oquiche H. 2019). Twelve samples from this unit were selected for the PAL 2019 PEB Analysis (Figure 7 and Figure 8)

L1L-2019-Unit 3 (domestic unit; 64 m^2) is found in the south central area of domestic Sector L. This area was selected for excavation because of the existing foundation and presence of *quincha* walls. The unit includes a large part of a domestic structure and a mound consisting of stone and midden material. Many of the wall foundations are preserved, including four posts. The cultural material recovered includes pottery, metals, and lithic findings. All diagnostic ceramic findings and decorated textiles are Tiwanaku, although some ceramic motifs resemble Tuilaca styles of post Tiwanaku. Organic material includes faunal remains, seashells, botanicals, textiles, and wooden artifacts. Notably, this unit shows a strong reliance on marine resources. Large quantities of fish bones, mollusk and crustacean shells, and fragments of fishing nets made of cotton were recovered here. Finally, the midden associated with the structure contained red pottery and camelid bones, which are associated with celebrations and feasts (Goldstein and Oquiche H. 2019). Nine samples from this unit were selected for the PAL 2019 PEB Analysis (Figure 7 and Figure 9).

Cerro San Antonio (L1) Sector L Units

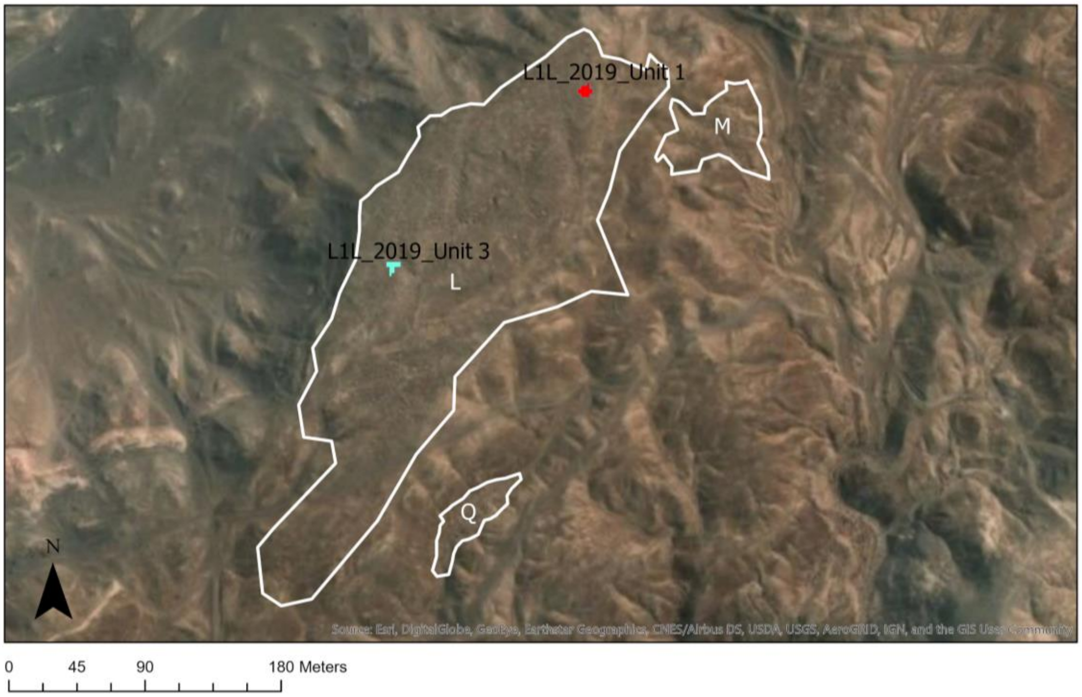


Figure 7: Location of Sector L units. Twelve samples from L1L-2019-Unit 1 and 9 samples from L1L-22019-Unit 3 were selected for the PAL 2019 PEB Analysis.

Sediment Samples in L1L-2019-Unit 1

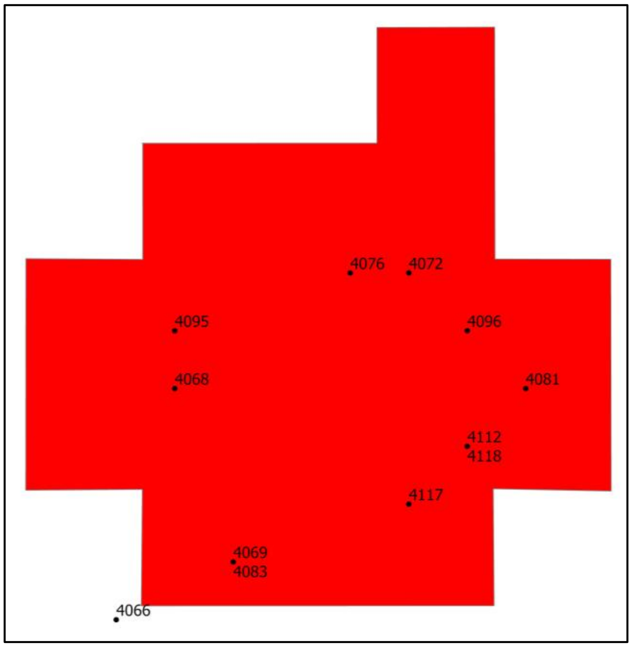


Figure 8: The location of sediment samples (specimen sample labeled in black) selected from L1L-2019-Unit 1 for the PAL 2019 PEB Analysis.

Sediment Samples in L1L-2019-Unit 3

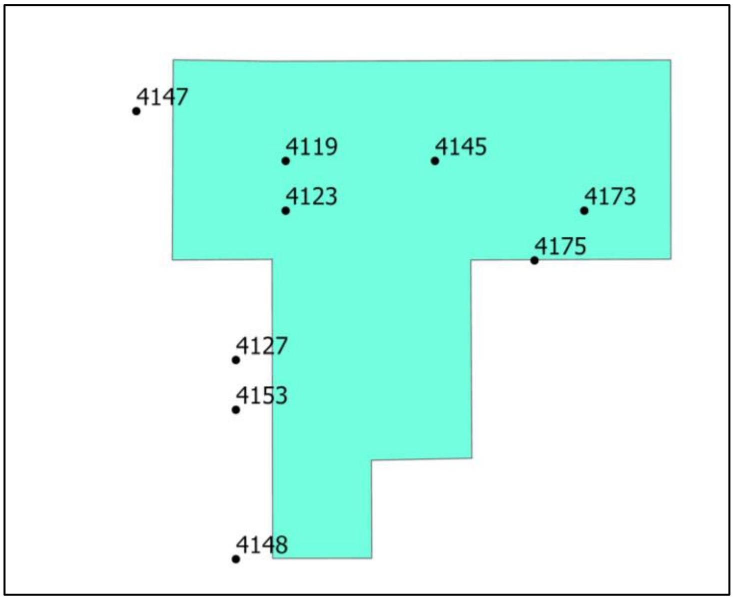


Figure 9: The location of sediment samples (specimen number labeled in black) selected from L1L-2019-Unit 3 for the PAL 2019 PEB Analysis.

3.5 Recovery Technique

For the PAL 2019 PEB analysis, half of each 2016 1.0-liter sample was analyzed, and the entirety of each 2019 0.5-liter sample was analyzed. Analyzing 0.5 L is sufficient because the arid environment of the Locumba Valley allows for excellent macrobotanical preservation because decomposers cannot grow in this desiccated context (Gallagher 2014). It is important, however, to consider how ancient human beings might have mechanically affected the decomposition of plant remains through grinding, cutting, pounding, and trampling, and how they might have chemically affected decomposition rates by enriching the native soil with nutrients (Gallagher 2014 [Beck 1989; Holliday 2004]). It is also important to consider the decomposition factors inherent in the plant or plant part. In other words, plants and plant parts do not share decomposition rates, and for example, leaves decompose faster than “woody”-plant parts that have high lignin-composition (Gallagher 2014 [Beck 1989; Berg and McClaugherty 2008]).

Dry-sieving techniques were used in the recovery process. Dry-sieving techniques are most appropriate for processing dry sediments (Goldstein and Hageman 2010; Pearsall 1989; Wagner 1988; White and Shelton 2014). Implementing flotation techniques would have added unnecessary labor, and adding water to dry sediment samples might damage macrobotanical findings (Gaggio 2014 [Goldstein and Hageman 2010]; Goldstein and Hageman 2010). Each of the 36 sediment samples was sifted through sifters of 4.0 mm, 2.0 mm, 1.0 mm, and 0.5 mm. Ceramic sherds, larger textile fragments, and larger seeds, such as *Prosopis* sp. seeds, and fruits, such as *Schinus molle* fruits, were found in the 4.00 and 2.0 mm fractions, while smaller seeds, such as *Chenopodium quinoa* and *Amaranthus* sp. seeds, were respectively found in the 1.0 and 0.5 mm fractions. A brush was used to ease the sediment and remains through the mesh.

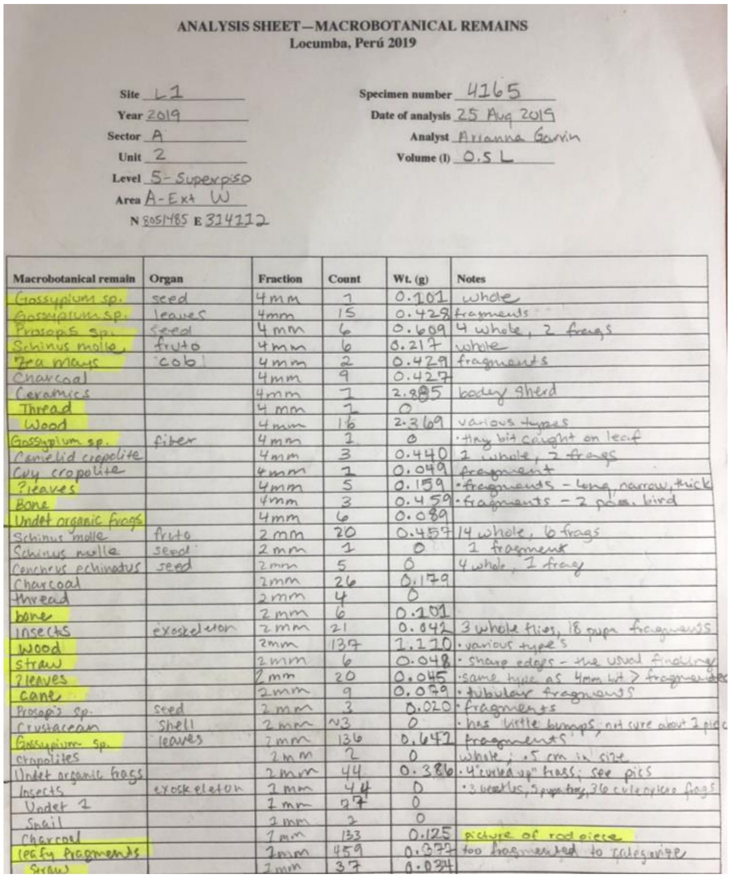
After the samples were sieved, inorganic and organic materials were extracted from the fractions of each sample. Inorganic materials include ceramic sherds, and organic materials extracted include macrobotanical remains, wool, mollusk and crustacean fragments, bones, feathers, and camelid and *cuy* coprolites. Macrobotanical findings include charcoal, straw, cane, seeds, fruits, chaff, rachis, husks, stems, and leaves. Botanical families represented in the macrobotanical findings include the following: Amaranthaceae, Anacardiaceae, Apiaceae, Asteraceae, Cactaceae, Cyperaceae, Fabaceae, Malvaceae, Poaceae, Solanaceae, and Verbenaceae. All materials were extracted from the upper 3 fractions, while all materials but charcoal, straw, and unidentifiable-shell fragments were extracted from the 0.5 mm fraction.

Once the remains were extracted from a fraction, the findings were identified using a preliminary photographic seed reference guide that Cindy Vergel originated for Moquegua

Tiwanaku sites in 2008 (Vergel and León 2009) and that UCSD graduate student, Giacomo Gaggio supplemented in 2014, which has been extensively expanded and amended with the help of Dr. Jade d'Alpoim Guedes through personal communication and through the help of Dr. Matthew Biwer, Dr. Maria Bruno, and Dr. Christine Hastorf via email communication. I include photos of my identified remains in Appendix I and II of this paper.

Each finding was categorized as either "whole," "fragment," "charred whole," or "charred fragment." Similar findings were grouped together and then counted and weighed as a group. Charred findings were counted and weighed separately, and the scale weighed the findings to the nearest 0.001 g. The categorized remains and their counts and weights were recorded on an analysis sheet (Figure 10), which included the site, year, specimen sample, cultural context, volume of sediment analyzed, and counts and weights for identified and unidentified taxa. The information from the analyses sheets was later entered into Microsoft Excel for analysis (Appendix V: PAL 2019 PEB Data).

Throughout the recovery process, drawings and descriptions were made and pictures were taken of representative findings and of seeds that could not be immediately identified. A list of 48 unidentifiable remains was created, although unidentifiable categories 2, 4, 5, 18, and 32 were eliminated during the recovery process and are not listed in the table of findings. Not all unidentifiable remains are plant remains. For example, unidentifiable 1 and unidentifiable 22 have respectively been identified as a desiccated insect egg and an insect part. Unidentifiable plant remains include seeds, endocarps, and husks. Most of the unidentifiable remains have been categorized with the help of Dr. Christine Hastorf through communication by email. See Appendix III for type photos and descriptions of unidentifiable findings.



ANALYSIS SHEET—MACROBOTANICAL REMAINS
Locumba, Perú 2019

Site L1
Year 2019
Sector A
Unit 2
Level 5- Superpiso
Area A-Ext W
N 8051485 E 314212

Specimen number 4165
Date of analysis 25 Aug 2019
Analyst Arianna Garvin
Volume (l) 0.5 L

Macrobotanical remain	Organ	Fraction	Count	Wt. (g)	Notes
Gossypium sp.	seed	4mm	1	0.101	whole
Gossypium sp.	leaves	4mm	15	0.428	fragments
Prosopis sp.	seed	4mm	6	0.609	4 whole, 2 frags
Schinus molle	fruto	4mm	6	0.217	whole
Zea mays	cob	4mm	2	0.429	fragments
Charcoal		4mm	9	0.427	
Ceramics		4mm	1	2.885	body sherd
Thread		4 mm	1	0	
Wood		4mm	16	2.369	various types
Gossypium sp.	fiber	4mm	1	0	· tiny bit caught on leaf
Camelid cropolite		4mm	3	0.440	1 whole, 2 frags
Cuy cropolite		4mm	1	0.049	fragment
?leaves		4mm	5	0.159	· fragments – long, narrow, thick
Bone		4mm	3	0.459	· fragments – 2 poss. bird
Undet organic frags		4mm	6	0.089	
Schinus molle	fruto	2mm	20	0.457	14 whole, 6 frags
Schinus molle	seed	2mm	1	0	1 fragment
Cenchrus echinatus	seed	2mm	5	0	4 whole, 1 frag
Charcoal		2mm	26	0.179	
thread		2mm	4	0	
bone		2mm	6	0.101	
insects	exoskeleton	2mm	21	0.042	3 whole flies, 18 pupa fragments
wood		2mm	137	1.110	· various type's
straw		2mm	6	0.048	· sharp edges – the usual findings
?leaves		2mm	20	0.045	· same type as 4mm but > fragmente
cane		2mm	9	0.079	· tubular fragments
Prosopis sp.	seed	2mm	3	0.020	· fragments
Crustacean	shell	2mm	~3	0	· has little bumps, not sure about 1 pi
Gossypium sp.	leaves	2mm	136	0.642	fragments
cropolites		2mm	2	0	whole; .5 cm in size
Undet organic frags		2mm	44	0.386	· 4 "curled up" frags; see pics
Insects	exoskeleton	1mm	44	0	· 3 beetles, 5 pupa frags, 36 coleoptera frags
Undet 1		1mm	27	0	
Snail		1mm	2	0	
Charcoal		1mm	133	0.125	picture of rod piece
leafy fragments		1mm	459	0.377	too fragmented to categorize
Straw		1mm	37	0.034	

Figure 10: PAL 2019 PEB Analysis sheet.

3.6 Quantitative Analysis of the Material

Quantification is a necessary step that follows the recovery of macrobotanical remains and that precedes the interpretation of the results (Marston 2014). There are various ways to quantify the findings, ranging from ratios and simple statistics to multivariate statistics (Marston 2014 [Pearsall 2000]). Simple numerical and statistical methods involving descriptive, ranking systems, standardized, and relative methods (Marston 2014) are used to quantify the 2019 PAL PEB data. More specifically, Chapter 4: Results, I present absolute counts and use standardized measures to compare L1 sectors and units, and Chapter 5: Discussion focuses largely on comparing the different proportions of one crop to another within in each sector and within in each unit and compares these taxa proportions across sectors and units.

Presenting absolute counts of the various taxa recovered is one of the most traditional methods, dating to the 1960s (Marston 2014 [Helbaek 1960, 1969; Renfrew 1973]). Absolute counts present raw data gathered without adjusting or manipulating it in any way (Marston 2014). The absolute counts are reported sample by sample (Marston 2014 [e.g. Miller 2010b; Riehl 1999]) or organized by period or by area within a site (Marston 2014 [e.g. Moore et al. 2000, Weiss and Kislev 2004]). In the PAL 2019 PEB study, counts are reported by sample, and I include the raw dataset in Appendix V of this thesis. In addition to reporting the absolute counts, it is valuable to explain how the remains were counted (Marston 2014). For example, in Chapter 4: Results, I explain how fragments that represent 75 percent of the seed or more may represent a count of “1,” or the same value given to whole counts.

Standardized measures are especially useful at addressing the challenge posed when sample sizes are not equal and/or when the number of samples taken at each unit or feature differs (Marston 2014). In the PAL 2019 PEB Analysis, I analyzed 0.5 L of each sample, but the number of samples from each unit varies. In addition, standardized measures may be used for spatial and temporal comparisons. More specifically, I calculated taxa density and presented the proportions of taxa. Calculating density involves standardizing taxon count or weight by the sediment volume, and determining the proportions of taxa involves comparing “the presence of one taxon to a larger category to which it belongs,” such as comparing “wheat grains to total cereal grains” (Marston 2014 [Miller 1988: 73-75; Pearsall 2000: 196-99]; Lennstrom and Hastorf 1995). Bar graphs may be used to illustrate the densities and the proportions of taxa (Lennstrom and Hastorf 1995). The quantification of the PAL 2019 PEB findings is presented in the next chapter, Chapter 4: Results.

Chapter 4: Results

Inorganic and organic materials were extracted from the 36 samples of the PAL 2019 PEB study. Inorganic findings include ceramic sherds, and organic findings include macrobotanical remains, wool, mollusk and crustacean fragments, bones, feathers, and camelid and *cuy* coprolites. Macrobotanical findings include charcoal, straw, cane, seeds, husks, fruits, utricles, flowers, pedicels, rachides, and leaves. The botanical families represented include: Amaranthaceae, Anacardiaceae, Apiaceae, Asteraceae, Cactaceae, Cyperaceae, Fabaceae, Malvaceae, Poaceae, Solanaceae, and Verbenaceae. (See Appendix V for the raw dataset.)

The results of this paper will focus on four categories of findings. I have grouped findings under "Bulk Materials," "Market Basket," "Industrial Group," and "Marine Subsistence" because this makes the dataset manageable and allows for comparative investigations. I first introduce "Bulk Materials," which includes fragments of wood, charcoal, straw, charred straw, and cane.

Second, I present the results of a "Market Basket" comprised of *Amaranthus* sp. and *Chenopodium* spp. of Amaranthaceae, *Schinus molle* of Anacardiaceae, *Arachis* sp., *Phaseolus* spp., and *Prosopis* sp. of Fabaceae, *Zea mays* of Poaceae, and *Capsicum* spp. of Solanaceae. I chose this set of taxa to comprise the "market basket" for a few reasons. First, this study is concerned with how food remains provide insight into ancient culinary and agrarian practices and how these food-related practices reflect ancient identities and migration histories. Although each taxon may be used in various ways, each market-basket taxon is a known Andean food. In fact, many of these taxa—such as quinoa, beans, and maize—served as staple foods. Second, these food taxa are well preserved, and I am confident about the seed identifications I include in the market basket. Although I did find other potential food sources in the samples, such as

Echinocactus seeds and *Solanum* sp. seeds, I excluded these taxa from the market basket because I have not yet identified them to the species level and am, therefore, uncertain about their uses as food. Finally, this paper is also concerned with how macrobotanical remains help us understand migration histories, or more specifically, how the L1 food remains help us understand Tiwanaku expansion from the Altiplano to the Peruvian coastal valleys. The high counts of market-basket taxa *Amaranthus* sp. and *Chenopodium* spp. are interesting because these taxa have Altiplano associations. Including these taxa in the market basket will allow me to compare the relative proportions of highland-associated cultivars to lowland-associated cultivars.

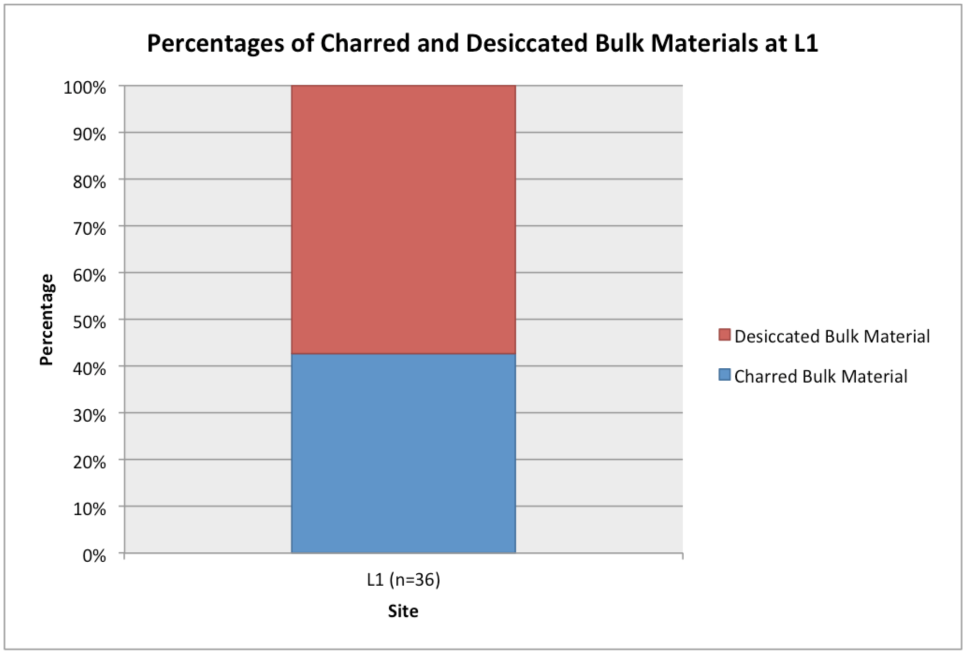
After presenting the results of the market-basket cultivars, I will introduce an “Industrial Group” comprised of *Gossypium* sp. of Malvaceae and camelid and *cuy* coprolites. I group these findings under “industrial” because cotton fibers and camelid wool could be made into threads and woven into textiles, while dung could be used as fuel. Finally, the findings of *Choromytilus chorus* –shell fragments are presented for insight into marine subsistence.

4.1 Bulk Materials

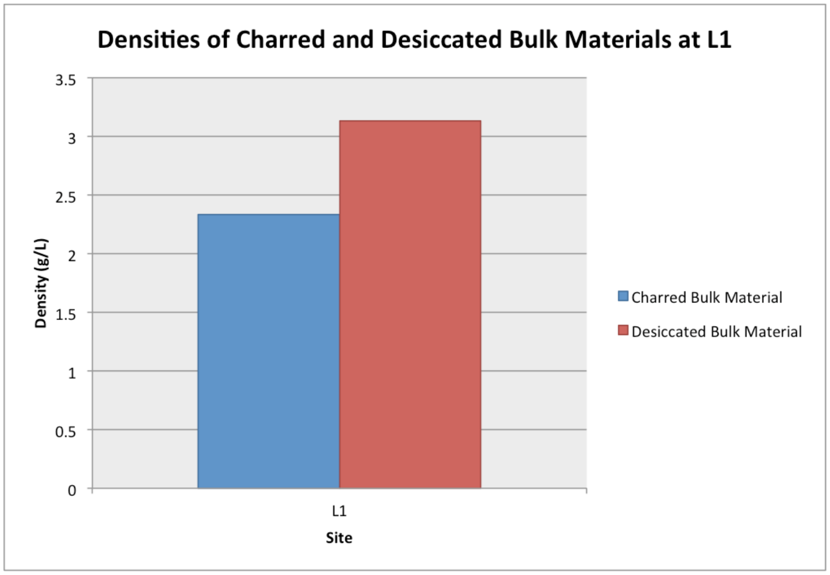
Fragments of wood, charcoal, straw, charred straw, and cane have been categorized as the “bulk materials” of the macrobotanical assemblage. Although counts and weights were both taken, weights are used for density calculations (weight (g) / volume (L)) because each bulk material breaks apart easily.

I first present graphs that show the proportions and densities of charred bulk materials and desiccated (“not-charred”) bulk materials at the site of L1 (Graphs 1 and 2), its sectors (Graphs 2 and 3), and its units (Graphs 4 and 5). Charred bulk materials include charcoal and charred straw and comprise a smaller proportion (42.71 percent) of the bulk materials site wide, while desiccated bulk materials include wood, straw, and cane and comprise a larger proportion (57.29 percent) of the bulk materials site wide (Graph 1). The density of charred bulk materials is 2.33 g/L, and the density of desiccated bulk materials at L1 is 3.13 g/L (Graph 2).

Graph 1: The proportions of charred and desiccated bulk materials at L1.

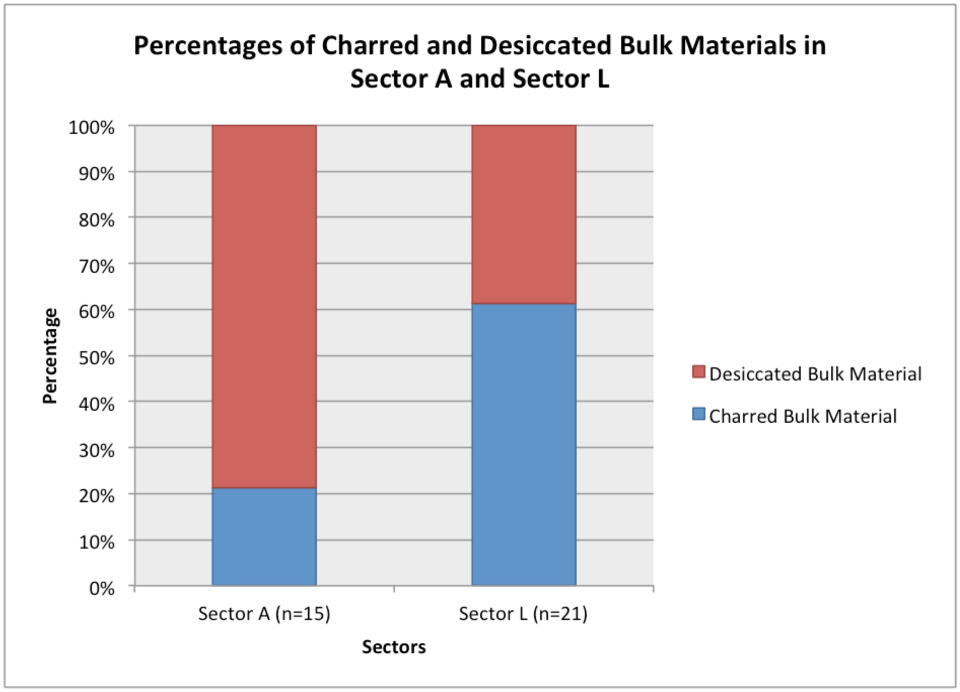


Graph 2: The densities of charred and desiccated bulk materials at L1.

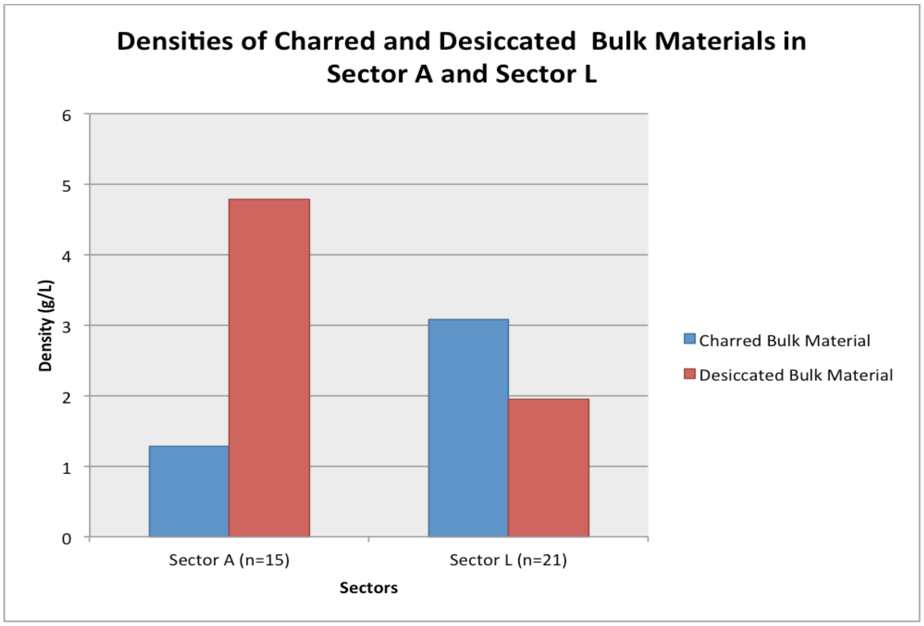


Sector A has more desiccated material (Graphs 3 and 4), and the proportion of desiccated to charred bulk materials in Sector A is 78.80 to 21.20 (Graph 3). On the other hand, Sector L has more burnt bulk material (Graphs 3 and 4). The proportion of desiccated to charred bulk materials in Sector L is 38.77 to 61.23 (Graph 3).

Graph 3: The proportions of charred and desiccated bulk materials in L1 sectors.



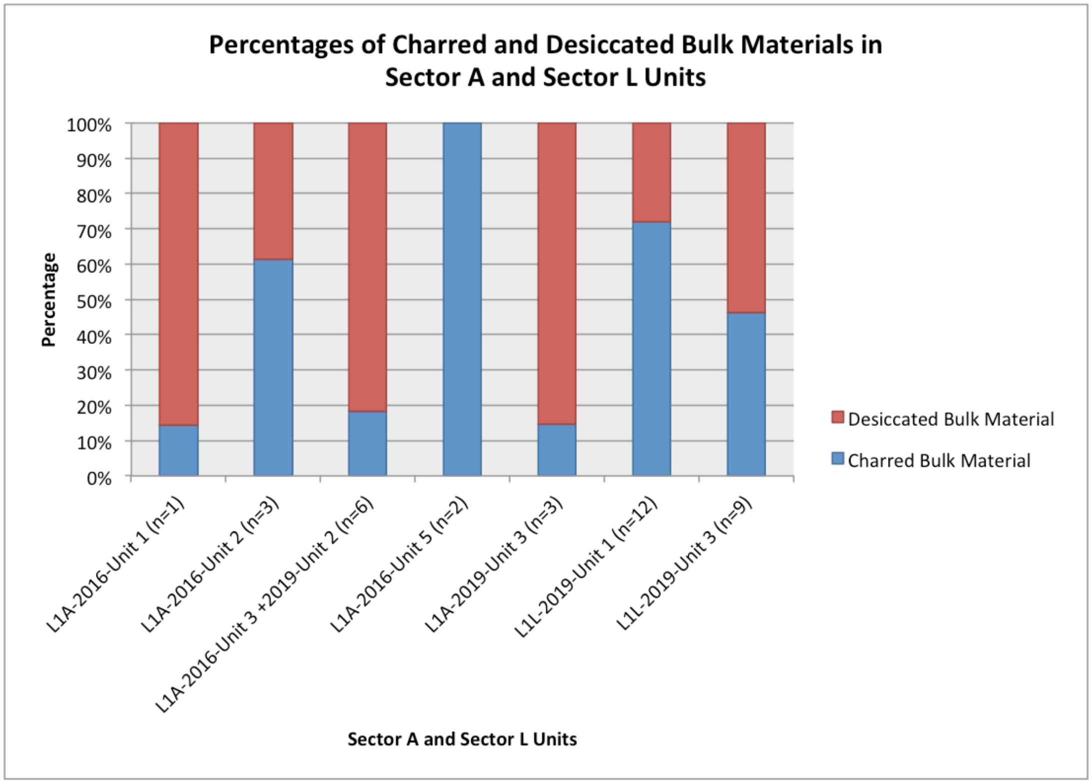
Graph 4: The densities of charred and desiccated bulk materials in L1 sectors.



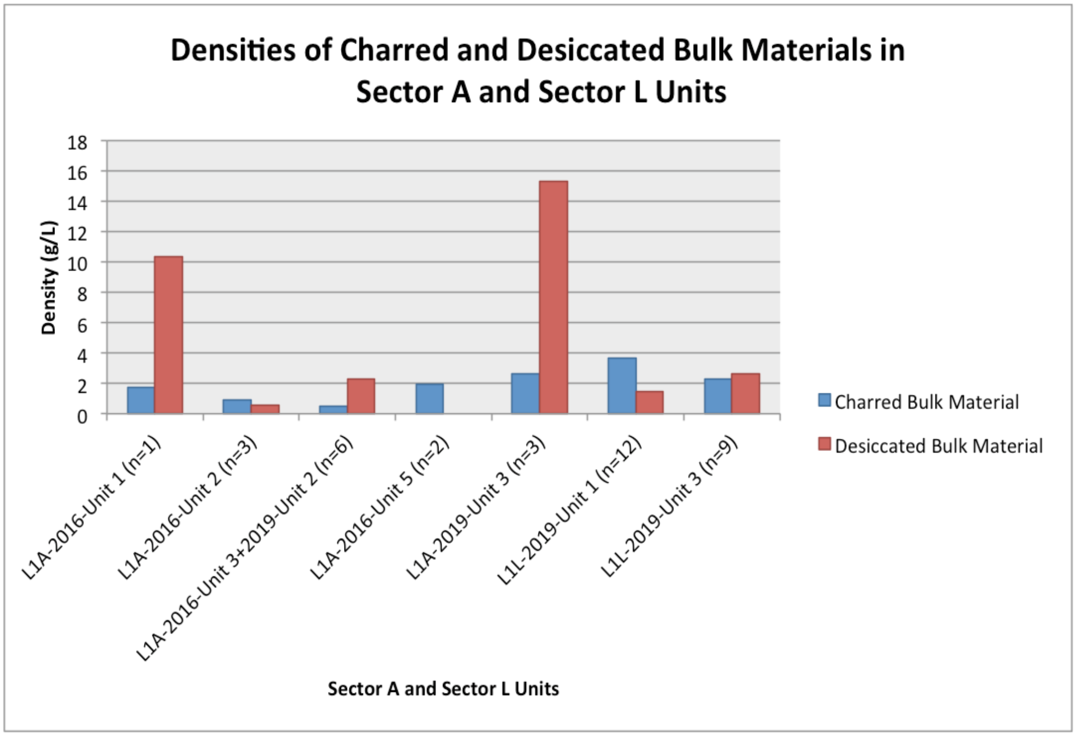
Comparing the proportions of charred to desiccated bulk materials across units (Graph 5) shows that Sector A units 2016-Unit 1 (domestic), 2016-Unit 3+3019-Unit 2 (plaza), and 2019-Unit 3 (domestic) have similar proportions of the two materials, with much higher proportions of desiccated bulk materials. L1A-2016-Unit 1 and L1A-2019-Unit 3 have notably high densities of desiccated bulk materials (Graph 6). On the other hand, Sector A ritual unit 2016-Unit 5 contains only charred bulk material, likely reflecting burning for ritual purposes (Graphs 5, 6).

Sector A unit 2016-Unit 2 (domestic) has similar charred to desiccated bulk-material proportions as Sector L unit 2019-Unit 1 (domestic/industrial), which has a much higher proportion of charred bulk material than desiccated bulk material. The percentage of charred bulk material in L1A-2016-Unit 2 is 61.41 percent, and the percentage of charred bulk material in L1L-2019-Unit 1 is 72.08 percent (Graph 5). Finally, Sector L 2019-Unit 3 (domestic) has a slightly higher proportion of desiccated bulk material than charred bulk material (Graph 5).

Graph 5: The proportions of charred and desiccated bulk materials in Sector A and Sector L units.

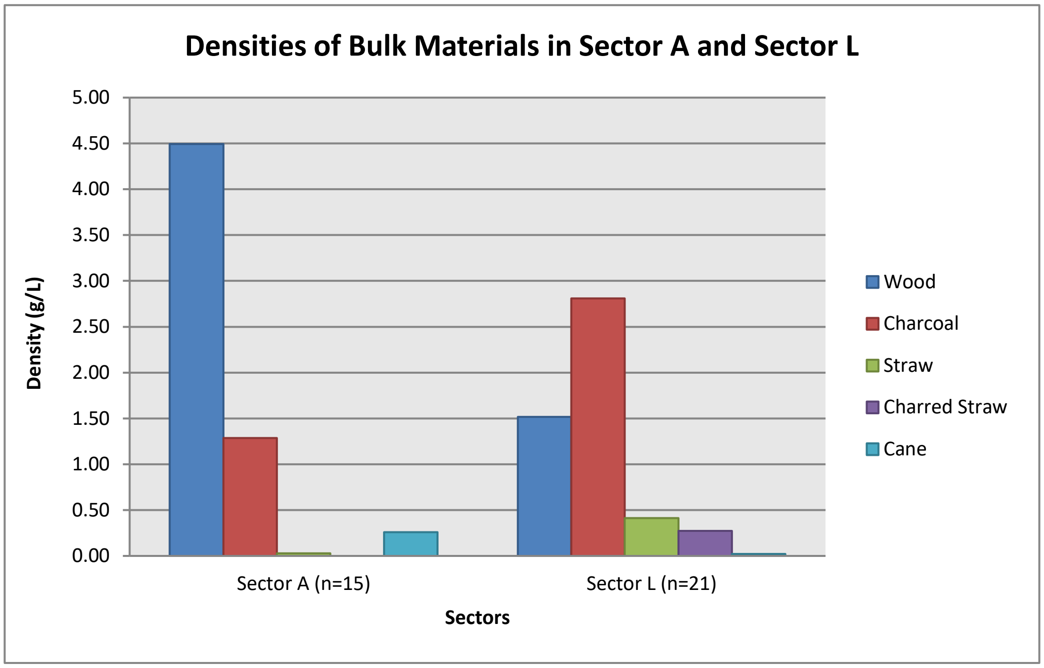


Graph 6: The densities of charred and desiccated bulk materials in Sector A and in Sector L units.

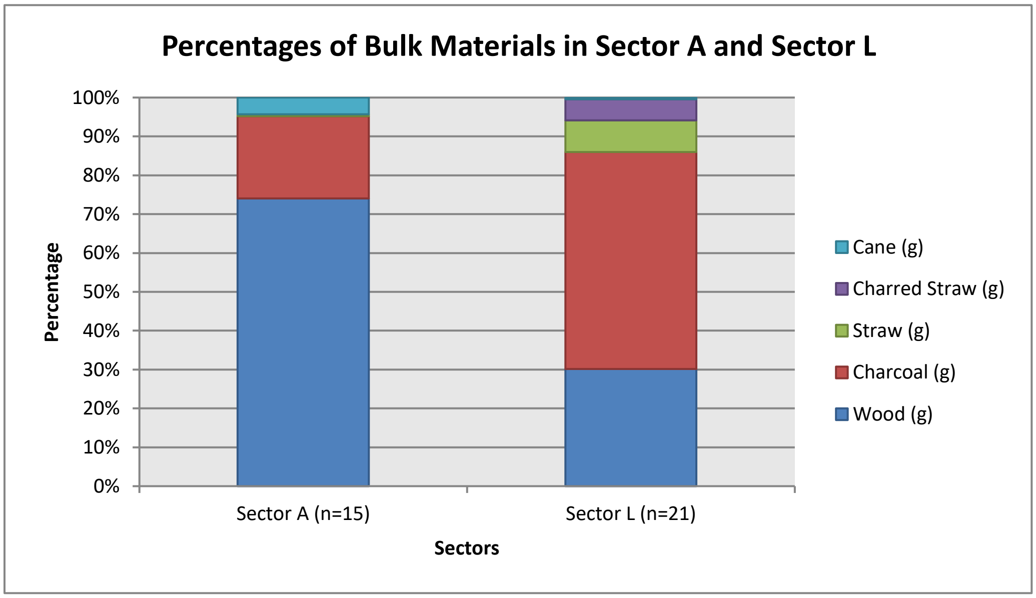


Graphs 7 through 10 separate the various types of bulk materials into 5 categories: wood, charcoal, straw, charred straw, and cane. Sector L has a larger charcoal density than Sector A has (Graph 7), comprising more than 50 percent of the bulk assemblage within Sector L (Graph 8). Comparing the units shows that L1L-2019-Unit 1 has the greatest charcoal density (3.69 g/L) (Graph 9) and that charcoal comprises 72.08 percent of the unit's bulk assemblage (Graph 10).

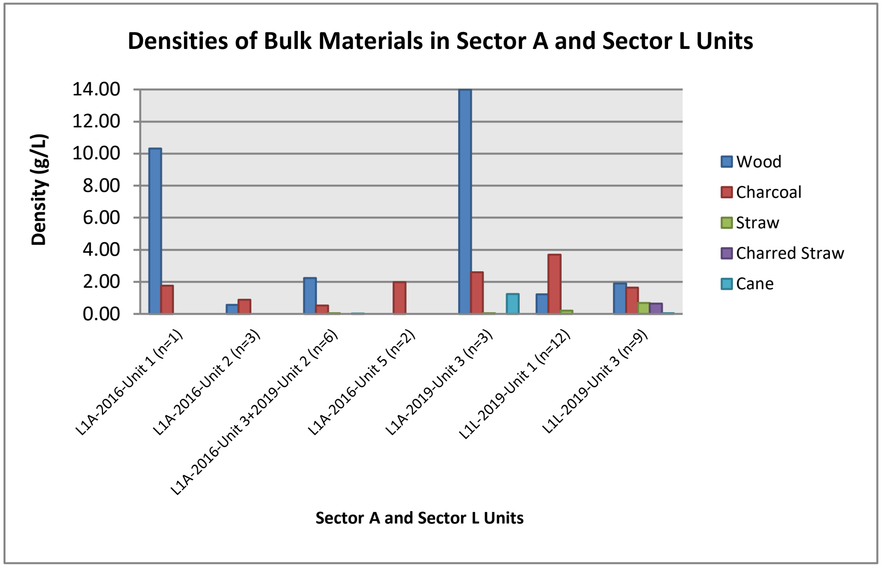
Graph 7: Comparing bulk densities in Sector A and Sector L.



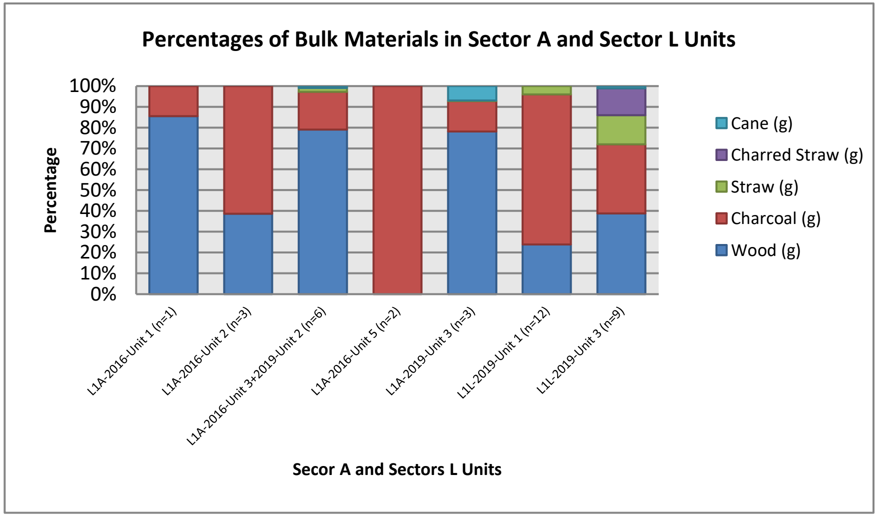
Graph 8: Bulk material intra- and inter-sector comparisons.



Graph 9: Comparing bulk densities in Sector A and Sector L units.



Graph 10: Bulk material intra- and inter-unit comparisons.



L1L-2019-Unit 1 contains both industrial and domestic areas, and the samples from this unit primarily represent domestic contexts, such as likely hearths and ash and domestic waste deposits. Samples L1-4096 and L1-4118 are densest in charcoal and were both collected from likely hearths, reflecting the burning of wood as fuel for cooking. Following these samples is L1-4112, a sample associated with domestic waste that appears stepped on while people lived here. The waste includes large concentrations of botanicals, textile fragments, and camelid bones. There is also a shallow depression located at the base of the level that contains cultural material, which might have been a storage or trash pit (Goldstein and Oquiche H. 2019). With the dense concentrations of charcoal, I believe people burned their trash in this space and that the context most likely represents a trash pit.

In comparison to L1L-2019-Unit 1, Sector L domestic unit 2019-Unit 3 contains less charcoal and demonstrates a more diverse bulk assemblage (Graphs 9 and 10). This unit has the largest densities of straw and charred-straw fragments, comprising 26.94 percent of the bulk assemblage in this unit. More specifically, the charred-straw fragments were recovered from samples L1-4127 and L1-4153, which also contained the largest concentration of straw fragments and are from a layer of sediment above hearths that were likely for individual use (Goldstein and Oquiche H. 2019).

Graph 10 shows that charcoal proportions in relation to the other bulk materials are somewhat consistent across the Sector A units 2016-Unit 1 (domestic), 2016-Unit 3 +2019-Unit 2 (plaza), and 2019-Unit 3 (domestic). Sector A domestic units 2016-Unit 1 and 2019-Unit 3 have particularly high wood densities (Graph 9), with much higher concentrations of wood than charcoal. (L1A-2019-Unit 3 also contained the greatest density of cane.) This might suggest that people living within these domestic units processed more woody plants, and this possibility is explored in *4.2 Market-Basket Cultivars*. In addition to the 3 domestic units, Sector A contains a plaza-associated area (L1A-2016-Unit 3 +2019-Unit 2) and a ritual unit (L1A-2016-Unit 5). The plaza-associated area contains low densities of bulk materials, where wood comprises 79.05 percent of the assemblage. On the other hand, charcoal is the only category of bulk material found in L1A-2016-Unit 5, which likely reflects burning for ritual purposes.

In short, Sector A domestic unit L1A-2016-Unit 2 and Sector L domestic unit L1L-2019-Unit 1 show much higher proportions of charcoal than wood (Graph 10). It should be noted, however, that L1A-2016-Unit 2 contains a relatively low density of total bulk material, while L1L-2019-Unit 1 contains the highest density of charcoal (Graph 9). On the other hand, Sector L domestic unit L1L-2019-Unit 3 contains a diverse assemblage of bulk material (Graphs 9 and 10), with wood comprising 38.82 percent of the bulk material here (Graph 10). Moreover, Sector A domestic units L1A-2016-Unit 1 and L1A-2019-Unit 3 demonstrate much larger densities of wood than charcoal (Graph 9). In the next section, wood and charcoal densities are compared to the market-basket cultivars to determine if the units containing larger proportions of wood dealt more with woody plants.

4.2 Market-Basket Cultivars

The families represented in the "market basket" include *Amaranthus* sp. and *Chenopodium* spp. of Amaranthaceae, *Schinus molle* of Anacardiaceea, *Arachis* sp., *Phaseolus* spp., and *Prosopis* sp. of Fabacaceae, *Zea mays* of Poaceae, and *Capsicum* spp. of Solanaceae. Although people may consume every taxon in the market basket, each taxon may be used for many purposes and may enter the archaeological record through various ways. How these cultivars were used is considered through contextualization.

4.2.1 Amaranthaceae

Amaranthus sp., *Chenopodium quinoa* (quinoa), and cf. *Chenopodium* sp.[8] represent the Amaranthaceae family in the samples. *Amaranthus* sp. seeds, utricles, and flowers and *Chenopodium* spp. seeds were found in the samples. All Amaranthaceae cultivars produce indehiscent and desiccate single-seeded fruits (Bruno 2008: 215). Morphologically, *Amaranthus*

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[8] On Dec. 2, 2019, Dr. Hastorf wrote that the cf. *Chenopodium* sp. seeds might be *quinoa* var. *melanospermum* (*quinoa negra*) but suggested that I reach out to Dr. Maria Bruno to confirm or reject this ID. Dr. Bruno wrote back rejecting the cf. *quinoa negra* identification. Instead, *quinoa negra*—commonly called this for its black-colored seeds—have thick seed coats with "reticulate patterning" (Bruno 2009: 220; Bruno email comm. 28 Feb. 2020). The cf. *Chenopodium* sp. seeds, on the other hand, are shiny and smooth (Bruno email comm. 28 Feb. 2020). Moreover, *quinoa negra* seeds are usually found in fractions greater than 0.50 and 1.00 mm screens (Bruno 2008: 220), but the cf. *Chenopodium* sp. seeds in the samples were smaller and were found in the 0.50 mm fraction.

sp. seeds have a hard, glossy seed coat and are ovular in shape, pinching in one direction (Figure 11). Although the *Amaranthus* sp. seed in the second picture of Figure 11 appears greater than 1 mm, most *Amaranthus* sp. seeds are slightly less than 1 mm in size and were usually found in the 0.5 mm fraction.

***Amaranthus* sp. Seeds**

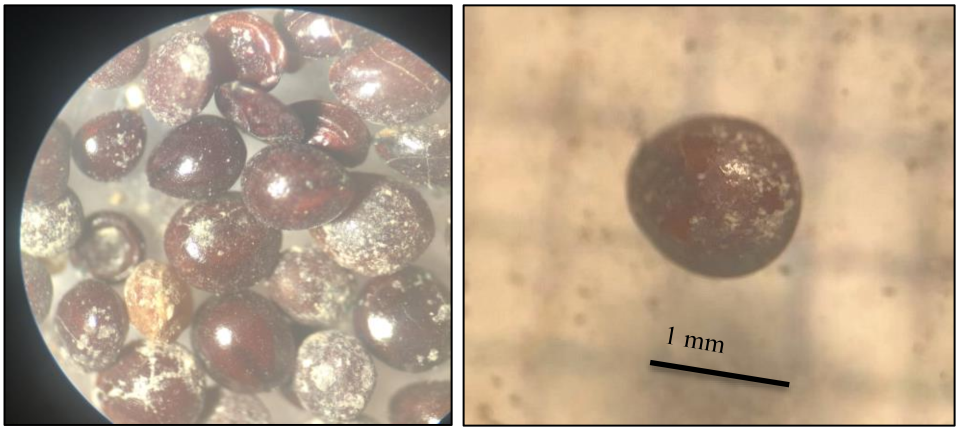


Figure 11: *Amaranthus* sp. seeds found in sample L1=4117.

The *Chenopodium quinoa* seed is hard, with a thin seed coat and has an embryo that wraps around the outer edge of the endosperm (Figure 12). The round quinoa seeds have a diameter between 0.90 to 1.6 mm (Bruno 2008: 219), and were found in the 1.0 mm fraction, although fragmented quinoa seeds were recovered from the 0.5 mm fraction.

***Chenopodium quinoa* seeds**

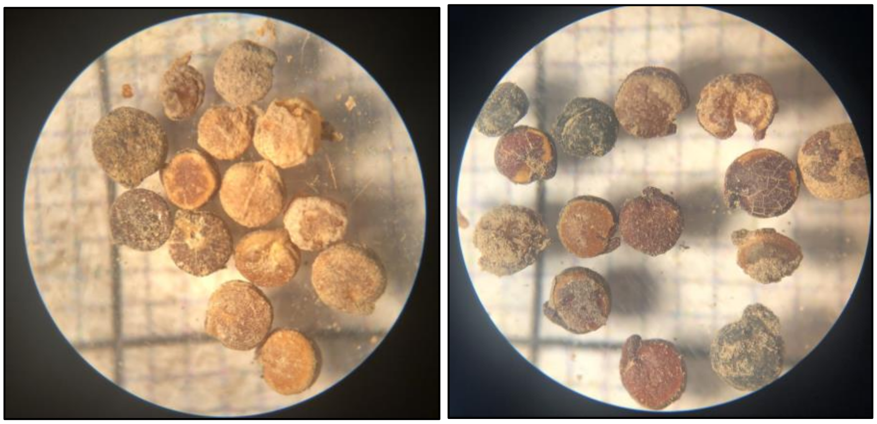


Figure 12: *Chenopodium quinoa* seeds found in samples L1=4069 (left image) and L1=3158 (right image).

Finally, the cf. *Chenopodium* sp. found in the samples were about 0.70 mm in size and found in the 0.50 mm fraction. In Vergel and Gaggio's photographic type collection, these seeds had been classified as *Amaranthus* sp. However, while reviewing the PAL 2019 PEB seeds with Dr. d'Alpoim Guedes, she noted that *Chenopodium* sp. seeds have a beak similar to what appears in the pictures below (Figure 13), whereas *Amaranthus* sp. seeds have "lips." She identified them as wild *Chenopodium* sp. seeds.

Wild cf. *Chenopodium* sp. seeds

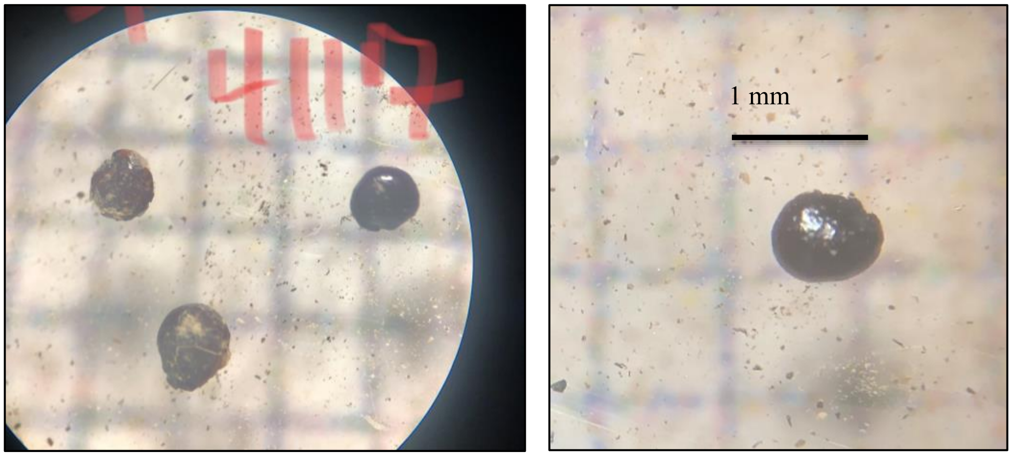


Figure 13: Wild cf. *Chenopodium* sp. seeds found in sample L1=4117.

Via email communication on February 28, 2020, Dr. Bruno mentioned that the seeds (Figure 13) almost look like wild kañawa (*Chenopodium pallidicaule* Aellen) but expressed how she does not think wild kañawa grows at this elevation. (L1 is located 600 masl.) Instead, she expressed a leaning towards wild *Amaranthus* sp.

I followed Dr. Bruno's email with a question in relation to Dr. d'Alpoim Guedes' identification of the seeds as wild *Chenopodium* sp. seeds (Figure 13) and her understanding of *Chenopodium* sp.-seed morphology, since Dr. d'Alpoim Guedes' understanding might be particular to the Old World. On May 19, 2020, Dr. Bruno stressed how it is difficult to make a determination based on these pictures. According to Dr. Bruno, the image with 3 seeds (Figure

13, left image) might be showing 3 different seeds. Of these 3 seeds, Dr. Bruno thought the top left seed might be *Amaranthus* sp. because it appears to have a more "lip-like" embryo, agreeing with Dr. d'Alpoim Guedes' understanding. (Dr. Bruno did mention that her impression of the "lip" on this seed could just be from the picture.) Dr. Bruno further noted how the bottom seed appears to have "some testa," making it more "chenopod-like." The image of the individual seed (Figure 13, right image), Dr. Bruno explained, might only be showing the endosperm, and its shape suggests it is more likely *Chenopodium* sp. than *Amaranthus* sp. However, Dr. Bruno is uncomfortable "making any more specific designation without knowing if there is some testa there and what size it is" (email comm. 19 May 2020).

During the recovery process, Amaranthaceae seeds were grouped by their condition in categories such as "whole," "fragment," and "charred whole," although no "charred whole" cf. *Chenopodium* sp. seeds were found and identified. A fragment of an Amaranthaceae seed includes at least 75 percent of the seed, and just as a whole seed represents a count of 1, an Amaranthaceae-seed fragment is counted as "1" in the analysis. To calculate density (count (c) / volume (L)), seed count is preferred over seed weight because fragment and whole seeds may be represented as equal. In addition, the seeds are of negligible weight (Lennstrom and Hastorf 1995). The scale does not account for weights lighter than 0.001 g, so the weight of Amaranthaceae seeds is only calculated when large quantities of Amaranthaceae seeds are present and weighed together.

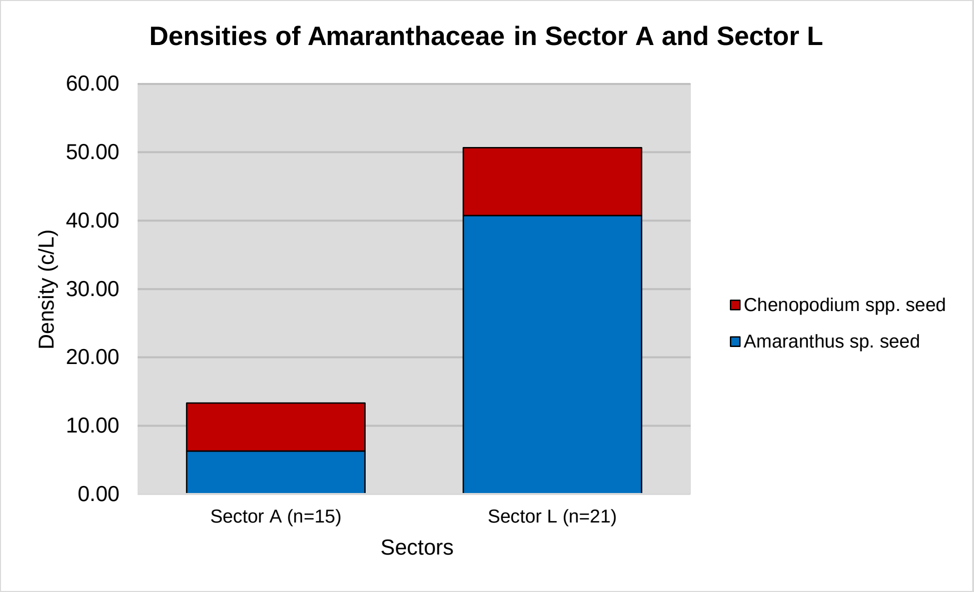
In Sector A, 100 Amaranthaceae seeds were recovered from the samples: 42 whole *Amaranthus* sp. seeds, 3 fragment *Amaranthus* sp. seeds, 2 charred, whole *Amaranthus* sp. seeds, 25 whole quinoa seeds, 2 fragment quinoa seeds, 9 charred, whole quinoa seeds, and 17 whole cf. *Chenopodium* sp. seeds. In Sector L, 532 Amaranthaceae seeds were recovered from the samples: 404 whole *Amaranthus* sp. seeds, 24 fragment *Amaranthus* sp. seeds, 59 whole quinoa seeds, 7 fragment quinoa seeds, 24 charred, whole quinoa seeds, 12 cf. *Chenopodium* sp. seeds, and 2 fragment cf. *Chenopodium* sp. seeds.

Amaranthus sp. and *Chenopodium* sp. may enter the archaeological record in various ways. First, each taxon may be thought of as a field weed (Biwer 2019; Bruno 2014: 7; Lennstrom et al. 1991) that is found in "canal fed small holdings" between 1400 and 2500 masl (Biwer 2019:125) and in "disturbed habitats" (Lennstrom et al. 1991: 6). This is especially true for most *Amaranth* species because very few are domesticated (Towle 1961: 37) and for wild *Chenopodium* sp. seeds, such as *quinoa negra*, or "quinoa's weedy counterpart" (Bruno 2008: 152). As a result, Amaranthaceae presence at a site might indicate that they were accidentally brought into the space through "field-processing activities" or may suggest that camelids consumed the seeds, which then entered the site as camelid dung was burned as fuel (Biwer 2019: 125 [Pearsall 1999]).

Second, Amaranthaceae seeds may be fodder for livestock or food for people (Biwer 2019: 125 [Brack and Egg 1999]). Nutritious quinoa seeds are used to thicken soups and to make *chicha* and flour (Biwer 2019 [Towle 2007: 36]). Moreover, burning quinoa creates an alkaline ash that may activate the alkaloids in coca leaves while chewing (Biwer 2019 [Bruno 2008]; Bruno 2008: 193). The leaves and seeds of Amaranth may be consumed or used medicinally to treat diarrhea, sore throat, cramps and rashes (Biwer 2019: 126 [Brack and Egg 1999: 27]). According to Sauer (1967), likely all Amaranth seeds are edible and taste like cereals when prepared properly (Sauer 1967: 104).

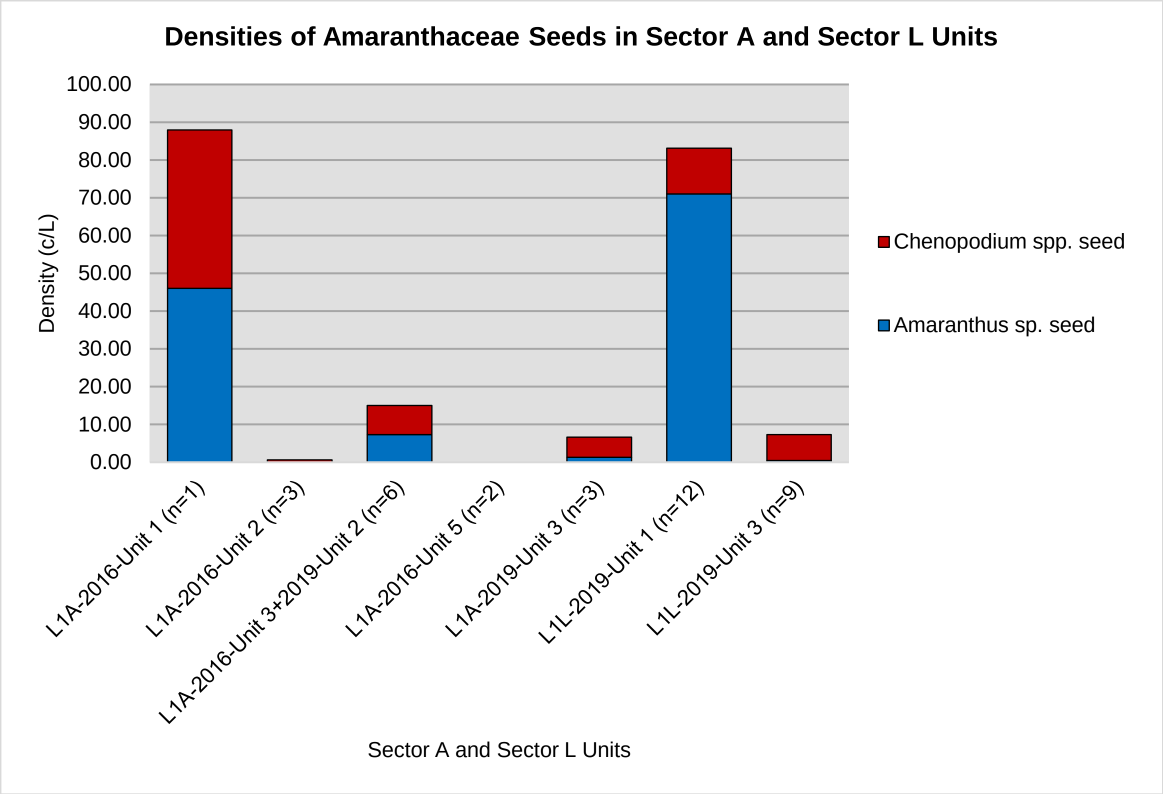
Graph 11 found below shows that Sector L has a higher density of Amaranthaceae seeds (50.67 c/L) than the density in Sector A (13.33 c/L), and comparing the proportions of market-basket-cultivars might suggest that the Sector L residents used Amaranthaceae cultivars more so than Sector A residents or might also reflect the primarily domestic contexts of the site. (Graph 12 shows that L1A-2019-Unit 5 is the only unit that has no Amaranthaceae seeds, which supports the interpretation of this unit as a ritual space.)

Graph 11: Comparing Amaranthaceae densities in Sector A and Sector L.



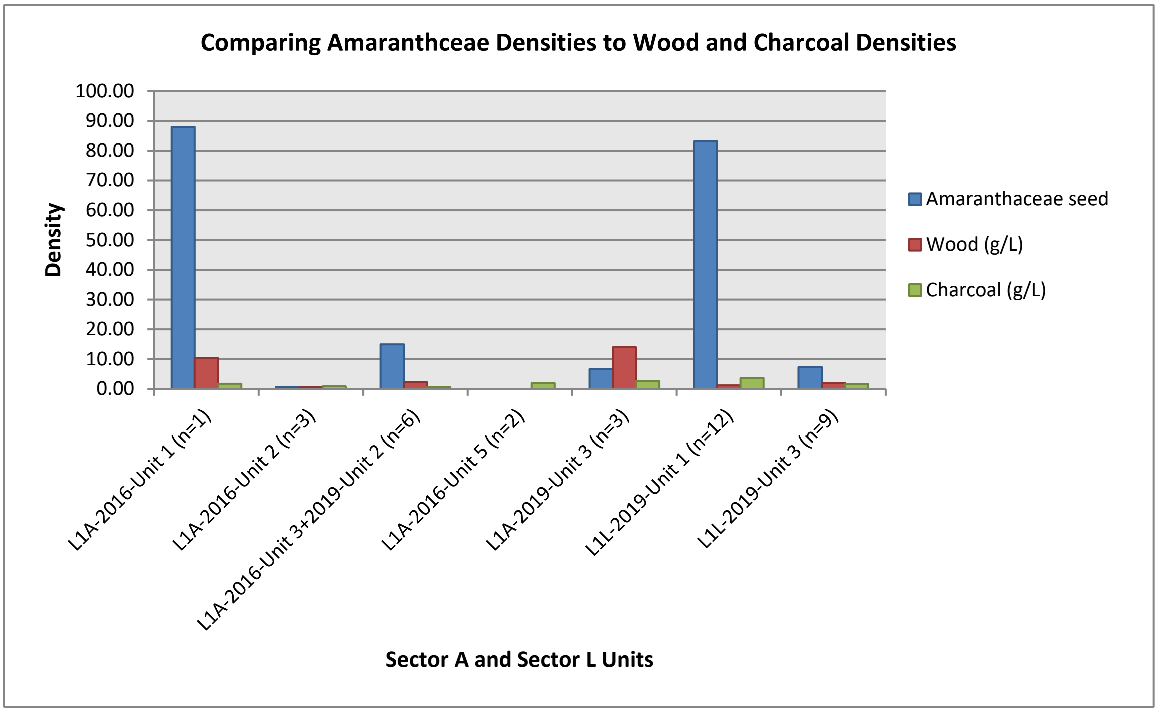
Comparing the three domestic units of Sector A and the two domestic units of Sector L (Graph 12) shows that L1A-2016-Unit 1 and L1L-2019-Unit 1 have high Amaranthaceae densities. It should be noted, however, that only one sample was analyzed from L1A-2016-Unit 1, so a more conservative conclusion might be that L1L-2019-Unit 1 is the “Amaranth House,” since 12 samples were analyzed from this unit. Across units, *Amaranthus* sp. seeds and *Chenopodium* spp. occur together with the exception L1A-2016-Unit 2, where only 1 quinoa seed was found. Moreover, wild cf. *Chenopodium* sp. are found in every unit where quinoa seeds exist. Although cf. *Chenopodium* sp. and *Amaranthus* sp. are thought of as weedy plants, their high densities and appearance with *Chenopodium quinoa* in domestic contexts might suggest possible food sources, especially in 2016-Unit 1 of Sector A and 2019-Unit 1 of Sector L.

Graph 12: Comparing Amaranthaceae densities in Sector A and Sector L units.



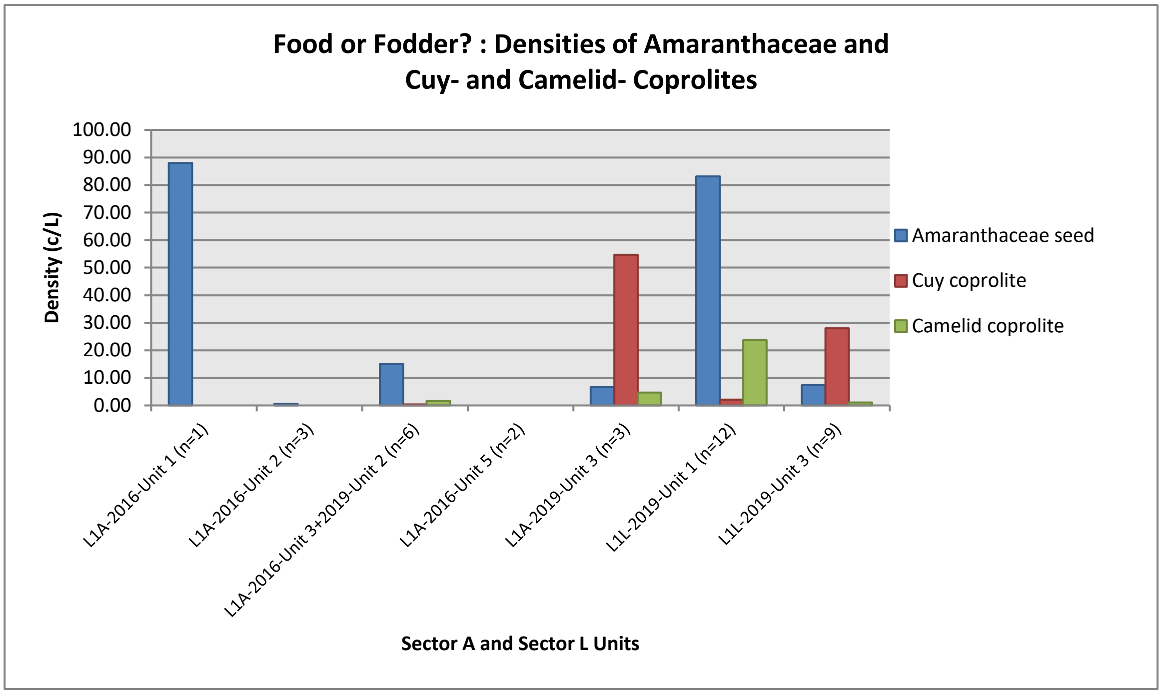
Graph 13 found below compares Amaranthaceae densities to charcoal and wood densities and shows that Amaranthaceae densities are high in units that contain notable densities of bulk material. In other words, very little Amaranthaceae occurs where there are low densities of bulk material (L1A-2016-Unit 2 and L1A-2016-Unit 5), which might suggest that both Amaranth and wood and charcoal were used for domestic purposes. There is, however, no marked patterning of Amaranthaceae with wood material or Amaranthaceae with charcoal material. For example, Amaranthaceae is greatest in L1A-2016-Unit 1, which has a larger wood density than charcoal density (Graph 13). Here, wood comprises 85.55 percent of the bulk assemblage (see Graph 10). On the other hand, Amaranthaceae is nearly just as dense in L1L-2019-Unit 1, but this unit has the greatest density of charcoal (Graph 13), which comprises 72.08 percent of the unit’s bulk material (see Graph 10).

Graph 13: Comparing Amaranthaceae densities to wood and charcoal densities in Sector A and Sector L units.



It could be argued that the Amaranthaceae findings might represent fodder. Comparing Amaranthaceae densities to *cuy*-coprolite and camelid-coprolite densities across units shows that the highest densities of *cuy* and camelid coprolites are also found with Amaranthaceae densities (Graph 14). A closer look into L1L-2019-Unit 1 of Sector L, however, suggests that Amaranthaceae was food for people. (This does not reject the possibility that Amaranthaceae was both food and fodder. Scraps leftover from cooking may have been fed to *cuys*, which were animals kept in people's homes.) The highest counts of Amaranthaceae are from samples L1-4081 (n=58), L1-4096 (n=157), L1-4112 (n=60), and 4117 (n=167), which were samples taken from hearths and domestic-waste areas. Moreover, these samples have no *cuy* droppings and contain little to no counts of camelid droppings. Finally, no camelid and *cuy* coprolites are found in L1A-2016-Unit 1, and interestingly, the sample analyzed from this unit comes from a storage pit containing a large quantity of botanical foods, including maize and beans.

Graph 14: Comparing densities of Amaranthaceae to densities of *cuy*- and camelid-coprolites in Sector A and Sector L units.



4.2.2 Anacardiaceae

Schinus molle (*molle*) is a woody plant found throughout the Locumba Valley. As already discussed, the *molle* plant parts may be used in various ways. *Molle* wood may be used as fuel or as building material (Biwer 2019 [Brack Egg 1999; Yacovleff and Herrara 1935]; Goldstein and Coleman 2004 [Breck Egg 1999; Yacovleff and Herrara 1935]). The plant's resin may act as insect repellent (Biwer 2019 [Brack Egg 1999: 450-451]; Goldstein and Coleman 2004 [Brack Egg 1999]). The volatile oil in *molle* leaves (Biwer 2019 [Brack Egg 1999: 450-451; Goldstein and Coleman 2004 [Brack Egg 1999]), *molle* resin (Goldstein and Coleman 2004 [Yacovleff and Herrera 1935]), and the sap in *molle* bark (Goldstein and Coleman 2004 [Brack Egg 1999]) may be used for medicinal and healing purposes. *Molle* leaves may be used to produce a yellow textile dye and have also been used as a catalytic fertilizer notably in highland maize farming (Goldstein and Coleman 2004 [Yacovleff and Herrera 1935]). Finally, *molle* fruits were processed to create the alcoholic beverage, *chicha de molle*, but this beverage is commonly associated with the Wari (Biwer 2019). The Tiwanaku, on the other hand, are known for consuming *chicha* made from maize. (See *2.7.2 Anacardiaceae: Schinus molle (molle/ Peruvian pepper)* for more details.)

Schinus molle fruits and seeds were found in the samples, and the identifications were confirmed with Dr. Matthew Biwer via email communication on January 20, 2020. The fruits of the plant are “resin-encased woody seeds, wrapped in bright red to purple papery exocarp and produced in panicles” (Goldstein and Coleman 524), but no exocarps of the fruits found in the samples were left intact. Every fruit recovered had a “spherical shape,” suggesting that none of the *molle* fruits had been processed for *chicha* (Biwer 2019). During the recovery process, *molle* seeds and fruits were categorized as “whole,” “fragment,” “charred whole,” and “charred fragment.” *S. molle* seeds fracture easily, and the counts of the seed fragments include pieces that represent only 25 percent of the seed. On the other hand, *S. molle* fruits do not fracture as easily. Out of the 124 *S. molle* fruits found in Sector A, only 24 are fragments, and out of the 73 *S. molle* fruits found in Sector L, only 6 are fragments. *S. molle* fruit fragments represent at least 75 percent of the fruit, so a fragment of *S. molle* fruit may be counted as “1” (just as a whole fruit) in the analysis. For these reasons, density by fruit count is used for archaeobotanical analysis.

***Schinus molle* seeds**

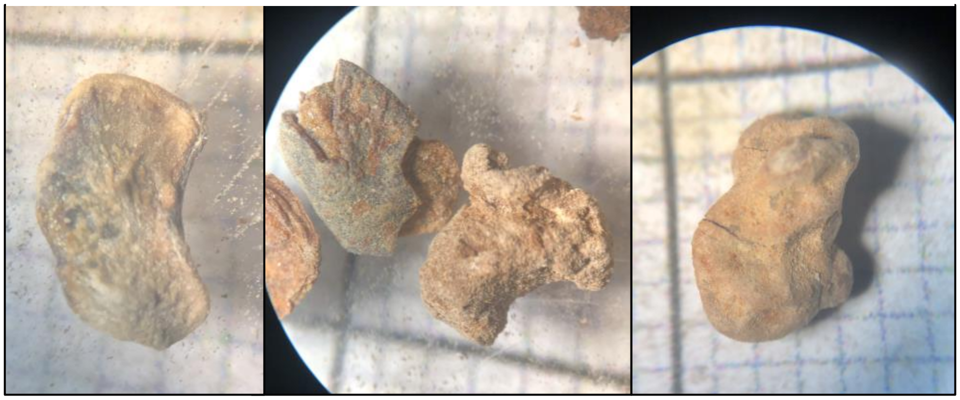
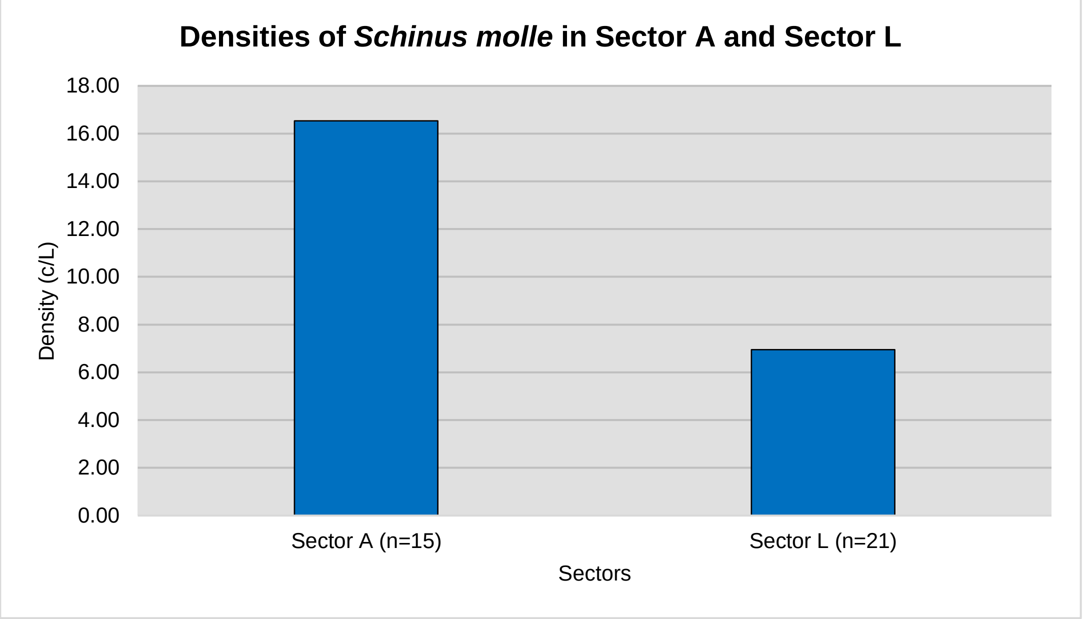


Figure 14: *Schinus molle* seeds found in samples L1=4119 (left and middle images) and L1=4163 (right image).

Figure 15: *Schinus molle* fruits found in sample L1=4165.

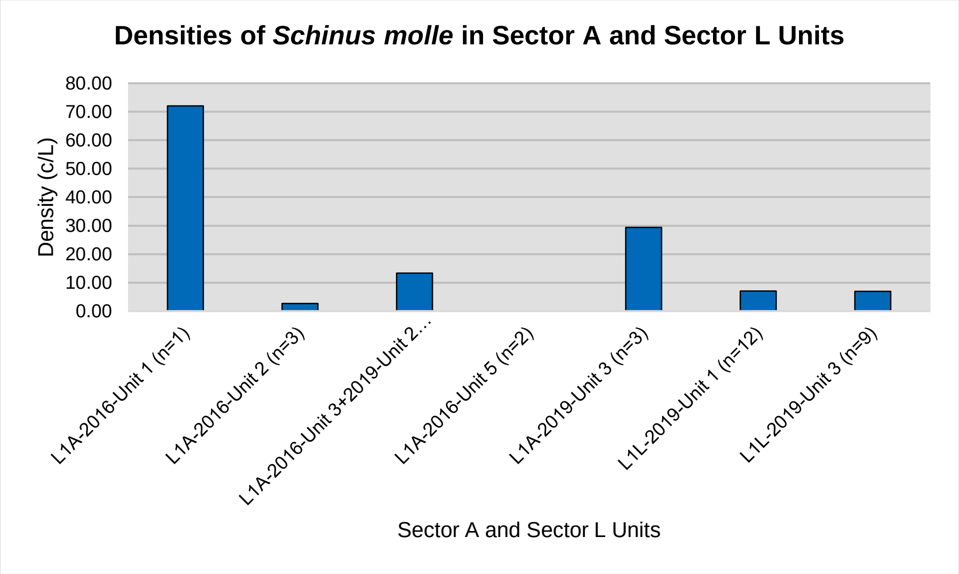
Graph 15 demonstrates that the density of *S. molle* fruits in Sector A (16.53 c/L) is greater than the density in Sector L (6.95 c/L), suggesting that the residents of Sector A more commonly used *molle*.

Graph 15: Comparing *molle* densities in Sector A and Sector L.



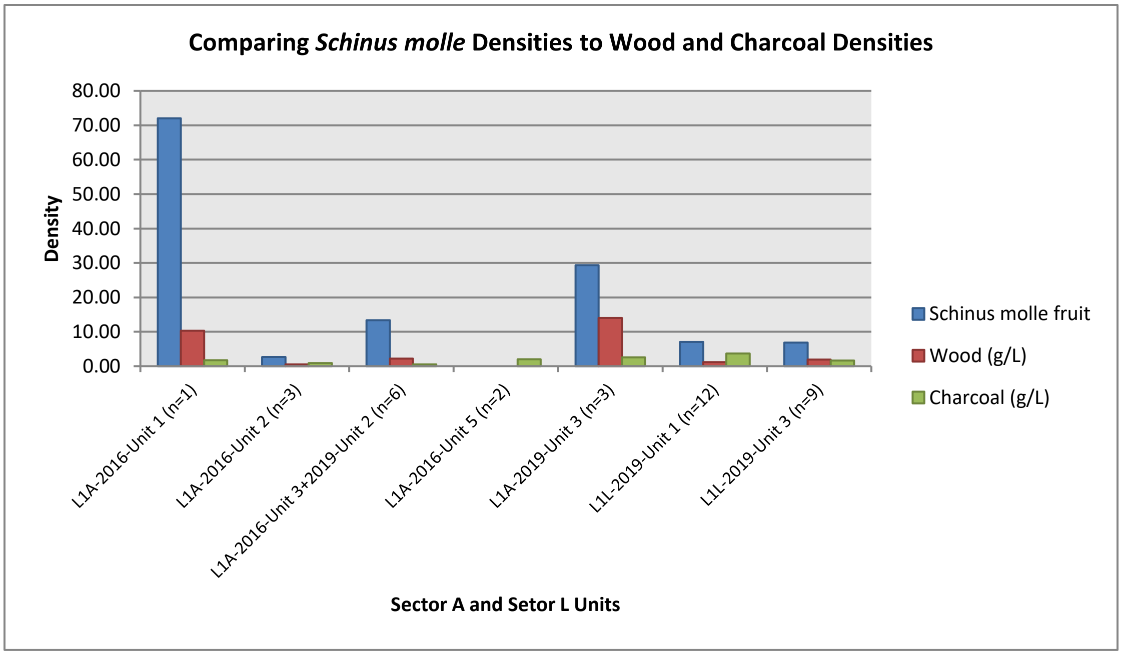
Within Sector A, *molle* density is notably concentrated in L1A-2016-Unit 1 (Graph 16). The sample taken from this unit comes from a storage pit containing a large quantity of botanicals, including maize and beans. Finally, L1A-2016-Unit 5 is the only unit where no *molle* fruits were found, supporting its interpretation as a ritual space (Graph 16).

Graph 16: Comparing *molle* densities in Sector A and Sector L units.



Graph 17 found below compares *molle* densities to charcoal and wood densities and shows that the highest *molle* densities occur with the highest densities of wood. I argue that the high densities of *molle* in Sector A domestic units L1A-2016-Unit 1 and L1A-2019-Unit 3 suggest that much of the wood in these units comes from the *molle* tree and that the wood was primarily used as fuel in these domestic contexts.

Graph 17: Comparing *molle* densities to charcoal and wood densities in Sector A and Sector L units.



4.2.3 Fabaceae

Arachis sp. (peanut), *Phaseolus* sp. (bean), and *Prosopis* sp. (carob bean) are represented within the Fabaceae family. As discussed, these cultivars are adapted to growing in the warm, low altitudinal zones of Perú.

The focus of the archaeobotanical analysis is on Fabaceae-seed density by count, but in addition to their seeds, *Prosopis* sp. leaves and *Phaseolus* sp. pods were found. Fabaceae seeds are noted as “whole,” “half,” or “fragment,” where a “half” seed indicates a seed that has split down the axis of the hilum and a “fragment” seed includes 75 percent or more of the whole seed. A “half” seed is given a value of 0.5, while “whole” and “fragment” seeds are each given a value of 1. No charred Fabaceae seeds were recovered.

Peanuts have long served as a high-protein complement to people’s diet (Masur 2010 [Bonavia 1991: 131; Estrella 1990: 113; Fernández y Rodríguez 2007: 107; Gillian 1945: 53; Nicholson 1960]) and could be prepared in various ways. Peanuts recovered from Peruvian coastal sites are usually one of two forms. The more common type has a long, slender and reticulated pod that has “one or two ‘hump-like protuberances’ present on its dorsal side,” while the other variety has a smaller pod that is slightly reticulated and has no protuberances (Masur 2012 [Towle 1961: 43]).

It is more common to recover peanut pods rather than kernels in the archaeological context because the peanut kernel is consumed while the pod is discarded (Masur 2012). In this case, however, no pods were recovered, and one peanut seed (whole but split in half) was found in L1=4161 of L1A-2019-Unit 2, or the area associated with the central plaza (Figure 16). It should be noted, however, that the identification of the peanut is not 100-percent certain. I identified this seed using Gaggio’s seed reference collection while in Locumba, but via email communication on February 28, 2020, Dr. Bruno expressed uncertainty with my identification, explaining that the seed looked a bit too flat to be a peanut.

cf. *Arachis* sp. seed

Figure 16: cf. *Arachis* sp. seed found in sample L1=4161.

Phaseolus spp. seeds (beans) were a staple food to Peruvian coastal people throughout the Preceramic period (6000 to 4200 B.C.) (Biwer 2019 [Hastorf 1999: 45-51]). By the Middle Horizon (600 to 1000 A.D.), Peruvian people regularly grew beans in the temperate coastal and middle valleys (Biwer 2019; Towle 1961). Because of their nitrogen-fixing properties and their nutritional value, beans are good to plant and to eat with maize (Biwer 2019: 114 [see Mt. Pleasant 2016]).

Two species of *Phaseolus* spp. seeds were identified (Figures 17, 18, and 19). The depressions that form the textured seed coat of the *Phaseolus lunatus* (lima bean) (Figure 18) make them distinguishable from the smooth-surfaced *Phaseolus vulgaris* (common bean) seeds (Figure 19). Although one *Phaseolus* seed was not identified to the species level, all *Phaseolus lunatus* seeds were recovered from 2016-Unit 1 of Sector A, while all *Phaseolus vulgaris* seeds were recovered from the two units of Sector L.

Phaseolus sp. Seed

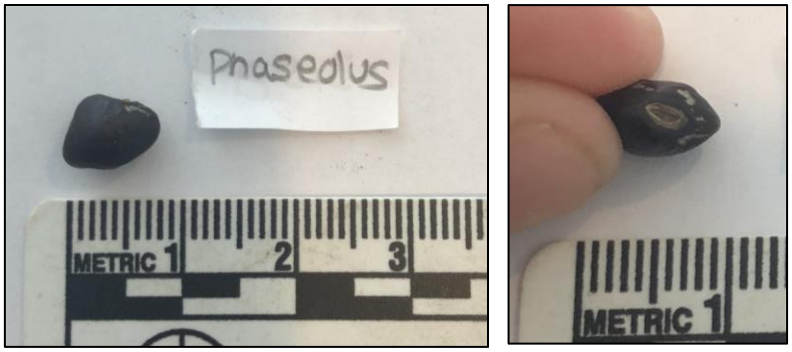


Figure 17: *Phaseolus* sp. seed found in sample L1=3158.

Phaseolus lunatus Seeds

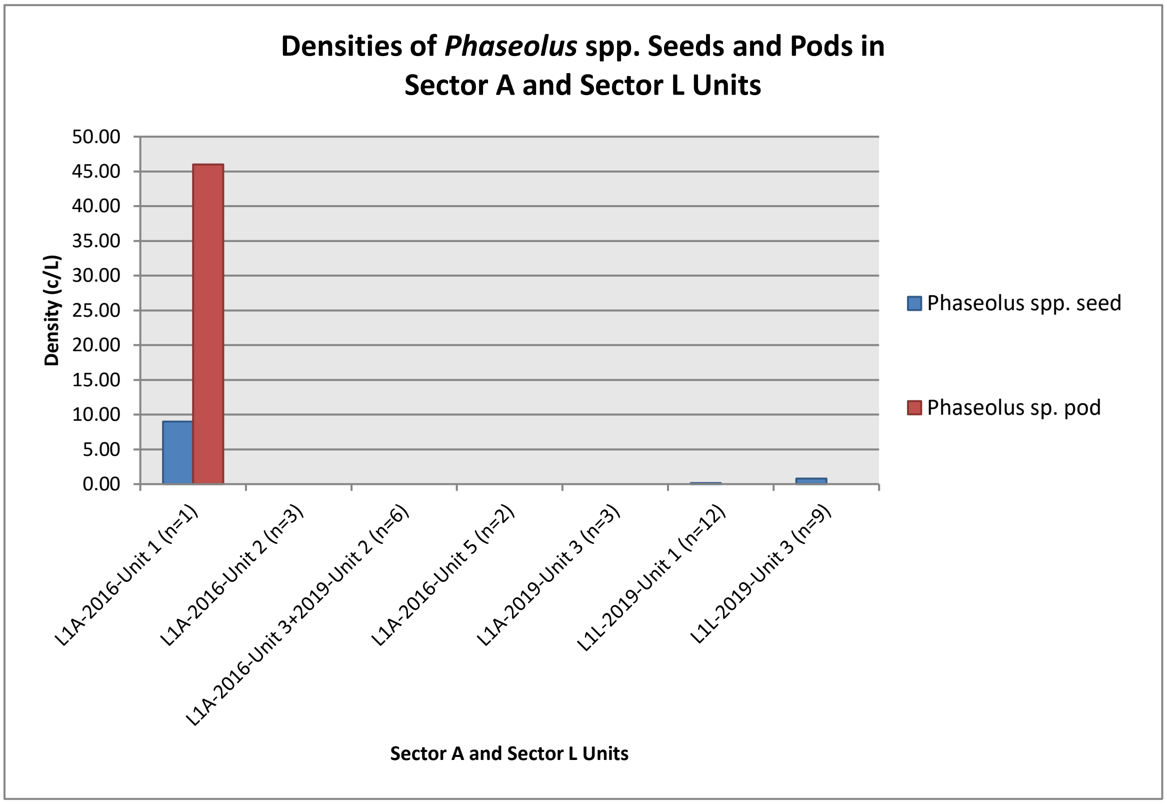
Figure 18: *Phaseolus lunatus* seeds found in sample L1=3158.

Phaseolus vulgaris Seeds

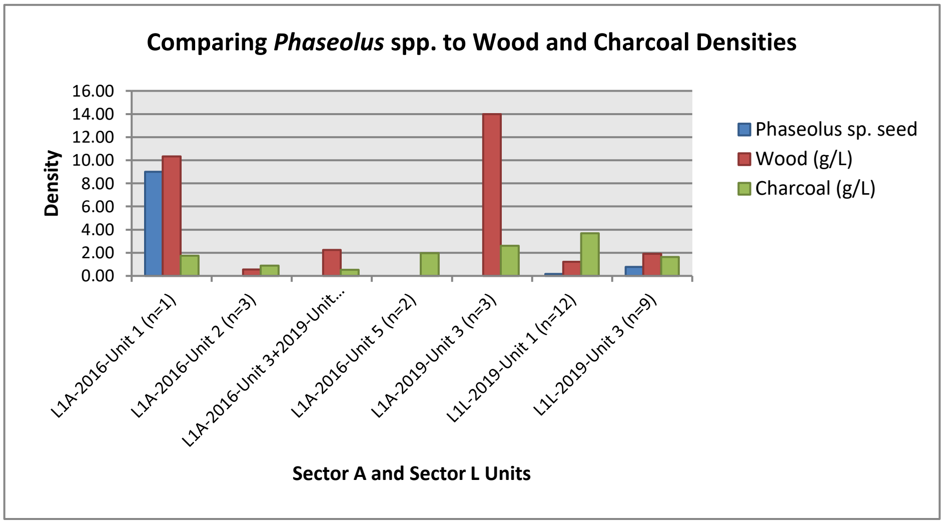
Figure 19: *Phaseolus vulgaris* seeds found in samples L1=4117 (left image) and from L1=4148 (right image).

As show in Graph 18, L1A-2016-Unit 1 by far has the greatest density of *Phaseolus* spp. The sample taken from this unit comes from a storage pit containing a large quantity of botanicals, partly comprised of maize and beans. Like peanuts, it might be more common to find *Phaseolus* pods than the seeds because people consume the seeds. However, L1A-2016-Unit 1 is the only unit where pods were recovered (Graph 18), so it is difficult to conclude from these findings whether or not beans were a large part of the L1 diet. L1A-2016-Unit 1 also contains a much larger proportion of wood over charcoal (Graph 19), suggesting that the pods might have been mixed in with the woody pieces and that we are dealing with an environment of limited fuel sources, where people used any available source of woody material as fuel.

Graph 18: Comparing densities of *Phaseolus* spp. seeds and pods in Sector A and Sector L units.



Graph 19: Comparing *Phaseolus* sp. densities to charcoal and wood densities in Sector A and Sector L units.

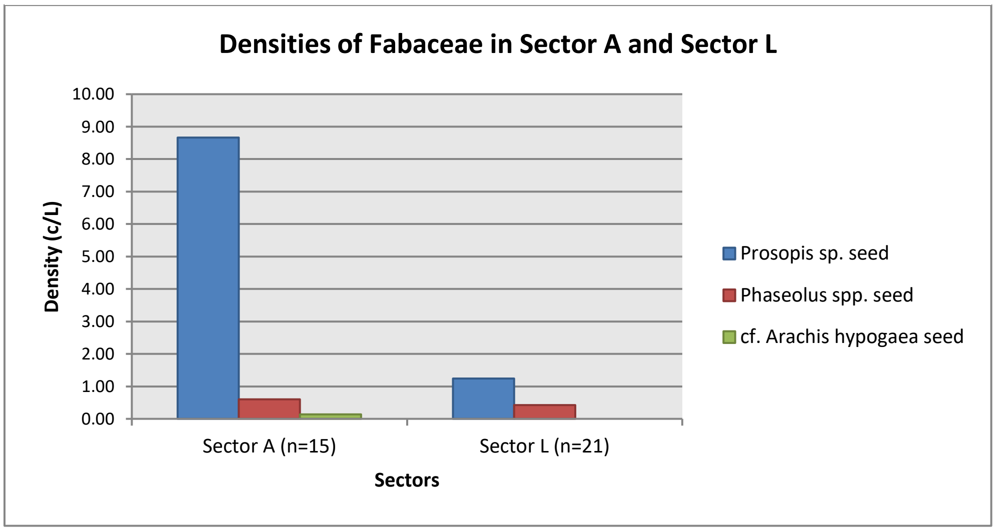


Although records do indicate that pre-Columbian people consumed the seeds of carob beans, the plant's pods and ground beans are often used as livestock fodder (Biwer 2019 [Towle 2007: 56]; Towle 1961) and its wood is used as fuel (Biwer 2019 [Towle 2007: 56]; Towle 1961) or for construction (Towle 1961 [Strong and Evans 1952]). The somewhat-rectangular shape and woody texture makes *Prosopis* sp. seeds easily recognizable in the archaeological record (Figure 20). As shown in Graph 20, the density of *Prosopis* sp. seeds is much greater in Sector A than it is in Sector L, suggesting that Sector A residents used *Prosopis* sp. more so than Sector L residents did.

***Prosopis* sp. Seeds**

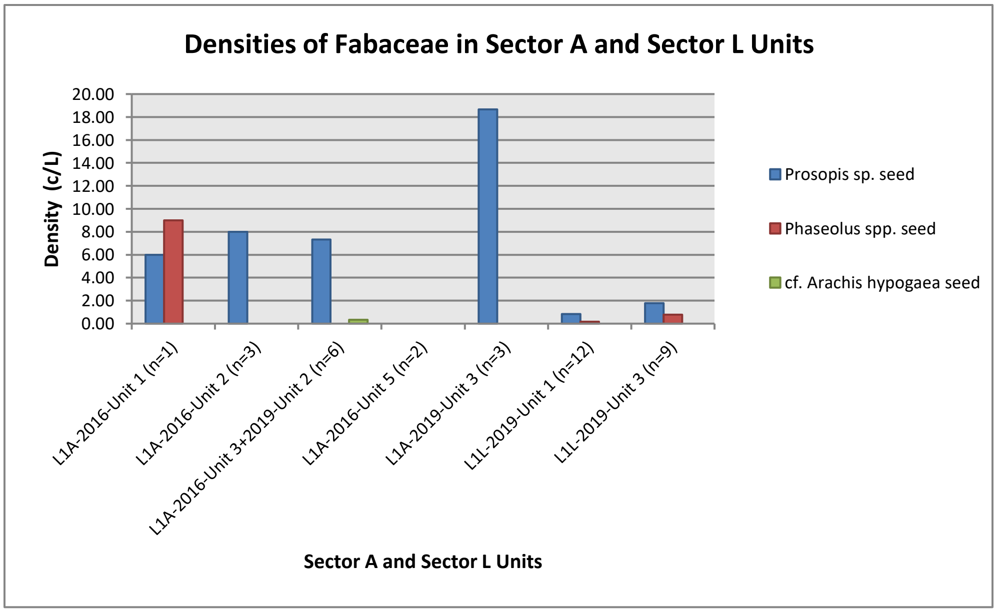
Figure 20: *Prosopis* sp. seeds found in sample L1=4165.

Graph 20: Comparing densities of Fabaceae in Sector A and Sector L.



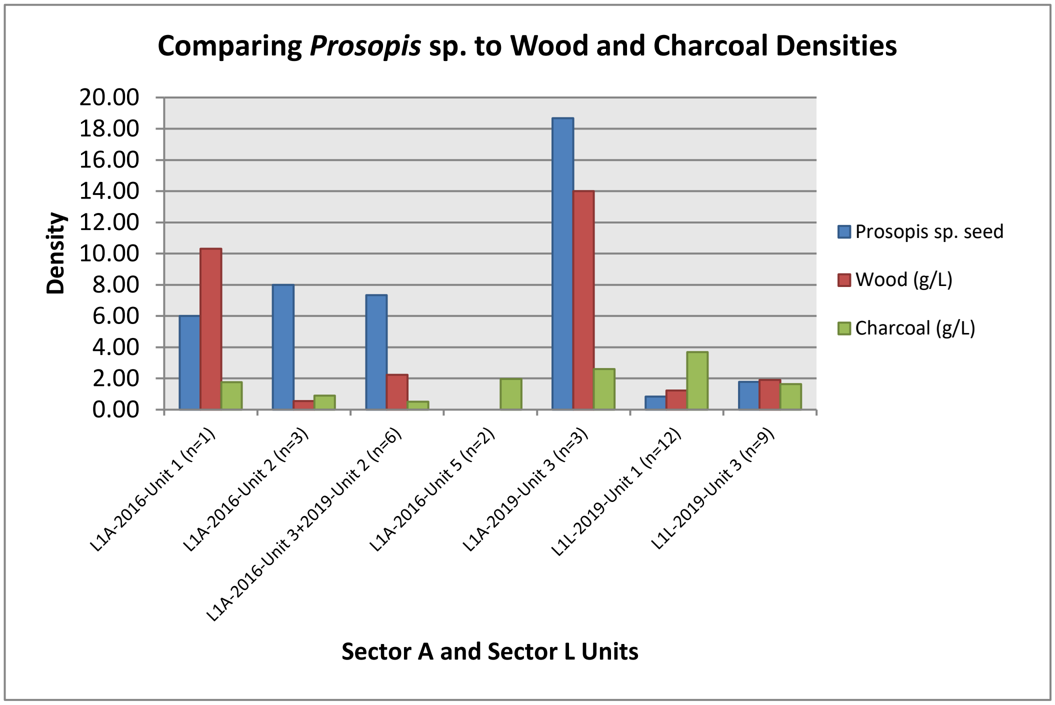
A closer look into the units (Graph 21), shows that all Sector A units contain *Prosopis* sp. seeds except for L1A-2019-Unit 5. (This unit contains no Fabacaceae seeds (Graph 21), further confirming its interpretation as a ritual space.) The consistent densities of *Prosopis* sp. across Sector A domestic units 2016-Unit 1, 2016-Unit 2, and combined plaza-associated units 2016 Unit 3+2019 Unit 2 and the high density of *Prosopis* in Sector A domestic unit 2019-Unit 3 show that Sector A residents commonly used *Prosopis* sp. (Graph 21).

Graph 21: Comparing densities of Fabaceae in Sector A and Sector L units.



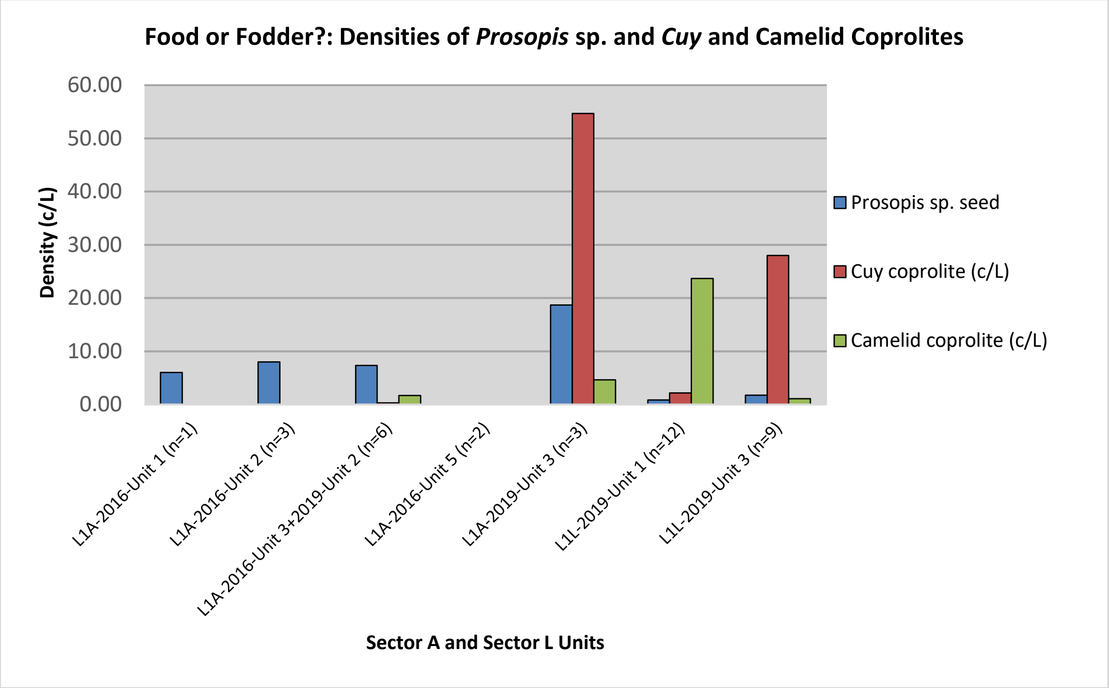
Showing similar patterning to Graph 17 that compares *Schinus molle* densities to wood and charcoal densities, Graph 22 that compares *Prosopis* sp. densities to wood and charcoal densities shows that the highest densities of wood occur with the highest densities of *Prosopis* sp. The *Prosopis* sp.-wood correlation is particularly notable in Sector A domestic units, L1A-2016 Unit 1 and L1A-2019-Unit 3. This suggests that wood from *Schinus molle* and *Prosopis* sp. plants was used as fuel in Sector A domestic units.

Graph 22: Comparing *Prosopis* sp. densities to charcoal and wood densities in Sector A and Sector L units.



Graph 23 comparing the *Prosopis* sp. densities to camelid and *cuy* coprolite densities does not support the argument that *Prosopis* sp. was used as livestock fodder. Instead, the high densities of camelid coprolites in Sector L, 2019-Unit 1 but low densities of *Prosopis* sp. might suggest that the residents in this unit had other fuel sources, such as camelid dung, and relied less heavily on woody plants *Prosopis* sp. and *molle*. Finally, domestic context L1A-2019-Unit 3 has a particularly high density of *Prosopis* sp. seeds, and most of them are from sediments taken from two deep storage pits that contained domestic garbage, such as sherds, camelid bones, and other botanical remains. These findings suggest that *Prosopis* sp. might have comprised part of the people's diet at Sector A.

Graph 23: Comparing densities of Fabaceae seeds and densities of *cuy*- and camelid- coprolites in Sector A and Sector L units.



4.2.4 Poaceae

Zea mays (maize) is a lowland crop that the Tiwanaku particularly valued because the cultivar could be brewed into the alcoholic beverage *chicha* (Bruno 2008 [Ramírez et al. 1960]; Langlie 2018), and scholars argue that the Tiwanaku expansion into the coastal valleys, such as the Moquegua Valley, was largely driven by the desire to acquire maize (Goldstein 1989; Goldstein 2003; Goldstein 2005; Langlie 2018 [Goldstein 2000, 2003; Hastorf et al. 2006]; Hastorf et al. 2006 [Kolata 1993; Sangines 1980; Rodriguez 1998; Rodriguez 2001; Goldstein 1989; Goldstein 1990; Goldstein (Ed.) 1993; Goldstein 1993; Janusek 2002; Kolata 1986; Torres 2001; Knobloch 2000)]). According to Goldstein, maize became a significant part of the

Moquegua-resident diet with Tiwanaku colonization (2003; 2005), so one might expect strong evidence for maize consumption in the Tiwanaku Cerro San Antonio samples.

Maize cobs (Figure 21) and kernels (Figure 22) were recovered from the samples. Instead of maize kernels, cobs are used to compare maize densities across sectors and units for a couple of reasons. First, maize kernels are consumed, while cobs are discarded. Cobs are more likely to be preserved in the archaeological record. Second, an outlier in kernel density within the samples might affect the interpretation of the results. Out of the 16 whole kernels (one of these charred) and 482 kernel fragments that were recovered from the samples, 11 of the whole kernels and 470 kernel fragments were found in sample L1-4161 of L1A-2019-Unit 2, or the "plaza" context (Figure 23). To count as a kernel "fragment," more than 50 percent of the kernel had to be present. These fragments were flakey, which is a likely byproduct of boiling techniques. However, contextualizing sample L1-4161 makes the interpretation of these flakey kernel fragments difficult. The sample was comprised of semi-loose fill that was removed to expose a base.

***Zea mays* cobs**

Figure 21: *Zea mays* cobs found in sample L1=4160.

Zea mays kernels

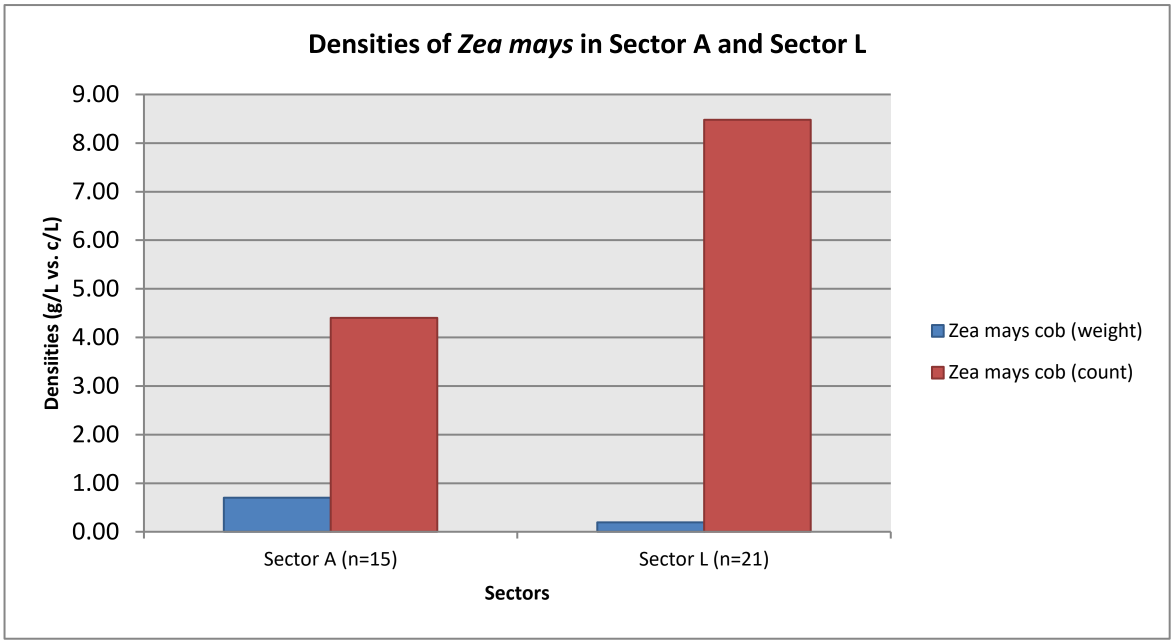
Figure 22: *Zea mays* kernels found in sample L1=4161.

Zea mays Flakey Kernel Fragments

Figure 23: *Zea mays* kernel fragments found in sample L1=4161.

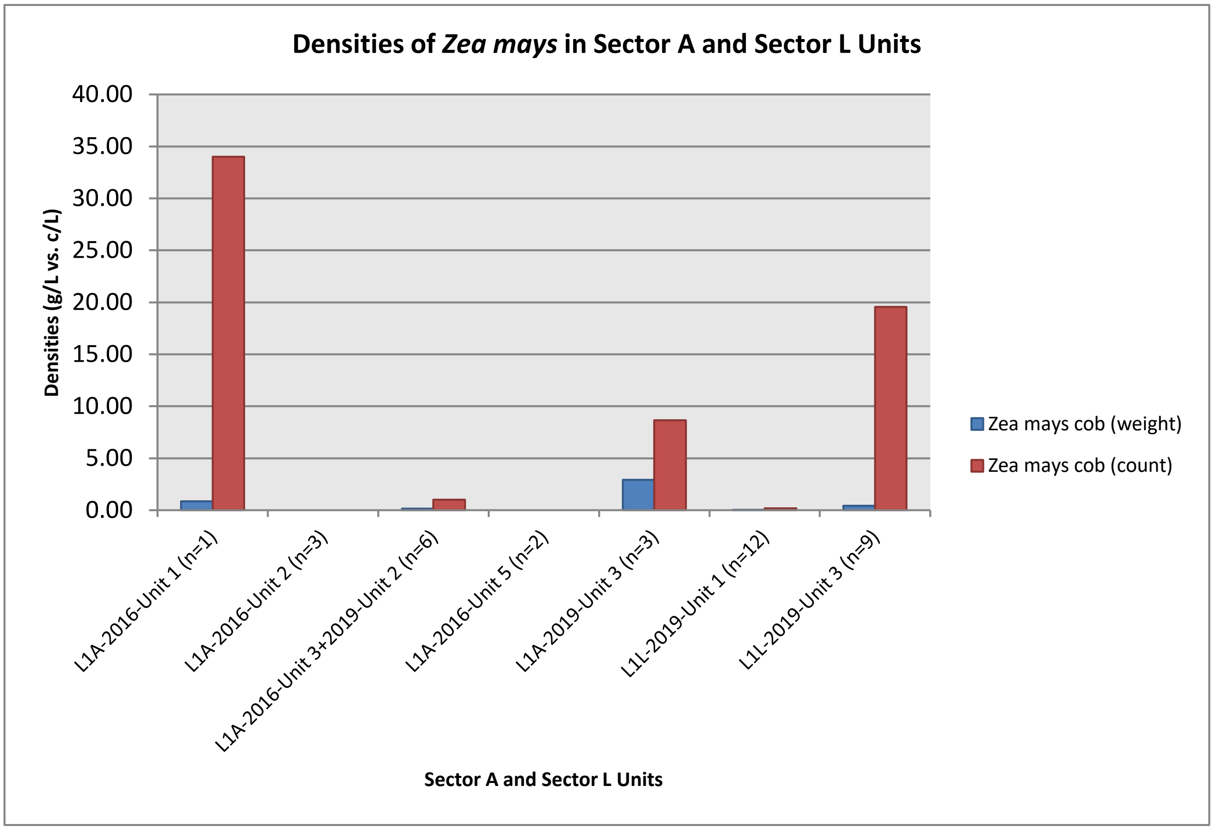
Zea mays cobs found in the samples have been categorized as "whole," "fragment," and "charred, fragment." Because the fragments greatly vary in size and an assortment of fragments may resemble one cob, Graph 24 compares cob-weight density to cob-count density. Cob-weight density shows that maize density is greater in Sector A, while cob-count density shows that maize density is greater in Sector L. These findings suggest that all L1 residents commonly consumed maize.

Graph 24: Comparing maize-cob densities based on weight and based on count in Sector A and Sector L.



Graph 25 below further confirms that maize was consumed at both sectors, showing that the cultivar is found in most domestic Sector A units and in both Sector L units. Within Sector A, the densities of maize are greatest in the domestic contexts of L1A-2016-Unit 1 and L1A-2019-Unit 3. Although no maize cobs were recovered from L1A-2016-Unit 2, 4 whole kernels and 2 kernel fragments were recovered from this unit, and although there is a low density of maize cobs in the analyzed samples of the “plaza-associated” units (L1A-2016-Unit 2 and L1A-2019-Unit 2), this was the same context that contained the hundreds of flakey kernel fragments. Expectedly, no maize is found within the ritual unit, L1-2016 Unit 5. Finally, a closer look into Sector L shows that the density of maize cobs is concentrated in 2019-Unit 3, suggesting that the residents of L1L-2019-Unit 3 consumed more maize than the residents of L1L-2019-Unit 1.

Graph 25: Comparing maize-cob densities based on weight and based on count in Sector A and Sector L units.



4.2.5 Solanaceae

The flavors of *Capsicum* sp. (*ají*) have contributed largely to Andean cuisine (Pearsall 2008). Twenty-five species of *Capsicum* are domesticated versions that originated throughout Central and South America (Chiou et al. 2017 [Moses and Umaharan 2012; Pickersgill 1972; Aguilar-Meléndez 2006; Hernández-Vedugo et al. 1999; Perry and Flannery 2007]), and archaeological evidence shows that *ají* is grown in both the coastal and highland regions of Perú (Chiou et al. 2017; Perry et al. 2007).

Ají seeds are somewhat ovular in shape, although the overall seed shape does vary according to species (Figures 24 and 25) (Chiou et al. 2017: 651). The “beak,” or the part of the seed that protrudes from the rest of the "seed body," characterizes the *ají* seed. Beak angle may be used as a diagnostic attribute (Chiou et al. 2017: 650). Sixteen *ají* seeds were found, and a consideration of the beak angle and the help of Dr. Matthew Biwer (via email communication on March 31, 2020) suggest that 3 different species might be present: *C. annuum, C. chinense*, and *C. frutescens.*

***Capsicum* sp. Seeds**

Figure 24: *Capsicum* sp. seeds found in L1=4148. Although he cannot be certain without viewing them in person, Dr. Biwer believes that they might be *C. chinense* or *C. frutescens* (email communication on March 31, 2020).

***Capsicum* spp. Seeds**

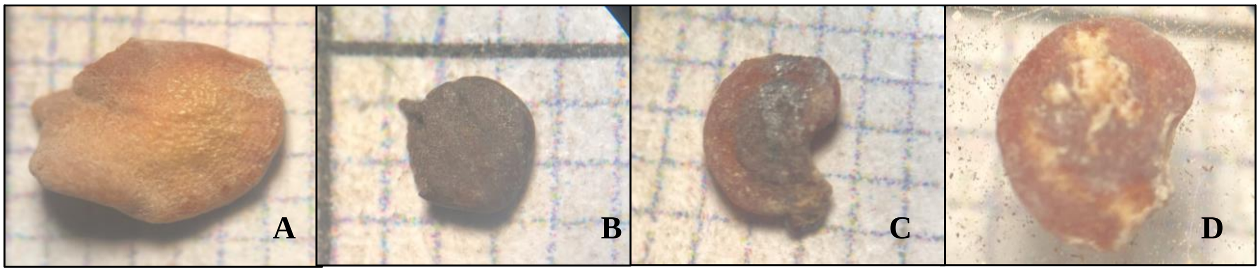
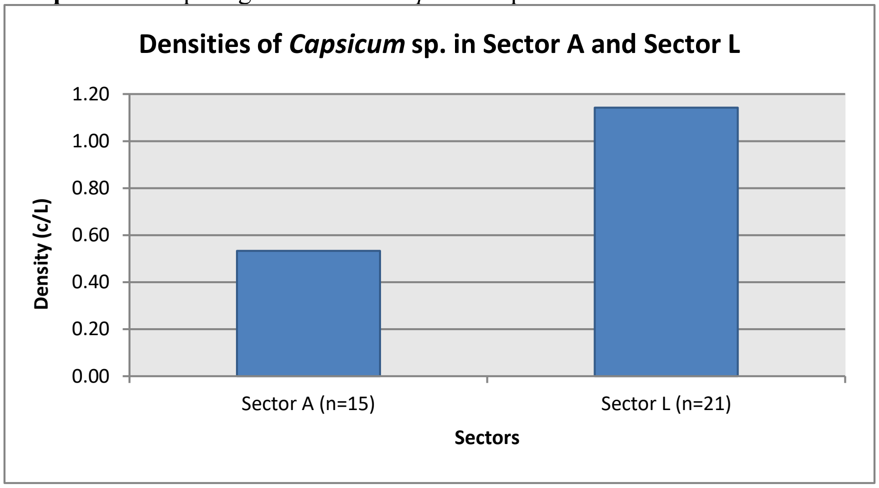


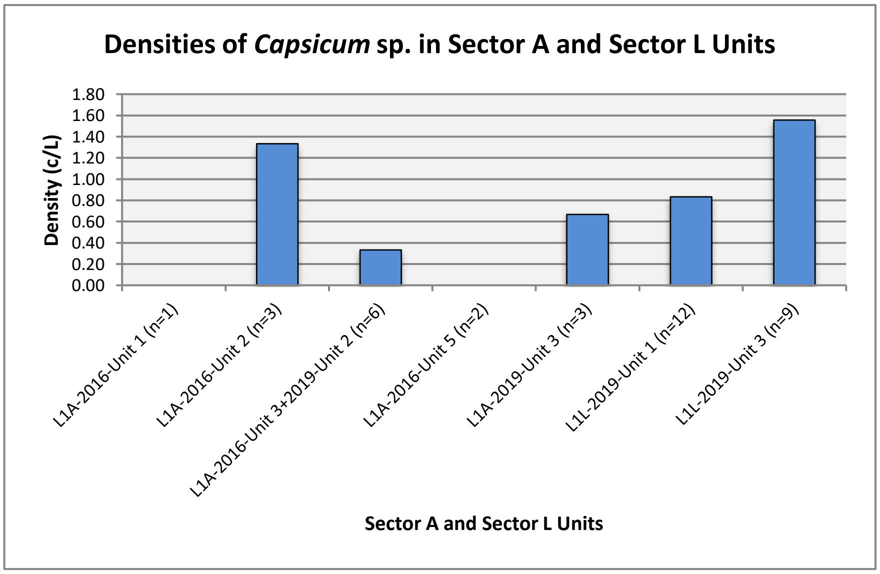
Figure 25: *Capsicum* spp. seeds from L1=4112 (A), L1=4123 (B), L1=4112 (C), and L1=4117 (D). Although he cannot be certain without viewing them in person, Dr. Biwer believes that "A" might be *C. annuum* or *C. chinense* and "B" might be *C. frutescens*. He is less certain about the genus-level identification of "C" and "D" but agrees that they are likely *Capsicum* as well, possibly *C. annuum* or *C. chinense* (email communication on March 31, 2020).

Because of their negligible weight, seed count is used to calculate the densities. Fifteen of the *ají* seeds are whole (1 of these charred). The one fragmented seed includes more than 75 percent of the seed, so it's given a value of "1" in the density calculations. According to Graph 26, Sector L has a greater density of *ají* than Sector A does, but a closer look into the units (Graph 27) shows that *ají* is found in all domestic units except for in L1A-2016-Unit 1. (Only one sample was analyzed from this unit, so this does not indicate that L1A-2016-Unit 1 residents did not use *Capsicum* seeds.) These findings likely suggest that all L1 residents used *ají*. Finally, no *ají* seeds were found in the ritual context of L1A-2016-Unit 5.

Graph 26: Comparing densities of *Capsicum* sp. in Sector A and Sector L.



Graph 27: Comparing densities of *Capsicum* sp. in Sector A and Sector L units.



4.3 The Industrial Group

This section discusses the findings of industrial remains, *Gossypium* sp. (cotton), and camelid and guinea pig (*cuy*) coprolites. Cotton plants are associated with cultures of the Peruvian coastal region. Cotton fibers have been useful to Peruvian people for thousands of years. The earliest evidence of its significance is found in the central Peruvian coastal region and dates to 3550 B.C. The findings included seeds, fibers, fruit, yarn, fishing nets, and fabrics (Wendel et al. 2010 [Vreeland, pers. comm]). Tiwanaku colonists would have had access to cotton in the Locumba Valley, and part of this study asks whether or not cotton became useful to the colonists.

Camelid and *cuy* were and continue to be significant animals to Peruvian highland people. Tiwanaku identity is normally associated with camelid-wool textiles (Lynch 1983: 8). For example, Tiwanaku tapestry tunics were completely made of wool (Isbell 2008: 738). In addition to being a source of wool, domesticated llamas and alpacas were beasts of burden and a source of food for the Altiplano people (Goldstein 2005 [Bermann 1994, 1997; Browman 1974, 1980b, 1984b, 1993; Lynch 1983; Webster 1993]). Finally, *cuys* are sacred Andean rodents, often kept in pens within people's homes. To Andean people, *cuys* are a delicacy consumed during special events, are used for health-diagnostic reasons, and are sacrificed for ritual purposes (Sandweiss and Wing 1997). Camelid and *cuy* presence at L1 suggests that the Tiwanaku colonists traveled with and continued to rely on these animals in the Locumba Valley.

4.3.1 Malvaceae: Gossypium sp.

Gossypium sp. seeds, leaves, calyx, and fiber have been collected from the samples. The mature cottonseed is brown and pear-shaped, or an ovoid that pinches at one end. Cottonseeds vary in size according to species, but the cottonseeds in the L1 samples were ~1 centimeter long

(Figure 26). The epidermal cells of the seed coats may produce long trichomes (cottonseed fibers), while others create shorter trichomes, or “fuzz hairs,” which are larger in diameter but have a thinner cell wall (Bouchaud et al. 2011). Trichome color depends on the interactions between pigments and cellulose, and although most cotton fibers are white or off-white in color (Figure 27), tertraploid cotton *G. barbadense* produces lint and fiber colors that range from white to different shades of green and brown (Paulo de Carvalho et al. 2014).

***Gossypium* sp. Seeds**

Figure 26: *Gossypium* sp. seeds found in sample L1=4069.

***Gossypium* sp. Fiber with Seeds**

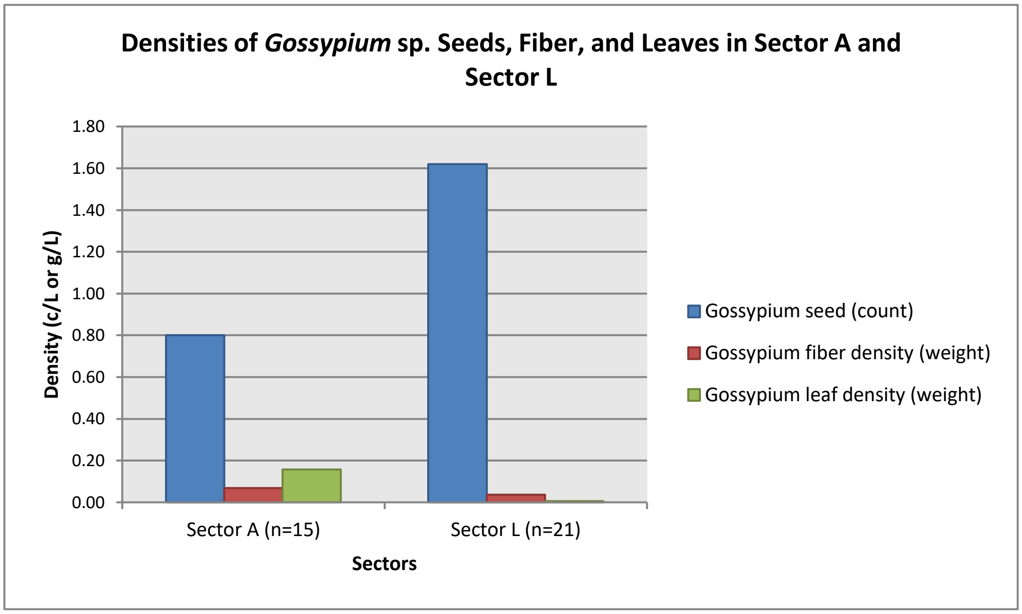
Figure 27: *Gossypium* sp. fiber and seeds found in sample L1=4069.

The seeds found in the L1 samples are categorized as “whole,” “charred whole,” and “charred fragment.” Although the *Gossypium* sp. seeds’ funicular caps are not all intact, the cottonseeds do not fragment easily unless charred. The fragmented seeds found in the samples were all charred, and these charred fragments comprised 75 percent or more of the whole seed. (For this reason, each fragmented cottonseed is given the “whole” value of 1.)

Cottonseeds may become charred through different mechanisms, and Bouchaud et al. write about 1) how fire may have been used to eliminate seeds after ginning and/or extracting oil, 2) how seeds may have been accidently burned when heated “to reduce the toxic gossypol context” (Knowles 1967), and 3) how burning dung may have caused some seeds to char (2011: 408). Recovering cottonseeds from an archaeological site is usually an indication of local cultivation because ginning would occur prior to exchanging cotton fibers, but it is also important to note that people may have traded cotton bolls and/or seeds (Bouchaud et al. 2011).

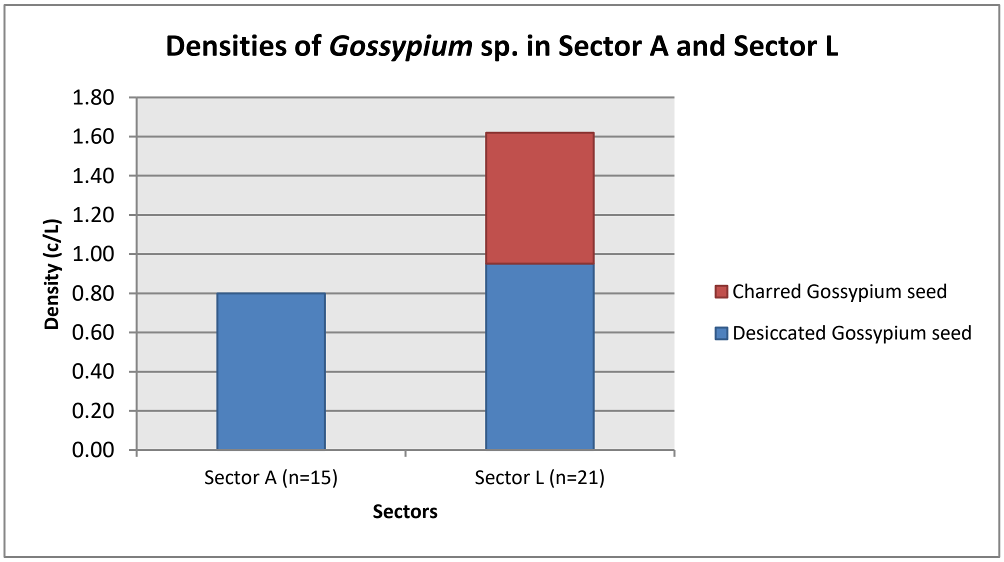
The analyses involve comparing densities of cottonseeds, leaves, and fiber across sectors and units. Counts are used to calculate cottonseed density. On the other hand, weights are used to calculate leaf and fiber densities because every leaf recovered is fragmented and the pieces of fiber significantly vary in size. Graphs 28 shows that the density of cottonseeds is twice as large in Sector L than it is in Sector A but that Sector A includes larger fiber and leaf densities than those of Sector L. Sector comparisons suggest that all L1 residents depended on this industrial plant.

Graph 28: Comparing cotton –seed, –fiber, and –leaf densities in Sector A and Sector L.



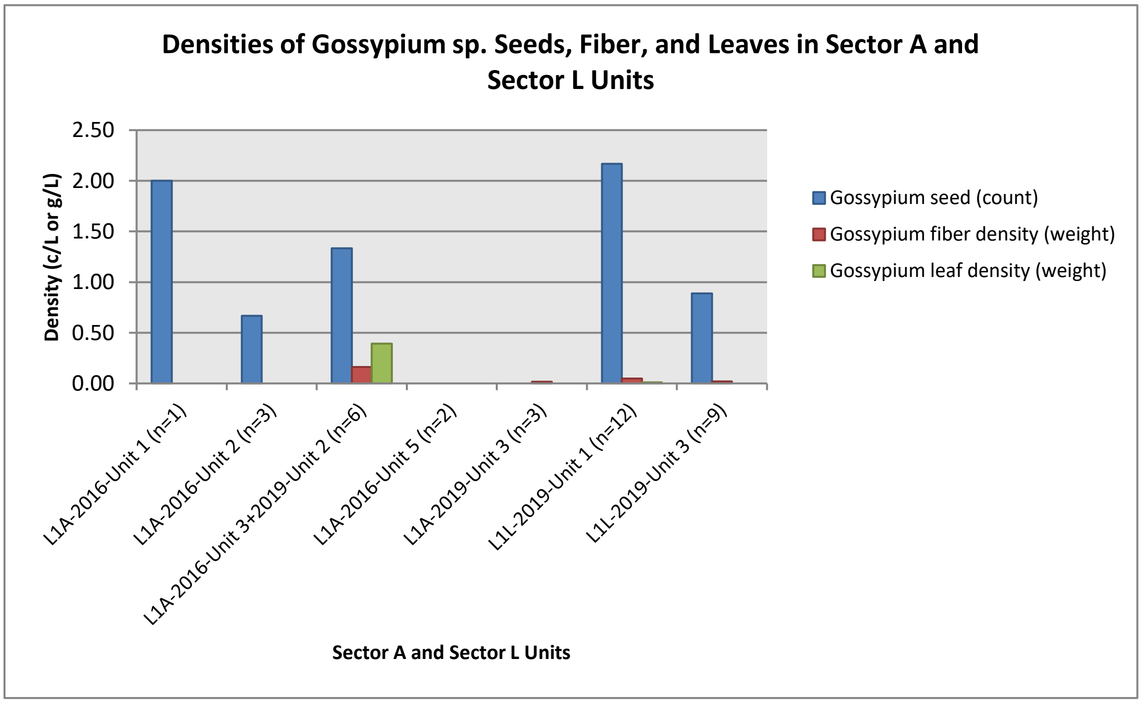
Although all L1 residents likely used cotton, Graphs 28 and 29 show that the cottonseed density is twice as large at Sector L than it is at Sector A. This might reflect the industrial context of Sector L unit 2019-Unit 1 and also suggest that Sector L residents depended more heavily on this plant. Graph 29 compares desiccated cottonseeds to charred cottonseeds, and the high concentration of charred cottonseeds in Sector L likely implies that these seeds were being used for domestic purposes in addition to industrial purposes.

Graph 29: Comparing charred and desiccated cottonseed densities in Sector A and Sector



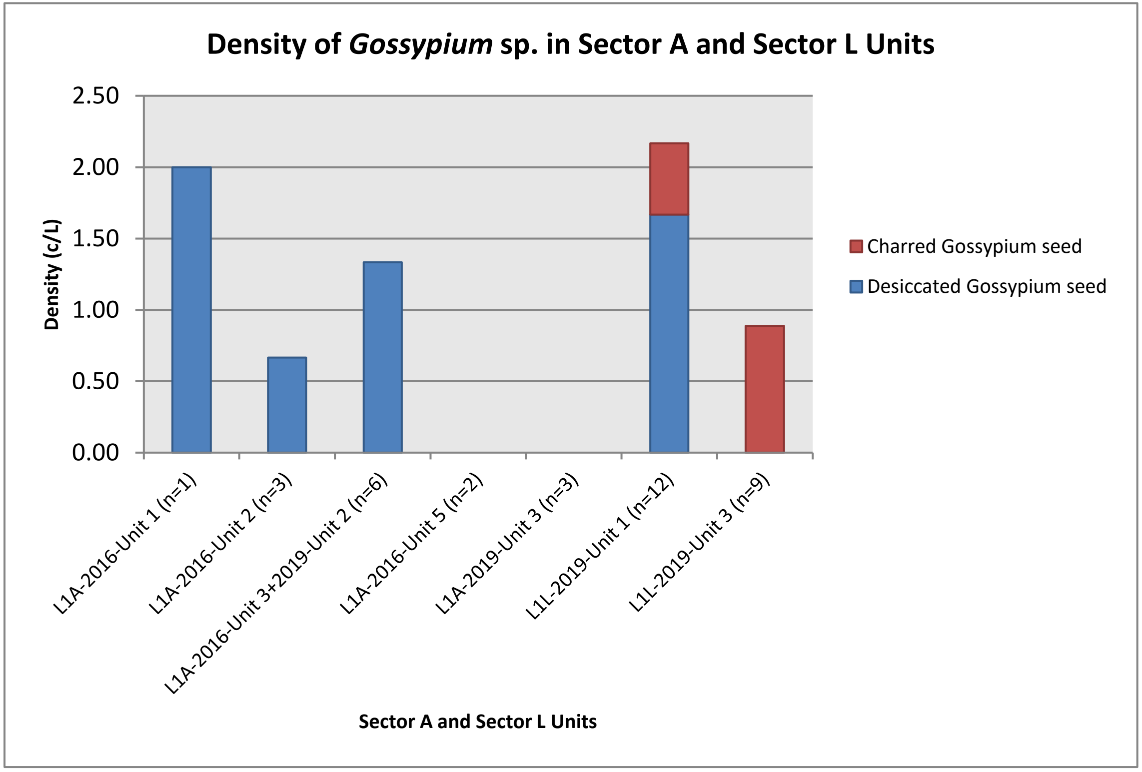
A look at Graph 30, shows that cottonseeds were found in all domestic units except for in L1A-2019-Unit 3, although 2 small cotton fibers were recovered from here (0.02 g/L). Expectedly, no cottonseeds are found at L1A-2019-Unit 5, reinforcing the idea that this unit is a ritual space. The combined "plaza-associated" units, L1A-2016-Unit 3 and L1A-2019-Unit 2 have the greatest leaf and fiber densities. The two samples, L1-4161 (semi-loose fill) and L1-4165 (sediment exposing floor), show no evidence of industrial processing. Moreover, the one cotton calyx recovered is from L1A-2019-Unit 2. The calyx adheres closely to the developing boll (Pkania 2016) and acts as a protective layer to the budding flower (Rost 1998), further supporting the idea that no cotton processing occurred here.

Graph 30: Comparing cotton –seed, –fiber, and –leaf densities in Sector A and Sector L units.



Many cottonseeds are concentrated in L1L-2019-Unit 1 (Graph 31). In addition to containing a domestic area, L1L-2019-Unit 1 includes an "industrial area," where textiles, raw textile materials, numerous needles, and stone of lapis lazuli are found. Most of the seeds (n = 8) in this unit come from sample L1-4069, which also contained 3 pieces of cotton and 16 fragmented leaves (0.01 g). The sample's context has been described as a small, circular pit containing numerous leaves and fragments of a burnt pot that was likely situated on the floor. The charred cottonseeds (n = 3) from this unit were found in sample L1-4096, a thick ash deposit and possible hearth, and in sample L1-4066, a matrix of household waste. These findings at L1L-2019-Unit 1 show both the industrial and domestic use of the cotton plant: first, the cottonseeds were removed from the fiber so that the fiber could be used for industrial purposes. Second, the cottonseeds were burned to extract the cottonseed oil, which was then used for cooking. Finally, once charred, the cottonseeds were discarded. At the domestic L1L-2019-Unit 3, all of the cottonseeds are charred (n = 4) and were recovered from sample L1-4123. This sample was taken from an area that contained *manos* and *matates* and shallow-pit features with ash, reinforcing the idea that cottonseeds were burned for their oil.

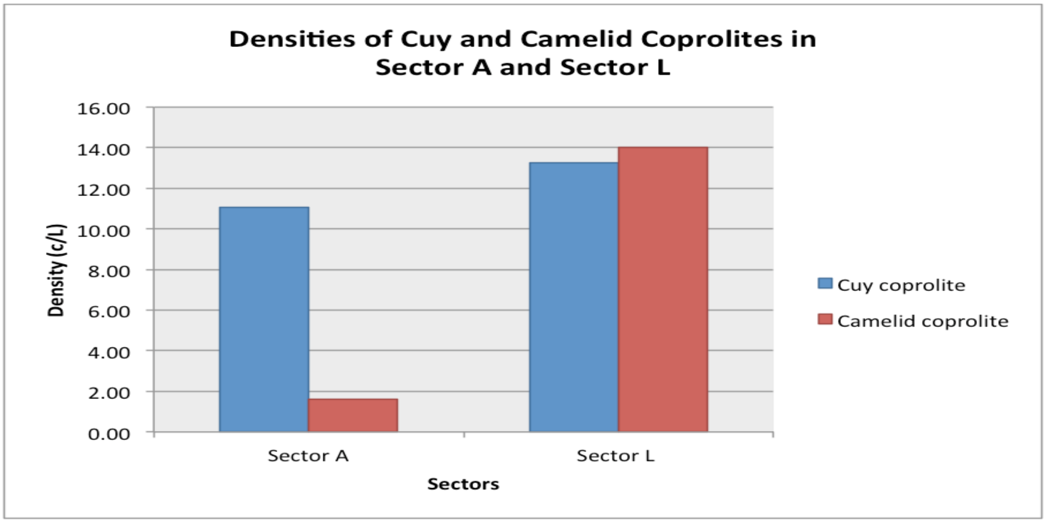
Graph 31: Comparing charred and desiccated cottonseed densities in Sector A and Sector L units.



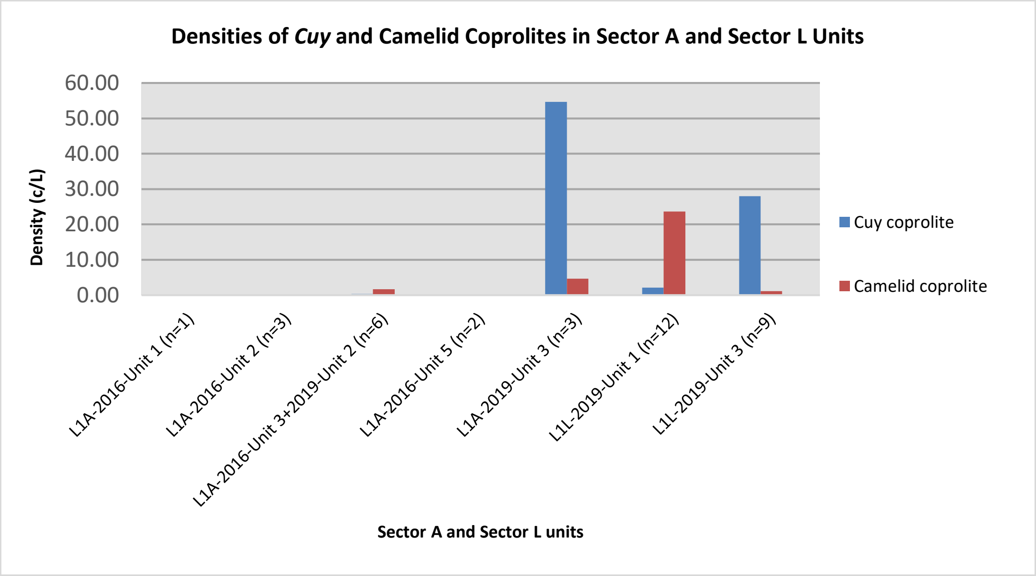
4.3.2 Cuy and Camelid Coprolites

Cuy and camelid coprolites were found in the L1 samples, and this suggests that the Tiwanaku colonists traveled west with these highland animals and continued to rely on them. Graph 32 shows similar densities of *cuy* coprolites at Sector A and Sector L, and Graph 33 shows that the *cuy* coprolites are concentrated at L1A-2019-Unit 3 and L1L-2019-Unit 3, which are both domestic contexts. Peruvian people raise *cuys* within their homes, so *cuys* were most likely fed the same foods that people ate in their homes.

Graph 32: Comparing densities of *cuy* and camelid coprolites in Sector A and Sector L.

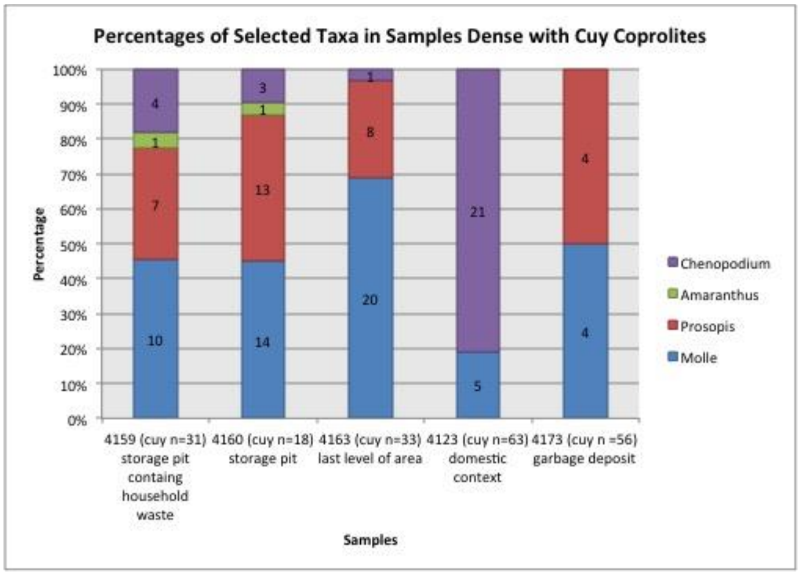


Graph 33: Comparing densities of *cuy* and camelid coprolites in Sector A and Sector L units.



In an attempt to distinguish food from fodder, Graph 34 compares *Schinus molle, Prosopis* sp., *Amaranthus* sp., and *Chenopodium* spp. counts within contexts that had the highest densities of *cuy* coprolites: L1-4159 (*cuy*-coprolite count (n) =31), L1-4160 (n=18), L1-4163 (n=33), L1-4123 (n=63), and L1-4173 (n=56). There is no discernable pattern between these samples, and *cuys* were most likely given the scraps from cooking and eating.

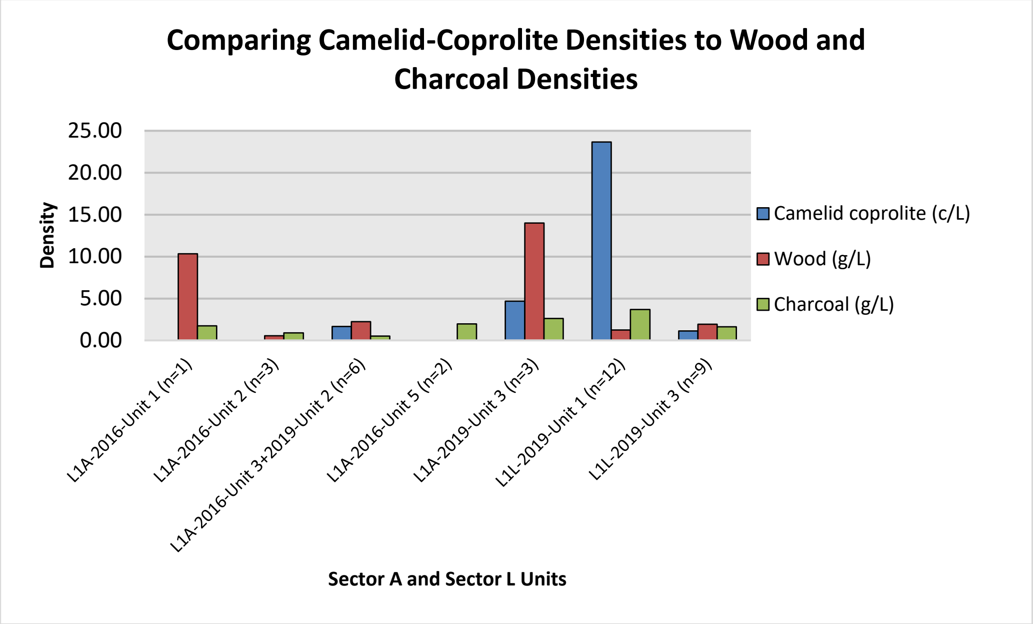
Graph 34: Comparing *Chenopodium* sp., *Amaranthus* sp., *Prosopis* sp., and *Schinus molle* in samples dense with *cuy* coprolites.



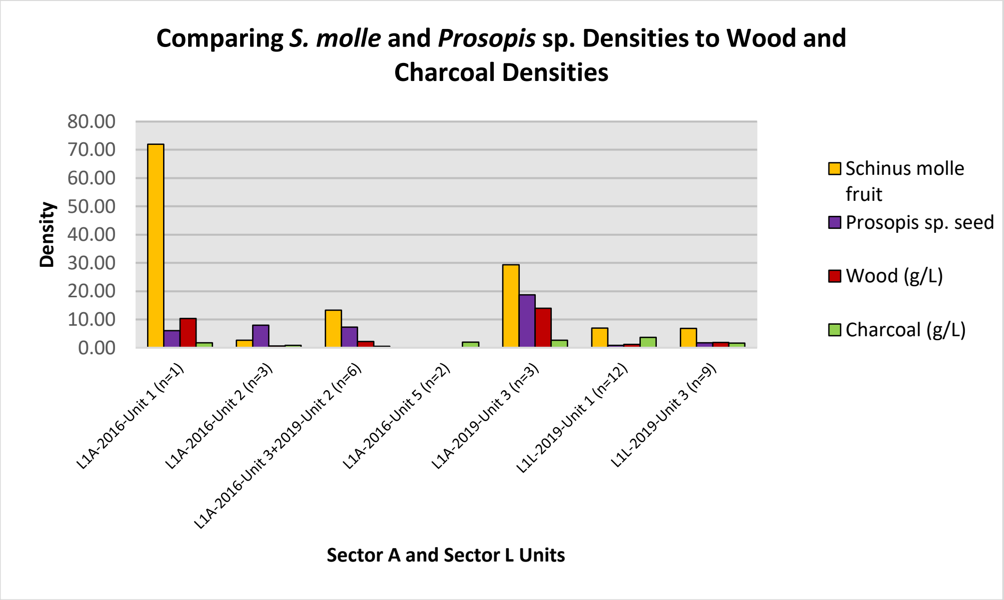
L1L-2019-Unit 1—which contains both an industrial and domestic area—has the highest density of camelid wool (0.167 g/L), suggesting that both wool and cotton fibers (Graph 30) were used for textile production. L1L-2019-Unit 1 also has the highest density of camelid coprolites (23.67 c/L) (Graph 33), suggesting that residents of this unit relied more heavily on these animals. Interestingly, the samples containing the largest numbers of camelid droppings (L1-4072, L1-4076, and L1-4095) are all from a thick ash deposit/possible hearth, revealing that camelid dung was burned as fuel. Finally, comparing the densities of camelid coprolites to wood and charcoal densities across units (Graph 35) and comparing wood and charcoal densities to the densities of *Schinus molle* and *Prosopis* sp. across units (Graph 36) confirms the argument that

Sector L domestic/industrial unit L1L-2019-Unit 1 relied more heavily on camelid dung as fuel (Graph 35), while Sector A domestic units L1A-2016-Unit 1 and L1A-2019-Unit 3 relied more heavily on woody plants to use as fuel (Graph 36).

Graph 35: Comparing densities of camelid coprolites, charcoal, and wood in Sector A and Sector L units.



Graph 36: Comparing densities of *Schinus molle*, *Prosopis* sp., charcoal, and wood in Sector A and Sector L units.



4.4 Marine Subsistence: Choromytilus chorus (choro)

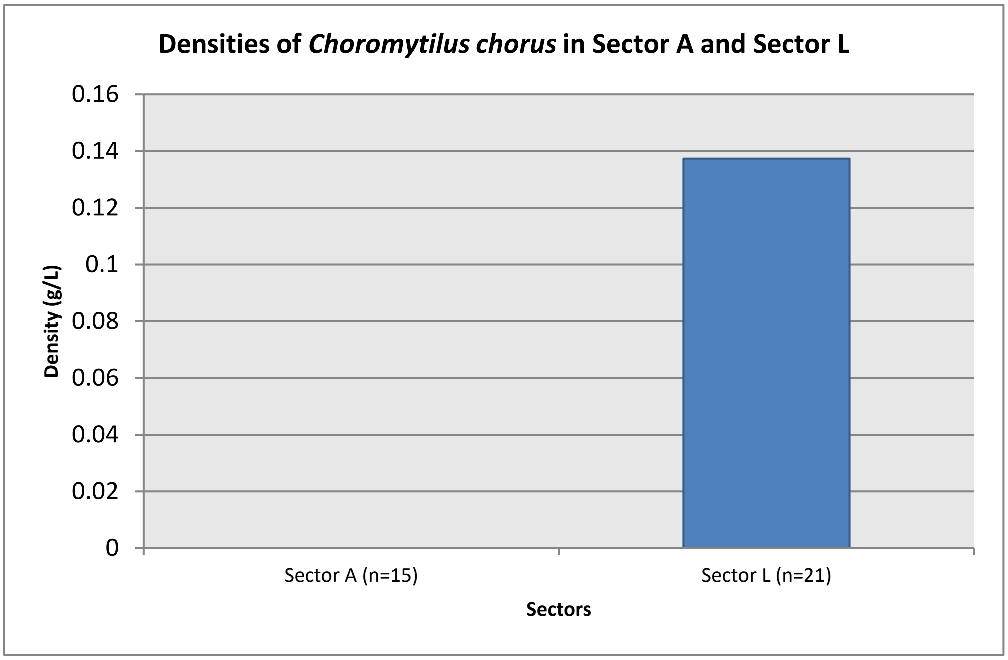
Choromytilus chorus (choro) is a bivalve that requires the cold ocean temperatures to survive and is therefore abundant in the Peruvian coastal waters during climate-stable years (non-ENSO years) (Sandweiss 2003). *Choro* has been a significant food source to Peruvian coastal people for thousands of years, as seen at the Preceramic sites in the Supe Valley on the Central Coast of Perú (Solis et al. 2001), and contributes to coastal Peruvian cuisine today.

The distinguishable purple-colored, *choro*-shell fragments were found in the L1 samples (Figure 28), and *choro* weight has been used to calculate the densities of *choro* within each sector and unit. Graph 37 shows that Sector A has a *choro*-weight density of 0.00 g/L, while Sector L has a *choro*-weight density of 0.137 g/L. Although the sample findings do not suggest that *choro* was a main food source at L1, these results do suggest that Sector L residents relied more heavily on this bivalve than Sector A residents did. Looking within Sector L (Graph 38) shows that *choro* fragments are concentrated at L1L-2019-Unit 3, which is interestingly the unit showing a strong dependence on marine resources. Large quantities of fish bones, mollusk and crustacean shells, and fragments of fishing nets made of cotton were recovered here.

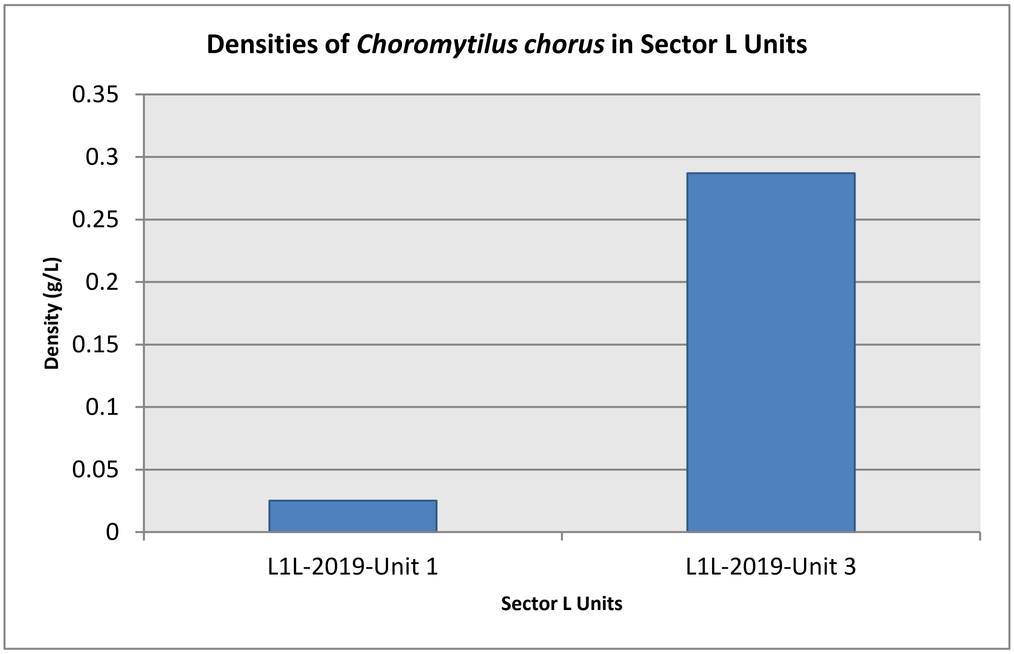
Fragments of *Choromytilus chorus*

Figure 28: *Choromytilus chorus*- shell fragments found in sample L1=4173.

Graph 37: Comparing densities of *Choromytilus chorus*- shell fragments in Sector A and Sector L.



Graph 38: Comparing densities of *Choromytilus chorus*- shell fragments in Sector L units.



Chapter 5: Discussion

Paul Goldstein (2005) proposes the “diasporic archipelago” model to explain the Tiwanaku expansion (A.D. 600 – 1100) from the Bolivian Altiplano into the Pacific coastal valleys, such as the Moquegua Valley. The diasporic archipelago model is an agency-orientated alternative to globalist paradigms that is based on 1) the Andean concept of the *ayllu*, 2) diasporic movements, and 3) John Murra’s (1964, 1968, 1972, 1985) vertical archipelago model. According to Goldstein, this form of diasporic colonization is detectable in the archaeological record through the following features:

1) “Permanent or long-term *residence* in complementary zones,
2) explicit manifestation of a maintained *identity* with the homeland nucleus,
3) *structural reproduction* of the social structure of the homeland,
4) *multiethnicity*—the distribution of immigrant colonies interspersed with colonies of other ethnic groups” (Goldstein 2005: 42).

Under Goldstein’s Proyecto Arqueológico Locumba (PAL), PhD candidate Matthew Sitek of the University of California, San Diego has been investigating Tiwanaku presence at the site of Cerro San Antonio (L1) of the middle Locumba Valley. Sitek is interested in understanding whether the L1 Middle Horizon sectors reflect one or a combination of the following: 1) primary Tiwanaku colonial enclaves comprised of highland people, 2) secondary Tiwanaku colonial enclaves comprised of people from Moquegua, or 3) local populations that acquired Tiwanaku material through trade (Goldstein and Oquiche H. 2015; Goldstein and Oquiche H. 2016; Goldstein and Oquiche H. 2019; Sitek 2018: 5-6; Sitek n.d.).

According to the 2016 and 2019 reported L1 data of the domestic sectors A and L, all diagnostic ceramic findings and decorated textiles are Tiwanaku, although some ceramic motifs resemble Tuilaca styles of post Tiwanaku (Goldstein and Oquiche H. 2016; Goldstein and Oquiche H. 2019). The excavations at Sector A and Sector L revealed midden deposits reflecting Tiwanaku behaviors that are similar to findings at Moquegua (Sitek 2018 [Goldstein 1989, 1993a]), alluding to the maintenance of a Tiwanaku homeland identity. Moreover, the residential sectors A and L are comprised of superimposed floors, are adjacent to dense midden deposits, and are associated with mortuary sectors (Sitek 2018; Sitek n.d.). These are features that indicate permanent or long-term residence at the site.

The PAL 2016 and 2019 findings reflecting desires to maintain Tiwanaku identity and indicating long-term residence at the site suggest that L1 was comprised of primary Tiwanaku colonial enclaves of highland people (hypothesis 1). This means that Goldstein's diasporic archipelago model is applicable to the Locumba Valley as it is to the Moquegua Valley (Sitek 2018). To confirm hypothesis 1, I propose that the macrobotanical assemblage at L1 should reflect the following: 1) Goldstein's "explicit manifestation of the maintained *identity* with the homeland nucleus" (2005: 42) through highland-associated domestic and industrial cultivars and animals; 2) Goldstein's "*structural reproduction* of the social structure of the homeland" (2005:42), or the Andean *ayllu*, through evidence of specialization (i.e. highland versus lowland sectors or homes), evidence of culinary differences, or evidence of an elite group at L1; and 3) a similar macrobotanical assemblage to primary Tiwanaku colonial sites, such as the Rio Muerto site of M43. In addition to being a primary Tiwanaku colony, M43 is found in the Moquegua Valley, which is located in the same altitudinal zone (900 masl) and shares the same ecology as the Locumba Valley.

5.1 Goldstein's Explicit Manifestation of the Maintained Identity with the Homeland Nucleus

If the Middle Horizon domestic sectors at Cerro San Antonio are primary Tiwanaku enclaves (hypothesis 1), the macrobotanical remains in the L1 samples should reflect Goldstein's "explicit manifestation of the maintained *identity* with the homeland nucleus" (2005: 42) through highland-associated domestic and industrial cultivars and animals. The results of the PAL 2019 PEB findings show large deposits of highland-associated Amaranthaceae seeds and highland-associated *cuy* and camelid coprolites. Because "food intensively creates the individual as well as the community through the daily practices of eating" (Atalay and Hastorf 2006), I argue that the Tiwanaku colonists at L1 maintained their highland identities in the Locumba Valley through the procurement or cultivation, preparation, and consumption of Amaranthaceae cultivars and through the domestication of *cuys* and camelids.

5.1.1 Amaranthaceae: Highland Foods in the Locumba Valley

Amaranthaceae cultivars are crops associated with the highlands, but the L1 samples show high densities of quinoa, wild cf. *Chenopodium* sp., and *Amaranthus* sp. occurring together in L1 domestic contexts. As explored in the results, contextualizing the L1 Amaranthaceae findings indicates that Amaranthaceae contributed to people's diet at both Sector A and Sector L. To recall, Amaranthaceae is found in hearths, domestic-waste contexts, and in a L1A-2016-Unit 1 storage pit containing food crops maize and beans. The presence of Amaranthaceae in the Sector A and Sector L samples suggests two possibilities under Goldstein's diaspora model (2005): 1) Tiwanaku colonists maintained their Tiwanaku identities in the Locumba Valley by acquiring Amaranthaceae cultivars through systems of exchange and continuing to include the highland-associated cultivar in their diet, or 2) Tiwanaku colonists maintained their Tiwanaku identities by growing and eating Amaranthaceae cultivars in the Locumba Valley.

The first possibility uses Murra's vertical archipelago model (1964, 1968, 1972, and 1985) as a framework to argue that L1 residents did not grow the Amaranthaceae cultivars locally but acquired the crops through systems of exchange that were developed as Tiwanaku people expanded into the western valleys. According to Murra's model, the Andean nonmarket system of production and exchange developed from small groups of people inhabiting opposing ecological zones of the vertically-complex ecological landscape, engaging in economic activities suitable to the zones (i.e. farming specific crops according to the elevation), and acquiring resources from the different ecological zones through exchange (Goldstein 2005; Murra 1972).

In this case, the Tiwanaku colonists established permanent or long-term residence at L1, a site located 600 masl and 35 km from the coastal waters. Here, they grew food crops such as peanuts, beans, maize, and *ají* that readily grow in this lowland complementary zone and then exchanged these cultivars for highland Amaranthaceae cultivars, such as quinoa. As mentioned, quinoa originated in the Altiplano and contains high soluble sugars that allow it to be frost-resistant (Jacobsen et al. 2007) and grow up to 4000 masl. Quinoa was the most important food source for Late-Formative Tiwanaku residents of the southern basin (Berryman 2010 [Wright et al. 2003]). *Amaranthus* sp., too, was originally grown in the high-altitudinal zones with frost-resistant crops such as quinoa (Pearsall 2008: 107). In short, acquiring highland Amaranthaceae cultivars through exchange and continuing to consume them in the Locumba Valley were ways to reinforce Tiwanaku identity.

The second possibility considers how Amaranthaceae cultivars do grow at lower elevations and even at sea level (Biwer 2019: 112) despite their highland origins. For example, there is evidence of low-level cultivation of quinoa and *quinoa negra* at early Formative Chiripa (Biwer 2019: 112 [Bruno and Whitehead 2003]). Moreover, *Amaranthus* sp. seems to grow better at lower altitudinal zones than quinoa does. For example, Sauer discusses how *Amaranthus caudates* (kiwicha) grows better than quinoa in water-scarce environments because they do not contain the bitter saponins that are found in quinoa, which must be drained from the seeds (1967: 128). There is evidence of drought-resistance in quinoa. As we have seen, *Chenopodium quinoa* was grown throughout the dry mid-Holocene period (Marsh 2016; Ortíz 2019). During this dry period, precipitation was infrequent, and Lake Titicaca was somewhere between 50 to 100 meters lower than its present level (Kolata 2003; Marsh 2015; Marsh 2016: 126 [Wirrmann and Oliveira Almeida 1987; Wirrmann and Mourguiart 1995; Seltzer et al. 1998; Cross et al. 2000; D'Agostino et al. 2002]). Moreover, it is known that quinoa does grow in environments with little water, such as in the salt desert of Bolivia (Aguilar and Jacobsen 2003: 39 [Mujíca et al. 1998]) or in the coastal region (Biwer 2019: 112, 134). Aguilar and Jacobsen (2003) note that to adapt to dry conditions, farmers in the Bolivian Altiplano plant native quinoa varieties that are "mixtures of genotypes" in combination with cultivars that are less drought resistant, which is referred to as the *aynoqas* production system (Aguilar and Jacobsen 2003: 33).

In addition to knowing that Amaranthaceae cultivars may grow in the coastal desert zone, the high concentrations of the weedy plant, *Amaranthus* sp., and the presence of cf. *Chenopodium* sp.—which is likely wild *Chenopodium* sp. or possibly wild *Amaranthus*[9]— in the L1 samples further supports the idea that Amaranthaceae was grown locally in the Locumba Valley and processed at the site (Graphs 39 and 40). Interestingly, Graph 40 shows that the highest proportion of cf. *Chenopodium* sp. is found in the plaza-associated contexts, L1A-2016-Unit 3 + 2019-Unit 2, suggesting that people separated the weedy counterpart before consuming

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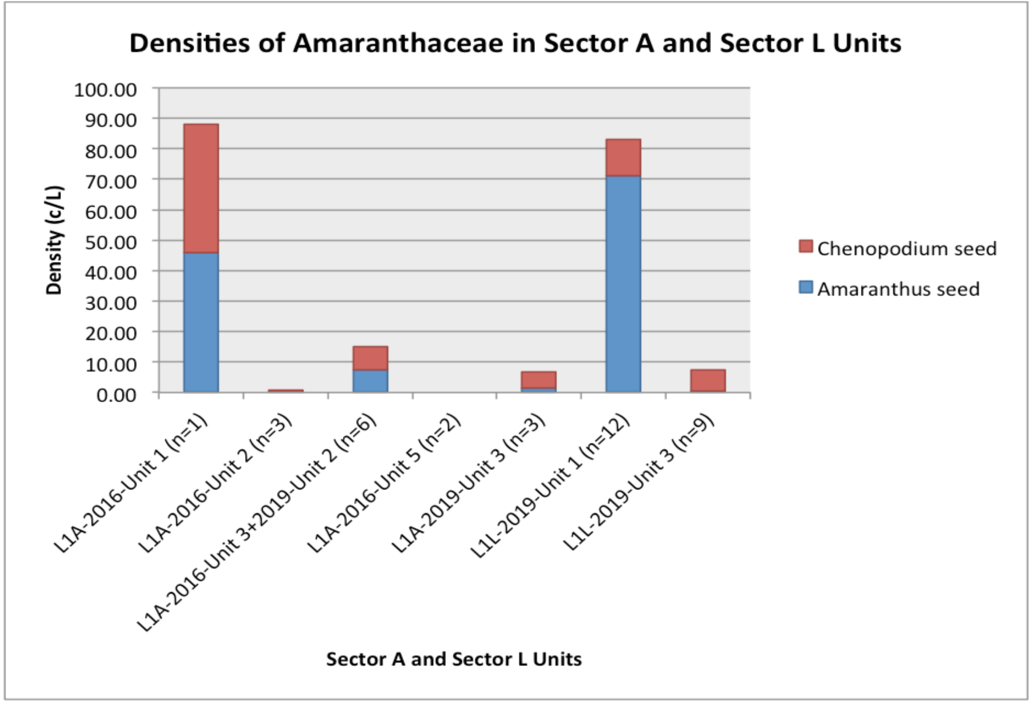
[9] Dr. d'Alpoim Guedes believes the cf. *Chenopodium* seeds look like wild Chenopodium, while in an email from February 28, 2020, Dr. Maria Bruno mentioned that she would lean towards identifying them as wild *Amaranthus* sp. In a later email on May 19, 2020, Dr. Bruno mentioned that the seeds I have categorized as cf. *Chenopodium* sp. might include both *Amaranthus* sp. and *Chenopodium* sp. seeds. Better photographs are needed.

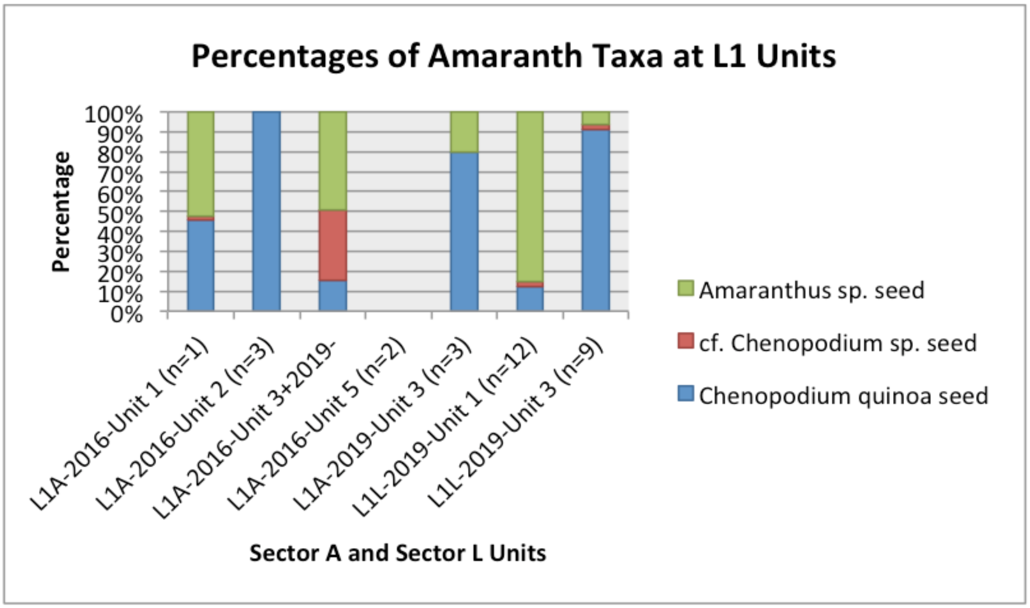
it in their homes. The high densities and proportions of *Amaranthus* sp. in L1A-2016-Unit 1 and L1L-2019-Unit 1 suggest that these two units are likely candidates for Amaranthaceae processing because they both have high densities of Amaranth cultivars that are largely comprised of *Amaranthus* sp. (Graphs 39 and 40). The high densities of *Amaranthus* sp. found within people's homes, however, also suggest that *Amaranthus* sp. was part of the diet for both people and *cuys*.

If the Locumba residents had acquired Amaranthaceae plants through trade, we might expect less wild and weedy Amaranthaceae seeds because these would have been separated out before trade. To recall, Bruno (2001: 96-98) found the weedy counterpart, *quinoa negra*, in equal or greater proportions to quinoa in Early Formative samples of the southern Titicaca Basin (Bruno 2008:22), leading Bruno and Whitehead to argue that people consumed both varieties during the Early Formative (Bruno 2008: 22 [Bruno and Whitehead 2003: 351]; Bruno and Whitehead 2003). However, throughout the Middle Formative, people more carefully selected seeds (Berryman 2010 [Bruno and Whitehead 2003]) and separated the weedy counterpart, *quinoa negra* (Bruno 2008 [Bruno and Whitehead 2003: 351]; Langlie 2018). In conclusion, it seems likely that the Tiwanaku colonists at L1 cultivated Amaranthaceae in the Locumba Valley, and I argue that cultivating the crop—in addition to preparing and consuming the crop—reinforced Tiwanaku identity.

Graph 39: Comparing densities of *Chenopodium* sp. and *Amaranthus* sp. in Sector A and Sector L units.



Graph 40: Percentages of *Amaranthus* sp., wild cf. *Chenopodium* sp., and *Chenopodium quinoa* at Sector A and Sector L units.



5.1.2 Cuys and Camelids: Highland Animals in the Locumba Valley

Cuys and camelids are highland-associated animals that were significant to Tiwanaku Altiplano people. *Cuys* were sacred Andean rodents that were consumed during special events, used in traditional healing, and sacrificed in ceremonies (Sandweiss and Wing 1997). The high densities of *cuy* coprolites recovered from domestic contexts indicate that Tiwanaku colonists continued to raise *cuys* in their homes when they settled in the Locumba Valley.

To the Tiwanaku, domesticated llamas and alpacas were beasts of burden and sources of wool and food (Goldstein 2005 [Bermann 1994, 1997; Browman 1974, 1980b, 1984b, 1993; Lynch 1983; Webster 1993]). During the 2019 excavation, camelid bones were recovered from domestic-waste contexts at L1A-2019-Unit 3 and L1L-2019-Unit 1. Interestingly, a midden associated with L1L-2019-Unit 3 contained red pottery and camelid bones, suggesting that the camelid was likely consumed during a celebration or feast (Goldstein and Oquiche H. 2019). Moreover, large numbers of camelid coprolites were recovered from sediment sampled from thick-ash deposits and possible hearths found in L1L-2019-Unit 1, indicating that camelid dung was used as fuel at L1.

5.2 The Structural Reproduction of the Social Structure of the Homeland

I chose eight taxa as a kind of “market basket” for intrasite comparisons. While this omits other taxa from the comparative analyses, it helps to clarify the relative proportions of these selected cultigens: *Amaranthus* sp. and *Chenopodium* spp. seeds of Amaranthaceae, *Schinus molle* fruits of Anacardiaceae, *Arachis hypogaea* seeds, *Phaseolus* spp. seeds, and *Prosopis* sp. seeds of Fabacaceae, *Zea mays* kernels and cobs of Poaceae, and *Capsicum* spp. seeds of Solanaceae.

The graphs included in this discussion first compare counts and then compare weights between the market-basket cultigens. Although I believe count is a more accurate measure for the comparative analyses because taxa-seed weight varies significantly (i.e. a bean versus a quinoa seed), the comparative analyses involving weights may reinforce count comparisons or call attention to taxa that have low counts but have high nutritional value (i.e. peanuts and beans). Moreover, the comparative analyses also consider differences in relative proportions when using maize cobs versus kernels. In the results, I had used cobs to calculate and compare maize densities because maize cobs are more likely to be preserved in the archaeological record. This is because kernels are consumed, while cobs are discarded. In addition, using cobs helped deal with the outlier sample 4161, which contains a great quantity of flakey kernel fragments. However, using kernels might be more appropriate for the analyses because cobs are heavy and edible plant parts, such as seeds, represent the other taxa in the market basket.

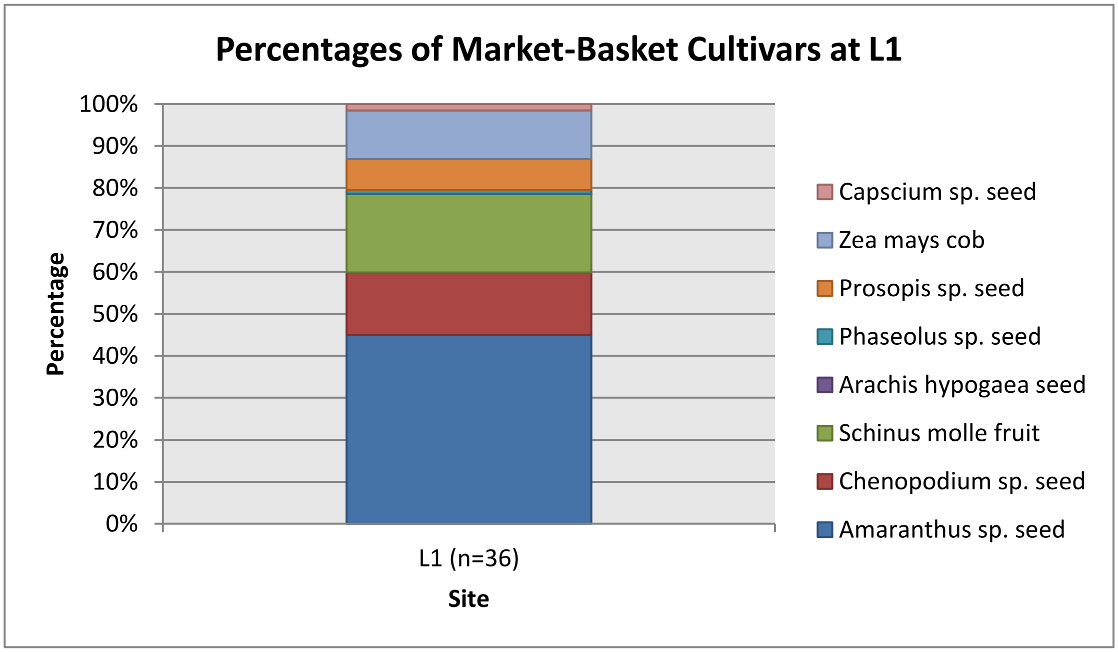
In this section, I argue that the comparative analyses using counts suggests that Amaranthaceae cultivars comprised a large part of the L1 diet (~44 to 60 percent), just as much as lowland cultivars did (~40 to 56 percent). On the other hand, the comparative analysis using weights shows how L1 residents included various lowland cultivars in their diet. Second, I argue that the comparative analyses reflects a diverse set of cultivars with a higher proportion of local foods in Sector A compared to a higher proportion of nonlocal *Amaranthaceae* in Sector L. Moreover, comparing the two Sector L units suggests that L1L-2019-Unit 1 is the “Highland Foods House,” showing a strong dependence on Amaranthaceae, while L1L-2019-Unit 3 is the “Lowland Foods House,” demonstrating a reliance on marine resources and resembling proportions of lowland cultivars similar to the Sector A-unit proportions. These findings may be interpreted through Goldstein’s structural reproduction of the social structure of the homeland.

5.2.1 Botanical Trends at Cerro San Antonio (L1)

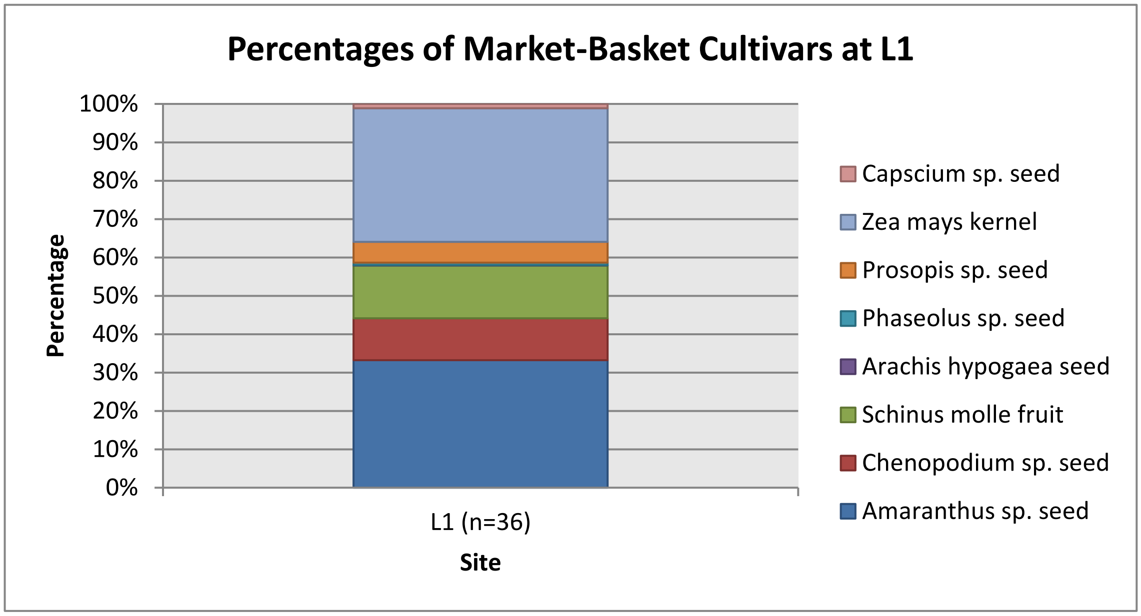
Comparing the eight taxa using counts shows that highland-associated Amaranthaceae cultivars comprised nearly the same proportion as the total proportion of the lowland-associated cultigens, *Schinus molle*, cf. *Arachis hypogaea*, *Phaseolus* spp., *Prosopis* sp., *Zea mays*, and *Capsicum* spp. Graph 41 that uses maize cobs suggests that Amaranthaceae cultivars comprise 59.91 percent of the L1 diet, while lowland cultivars comprise 40.09 percent of the L1 diet. Of the 40.09 percent, *molle*—a cultivar that readily grows in the Locumba Valley and is used for various purposes— is of importance.

The intrasite comparisons using maize kernels, or Graph 42, show that Amaranthaceae cultivars comprise 44.16 percent of the L1 diet, while lowland cultivars comprise 55.84 percent of the assemblage. In Graph 42, maize kernels become the emphasis of the lowland-food diet of L1. Maize kernels comprise 34.80 percent of the market-basket assemblage. Because the comparative analysis deals mostly with edible plant parts (i.e. seeds), using kernel count over cob count might be more appropriate.

Graph 41: Market-basket intrasite comparison based on counts. Cobs are used to represent *Zea mays*.



Graph 42: Market-basket intrasite comparison based on counts. Kernels are used to represent *Zea mays*.



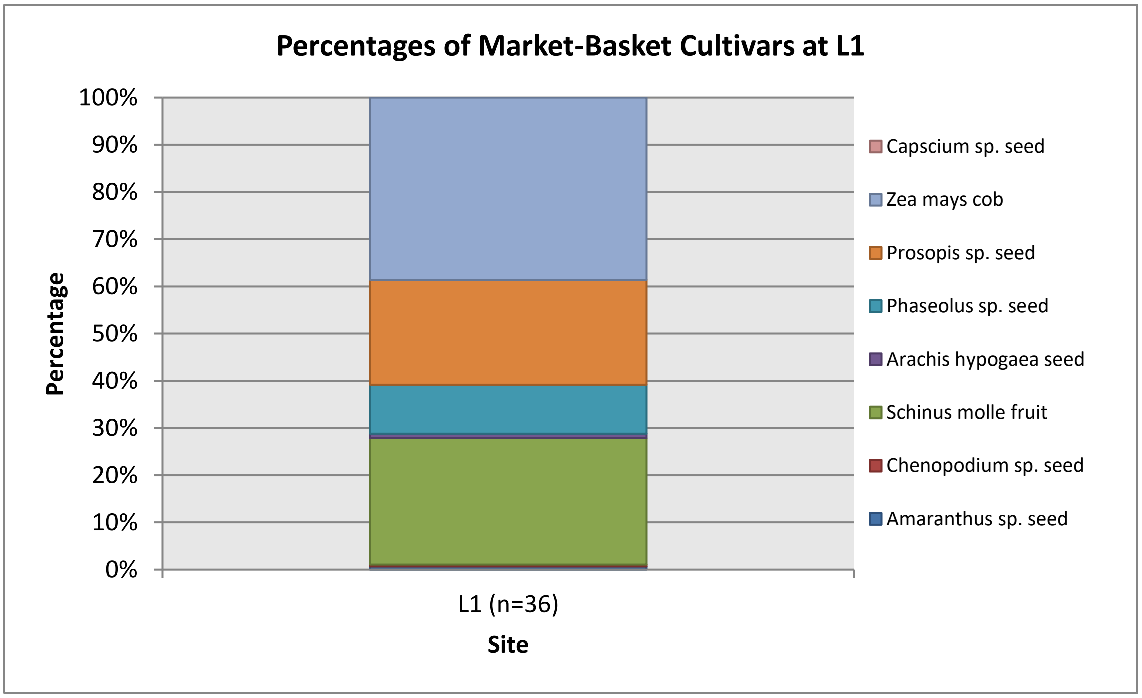
Amaranthaceae and *Capsicum* spp. seeds are of negligible weight. For example, the weight of Amaranthaceae seeds could only be calculated when large quantities of these seeds were present and weighed together on the 0.001-scale, and this is highlighted in Graphs 43 and 44, which use weights to compare the eight taxa. The graphs comparing weights tell a different story than the count-based graphs: the L1 diet was comprised of a diverse set of lowland foods.

In the weight-based comparisons (Graphs 43 and 44), maize and *molle* continue to be significant. Maize-cob weight comprises 38.57 percent of the total market-basket weight (Graph 43), and kernel weight comprises 41.46 percent of the assemblage (Graph 44). *Molle* comprises 25.51 (Graph 44) to 26.77 percent (Graph 43) of the assemblage. The importance of *Prosopis* sp. becomes more apparent, with the cultivar comprising 21.20 (Graph 44) to 22.24 (Graph 43) percent of the total. Finally, the low counts of cf. *Arachis hypogaea* (peanut) and *Phaseolus* spp. (bean) seeds that are not recognized in the graphs comparing counts are recognized here, reminding us to consider the significant agricultural and nutritional value of these cultivars.

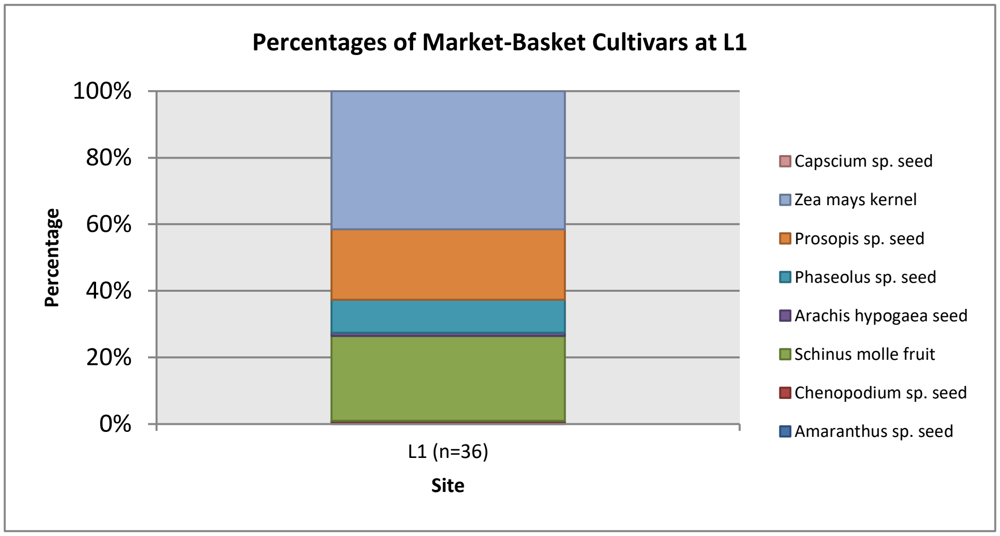
Growing peanuts in the Locumba Valley produces high yields, so peanuts would have served as a high-protein complement to the L1 diet. As mentioned, peanuts grow well in “sandy, well-drained loam soils” with warm temperatures and adequate water (Masur 2010 [Woodroof 1966: 29]) and are normally grown between 46 to 1000 masl for highest yields (Masur 2010 [Moseley 2001: 31]).

Notably, beans comprise ~10 percent of the market-basket, weight-based assemblage. Beans also grow well in the Locumba Valley, and planting beans might have contributed largely to the productive maize agriculture in the Tiwanaku colonial valleys. To recall, continuously planting maize depletes the soil of nitrogen, while beans are nitrogen-fixing plants. In addition to planting the cultivars together, it is good to eat them together. Beans are high in protein and in amino acids lysine and isoleucine, while maize has little nutritional value and are deficient in these amino acids. Beans, therefore, may be thought of as a “nutritional complement to maize” (Biwer 2019: 114 [see Mt. Pleasant 2016]).

Graph 43: Market-basket intrasite comparison based on weights. Cobs are used to represent *Zea mays*.



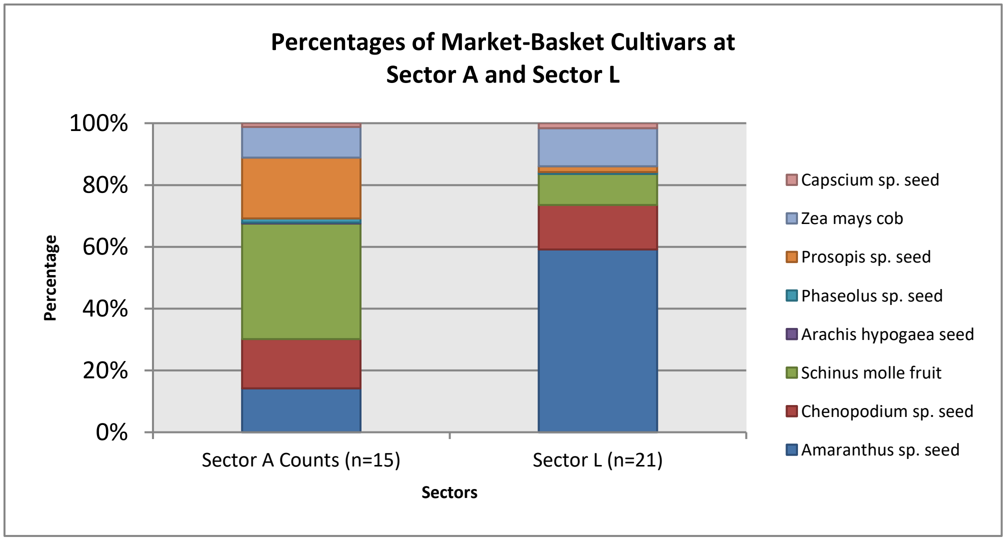
Graph 44: Market-basket intrasite comparison based on weights. Kernels are used to represent *Zea mays*.



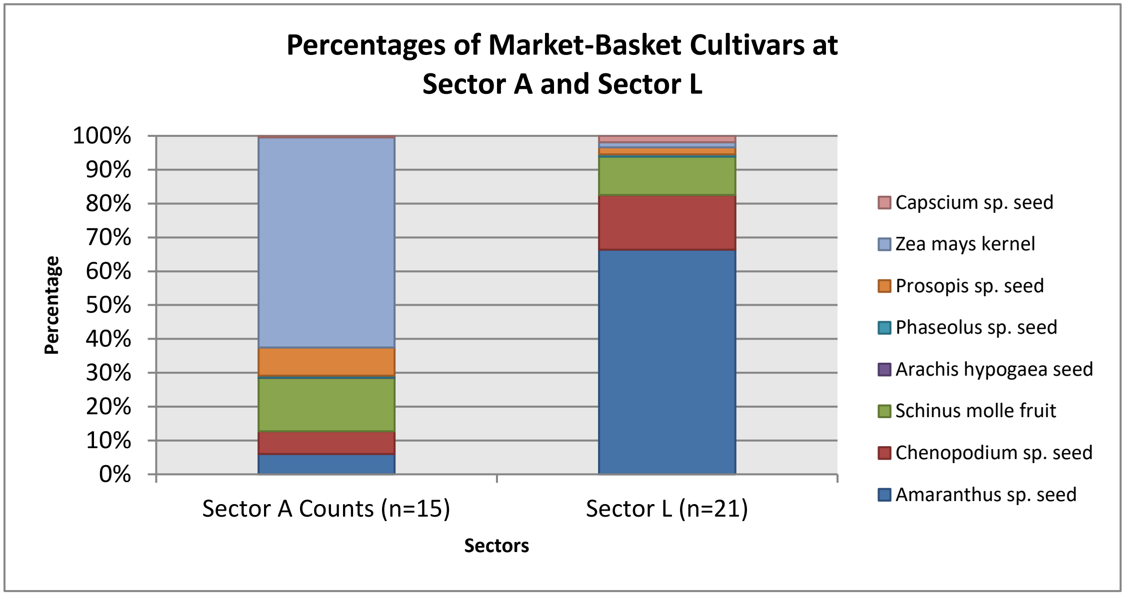
5.2.2 Botanical Trends in Sector A and in Sector L

Graphs 45 and 46 comparing the proportions of market-basket cultivars based on counts shows a diverse set of cultivars with a higher proportion of local foods in Sector A compared to a higher proportion of nonlocal *Amaranthaceae* in Sector L. Graph 45 that uses cobs to represent maize suggests that *molle* was particularly significant to the Sector A residents and that Sector A residents consumed roughly similar proportions of maize, *Prosopis* sp., *Chenopodium* spp., and *Amaranthus* sp.

Graph 45: Market-basket intra-sector comparison based on counts. Cobs are used to represent *Zea mays*.



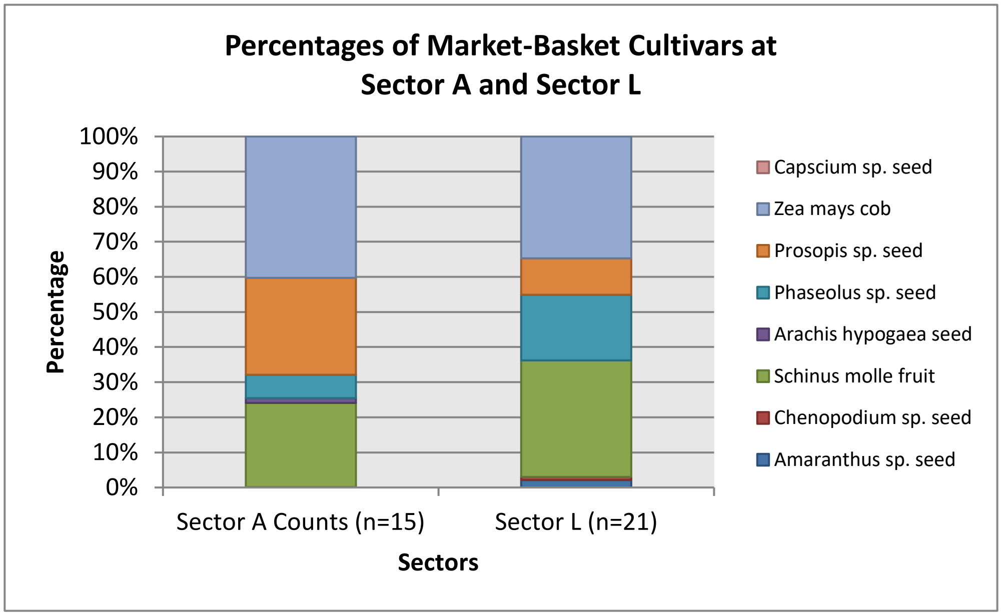
Graph 46: Market-basket intra-sector comparison based on counts. Kernels are used to represent *Zea mays*.



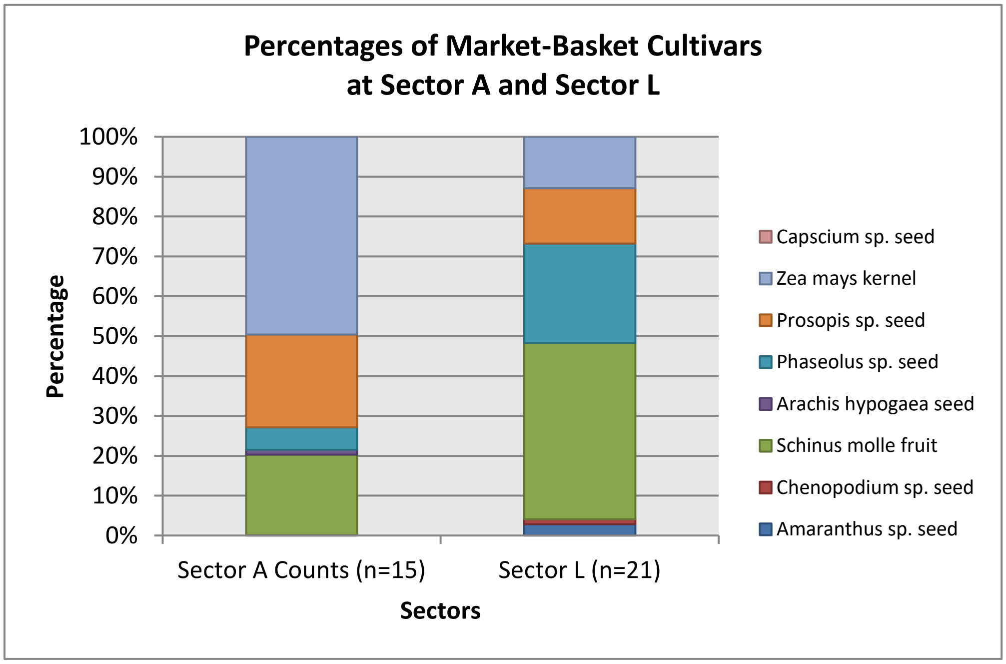
Although Sector L residents did consume lowland foods, Graph 45 and Graph 46 suggests that they had a highland-based diet, where Amaranthaceae cultivars comprise 73.53 percent of the market-basket counts in Graph 45 and 82.54 percent of the market-basket counts in Graph 46. Graph 46 that uses kernels to represent maize suggests that maize instead of *molle* (Graph 45) was particularly significant to Sector A residents and that Sector A residents consumed little highland cultivars. In short, the intra-sector comparisons based on counts suggest that Sector A is associated with more lowland foods, particularly *molle* and maize, while Sector L is associated with more highland foods, particularly *Amaranthus* sp.

Graphs 47 and 48 comparing the proportions of market-basket cultivars based on weights show that Sector A and Sector L residents had similar diets comprised of mostly lowland maize, *Prosopis* sp., beans, and *molle*. Moreover, cf. *Arachis hypogaea* is also recognized in the intra-sector comparisons based on weights. The graphs based on weights emphasize the importance of lowland foods. For example, Graph 48 suggests that 49.60 percent of the Sector A diet was comprised of maize and that 24.9 percent of the Sector L diet was comprised of beans. There is, however, a small percentage of Amaranthaceae present in Sector L. The 3.06 to 4.09 percent of Amaranthaceae is significant considering the negligible weight of Amaranthaceae seeds, adding value to the argument that Sector L has more highland associations than Sector A does.

Graph 47: Market-basket intra-sector comparison based on weights. Cobs are used to represent *Zea mays*.



Graph 48: Market-basket intra-sector comparison based on weights. Kernels are used to represent *Zea mays*.

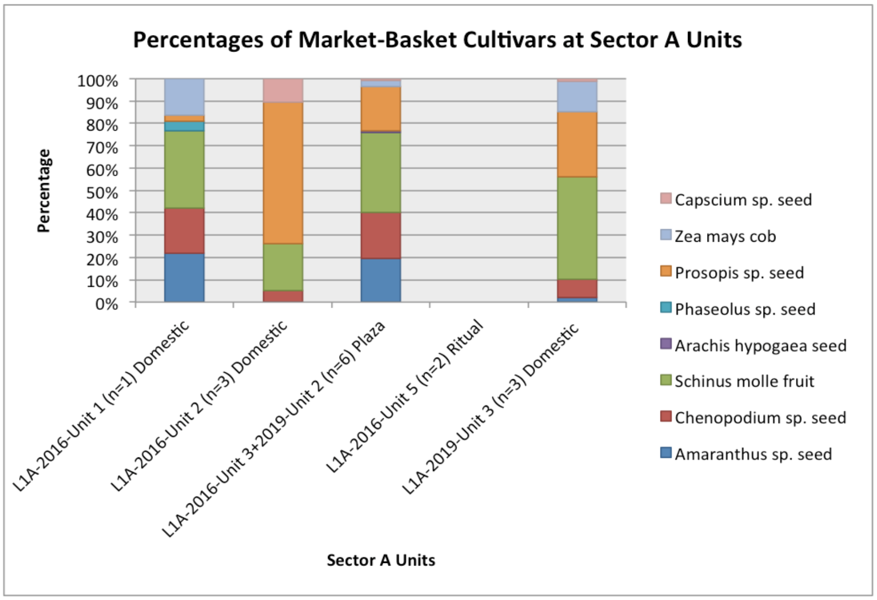


5.2.3 Botanical Trends in Sector A and in Sector L Units

To summarize, there seems to be a higher proportion of local foods in Sector A compared to a higher proportion of nonlocal *Amaranthaceae* in Sector L. Moreover, Graphs 49 and 50 and Figures 29 and 30 that use counts to compare the proportions of market-basket cultivars in each Sector A unit suggest that Sector A domestic units L1A-2016-Unit 1, L1A-2016-Unit 2, and L1A-2019-Unit 3 and plaza area L1A-2016-Unit 3 + L1A-2019-Unit 2 contain a diverse set of cultivars. Although mostly local foods are present in these units, the intra-unit comparisons do show that Amaranthaceae is present in these Sector A areas.

More specifically, in Graph 49 and Figure 29 that use cobs to represent maize, Amaranthaceae comprises 42.11 percent of the market basket in domestic L1A-2016-Unit 1 and 40.18 percent of the market basket in the combined plaza units, L1A-2016-Unit 3 and L1A-2019-Unit 2. In Graph 50 and in Figure 30, which use kernels to represent maize, Amaranthaceae increases to 50.29 percent in domestic L1A-2016-Unit 1, but decreases significantly in the combined plaza units, as kernels comprise 81.53 percent of the market-basket assemblage in this area.

Graph 49: Market-basket intra-unit comparison in Sector A based on counts. Cobs are used to represent *Zea mays*.



Map Displaying Proportions of Market-Basket Cultivars at L1 Sector A Units

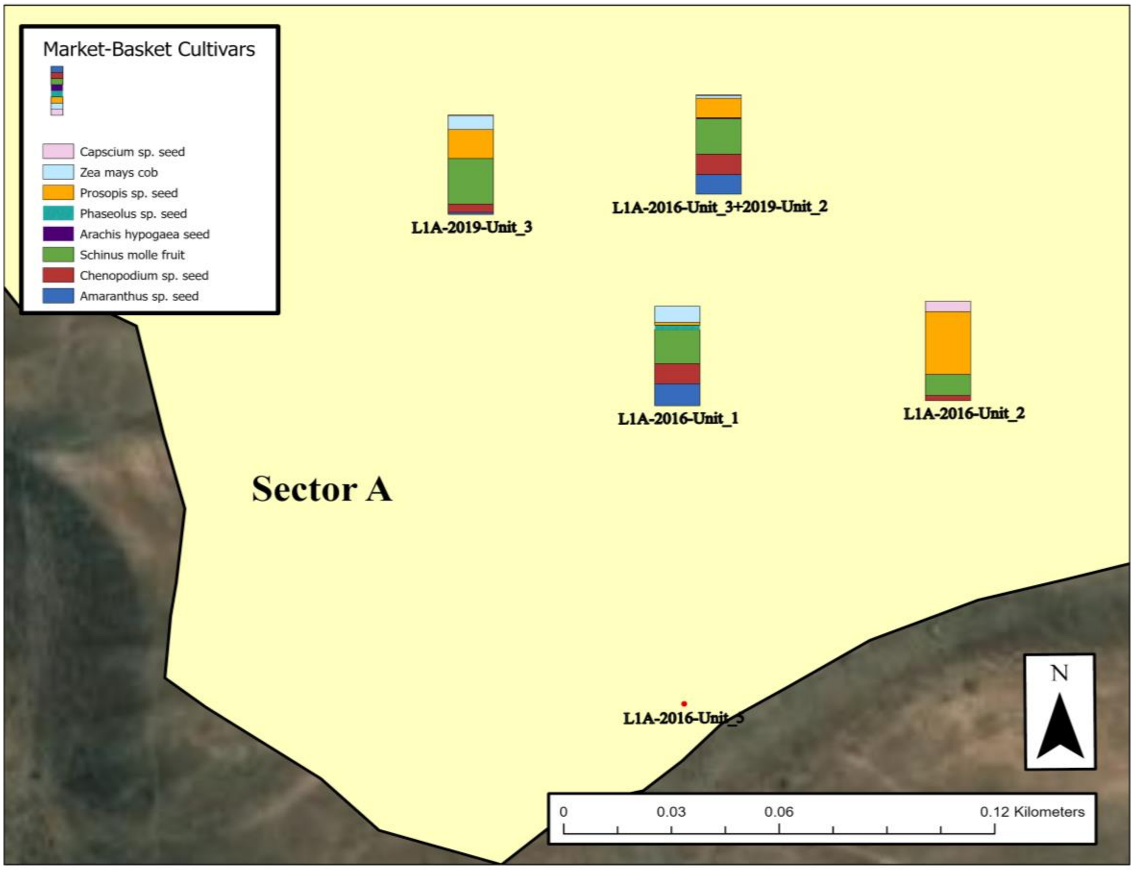
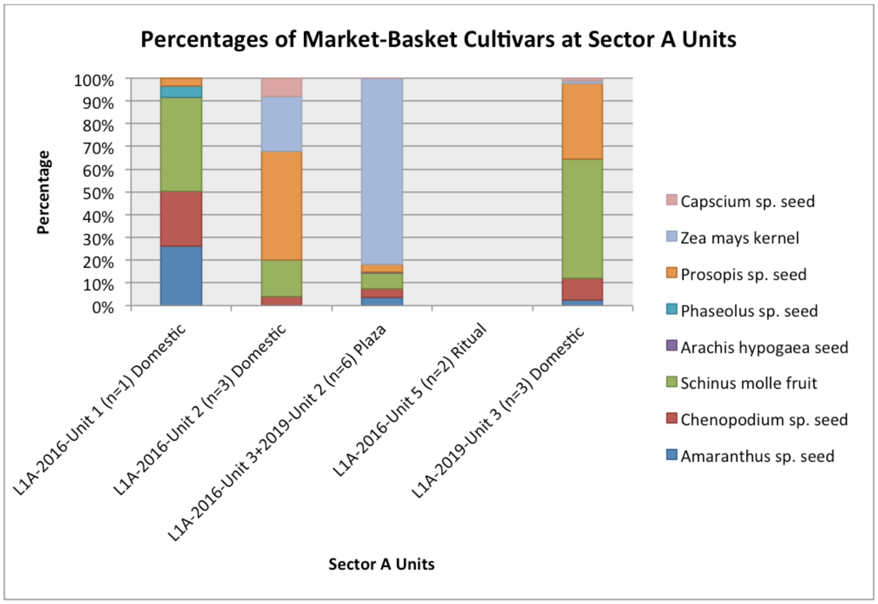


Figure 29: L1 Sector A market-basket intra-unit comparison based on counts. Cobs are used to represent *Zea mays*.

Graph 50: Market-basket intra-unit comparison in Sector A based on counts. Kernels are used to represent *Zea mays*.



Map Displaying Proportions of Market-Basket Cultivars at L1 Sector A Units

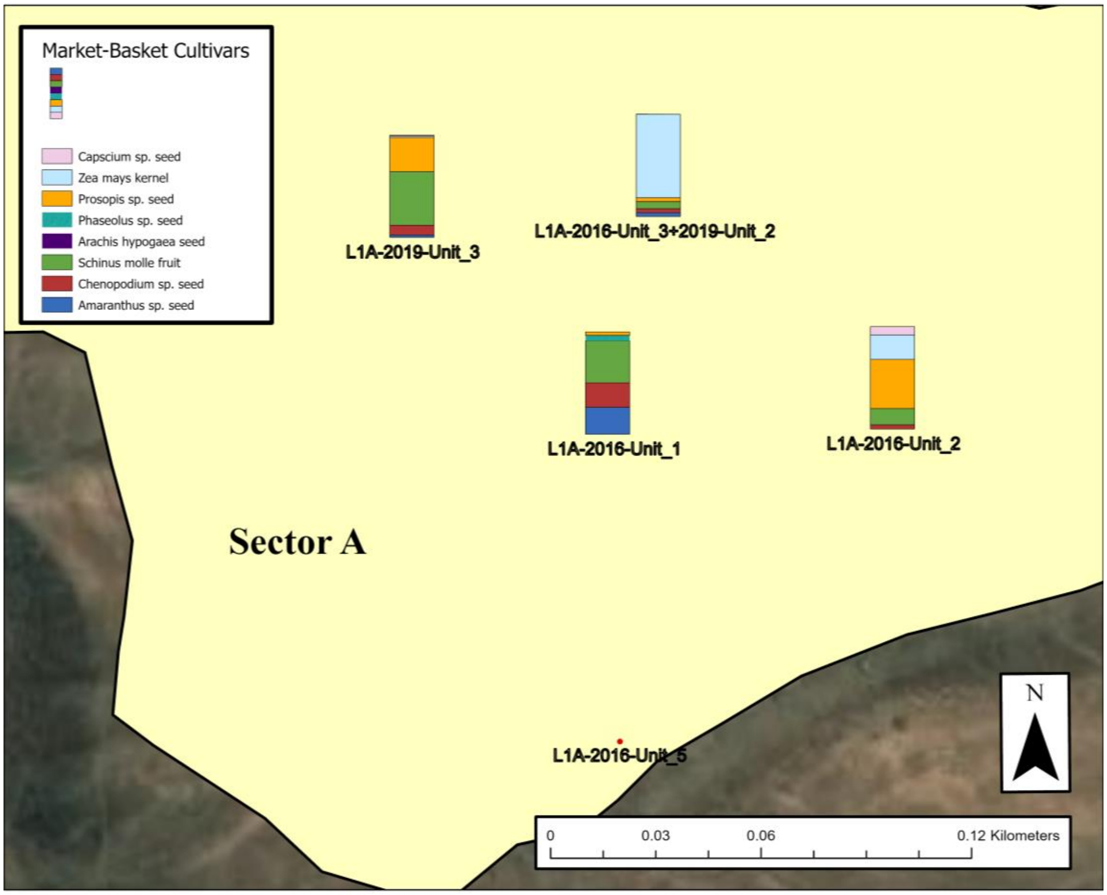
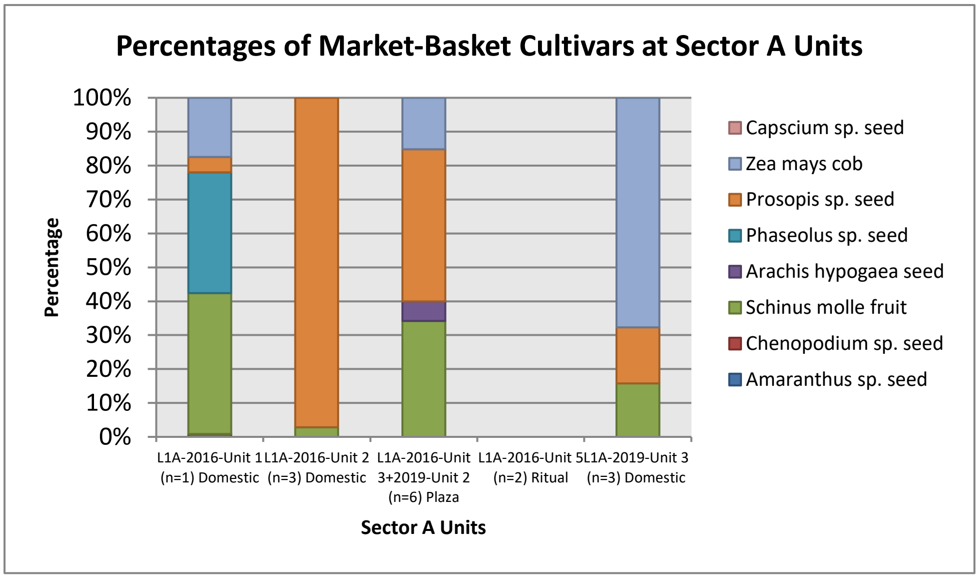


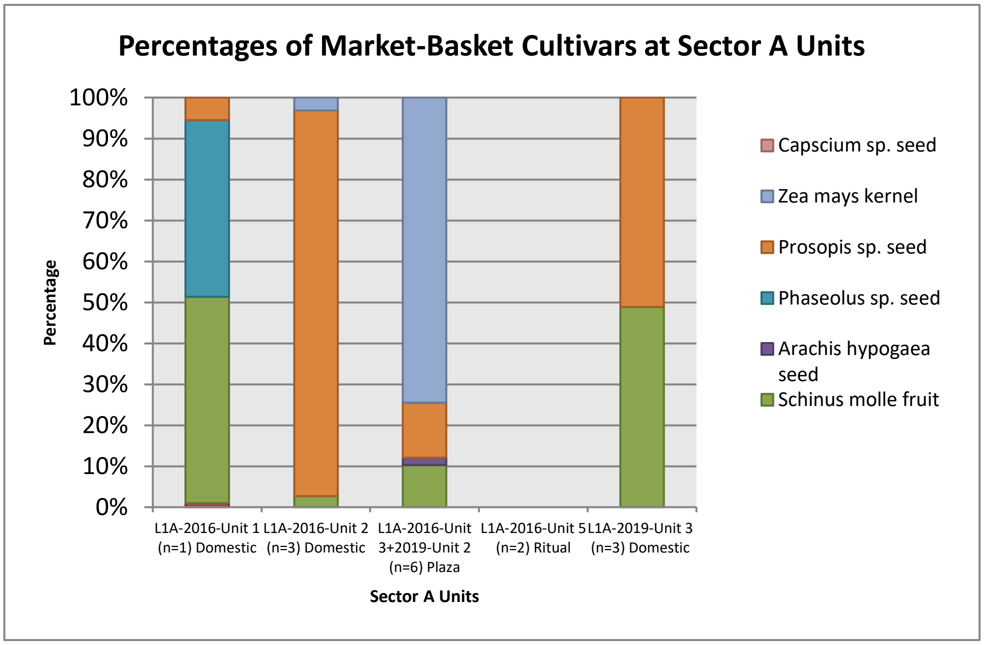
Figure 30: L1 Sector A market-basket intra-unit comparison based on counts. Kernels are used to represent *Zea mays*.

Graphs 51 and 52, which use weights for the intra-unit comparisons, continue to reflect a diverse set of cultivars in most units and emphasize the importance of *Phaseolus* spp., *Prosopis* sp., maize, and *molle* across Sector A. Moreover, cf. *Arachis hypogaea* is recognized in the plaza-associated unit. Finally, no market-basket cultivars are found in L1A-2016-Unit 5, reinforcing the PAL 2016 argument that this unit is a ritual space.

Graph 51: Market-basket intra-unit comparison in Sector A based on weights. Cobs are used to represent *Zea mays*.



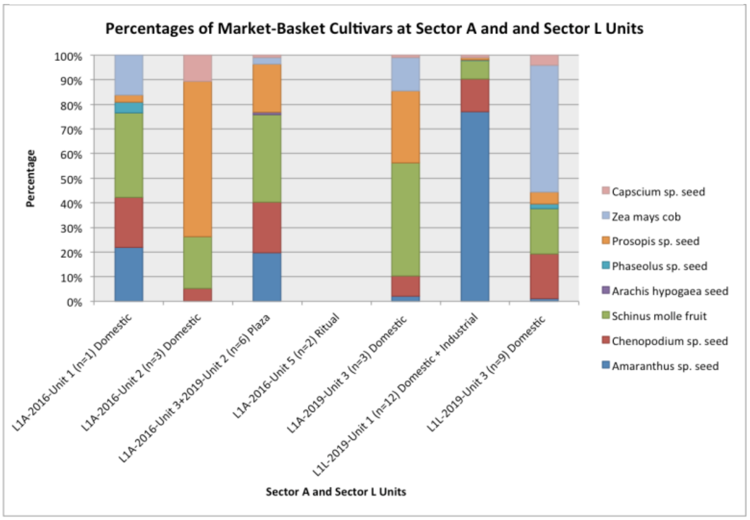
Graph 52: Market-basket intra-unit comparison in Sector A based on weights. Kernels are used to represent *Zea mays*.



A closer look into Sector L shows two contrasting units (Graphs 53 and 54 and Figures 31 and 32). The large percentage of Amaranthaceae cultivars found in Sector L is concentrated in L1L-2019-Unit 1, a unit positioned closest to the Andean region and above the other homes (Figures 31, 32, 33 and 34). In count-based Graphs 53 and 54, Amaranthaceae comprises 90.24 percent of the market-basket assemblage in this unit, while lowland foods comprise the remaining 10 percent. The reverse is true in the weight-based Graphs 55 and 56. In L1L-2019-Unit 1, lowland foods comprise 90 percent of the assemblage: ~61 to 65 percent *molle*, ~11 percent *Prosopis* sp., ~9 percent *Phaseolus* spp., and ~3 to 9 percent maize. Although Amaranthaceae comprises only ~10 percent of the market-basket assemblage in L1L-2019-Unit 1, this percentage is still significant considering the negligible weight of their seeds. In short, because Amaranthaceae comprises 90 percent of the count-based assemblage and 10 percent of the weight-based assemblage in L1L-2019-Unit 1, I call L1L-2019-Unit 1 the "Highland Foods House" (Figures 31 and 32).

On the other hand, L1L-2019-Unit 3 displays a much more diverse set of cultivars in the count-based Graphs 53 and 54, resembling proportions of lowland and Amaranthaceae cultivars like the Sector A-unit proportions. In Graph 54, for example, Amaranthaceae comprise 36.07 percent, *molle* comprise 33.88 percent, beans comprise 3.83 percent, *Prosopis* sp. comprise 8.74 percent, maize comprise 9.84 percent, and chili peppers comprise 7.65 percent. Moreover, the weight-based graphs highlight maize and beans. Maize cobs comprise 46.17 percent of the assemblage (Graph 55), and maize kernels comprise 19.03 percent of the assemblage (Graph 56). Beans comprise 23.29 percent in Graph 55 and 35.03 percent in Graph 56. The intra-unit graphs also show significant proportions of *molle* and *Prosopis* within L1L-2019-Unit 3. As a result, I refer to L1L-2019-Unit 3 as the "Lowland Foods House" (Figures 31 and 32).

Graph 53: Market-basket intra-unit comparison based on counts. Cobs are used to represent *Zea mays*.



Map Displaying Proportions of Market-Basket Cultivars at L1 Sector L Units

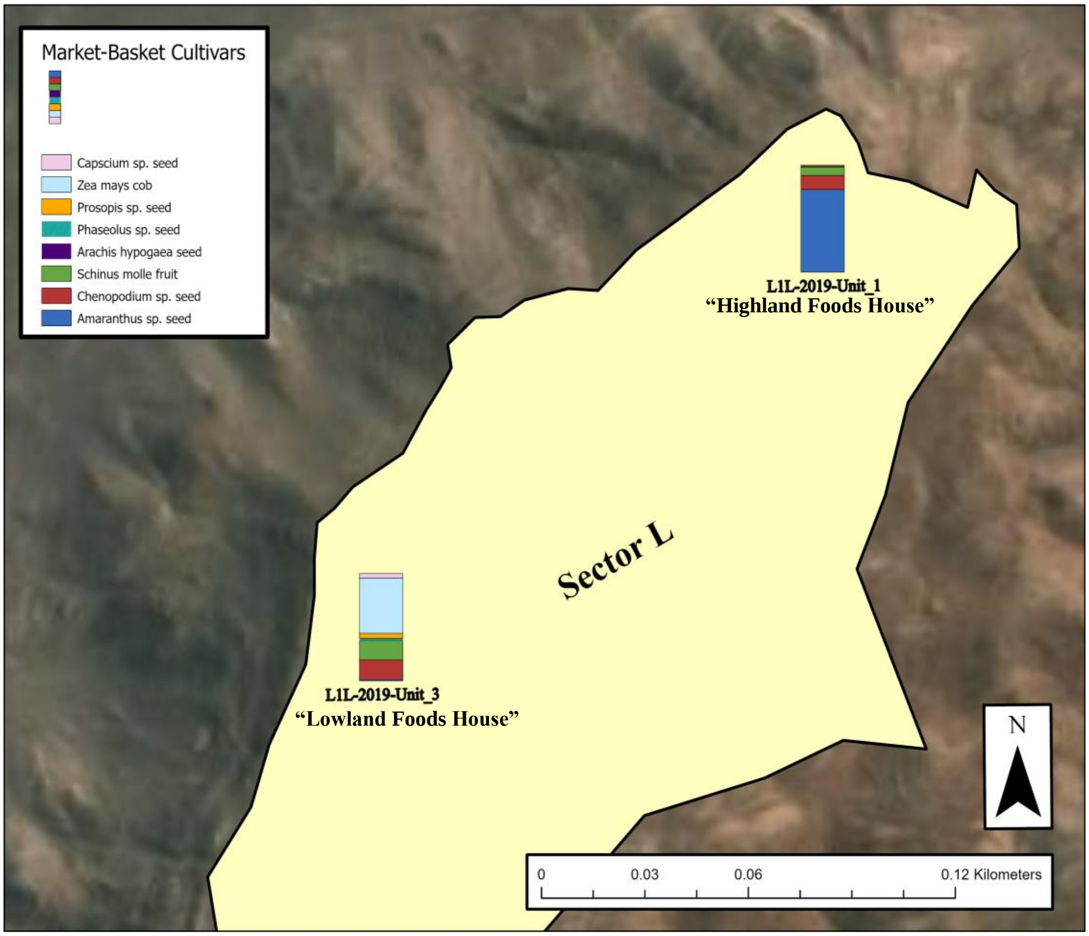
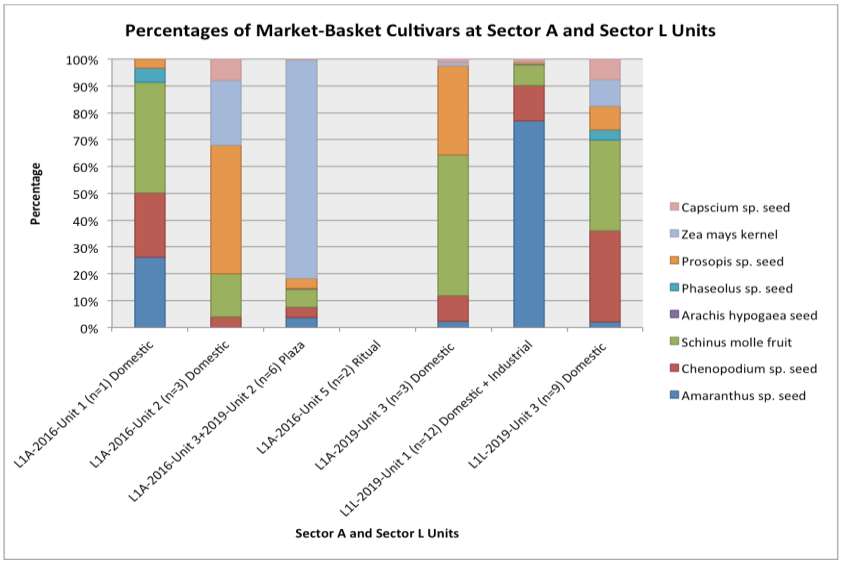


Figure 31: L1 Sector L market-basket intra-unit comparison based on counts. Cobs are used to represent *Zea mays*.

Graph 54: Market-basket intra-unit comparison based on counts. Kernels are used to represent *Zea mays*.



Map Displaying Proportions of Market-Basket Cultivars at L1 Sector A Units

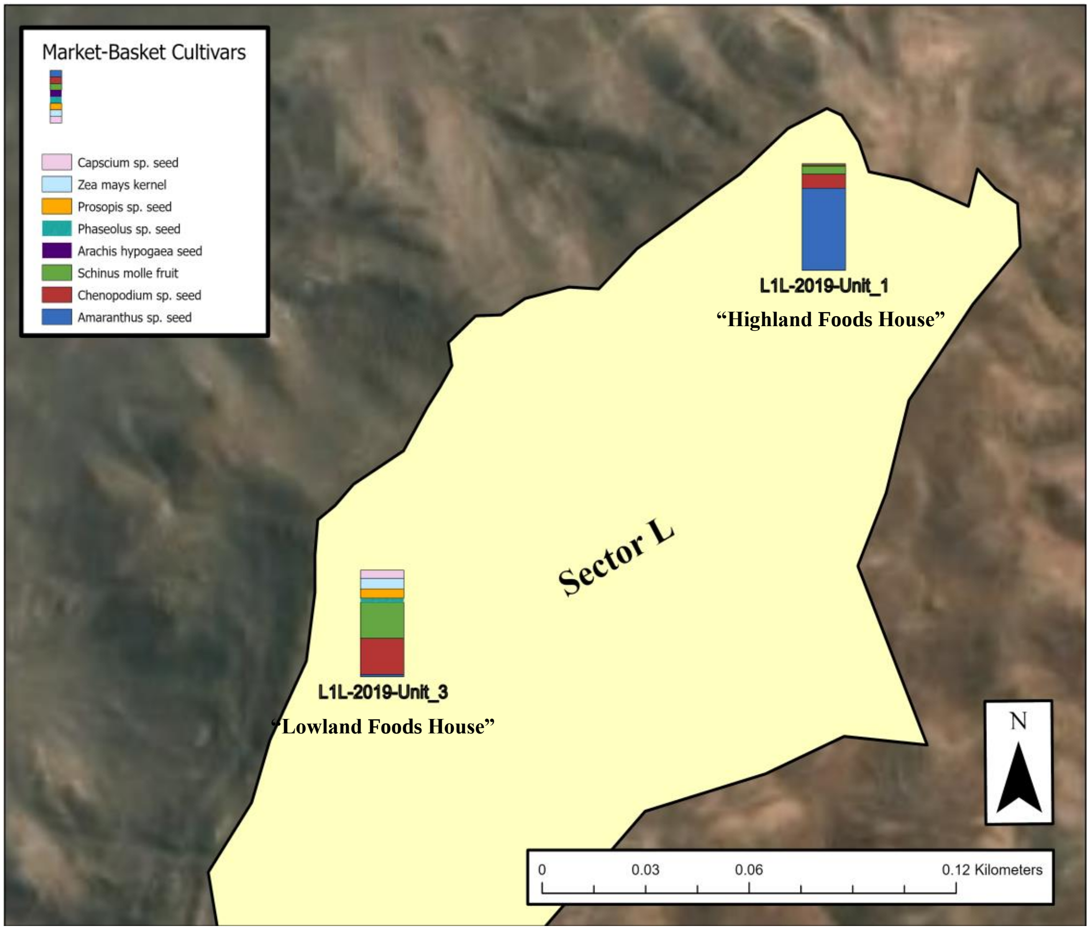
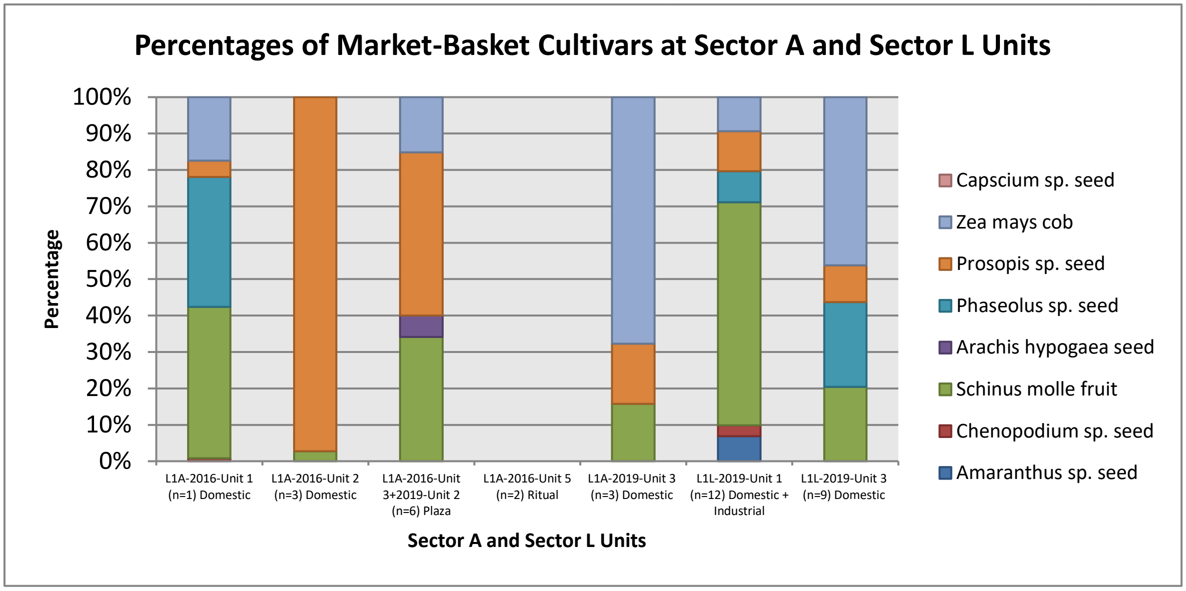
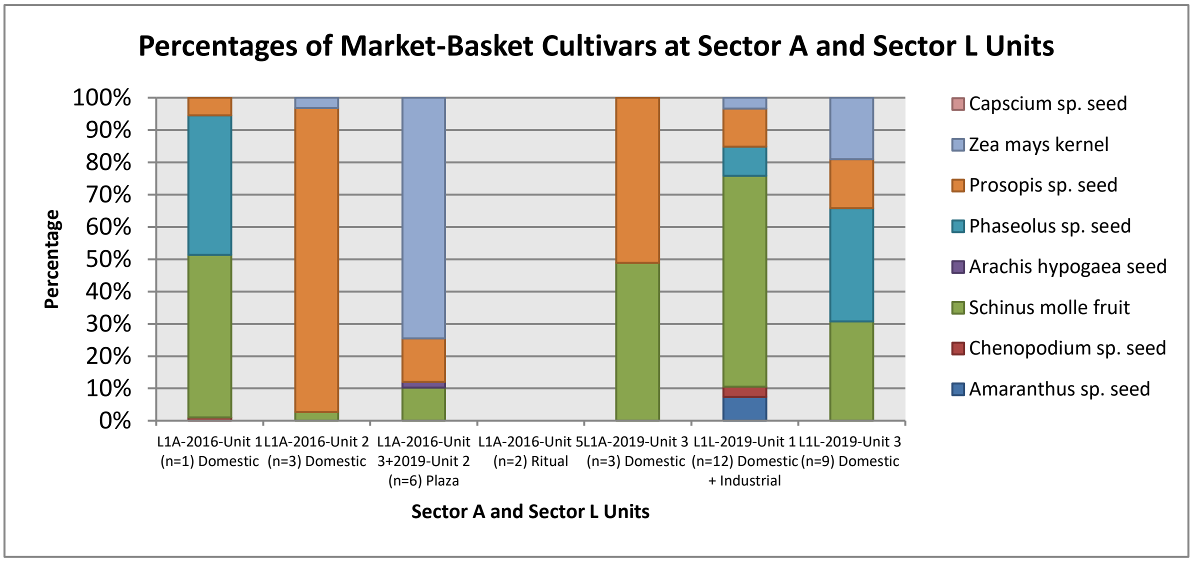


Figure 32: L1 Sector L market-basket intra-unit comparison based on counts. Kernels are used to represent *Zea mays*.

Graph 55: Market-basket intra-unit comparison based on weights. Cobs are used to represent *Zea mays*.



Graph 56: Market-basket intra-unit comparison based on weights. Kernels are used to represent *Zea mays*.



5.2.4 Summary of the Comparative Analyses

The comparative analyses using counts suggest that highland-associated Amaranthaceae cultivars comprised a large part of the L1 diet, in proportions similar to the total proportion of local cultivars *Schinus molle*, *Arachis hypogaea*, *Phaseolus* spp., *Prosopis* sp., *Zea mays*, and *Capsicum* spp. This comparison confirms hypothesis 1, or that the domestic sectors at L1 reflect primary Tiwanaku colonial enclaves comprised of highland people.

The comparative analyses using weights highlights the significance of lowlands crops, such as Tiwanaku-desired maize and nutritious beans. One might argue that the weight-based analyses support hypothesis 2, or that the domestic sectors at L1 reflect secondary Tiwanaku colonial enclaves comprised of people from Moquegua. PEB investigations at primary Tiwanaku colonial sites in the Moquegua Valley [Gaggio 2014; Somerville et al. 2015 [Gaggio 2014; Gaggio and Goldstein 2015; Muñoz Rojas et al. 2009, Vergel and León 2009]; Vergel and León 2009) show high ubiquity and concentrations of maize, indicating a surplus of maize in the Moquegua Valley that was partly exported to the Tiwanaku core region (Somerville et al. 2015 [Hastorf et al.2006]). If L1 was an offshoot of the Moquegua Tiwanaku province, there would likely be even higher concentrations of maize at L1. The small percentage of Amaranthaceae present in the Sector L weight-based graph should also be noted. This percentage is significant considering the negligible weight of Amaranthaceae seeds, suggesting that Sector L residents consumed highland cultivars and attempted to maintain these highland ties despite the great abundance of local, lowland cultivars. Like the count-based analyses, I argue these findings are more likely to support hypothesis 1.

Interesting patterns emerge in the intra-sector and intra-unit comparisons. Sector L has a higher proportion of nonlocal Amaranthaceae that is concentrated in L1L-2019-Unit 1, which I call the “Highland Foods House.” On the other hand, L1L-2019-Unit 3, or the “Lowland Foods House,” is mostly comprised of lowland foods and reflects a diverse set of market-basket cultivars in similar proportions to those found in the Sector A domestic and plaza units, or the “Lowland-Resembling Units.” Below are maps (Figures 33 and 34) displaying the proportions of market-basket cultivars throughout Sector A and Sector L units at Cerro San Antonio (L1).

Market-Basket Proportions at Cerro San Antonio (L1) Units

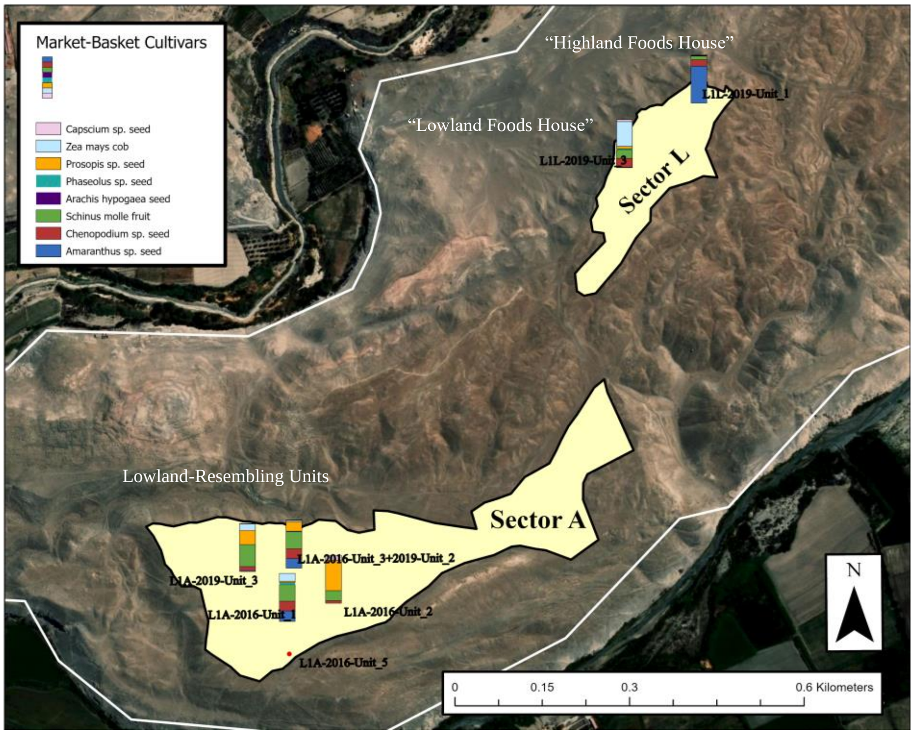


Figure 33: L1 market-basket intra-unit comparison based on counts. Cobs are used to represent *Zea mays*.

Market-Basket Proportions at Cerro San Antonio (L1) Units

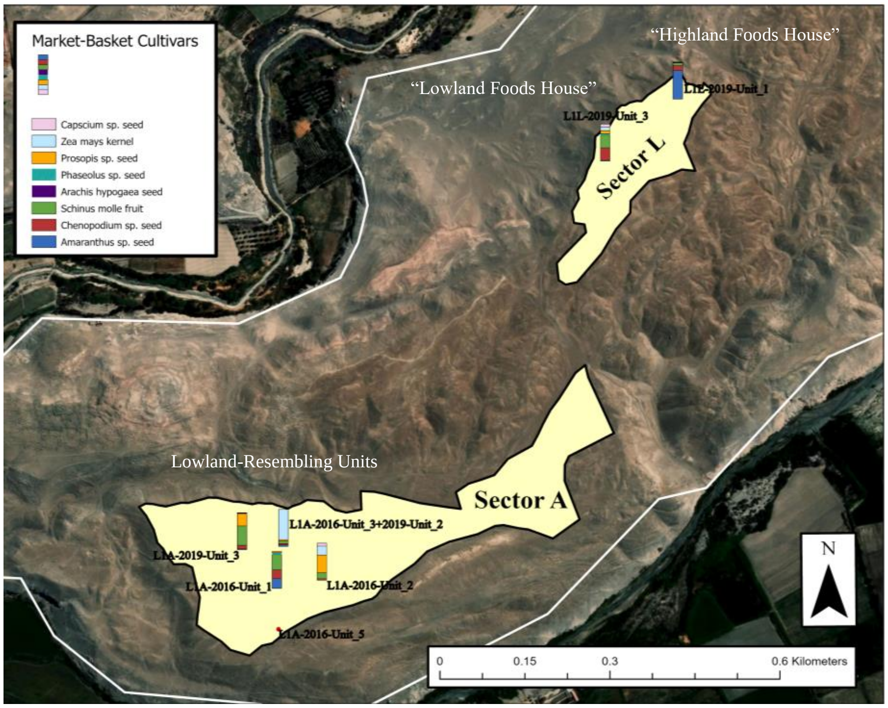


Figure 34: Kernels are used to represent *Zea mays* instead of cobs (Figure 33).

Because of the marked differences between the two units of Sector L, I simplify L1L-2019-Unit 1 as the "Highland Foods House" and L1L-2019-Unit 3 as the "Lowland Foods House" to suggest that these findings might be evidence for Goldstein's "*structural reproduction* of the social structure of the homeland" (2005:42). In other words, culinary differences at L1 are characteristic of the Andean *ayllu* structures (Goldstein 2005: 30 [Duviols 1974; Platt 1986], the reflexivity of the *ayllu* (Goldstein 2005: 30 [Urton 1993], and the *ayllu* tendency to structure into "nested hierarchies of moieties" (Goldstein 2005: 30 [Albarracin Jordan 1996a,b]). In addition, the archaeological findings during the 2016 and 2019 excavations reinforce these opposing structures inherent in the PEB intrasite comparisons and show evidence of specialization.

According to the PAL 2019 report, the "Highland Foods House" (L1L-2019-Unit 1) contains a domestic area and an industrial area. The domestic area includes a hearth, plant remains, and ceramic *llana*. The PAL 2019 PEB Analysis shows that the greatest density of Amaranthaceae seeds is from the domestic context of L1L-2019-Unit 1. Moreover, this area also contained the greatest density of camelid coprolites, which were used as fuel for cooking. The industrial area included raw textile material, textiles, needles, and stones of lapis lazuli. Interestingly, the PEB findings show that cottonseed densities are greatest in this unit. Although cotton is a lowland cultivar and Tiwanaku culture is associated with wool textiles, these findings likely suggest that the "Highland-Foods-House" (L1L-2019-Unit 1) residents continued to produce textiles as they did in the Tiwanaku core, although they likely incorporated the local cotton fibers into their textile production. In short, the dense deposits of highland-associated Amaranthaceae seeds and camelid coprolites and the industrial cottonseeds offer the possibility that the residents here associated more closely to Tiwanaku identity through cooking and industrial practices.

The PEB intrasite analysis of the “Lowland Foods House” (L1L-2019-Unit 3) suggests that the residents relied more heavily on local cultivars than the residents of the “Highland Foods House” (L1L-2019-Unit 1). Interestingly, the PAL 2019 report discusses how the “Lowland Foods House” (L1L-2019-Unit 1) demonstrates a particularly strong reliance on marine resources. During the 2019 excavation, large quantities of fish bones, mollusk and crustacean shells, and fragments of fishing nets made of cotton were recovered from this unit (Goldstein and Oquiche H. 2019). As shown in the PEB results, *Choromytilus chorus* -shell fragments were only recovered from Sector L, and these shells were concentrated in this unit. To summarize, the dense deposits of local cultivars and marine foods suggest that in comparison to the residents of the “Highland Foods House” (L1L-2019-Unit 1), the residents of the “Lowland Foods House” (L1L-2019-Unit 3) were more likely to engage in local practices and less likely to engage in highland practices that would have associated them with the Tiwanaku homeland.

To conclude this section, I recognize that categorizing L1L-2019-Unit 1 as the “Highland Foods House” and categorizing L1L-2019-Unit 3 as the “Lowland Foods House”—which more closely resembles the Sector A units—are oversimplifications. First, only 36 samples were analyzed in this study, and not all PEB findings from these samples fit neatly in these opposing structures. For example, I have argued that *cuys* and camelids are highland-associated animals. However, the samples show that L1L-2019-Unit 3 has a higher density of *cuy* coprolites, and the 2019 excavation uncovered camelid remains from the midden associated with this unit. The interpretations that I offer in this section are clearly preliminary but are patterns that might further develop as more samples from L1 are analyzed and that may be supported by other archaeological studies.

5.3 Comparing L1 to M43, a Rio Muerto Site of the Moquegua Valley

To recall, the Tiwanaku people expanded into the coastal valleys throughout the Middle Horizon (A.D. 500- 1100). Between 10,000 to 20,0000 Tiwanaku people colonized the Osmore Drainage of the Moquegua Valley (Somerville et al. 2015), which could readily grow lowland crops such as maize, beans, peanuts, and *ají.* In this section, I hypothesize the following: If L1 was comprised of primary Tiwanaku colonial enclaves of highland people (hypothesis 1) like the Tiwanaku settlements of the Moquegua Valley, then the macrobotanical assemblage at L1 should reflect a similar macrobotanical assemblage to domestic Tiwanaku sites of the Moquegua Valley. To test this, I compare the L1 PAL 2019 PEB findings to 2008 PEB findings from the Rio Muerto Site of M43 (Vergel and León 2009). Rio Muerto is the "third largest Tiwanaku settlement group in the Moquegua Valley" (Somerville et al. 2015).

The focus of Tiwanaku dietary practices is usually on maize and rightfully so. Tiwanaku of the Lake Titicaca Basin valued maize as a luxury food because the cultivar was nonlocal (Reilly 2017) and could be brewed into *chicha*, an alcoholic beverage that was particularly significant in ritual activities and feasts (Biwer and VanDerwarker 2015). Although Tiwanaku farmers in the basin learned to grow the crop in the "microclimate pockets" near the lake (Langlie 2018), Tiwanaku-core residents usually imported maize from colonies located in the Pacific coastal valleys, such as the Moquegua Valley, (Langlie 2018 [Goldstein 2005, 2003; Hastorf et al. 2006]; Reilly 2017 [Hastorf et al. 2006: 430; Logan et al. 2012:248-249; Wright et al. 2003: 393]), where it productively grows (Goldstein 2005; McEwan 2006).

Large concentrations of maize have been recovered from Tiwanaku colonial sites in the Moquegua Valley, or more specifically from the domestic and funerary contexts at Rio Muerto (Somerville et al. 2015 [Vergel and León 2009]), from the domestic contexts at Omo M10

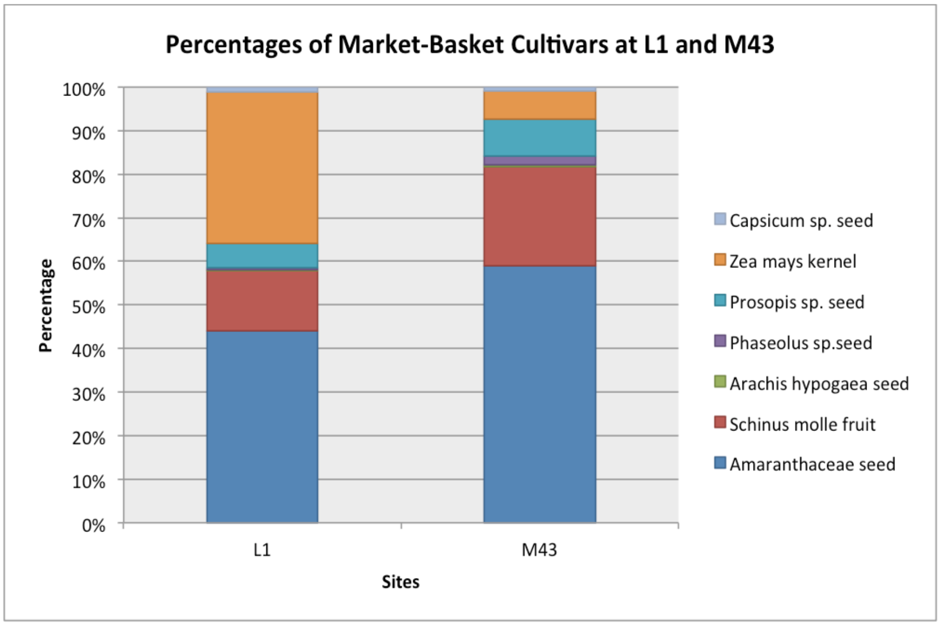
(Somerville et al. 2015 [Muñoz Rojas et al. 2009]), and from the Omo Temple (Somerville et al. 2015 [Gaggio 2014; Gaggio and Goldstein 2015]; Gaggio 2014). There also seems to have been a surplus of maize within the Moquegua Valley, and maize-cupule analysis suggests that some of this surplus was exported to the Tiwanaku core region (Somerville et al. 2015 [Hastorf et al. 2006]). Analyzing stable isotopes of 33 Tiwanaku colonial residents of the Moquegua Valley and comparing their isotopic markers to markers from Tiwanaku-core residents support the maize-heavy diet of the Tiwanaku Moquegua Valley. Somerville et al. 2015 found that the Tiwanaku colonists consumed more C_4 plants than those living in the Tiwanaku core, and they traced the high C_4 dietary signal to maize because of the overwhelming presence of kernels and cobs at Moquegua-Valley Tiwanaku sites. Finally, more recent stable carbon and nitrogen isotope data gathered from individuals at Omo M10 found diets rich in C_4, further supporting the Somerville et al. 2015 findings (Santillan Goode 2018).

According to Somerville et al. 2015, the high C_4 diets of the Tiwanaku colonists "are consistent with the model of Tiwanaku expansion in which highland residents settled in lower-altitude valleys and produced maize for export back to the *altiplano* core, where high altitude and low temperatures limited its production" (Somerville et al. 2015: 418). I agree with Somerville et al. 2015 here, and if L1 is indeed a primary Tiwanaku colony, the L1 samples should show similar proportions of maize as the maize proportions in the M43 samples.

I do, however, believe that dietary investigations place too much emphasis on maize at these Tiwanaku-colonial valley sites. Because Tiwanaku colonists continued eating highland-associated foods, there should also be strong evidence of highland cultivars at the primary Tiwanaku colonial site of M43. As discussed earlier, Tiwanaku colonists could have grown Amaranthaceae cultivars locally or could have acquired these highland crops in exchange for lowland maize. In addition to sharing similar proportions of maize, I argue that the L1 samples should reflect similar proportions of highland cultivars to the M43 samples if L1 is a primary Tiwanaku colony. On the other hand, if the L1 samples reflect notably lower proportions of highland cultivars, L1 might be a secondary Tiwanaku colony, or a settlement of Tiwanaku people that migrated from Moquegua.

The proportions of L1 "market-basket" cultivars, or more specifically, Amaranthaceae seeds, *Schinus molle* fruits, *Arachis hypogaea* seeds, *Phaseolus* spp. seeds, *Prosopis* sp. seeds, *Zea mays* kernels, and *Capsicum* spp. seeds, are compared to the proportions of the same "market-basket" cultivars at M43. No weights were taken for the M43 findings, so counts are used in the comparative analysis. Because I am unsure whether the cf. *Chenopodium* sp. in the L1 samples is wild *Chenopodium* sp. or wild *Amaranthus* sp., *Chenopodium* spp. and *Amaranthus* spp. findings are combined to form an Amaranthaceae category for each site. The results are illustrated in Graphs 57 and 58 and Figure 35 found below.

Graph 57: L1 and M43 market-basket inter-site comparison based on counts.



The Proportions of Market-Basket Cultivars at M43 and L1

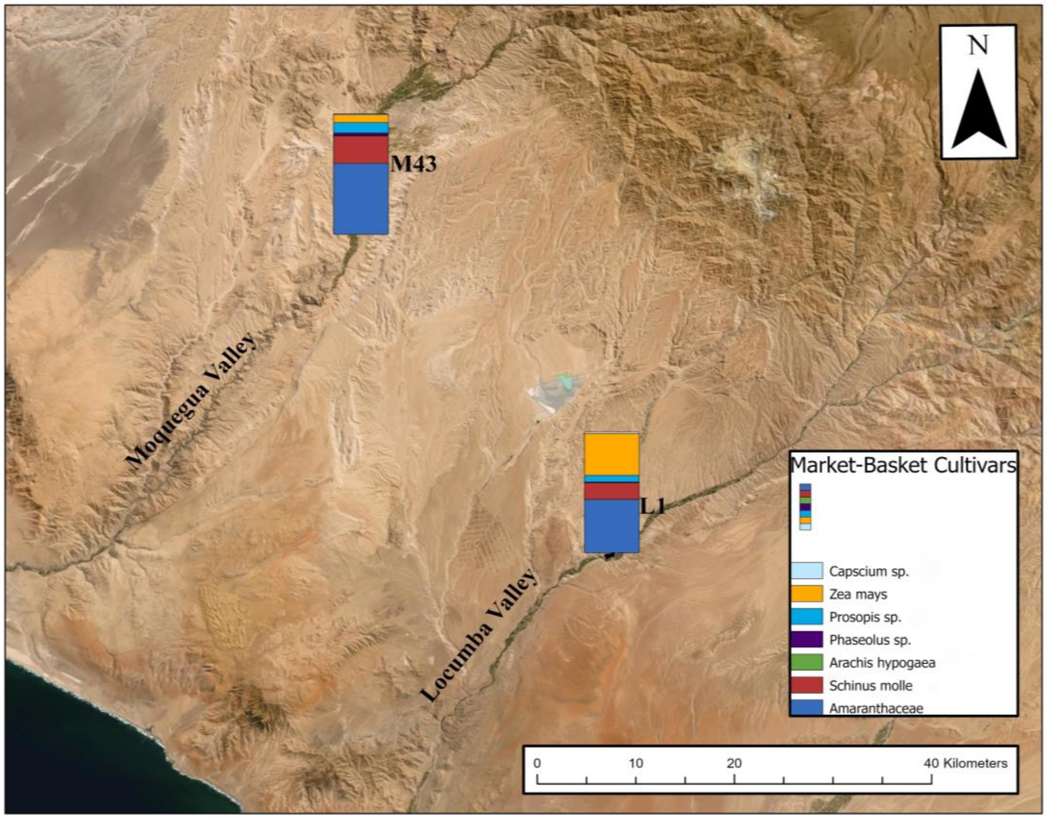
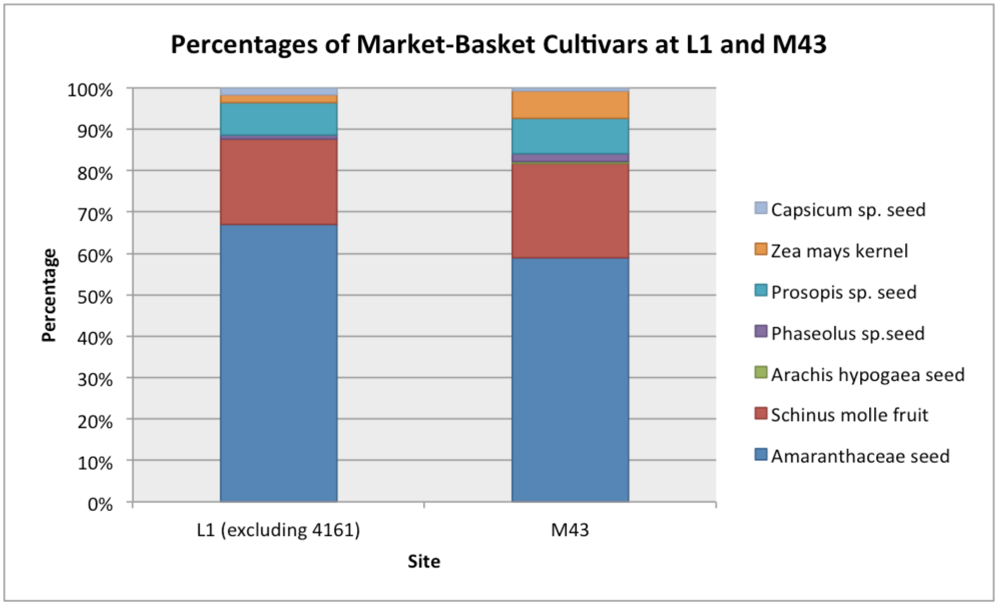


Figure 35: Map of M43 and L1 market-basket inter-site comparisons based on counts.

Graph 58: L1 and M43 market-basket inter-site comparison based on counts when the outlier sample L1=4161 is removed from L1.



The preliminary PEB findings at L1 show comparable market-basket proportions to M43, sharing a similarly strong dependence on Amaranthaceae, *molle*, *Prosopis* sp., and maize (Graph 57, Graph 58, and Figure 35). Graph 58, which excludes the outlier sample 4161[10] from the analysis, shows that L1 residents and M43 residents had remarkably similar diets. More sediment samples from L1 should be analyzed and compared to the PEB findings from domestic, primary Tiwanaku colonial sites and core sites for further research.

I argue that L1 is a primary Tiwanaku colony because these initial findings show similar proportions of market-basket cultivars and a strong reliance on highland-associated Amaranthaceae cultivars at L1 and M43. One might argue, however, that the market-basket similarity between L1 and M43 suggests that L1 is a secondary colony, or that Tiwanaku Moquegua-Valley residents colonized the Locumba Valley and continued to use the market-

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[10] To recall, L1 sample 4161 is considered an outlier. Out of the 16 whole kernels and 482 kernel fragments that were recovered from the samples, 11 of the whole kernels and 470 kernel fragments were found in sample L1-4161 of L1A-2019-Unit 2, or the “plaza” context.

basket resources as they had done so in Moquegua. Instead, I argue that if L1 was a secondary colony, then L1 should show a greater dependence on lowland resources and a lesser dependence on highland resources than at M43. This is because L1 would have no direct connection to the Altiplano, while M43 would. Interestingly, Graphs 57 and 58 demonstrate that M43 has a higher dependence on lowland resources, *molle*, peanuts, beans, and *Prosopis*, than L1 does. In other words, this might suggest that L1 has slightly stronger highland associations.

As learned earlier in the discussion, the L1 market-basket intrasite comparison based on seed counts highlights the significance of Amaranthaceae cultivars to the L1 people. In the M43 and L1 market-basket inter-site comparison based on counts, Amaranthaceae appears to be either more significant (Graph 57) or slightly less significant (Graph 58) to Tiwanaku-Moquegua residents. These findings place an emphasis on highland-associated Amaranthaceae cultivars at both Tiwanaku colonial sites, which may be contrasted to excavation findings (Somerville et al. 2015 [Gaggio 2014; Gaggio and Goldstein 2015; Muñoz and Rojas et al. 2009; Vergel and León 2009]; Gaggio 2014; Vergel and León 2009), maize-cupule analysis (Somerville et al. 2015 [Hastorf et al. 2006]), and isotope analyses (Santillan Goode 2018; Somerville et al. 2015) that emphasize the importance of maize in the Moquegua Valley. In other words, the PEB findings completely subvert the archaeological perspective from coarse screening by broadening the nutritional mix. The M43 and L1 comparisons based on systematic PEB analysis suggest that studies at primary Tiwanaku colonial sites should focus more attention on the presence of highland-associated Amaranthaceae cultivars through PEB studies that focus on both seed counts and weights.

Chapter 6: Conclusion

This thesis uses the Tiwanaku site of Cerro San Antonio in the Locumba Valley, Perú as a case study to understand how food remains are telling of ancient culinary and agrarian practices and how these food-related activities reflect ancient identities and migration histories. In the introduction chapter of this thesis, I argue that focusing on the Tiwanaku is particularly informative for inquires related to food, migration, and identity. I argue this for a few reasons: 1) the Tiwanaku homeland is located in the Bolivian Altiplano, where a set of frost-resistant crops, like potato (*Solanum tuberosum*) and quinoa (*Chenopodium quinoa*), were domesticated and could grow; 2) the Tiwanaku-core desire for nonlocal cultivars, especially maize (*Zea mays*), contributed largely to the civilization's expansion into the Peruvian coastal valleys (Goldstein 2005); and 3) the Tiwanaku migration history deals with two distinct ecological environments, or the coastal-valley zone and the Altiplano, which presents an opportunity to explore complementary resource zones and how identity is intimately linked to the environment.

To review, the ancient Tiwanaku civilization (ca. A.D. 500-1100) originated in the Bolivian Altiplano of the south-central Andes (Janusek 2003 [Posnansky 1914, 1945; Bennett 1934; 1950]; Stanish 2003), which reaches 3800 masl (Marsh 2016; Kolata 1986; Stanish 2003). In the Altiplano, farmers grow frost-resistant crops, such as quinoa (*Chenopodium quinoa*), kiwicha (*Amaranthus caudatus*), potatoes (*Solanum tuberosum*), and other tuber crops oca (*Oxalis tuberosus*), olluco (*Ullucus tuberosa*), isanu (*Trapeolum tuberosum*), and mashua (*Tropaeolum tuberosum*) (Bermann 1997; Berryman 2010 [Carter 1976; Bruno 2008; Johnsson 1986]; Bruno and Hastorf 2016; Goldstein 2005 [Browman 1984b; Towles 1961; Weberbauer 1936]; Kolata 1986; Langlie 2018 [Hastorf et al. 2006; Wright et al. 2003]; Lennstrom et al. 1991).

Throughout the Middle Horizon from A.D. 600-1100, the Tiwanaku civilization expanded into the coastal valleys, such as the Moquegua Valley, to acquire lowland crops that cannot be grown in the Tiwanaku core region (Goldstein 2005). Lowland cultivars include tropical fruits, such as cherimoya (*Annona cherimola)* and avocado (*Persea americana)*, psychotropic plants, coca (*Erythroxylum* sp.), cotton (*Gossypium* sp.), *molle* pepper (*Schinus molle)*, peanuts (*Arachis sp.*), beans (*Phaseolus* sp.), chili peppers (*Capsicum* sp.), and maize (*Zea mays*) (Berryman 2010; Biwer 2019 [Pulgar Vidal 1996: 66-71]). The central motive for Tiwanaku expansion was acquiring maize because the cultivar could be brewed into *chicha*, an alcoholic beverage that was particularly significant in ritual activities and feasts (Biwer and VanDerwarker 2015; Goldstein 2005). To explain Tiwanaku expansion into the Moquegua Valley, Paul Goldstein (2005) proposes the "diasporic archipelago" model. The diasporic archipelago model is based on 1) the Andean concept of the *ayllu*, 2) diasporic movements, and 3) John Murra's (1964, 1968, 1972, 1985) vertical archipelago model.

UCSD PhD candidate Matthew Sitek has been conducting household archaeology to investigate Tiwanaku presence at the site of Cerro San Antonio (L1) of the middle Locumba Valley, which is located 600 masl in the Peruvian desert region (Sitek 2018; Sitek n.d.). This area is suitable for growing lowland crops, including tropical fruits, coca, maize, peppers, peanuts, beans, and chili peppers. More specifically, Sitek has been testing whether or not the L1 Middle-Horizon sectors reflect one or a combination of the following: 1) primary Tiwanaku colonial enclaves comprised of highland people (hypothesis 1), 2) secondary Tiwanaku colonial enclaves comprised of people from Moquegua (hypothesis 2), or 3) local populations that acquired Tiwanaku material through trade (hypothesis 3) (Goldstein and Oquiche H. 2015; Goldstein and Oquiche H. 2016; Goldstein and Oquiche H. 2019; Sitek 2018: 5-6; Sitek n.d.).

The PAL 2016 and 2019 findings suggest that L1 residents attempted to maintain Tiwanaku identities in the Locumba Valley. The 2016 and 2019 reported L1 data states that all diagnostic ceramic findings and decorated textiles at domestic sectors A and L are Tiwanaku (Goldstein and Oquiche H. 2016; Goldstein and Oquiche H. 2019). Moreover, Sector A and Sector L midden deposits suggest L1 practices were similar to those practices of Tiwanaku-primary colonists at Moquegua (Sitek 2018 [Goldstein 1989, 1993a]). There is also indication of long-term residence at L1. For example, the residential sectors A and L are comprised of superimposed floors, are adjacent to dense midden deposits, and are associated with mortuary sectors (Sitek 2018). In conclusion, the archaeological findings suggest that L1 was a primary Tiwanaku colony, or was comprised of Tiwanaku people that came directly from the Altiplano core (hypothesis 1). If the L1 Middle-Horizon sectors reflect primary Tiwanaku colonies, then Goldstein's "diasporic archipelago" model may be used to explain Tiwanaku expansion into the Locumba Valley as the model is used to explain Tiwanaku expansion into the Moquegua Valley.

Under PAL, I conducted a PEB analysis in August of 2019 on 36 samples from L1 domestic sectors A and L to test whether or not the L1 samples reflects aspects of Goldstein's Andean diasporic model. More specifically, I argue that to confirm hypothesis 1, the L1 macrobotanical assemblage should reflect the following features of Goldstein's model: 1) Goldstein's "explicit manifestation of the maintained *identity* with the homeland nucleus" (2005: 42) through highland-associated domestic and industrial cultivars and animals; 2) Goldstein's "*structural reproduction* of the social structure of the homeland" (2005:42), or the Andean *ayllu*, through evidence of specialization (i.e. highland versus lowland sectors or homes) or through evidence of an elite group at L1; and 3) a similar macrobotanical assemblage to primary Tiwanaku colonial sites, such as the Rio Muerto site of M43.

To conduct the PEB study, the samples were filtered through 4.0 mm, 2.0 mm, 1.0 mm, and 0.5 mm sieves, and the inorganic and organic materials recovered from each fraction were weighed, counted, identified, and recorded. To help with identifications, I used the photographic type collection that Cindy Vergel had started and that UCSD graduate student Giacomo Gaggio had expanded for PEB studies conducted in the Moquegua Valley. Furthermore, paleoethnobotanists Dr. Jade d'Alpoim Guedes, Dr. Christine Hastorf, Dr. Matthew Biwer, and Dr. Maria Bruno helped with the identifications discussed in this thesis.

The results of this study focuses on four categories of macroremains: the "Bulk Materials," a "Market Basket," an "Industrial Group," and "Marine Subsistence." The "Bulk Materials" is comprised of fragments of wood, charcoal, straw, charred straw, and cane. The "Market Basket" includes known food taxa, *Amaranthus* sp. and *Chenopodium* spp. of Amaranthaceae, *Schinus molle* of Anacardiaceae, *Arachis* sp., *Phaseolus* spp., and *Prosopis* sp. of Fabaceae, *Zea mays* of Poaceae, and *Capsicum* spp. of Solanaceae. It is noted that each of the market-basket cultivars has other uses in addition to being a possible food source. The "Industrial Group" is comprised of *Gossypium* sp. of Malvaceae and of camelid and *cuy* coprolites. *Gossypium* sp. fibers and camelid wool were woven into textile materials; camelid coprolites were burned as fuel; and *cuys* were kept in homes. Finally, marine subsistence is explored through the findings of *Choromytilus chorus* -shell fragments.

In the discussion of the PAL 2019 PEB results, I argue that the PEB findings support that L1 is a primary Tiwanaku colony (hypothesis 1) because there is 1) evidence of explicit attempts to maintain a Tiwanaku highland identity, 2) evidence of specialization and culinary differences that are characteristic of Tiwanaku homeland social patterning, and 3) evidence that the proportions of local and nonlocal foods at L1 resemble the proportions of local and nonlocal foods at a primary Tiwanaku colony, the Rio Muerto site of M43.

The L1 Tiwanaku colonists maintained their highland identities in the Locumba Valley through acquiring or cultivating, preparing, and consuming Amaranthaceae, a highland-associated cultivar. In *5.1.1 Amaranthaceae: Highland Foods in the Locumba Valley*, I suggest that the presence of Amaranthaceae cultivars in Sector A and Sector L samples means that Tiwanaku colonists acquired Amaranthaceae cultivars through systems of exchange or that Tiwanaku colonists grew the cultivars locally in the valley. The first possibility uses Murra's vertical archipelago model (1964, 1968, 1972, and 1985), while the second possibility considers how Amaranthaceae cultivars do grow at lower elevations or at sea level (Biwer 2019: 112) and considers the implications of weedy and wild Amaranthaceae seeds in the samples. Although both possibilities support Goldstein's model and reflect ways L1 colonists maintained their Tiwanaku homeland identities, I lean more towards the second possibility and suggest that cultivating Amaranthaceae—in addition to preparing and consuming the crop—reinforced Tiwanaku identities in the Locumba Valley.

In *5.1.2 Cuys and Camelids: Highland Animals in the Locumba Valley*, I argue that domesticating *cuys* and camelids were additional ways L1 residents maintained their Tiwanaku highland identities. The high densities of *cuy* coprolites recovered from domestic contexts indicate that Tiwanaku colonists continued to raise *cuys* in their homes when they settled in the Locumba Valley, while the large numbers of camelid coprolites found in L1 samples from thick-ash deposits and possible hearths suggest that camelid dung was burned as fuel.

The comparative analyses of market-basket cultigens in *5.2 The Structural Reproduction of the Social Structure of the Homeland* demonstrate efforts to maintain homeland identities and reflect patterns that may be interpreted through Goldstein's structural reproduction of the social structure of the homeland. First, as discussed in *5.2.1 Botanical Trends at Cerro San Antonio (L1),* the intrasite comparative analyses based on counts suggests that Amaranthaceae cultivars were a large part of the L1 diet and were used in similar proportions to the total proportion of local crops, *molle,* peanuts, beans, *algarrobo,* and *ají*. Although the intrasite comparative analyses based on weights emphasizes the importance of lowland crops, such as maize and beans, the small percentage of Amaranthaceae cultivars is recognizable considering the negligible weight of their seeds. These findings may be interpreted as strong efforts to maintain highland associations despite the abundance of local, lowland crops.

In *5.2.2 Botanical Trends in Sector A and Sector L* and *5.2.3 Botanical Trends in Sector A and Sector L units,* I discuss how preliminary intra-sector and intra-unit comparisons might reflect Goldstein's "*structural reproduction* of the social structure of the homeland" (2005:42) and how these patterns might further develop as more samples from L1 are analyzed. The preliminary, marked differences between the two Sector L units leads me to call L1L-2019-Unit 1 the "Highland Foods House" and L1L-2019-Unit 3 the "Lowland Foods House," although I do recognize that these names are oversimplifications.

The "Highland Foods House" is located furthest east (closest to the Andean region) and above the other homes, and it contains both a domestic and an industrial area. In terms of food-related activities, the "Highland-Foods-House" residents seem to have consumed large quantities of Amaranthaceae cultivars and used camelid dung as fuel. (By far, this unit contains the greatest proportions of Amaranthaceae cultivars and greatest densities of camelid coprolites.) The industrial area shows evidence that the "Highland-House" residents continued to produce wool textiles as they had done so in the Tiwanaku core, although they included local cotton fibers into their textiles when they encountered the cultivar in Locumba.

On the other hand, L1L-2019-Unit 3, or the “Lowland Foods House,” shows a greater dependence on local cultivars, and its residents appear to have engaged in more local, coastal practices. The 2019 excavation of this unit revealed large quantities of fish bones, mollusk and crustacean shells, and fragments of fishing nets made of cotton, reflecting a strong reliance on marine resources. The PEB findings confirmed the coastal dependences as all *Choromytilus chorus* -shell fragments were recovered from Sector L and were concentrated in the “Lowland Foods House.” Moreover, the “Lowland Foods House” reflects proportions of cultivars similar to the proportions of Sector A domestic and plaza units, or the Sector A lowland-resembling units.

Finally, the count-based proportions of market-basket cultivars recovered from L1 during the PAL 2019 PEB study were compared to the count-based proportions of market-basket cultivars recovered from the 2008 PEB study conducted at M43 (Vergel and León 2009). The comparison reflected similar proportions of market-basket cultivars and a strong reliance of highland-associated Amaranthaceae cultivars at each site. This suggests that L1, like M43, had direct connections with the Altiplano. Although more L1 samples should be analyzed and further compared to other domestic, primary Tiwanaku colonial sites and core sites, I argue that the PAL 2019 PEB findings do suggest that L1 is a primary Tiwanaku colony with strongly maintained connections to the Altiplano.

Appendix I: Pictures of Identified Remains Discussed in the Thesis

Macrobotanical Remains

Amaranthaceae

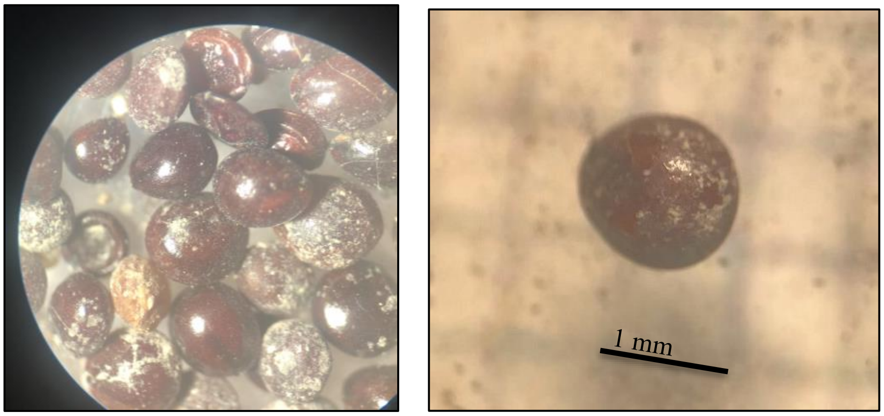

Figure A1: *Amaranthus* sp. seeds from L1=4117. Dr. Bruno confirmed ID via email communication on February 28, 2020.

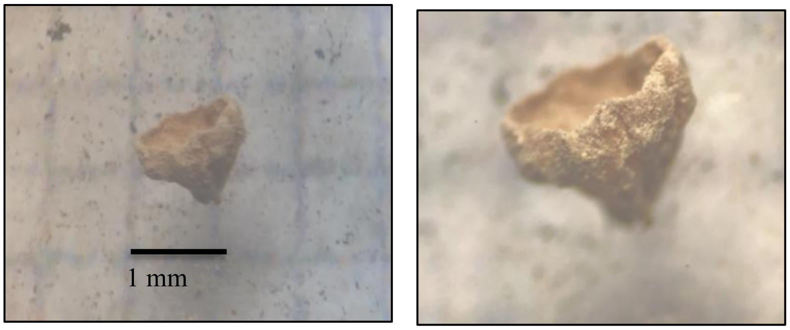

Figure A2: *Amaranthus* cf. *hybridus* utricle from L1=4117.

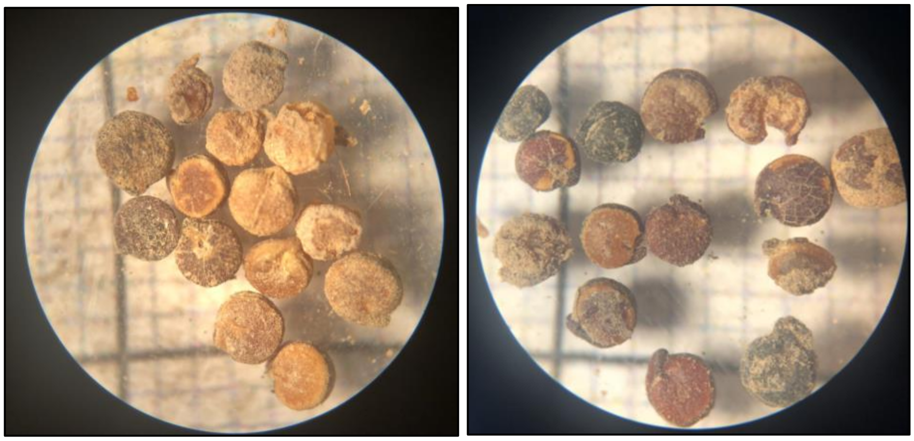

Figure A3: *Chenopodium quinoa* (quinoa) seeds from L1=4069 (right image) and L1=3158 (left image). Dr. Bruno confirmed ID via email communication on February 28, 2020.

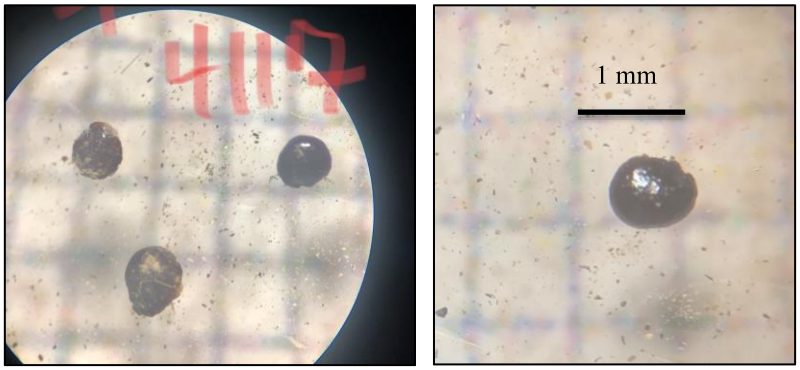

Figure A4: cf. *Chenopodium* sp. seeds from L1=4117. In their photographic type collection, Vergel and Gaggio identified these seeds as *Amaranthus* sp., while Dr. d'Alpoim Guedes identified these seeds as wild *Chenopodium* sp. seeds because of their apparent "beaks." In her email from May 19, 2020, Dr. Bruno described how I might be dealing with 3 different seeds (left image).

Anacardiaceae

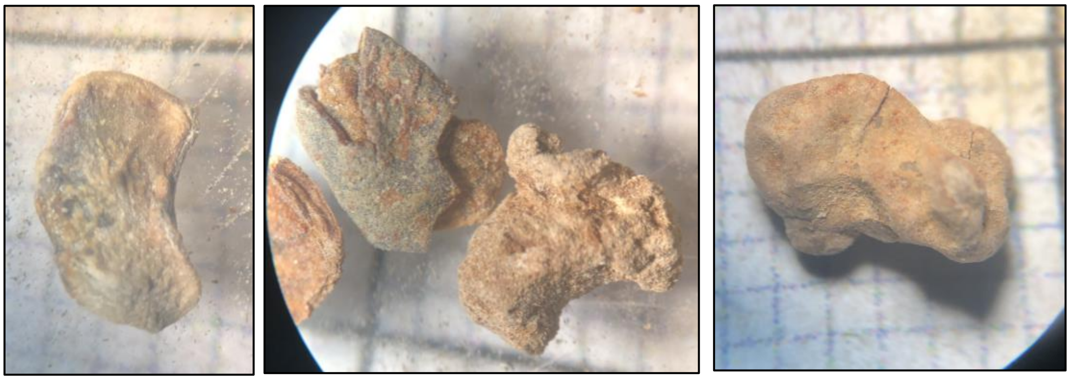

Figure A5: *Schinus molle* (molle) seeds from L1=4119 (left and middle images) and L1=4163 (right image). Dr. Biwer confirmed ID via email communication on January 20, 2020.

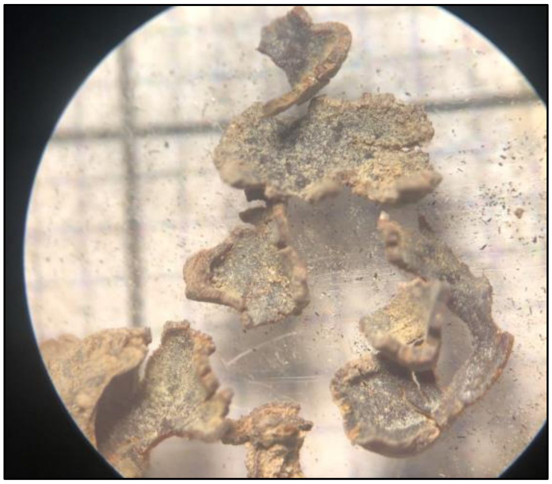

Figure A6: *Schinus molle* (molle) seed fragments from L1=4096. Dr. Biwer confirmed ID via email communication on January 20, 2020.

Figure A7: *Schinus molle* (molle) fruits from L1=4165.

Fabaceae

Figure A8: cf. *Arachis* sp. (peanut) seed from L1=4161.

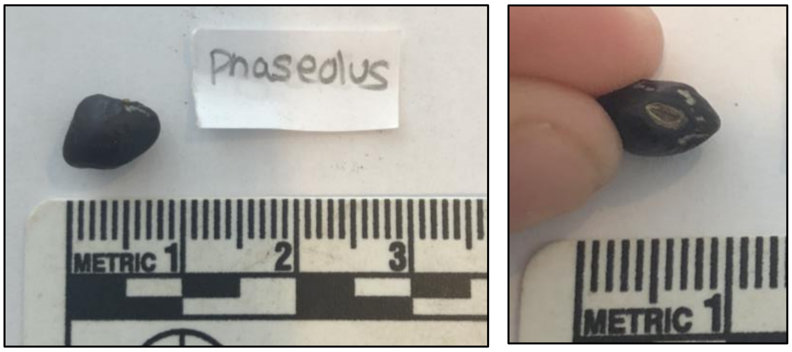

Figure A9: *Phaseolus* sp. (bean) seed from L1=3158. Dr. Bruno confirmed ID via email communication on February 28, 2020.

Figure A10: *Phaseolus lunatus* (lima bean) seeds from L1=3158.

Figure A11: *Phaseolus vulgaris* (common bean) seeds from L1=4117 (left image) and from L1=4148 (right image).

Figure A12: *Phaseolus* sp. (bean) pods from L1=3158.

Figure A13: *Prosopis* sp. (carob bean) seeds from L1=4165.

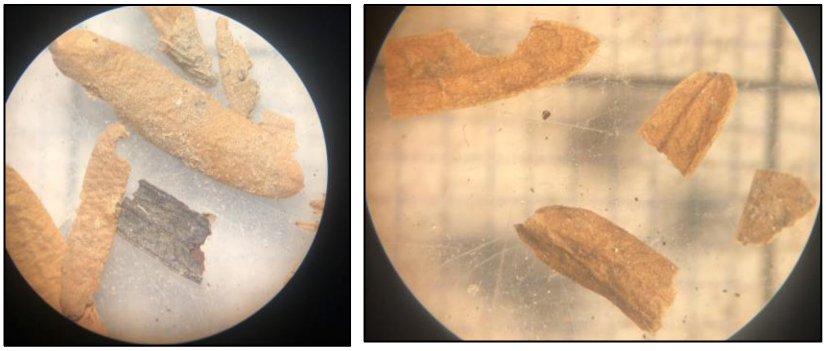

Figure A14: *Prosopis* sp. (carob bean) leaves from L1=4160.

Malvaceae

Figure A15: *Gossypium* sp. (cotton) seeds from L1=4069.

Figure A16: *Gossypium* sp. (cotton) leaves from L1=4165.

Figure A17: *Gossypium* sp. (cotton) calyx from L1=4161.

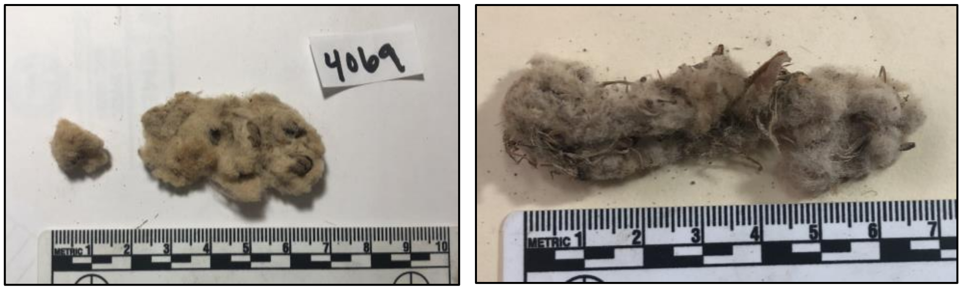

Figure A18: *Gossypium* sp. (cotton) fibers from L1=4069 (left image) and L1=4161 (right image).

Poaceae

Figure A19: *Zea mays* (maize) kernel fragments from L1=4148.

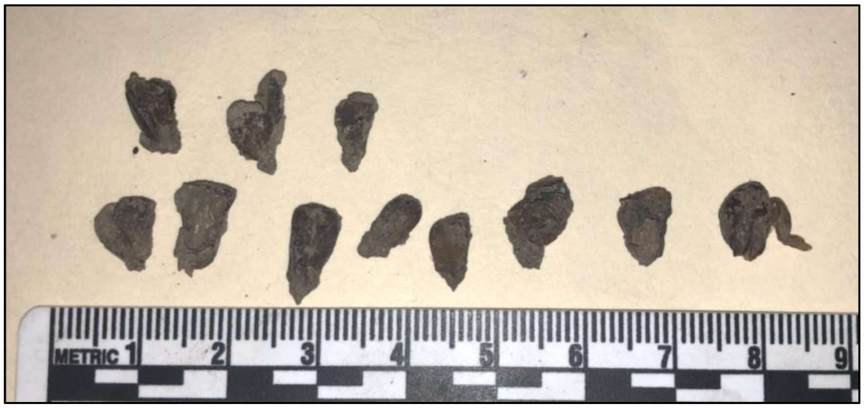

Figure A20: *Zea mays* (maize) kernels from L1=4161.

Figure A21: *Zea mays* (maize) flakey kernel fragments from L1=4161.

Figure A22: *Zea mays* (maize) cob from L1=4123.

Figure A23: *Zea mays* (maize) cob and cob fragment from L1=4159.

Figure A24: *Zea mays* (maize) cob and cob fragments from L1=4160.

Figure A25: *Zea mays* (maize) cob fragments from L1=4165.

Solanaceae

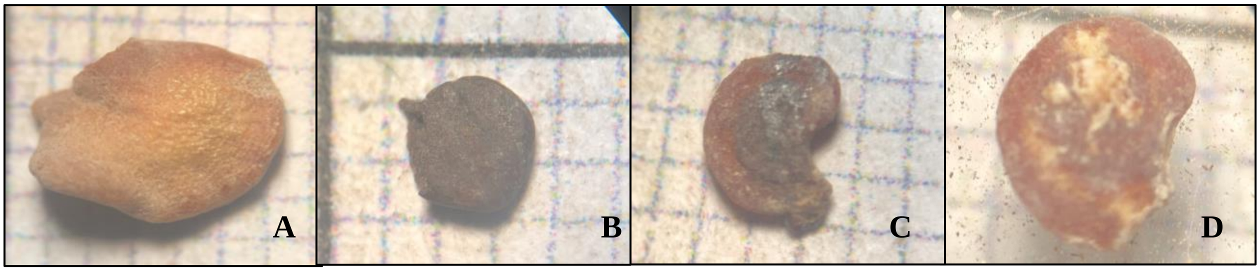

Figure A26: *Capsicum* spp. seeds from L1=4112 (A), L1=4123 (B), L1=4112 (C), and L1=4117 (D). Although he cannot be certain without viewing them in person, Dr. Biwer believes that “A” might be *C. annuum* or *C. chinense* and “B” might be *C. frutescens*. He is less certain about the genus-level identification of “C” and “D” but agrees that they are likely *Capsicum* as well, possibly *C. annuum* or *C. chinense* (email communication on March 31, 2020).

Figure A27: *Capsicum* sp. seeds found in L1=4148. Although he cannot be certain without viewing them in person, Dr. Biwer believes that they might be *C. chinense* or *C. frutescens* (email communication on March 31, 2020).

Non-plant Material

Coprolites

Figure A28: *Cuy* coprolites from L1=4159.

Figure A29: Camelid coprolites from L1=4159.

Figure A30: Camelid wool from L1=4069.

Marine-shell fragments

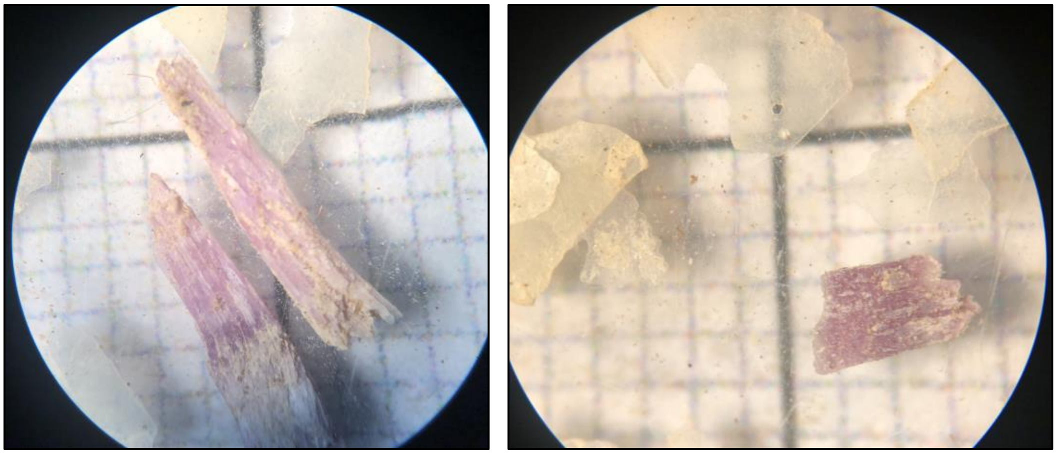

Figure A31: *Choromytilus chorus* (*choro*) fragments from L1=4173.

Appendix II: Pictures of Other Identified Remains

Asteraceae

Figure A32: *Bidens* sp. seeds from L1=4112 (left image) and L1=4159 (right image).

Figure A33: *Sonchus asper* seed from L1=4148.

Cactaceae

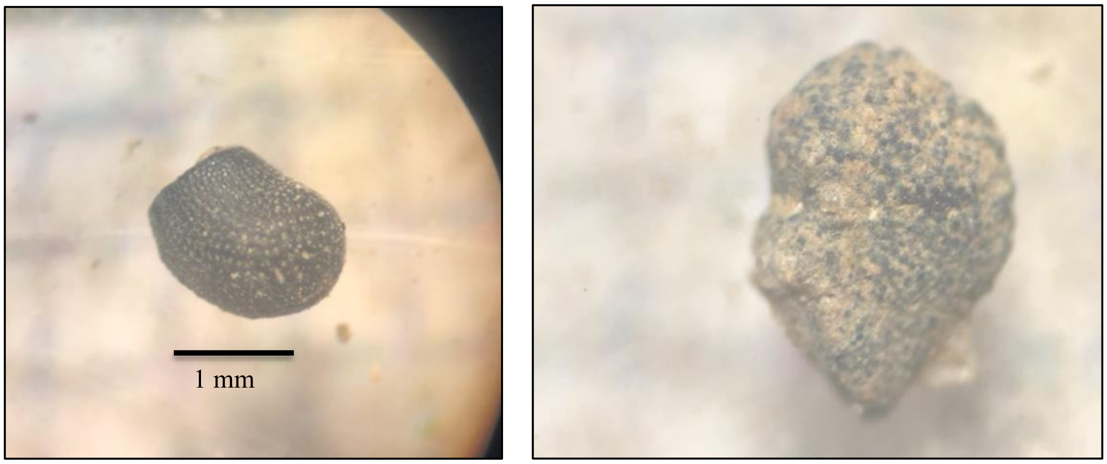

Figure A34: Echinocactus seeds from L1=4165 (left image) and L1=4159 (right image). Dr. Hastorf (12/2/2019) and Dr. Bruno (2/28/2020) confirmed IDs via email communication.

Cyperaceae

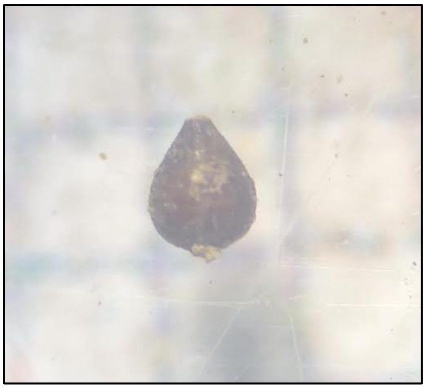

Figure A35: Cyperaceae seed from L1=4069. Dr. d'Alpoim Guedes helped ID, and Dr. Hastorf seemed to agree with ID over email communication on December 2, 2019.

Poaceae

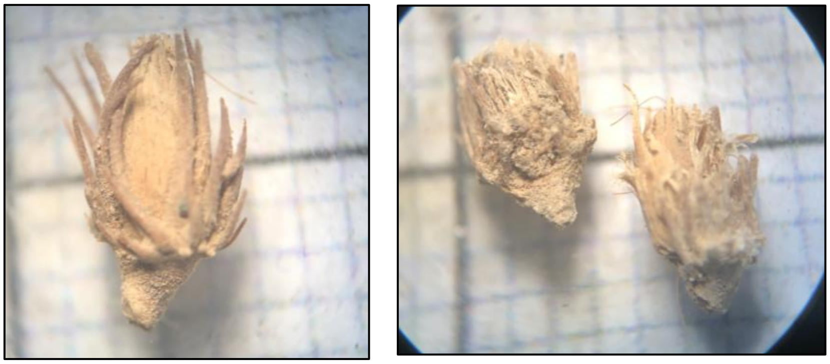

Figure A36: *Cenchrus enchinatus* seeds from L1=4159.

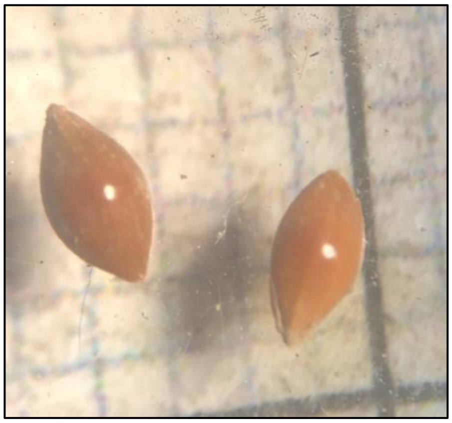

Figure A37: *Panicum* sp. seed from L1=4165.

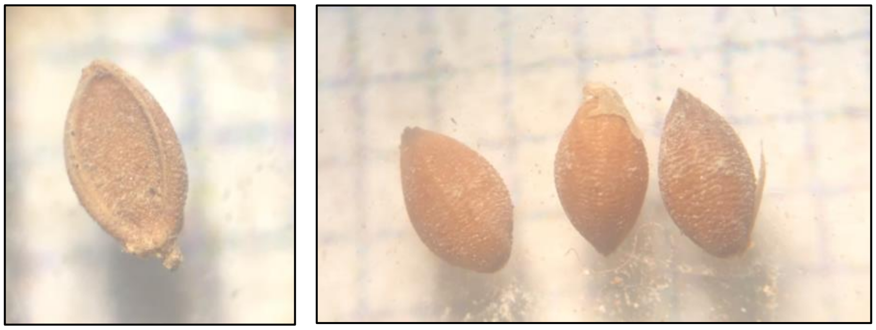

Figure A38: *Setaria* sp. seeds from L1=4161 (left image) and from L1=4148 (right image).

Solanaceae

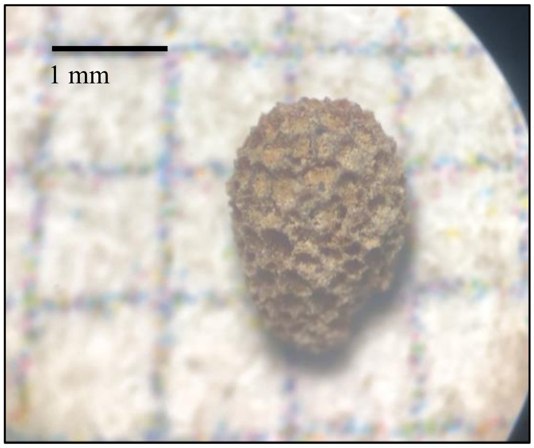

Figure A39: cf. *Nicotiana* sp. seed from L1=4096. Dr. Hastorf confirmed ID via email communication on Dec. 2, 2019. Via email communication on Feb. 28, 2020, Dr. Bruno expressed uncertainty about this ID because *Nicotiana* sp. seeds tend to be very small, <0.5 mm.

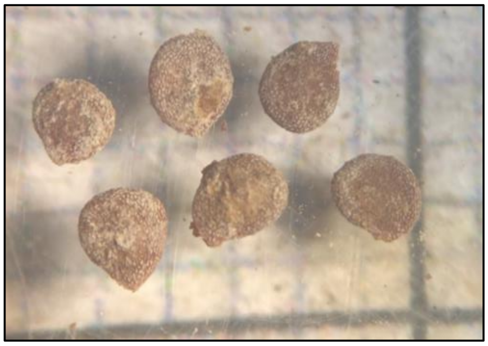

Figure A40: *Solanum* sp. seeds from L1=4165. Dr. d'Alpoim Guedes' ID, and Dr. Hastorf (12/2/2019) and Dr. Bruno (2/28/2020) confirmed ID via email communication.

Verbenaceae

Figure A41: *Verbena* sp. seeds from L1=4159 (left image) and L1=4096 (right image).

Appendix III: Pictures of Unidentifiable Remains

Figure A42: Straw fragments from L1=4117 (left image) and L1=4153 (right image). The specimens are possibly fragments of *quincha* (cane) or *Equisetum* sp., but comparisons should be made using stereoscope. Via email communication on December 2, 2019, Dr. Hastorf expressed concern that these specimens might be modern.

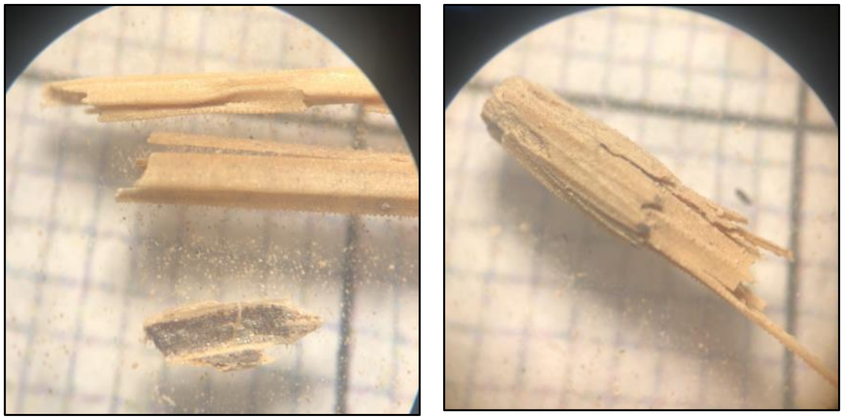

Figure A43: Straw fragments from L1=4117 under magnification.

Figure A44: Charred-straw fragments from L1=4153.

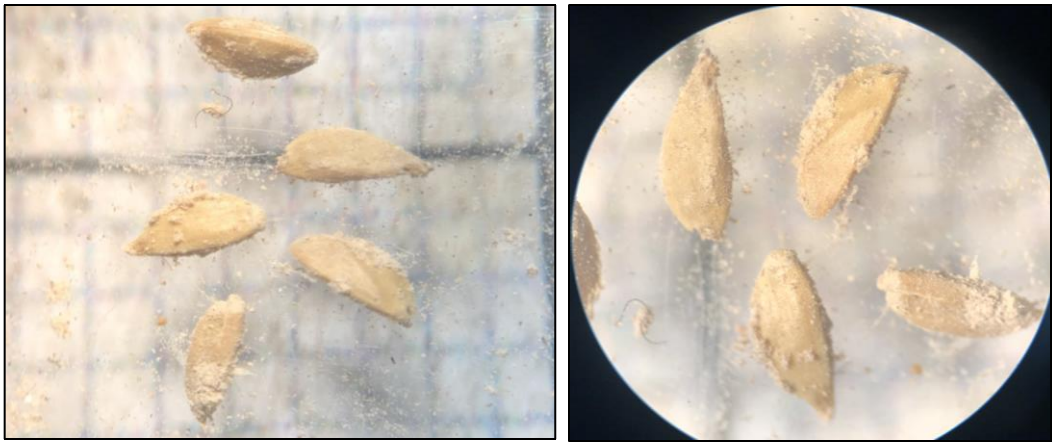

Figure A45: cf. *Cenchrus*-1 from L1=4095. Dr. Hastorf agreed that these specimens are Poaceae via email communication on December 2, 2019.

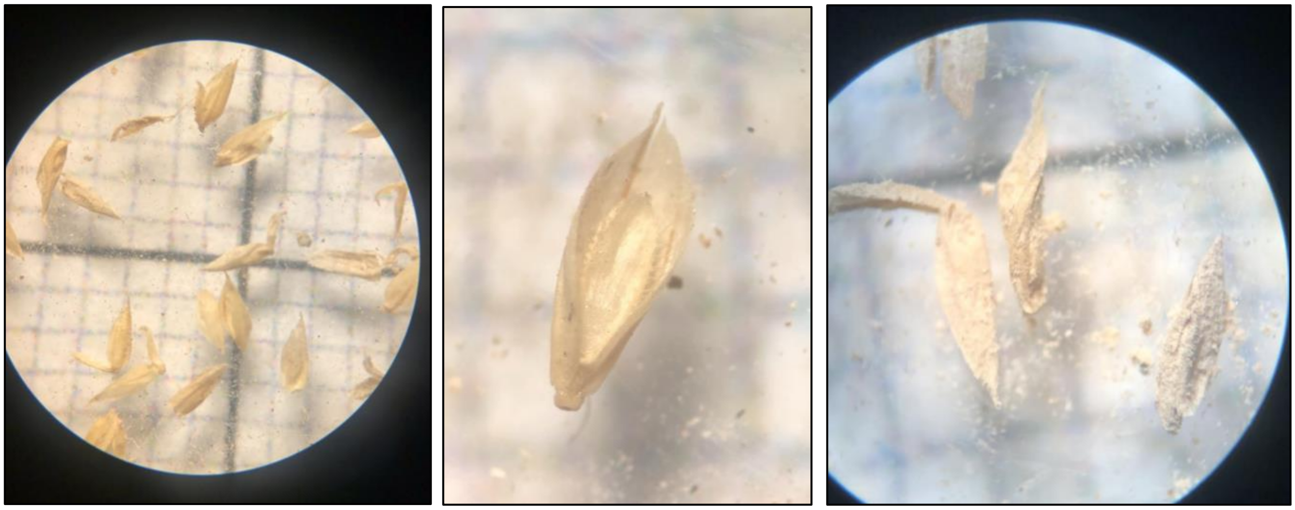

Figure A46: cf. *Cenchrus*-2 from L1=4170 (left image), L1=4159 (middle image), and L1=4095 (right image). Dr. Hastorf agreed that these specimens are Poaceae via email communication on December 2, 2019.

Unidentifiable Specimens: Unident 1- Unident 48

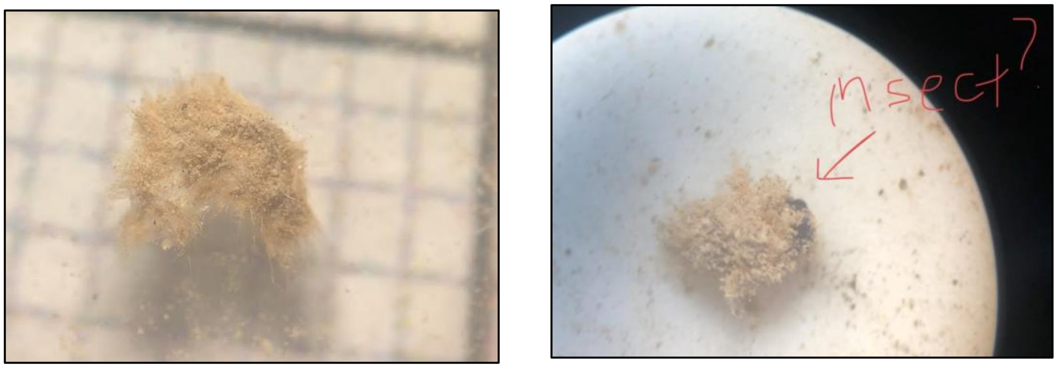

Figure A47: Unident 1 from L1=4119. This specimen is likely a desiccated insect egg/covering.

Unident 2: category in Excel eliminated

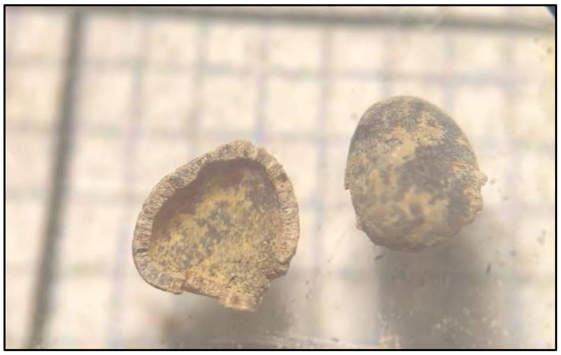

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Figure A48: Unident 3 from L1=4117. According to Dr. Hastorf via email communication on Dec. 2, 2019, this is an endocarp that is difficult to ID without seeing the exterior closer up. A picture with better magnification and better contrasting light needs to be taken.

Unident 4: identified as *Setaria*; category in Excel eliminated

Unident 5: identified as *Schinus molle* seed fragments; category in Excel eliminated

Figure A49: Unident 6, or cf. *Arracacia xanthorrhiza*, from L1=4161 (left image) and L1=3168 (right image). According to Dr. Hastorf via email communication on Dec. 2, 2019, *Arracacia xanthorrhiza* seems to have Caribbean origins, so it might not be indigenous to Andean coastal valleys and would have therefore been brought in during the Colonial period. Dr. Hastorf expressed concerned that Unident 6 might be modern.

Figure A50: Unident 7, or cf. Poaceae/ cf. *Cenchrus*, from L1=4161.

Figure A51: Unident 8 from L1=4161. The interior of this specimen is hollow.

Figure A52: Unident 9 from L1=4161. According to Dr. Hastorf via email communication on Dec. 2, 2019, these specimens are possibly mouse dung. Better large-scale pictures of the interior are needed.

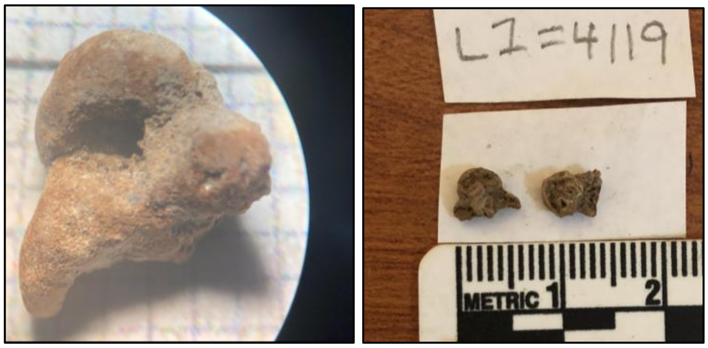

Figure A53: Unident 10 from L1=4119. According to Dr. Hastorf via email communication on Dec. 2, 2019, it is unclear if these specimens are plant because cellular patterning is not visible.

Figure A54: Unident 11 from L1=4112. According to Dr. Hastorf via email communication on Dec. 2, 2019, it is unclear if this specimen is plant. The specimen might be a stalk or an insect.

Figure A55: Unident 12 from L1=4112. According to Dr. Hastorf via email communication on Dec. 2, 2019, it is unclear if this specimen is plant.

Figure A56: Unident 13 from L1=4096. According to Dr. Hastorf via email communication on Dec. 2, 2019, it is unclear if this specimen is plant matter.

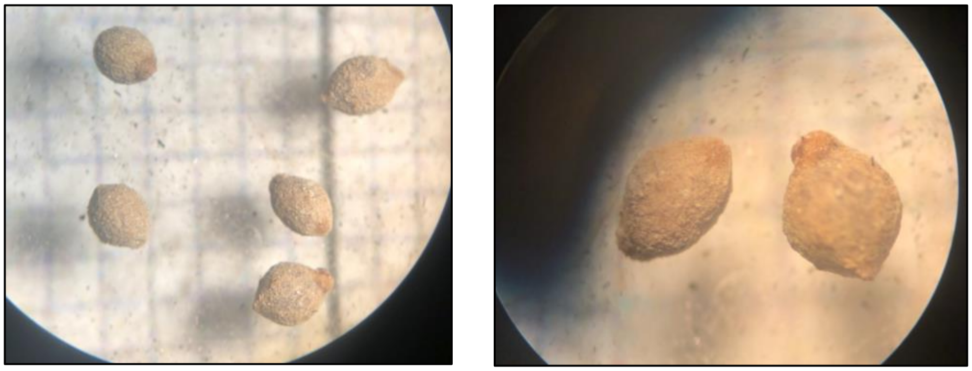

Figure A57: Unident 14, or cf. Cyperaceae, from L1=4096. Dr. Bruno agreed with possible family ID via email communication on February 28, 2020.

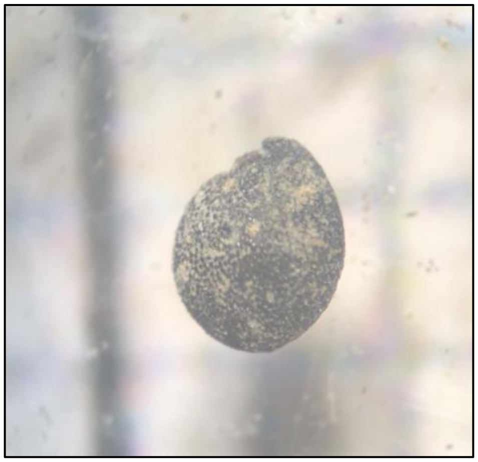

Figure A58: Unident 15 from L1=4096.

Figure A59: Unident 16 from L1=4096.

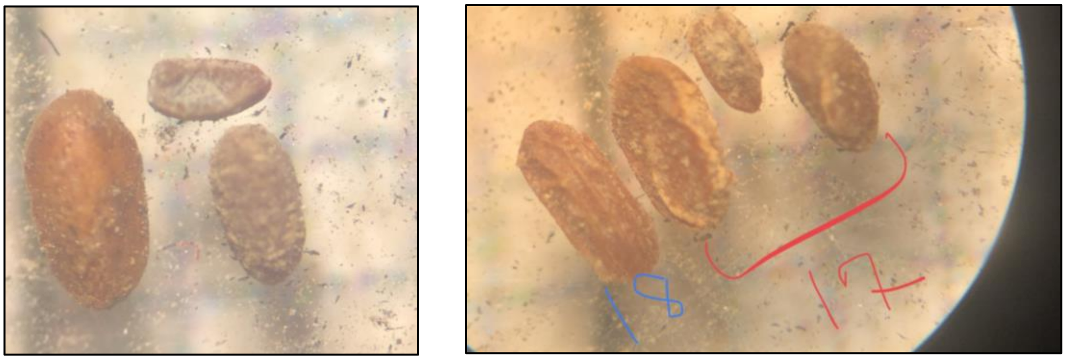

Figure A60: Unident 17 from L1=4096.

Unident 18: identified as *Verbena* sp.; category in excel eliminated

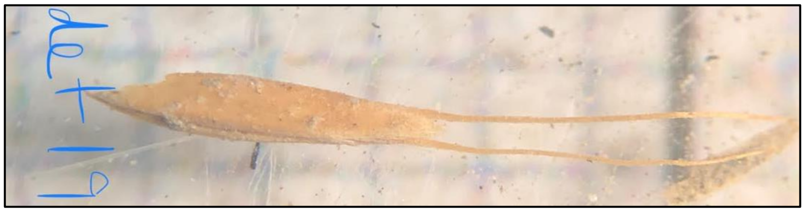

Figure A61: Unident 19, or cf. *Cenchrus*, from L1=4161.

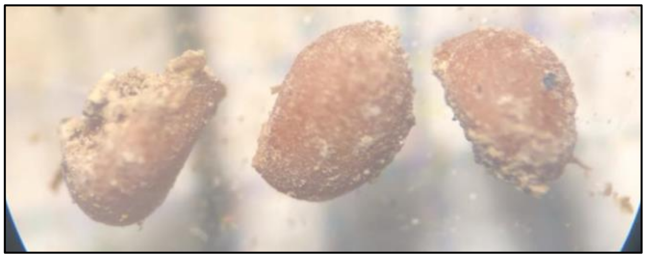

Figure A62: Unident 20 from L1=4161. Each specimen has a tip and no flat surface.

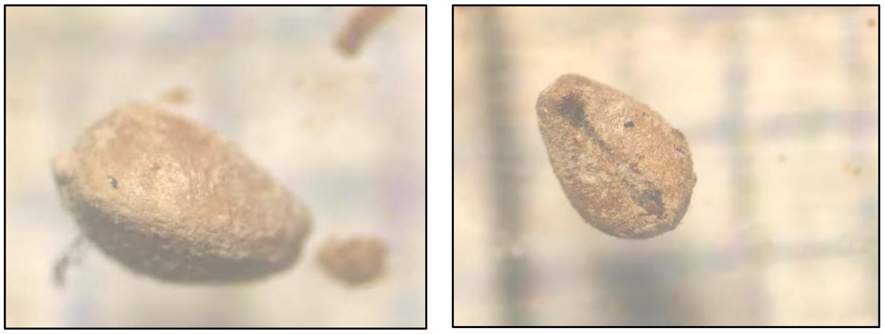

Figure A63: Unident 21 from L1=4161. According to Dr. Hastorf via email communication on Dec. 2, 2019, this specimen does not look like a seed, although the specimen could be a seed endocarp.

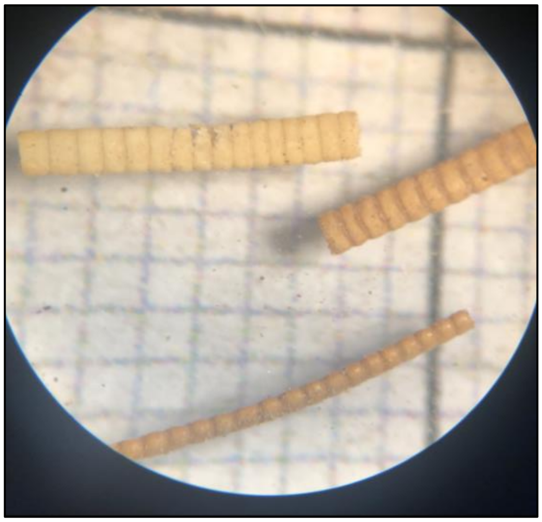

Figure A64: Unident 22 from L1=3158. According to Dr. Hastorf via email communication on December 2, 2019, these specimens look like insect parts.

Figure A65: Unident 23 from L1=4165. According to Dr. Hastorf via email communication on Dec. 2, 2019, this specimen looks like an endocarp.

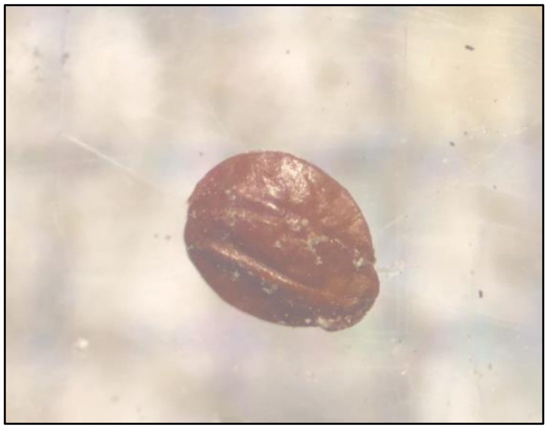

Figure A66: Unident 24 from L1=4165.

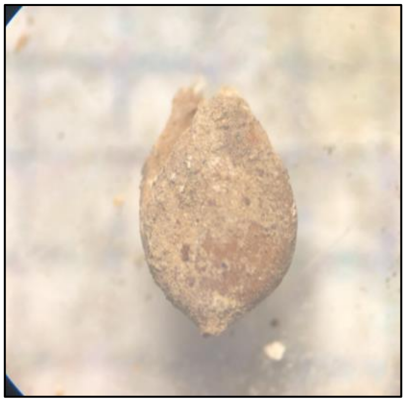

Figure A67: Unident 25, or cf. Cyperaceae, from L1=4159.

Figure A68: Unident 26 from L1=4159. According to Dr. Hastorf via email communication on Dec. 2, 2019, the endocarp should be removed to look at the seed.

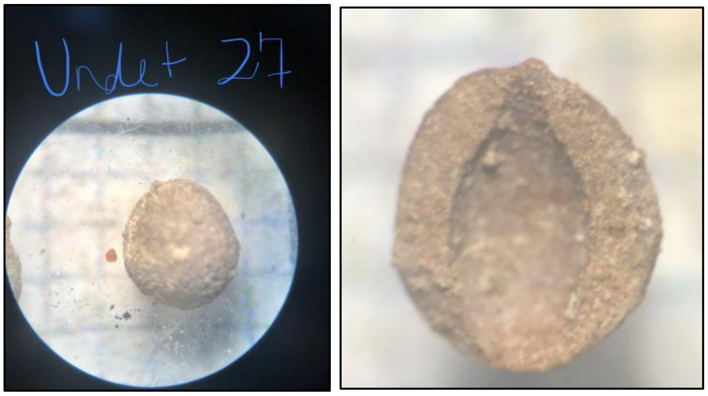

Figure A69: Unident 27 from L1=4159. This husk is spherical and has an inner cavity.

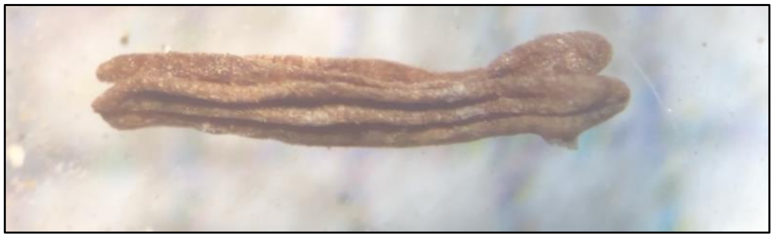

Figure A70: Unident 28 from L1=4159. According to Dr. Hastorf via email communication on Dec. 2, 2019, this specimen looks like a modern herb fragment.

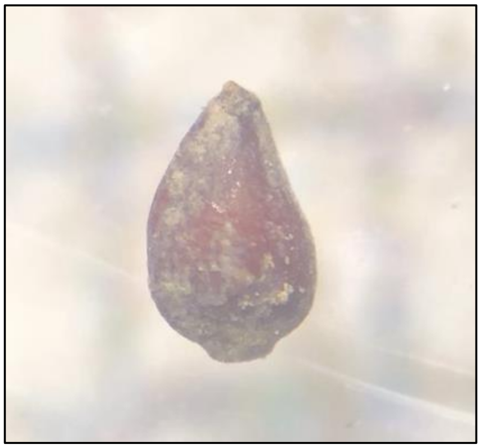

Figure A71: Unident 29 from 4158.

Figure A72: Unident 30 from 4158.

Figure A73: Unident 31 from L1=4170. According to Dr. Hastorf via email communication on Dec. 2, 2019, these specimens look modern.

Unident 32: category eliminated

Figure A74: Unident 33 from L1=4147. Dr. Hastorf identified this specimen as *Festuca* via email communication on December 2, 2019.

Figure A75: Unident 34 from L1=4160. According to Dr. Hastorf via email communication on Dec. 2, 2019, these specimens look like modern Poaceae.

Figure A76: Unident 35 from L1=4081. The outer shell feels like *Prosopis* but has pentagonal indentations.

Figure A77: Unident 36 from L1=4083. Dr. Hastorf confirmed Apiaceae family ID via email communication on December 2, 2019.

Figure A78: Unident 37 from L1=4066.

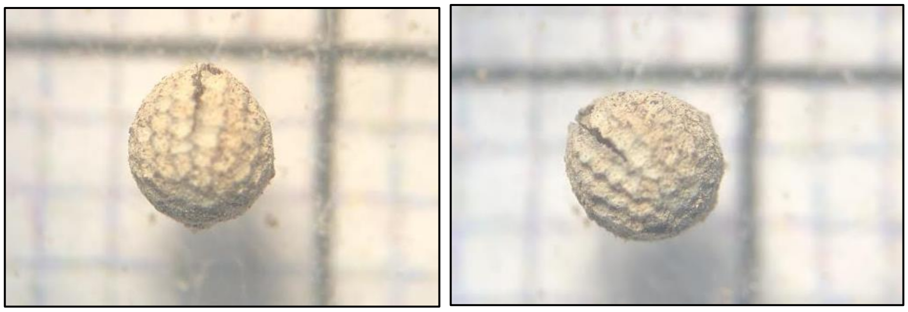

Figure A79: Unident 38 from L1=4170. According to Dr. Hastorf via email communication on Dec. 2, 2019, this specimen is not a seed but likely an insect.

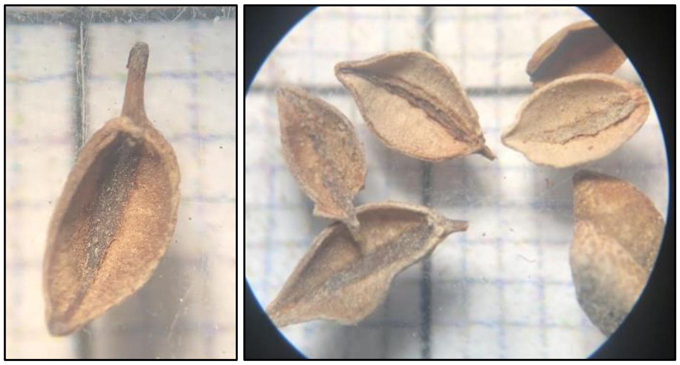

Figure A80: Unident 39 from L1= 3168. According to Dr. Hastorf via email communication on Dec. 2, 2019, these specimens are an exterior endo/pericarp.

Figure A81: Unident 40 from L1=4072.

Figure A82: Unident 41 from L1=4127. According to Dr. Hastorf via email communication on Dec. 2, 2019, this specimen is a Poaceae.

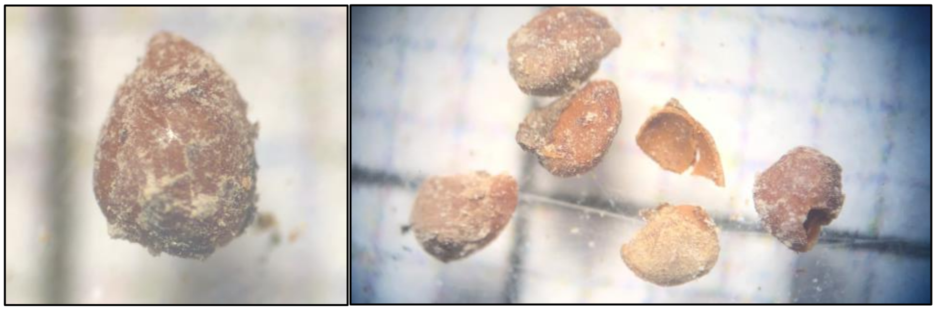

Figure A83: Unident 42 from 3169.

Figure A84: Unident 43 from L1=3158. According to Dr. Hastorf, this specimen is possibly Asteraceae.

Figure A85: Unident 44 from L1=3168 identified as Solanaceae. Family confirmed by Dr. Hastorf via email communication on Dec. 2, 2019, but species remains unknown.

Figure A86: Unident 45 from L1=3168. According to Dr. Hastorf via email comm. on Dec. 2, 2019, this specimen is Poaceae.

Figure A87: Unident 46 from L1=3168. According to Dr. Hastorf via email communication on Dec. 2, 2019, this specimen is an Asteraceae.

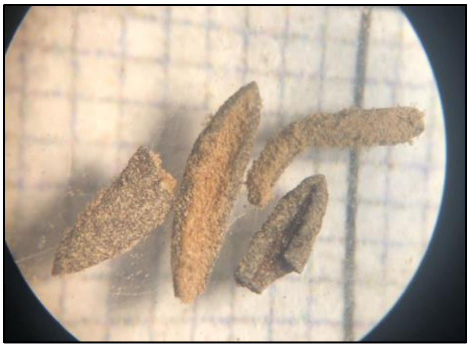

Figure A88: Unident 47 from L1=3158. According to Dr. Hastorf via email communication on Dec. 2, 2019, these specimens are *Verbena* sp.

Figure A89: Unident 48 from L1=4096.

Appendix IV: List of Sector, Unit, and Sample Descriptions

SECTOR A	In 2016, PAL excavated 5 test units (2x2 meters) in Sector A, a large domestic sector of the Tiwanaku period. The excavations were focused in the primary domestic occupation area, which was marked by dense household debris. Although the deposits were shallow, the material preservation was excellent. More specifically, the units for excavation were chosen based on previous survey data and satellite images, which were then found in the field using a GPS. The exact locations of the units were altered slightly from pre-selected locations. Soil samples were collected from the levels for future analysis (Goldstein and Oquiche H. 2016). From 2018-2019, 2 units were excavated: L1A-2019-Unit 2 (expansion of L1A-2016-Unit 3, exposing a ritual structure) and L1A-2019-Unit 3 (domestic complex with storage pits). Due to time constraints, unit 1 was not excavated (Goldstein and Oquiche H. 2019).
L1A-2016-Unit 1: DOMESTIC	Located in the center of the western portion of Sector A. The unit appears to be in a corner space of a domestic clearing. A significant quantity of stone materials was recovered. This unit contains a notable storage pit containing a significant amount of botanical remains, including maize and beans (Goldstein and Oquiche H. 2016).
3158 - Area B; Level 2; R-2	R-2 is a domestic feature partly lined with stones, containing large quantities of botanicals, such as maize, beans, and wood (Goldstein and Oquiche H. 2016).
L1A-2016-Unit 2: DOMESTIC	Unit 2 is in the eastern end of the primary domestic occupation within Sector A, approximately 75 meters east of Unit 1. This unit is also found in the center of three small domestic stone mounds found on the surface layer: one in the northwest corner with a semicircular depression (Area B), one in the southwest corner (Area A), and one in the southeast corner (Area C) (Goldstein and Oquiche H. 2016).
3166- Area C; Level 2; R-1	R-1 is a superficial depression associated with the Area C stone mound. The hole contained many botanicals and other organic materials. The base of the feature is somewhat in the form of a basin (Goldstein and Oquiche H. 2016).
3167- Area A, level 2, R-2	R-2 is a shallow depression that was exposed under the stone mound in Area A. The depression contained small numbers of botanicals, animal bones, crustaceans, and mollusks. The depression possibly formed naturally under the stone mound (Goldstein and Oquiche H. 2016).
3168- Area E, level 1, R-3	R-3 is a shallow hole that forms from the wall of the northwest corner of the north unit. The hole contained moderate numbers of botanicals and cultural material (Goldstein and Oquiche H. 2016).
L1A-2016-Unit 3: PLAZA	Unit 3 is located a little over 60 meters north of Unit and slightly north of the central plaza of Sector A. This unit crossed a large mound found directly south, which is likely a structure associated with the central plaza. Adobe bricks were found eroding from this mound (Goldstein and Oquiche H. 2016).
3085-Area B; level 3	Area B was excavated until no cultural materials were found (Goldstein and Oquiche H. 2016).
3087-Area A; R-1	R-1 is a superficial depression in the southeast quadrant of the unit, associated with Area A (Goldstein and Oquiche H. 2016).
L1A-2016-Unit 5: RITUAL	Unit 5 is in the most southern portion of Sector A, approximately 80 m south of Unit 1. A surface feature within the unit shows evidence of looting. The feature resembles the surface storage structures found in Tiwanaku contexts in Moquegua. The unit includes a structure that

	resembles a ritual structure in Moquegua and that contains fragments of copper artifacts and miniature ceramic vessels (Goldstein and Oquiche H. 2016).
3169-Area A; level 2	Sediment found inside of the ritual structure. Some sediment was compact. Important stones were removed from the inside of the structure. Copper artifacts were recovered, including a fragment of a *tupu* (Goldstein and Oquiche H. 2016).
3170-Area A; level 2	Sediment found inside of the ritual structure. Some sediment was compact. Important stones were removed from the inside of the structure. Copper artifacts were recovered, including a fragment of a *tupu* (Goldstein and Oquiche H. 2016).
L1A-2019-Unit 2: PLAZA	Total area of 22 m^2. Found in the center of the domestic Sector A, directly adjacent to the central plaza. It is an expansion of L1A-2016-Unit 3. This unit exposed the remains of a ritual structure (likely a platform) made of adobes. The structure, however, was damaged during Prehispanic times, making it difficult to interpret today. Various types of material culture were recovered from this unit. The cultural material includes pottery, metals, and lithic findings. All diagnostic ceramic findings and decorated textiles are Tiwanaku, although some ceramic motifs resemble Tuilaca styles of post Tiwanaku. Organic material includes faunal remains, seashells, botanicals, textiles, and wooden artifacts. Notable findings in this unit include: a Tiwanaku 4-cornered hat, a large basket with human hair, and large quantities of high-quality Tiwanaku ceramics (Goldstein and Oquiche H. 2019).
4158- Area C-Cen; 5-superpiso	Characterized by very compact, possible floor surface that was removed. There is another compact layer beneath this one (Goldstein and Oquiche H. 2019).
4161-Area C-Ext W; 4-Superpiso	Semi-loose fill was removed, exposing a compact base (Goldstein and Oquiche H. 2019).
4165- Area A-Ext W; 5-Superpiso	All remaining adobe fragments were removed from this level, and this exposed a likely floor (compact and leveled). There are no impressions of the original structure, and there are intrusive rat nests (Goldstein and Oquiche H. 2019).
4170-Area B; level 3	The top layer of wind-driven sediment was removed. The base of the feature is uneven, likely the effects of human intrusion (Goldstein and Oquiche H. 2019).
L1A-2019-Unit 3: DOMESTIC	Total area of 8 m^2. Found in the western part of the domestic Sector A. Three Tiwanaku storage pits were uncovered; one storage pit was deliberately made, lined with stones and plaster. All 3 pits likely stored Tiwanaku household goods and then later turned into garbage pits. Various types of material culture were recovered from this unit. The cultural material includes pottery, metals, and lithic findings. All diagnostic ceramic findings and decorated textiles are Tiwanaku, although some ceramic motifs resemble Tuilaca styles of post Tiwanaku. Organic material includes faunal remains, seashells, botanicals, textiles, and wooden artifacts (Goldstein and Oquiche H. 2019).
4159-Area B, level 3, Rasgo R-2	R-2 is a relatively deep storage pit with vertical walls and basin-shaped bottom. It contained household waste. R-2 fits in the southern wall (Goldstein and Oquiche H. 2019).
4160-? area, level 4 superpiso, R-1	R-1 is a deliberately made storage pit that is lined with stone. A stone necklace was situated on the surface. The pit is in good condition and was filled with domestic garbage, such as sherds, camelid bones, and botanical findings (Goldstein and Oquiche H. 2019).
4163-Area C; 4-superpiso	Last level of Area C. Some material remains were found here

	(Goldstein and Oquiche H. 2019).
SECTOR L	From 2018-2019, PAL excavated two units, Units L1L-2019-Unit 1 and L1L-2019-Unit 3, which total an area of 124 m^2. Each unit is a separate domestic structure. Due to time constraints, L1L-2019-Unit 2 was not excavated (Goldstein and Oquiche H. 2019).
L1L-2019-Unit 1: DOMESTIC + INDUSTRIAL	Total area of 60 m^2. Found in the north end of the domestic Sector L, adjacent to *quincha* wall. All diagnostic ceramic findings and decorated textiles are Tiwanaku, although some ceramic motifs resemble Tuilaca styles of post Tiwanaku. Within Unit 1, Sitek has distinguished two areas of specialized activities: 1) area of cooking: hearth, plant remains, and ceramic *llana*, and 2) industrial area: textiles, numerous needles, raw textile material, and stone of lapis lazuli (Goldstein and Oquiche H. 2019).
4066-Area A; 4-superpiso, R-3	Dense matrix with household waste that is in the southwestern part of the area (Goldstein and Oquiche H. 2019).
4068-Area D-SE; 4-superpiso, R-2	Shallow pit feature adjacent to *quincha* wall. The pit is not very profound but might have been an informal storage pit. The pit's shape is relatively circular and has a compact base. There is also ash in this pit (Goldstein and Oquiche H. 2019).
4069-Area A; 4-superpiso; R-4	Small, circular pit that contains burnt *olla* (pot) fragments that were possibly on the floor. However, none of the fragments were *in situ*. There are many leaves present (Goldstein and Oquiche H. 2019).
4072- Area F; 4-superpiso	Characterized by layer of ash. Includes R-5, which is thick ash deposit / possible hearth (Goldstein and Oquiche H. 2019).
4076- Area F; 4-superpiso	Characterized by layer of ash. Includes R-5, which is thick ash deposit / possible hearth (Goldstein and Oquiche H. 2019).
4081-Area F; 4-superpiso	Layer of ash; * R-6 and part of R-5, which each is thick ash deposit / possible hearth (Goldstein and Oquiche H. 2019).
4083-Area A; 4-superpiso	Comprised of loose silt. Patches of floor were exposed although preserved poorly. There are multiple features in this area, including R-3 and R-4 (Goldstein and Oquiche H. 2019).
4095; Area F; 4-superpiso	Layer of ash. *Includes R-5 and R-6, which each are thick ash deposit / possible hearth (Goldstein and Oquiche H. 2019).
4096; Area F; 4-superpiso; R-6	R-6: thick ash deposit / possible hearth that is more profound than R-5. This area also contains fragments of *manos* and a *metates* that are directly associated with this level (Goldstein and Oquiche H. 2019).
4112- Area E; 5-superpiso	Second floor. AREA E-SE: domestic waste that appears stepped on while people were living here. There is a large concentration of botanical findings, textile fragments, and camelid bones. There is a shallow depression located at the base of the level that contains cultural material, which might have been a storage or trash pit (Goldstein and Oquiche H. 2019).
4117- Area E; 5-superpiso	Second floor. AREA E-SE: domestic waste that appears stepped on while people were living here. There is a large concentration of botanical findings, textile fragments, and camelid bones. There is a shallow depression located at the base of the level that contains cultural material, which might have been a storage or trash pit (Goldstein and Oquiche H. 2019).
4118-Area F;? level; R-5	Likely a hearth or used feature. There are two places within the area that reflect burning (carbonized sediment). Dense with ashes and botanical findings (Goldstein and Oquiche H. 2019).
L1L-2019-Unit 3: DOMESTIC	Total area of 64 m^2; Found in the south-central area of domestic Sector L. This area was selected for excavation because of the existing foundation and presence of *quincha* posts. The unit includes a large part of a domestic structure and a mound of stone/midden. Many of the

	wall foundations are preserved, including four posts. The cultural material recovered includes pottery, metals, and lithic findings. All diagnostic ceramic findings and decorated textiles are Tiwanaku, although some ceramic motifs resemble Tuilaca styles of post Tiwanaku. Organic material includes faunal remains, seashells, botanicals, textiles, and wooden artifacts. Notably, this unit shows a strong reliance on marine resources. Large quantities of fish bones, mollusk and crustacean shells, and fragments of fishing nets made of cotton were recovered. Finally, the midden associated with the structure contained red pottery and camelid bone, which are associated with celebrations/feasts (Goldstein and Oquiche H. 2019).
4119-Area A-N; 4-superpiso; R-4	Profound pit containing gravel and sherds (Goldstein and Oquiche H. 2019).
4123-Area A-S; 4-superpiso	Little cultural material recovered, which included several *manos* and *matates*. The area includes R-1, R-2, and R-3. R-1 is a shallow pit with a moderate amount of ash and some materials, and R-3 is a shallow depression containing ash (Goldstein and Oquiche H. 2019). (No description of R-2 in the report.)
4127-Area C-CEN; 4-Superpiso	Relatively large area along the west side of the unit. Ashes found in level 3 are an indication of hearths likely for individual use (Goldstein and Oquiche H. 2019).
4145-Area G; 4-superpiso; R-6	Pit with stones (made of stones?) and trash material. Area G, in general, was an area where trash was deposited (Goldstein and Oquiche H. 2019).
4147-Area H; 4-superpiso	NW corner space of the unit. No floor was found here. Various mollusks were recovered, and a small feature in the corner contained one *molusco de oliva* (Goldstein and Oquiche H. 2019).
4148-Area J; 4-superpiso	Significant quantity of gravel and deteriorated stones recovered. Most of the material was recovered along the quincha wall (Goldstein and Oquiche H. 2019).
4153-Area C-CEN; 4-superpiso	Relatively large area along the west side of the unit. Ashes found in level 3 appear to be hearths likely for individual use (Goldstein and Oquiche H. 2019).
4173-Area F-S; 4-superpiso	Final stratum of the south portion of the rock and garbage deposit. The stratum is not as dense as the upper layers but still includes high concentrations of ceramics, faunal remains, and botanicals (Goldstein and Oquiche H. 2019).
4175-Area F-S; 4-superpiso	Final stratum of the south portion of the rock and garbage deposit. The stratum is not as dense as the upper layers but still includes high concentrations of ceramics, faunal remains, and botanicals (Goldstein and Oquiche H. 2019).

Appendix V: PAL 2019 PEB Data

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	3085		3087		3158		3166		3167		3168		3169	
Year	2016-3		2016-3		2016-1		2016-2		2016-2		2016-2		2016-5	
Sector	A		A		A		A		A		A		A	
Unit	3		3		1		2		2		2		5	
Level	3				2		2		2		1		2	
Area	B				B		C		A		E		A	
Rasgo			1		2		1		2		3			
N	8051486		8051486				8051425		8051425		8051425		8051335	
E	314115		314115				314183		314183		314183		314105	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	20-Sept-19		20-Sept-19		20-Sept-19		16-Sept-19		18-Sept-2019		19-Sept-2019		16-Sept-2019	
Analyst	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
Charcoal	36	0.115	52	0.205	189	0.876	53	0.033	281	0.72	133	0.584	11	0.187
Wood	196	0.496	11	0.044	342	5.16	10	0	92	0.364	301	0.476	0	0
Straw	0	0	4	0	11	0	0	0	5	0	5	0	0	0
Charred straw	0	0	0	0	0	0	0	0	0	0	6	0	3	0
Cane	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthaceae														
Amaranthus sp. seed (whole)	0	0	1	0	22	0	0	0	0	0	0	0	0	0
Amaranthus sp. seed (fragment)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Amaranthus sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. seed (total)	0	0	1	0	23	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. flower (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. flower (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. flower (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium quinoa seed (whole)	0	0	0	0	16	-	0	0	0	0	0	0	0	0
Chenopodium quinoa seed (fragment)	0	0	0	0	1	-	0	0	0	0	0	0	0	0
Chenopodium quinoa seed (charred, whole)	0	0	0	0	3	-	0	0	1	0	0	0	0	0
Chenopodium quinoa seed (total)	0	0	0	0	20	0.02	0	0	1	0	0	0	0	0
cf. *Chenopodium* sp. seed (whole)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
cf. *Chenopodium* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Chenopodium* sp. seed (total)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Chenopodium spp. seed total (*Chenopodium quinoa*	0	0	0	0	21	0.02	0	0	1	0	0	0	0	0
Anacardiaceae														
Schinus molle fruit (whole)	0	0	0	0	33	-	0	0	1	0.03	0	0	0	0
Schinus molle fruit (fragment)	0	0	0	0	3	-	0	0	1	0	0	0	0	0
Schinus molle fruit (charred, fragment)	0	0	0	0	0	0	1	0	**1**	0	0	0	0	0
Schinus molle fruit (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle fruit (total)	0	0	0	0	36	1.021	1	0	3	0.03	0	0	0	0
Schinus molle seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle seed (fragment)	0	0	2	0	10	0	2	0	0	0	0	0	2	0
Schinus molle seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle seed (total)	0	0	2	0	10	0	2	0	0	0	0	0	2	0
Asteraceae														
Sonchus asper seed (whole)	0	0	2	0	0	0	0	0	0	0	10	0	1	0
Sonchus asper seed (fragment)	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Sonchus asper seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper seed (total)	0	0	2	0	0	0	0	0	0	0	12	0	1	0
Bidens sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bidens sp. seed (fragment)	0	0	0	0	1	0	0	0	2	0	0	0	0	0
Bidens sp. seed (total)	0	0	0	0	1	0	0	0	2	0	0	0	0	0
Cactaceae														
Echinocactus seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinocactus seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Echinocactus seed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae														
Cyperaceae seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabacaceae														
Prosopis sp. leaf (whole)	0	0	0	0	0	0	0	0	2	0	1	0	0	0
Prosopis sp. leaf (fragment)	1	0	0	0	2	0	0	0	8	0	14	0	0	0
Prosopis sp. leaf (total)	1	0	0	0	2	0	0	0	10	0	15	0	0	0
Prosopis sp. seed (whole)	0	0	0	0	2	-	4	0.465	8	0.581	0	0	0	0
Prosopis sp. seed (fragment)	0	0	0	0	1	-	0	0	0	0	0	0	0	0
Prosopis sp. seed (total)	0	0	0	0	3	0.111	4	0.465	8	0.581	0	0	0	0
cf. *Prosopis* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Phaseolus sp. pod (fragment)	0	0	0	0	23	1.155	0	0	0	0	0	0	0	0
Phaseolus sp. pod (total)	0	0	0	0	23	1.155	0	0	0	0	0	0	0	0
Phaseolus sp. seed (whole)	0	0	0	0	1	0.143	0	0	0	0	0	0	0	0
Phaseolus sp. seed (total)	0	0	0	0	1	0.143	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (whole)	0	0	0	0	1	-	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (half)	0	0	0	0	5	-	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (total)	0	0	0	0	6	0.731	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (half)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Arachis* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Arachis* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malvaceae														
Gossypium sp. fiber	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. leaves	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. calyx	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (whole)	0	0	0	0	1	0.032	0	0	1	0.102	0	0	0	0
Gossypium sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (total)	0	0	0	0	1	0.032	0	0	1	0	0	0	0	0
cf. *Gossypium* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Malva* sp. seed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marantaceae														
cf. *Maranta* sp. seed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae														

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	3085		3087		3158		3166		3167		3168		3169	
Year	2016-3		2016-3		2016-1		2016-2		2016-2		2016-2		2016-5	
Sector	A		A		A		A		A		A		A	
Unit	3		3		1		2		2		2		5	
Level	3				2		2		2		1		2	
Area	B				B		C		A		E		A	
Rasgo			1		2		1		2		3			
N	8051486		8051486				8051425		8051425		8051425		8051335	
E	314115		314115				314183		314183		314183		314105	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	20-Sept-19		20-Sept-19		20-Sept-19		16-Sept-19		18-Sept-2019		19-Sept-2019		16-Sept-2019	
Analyst	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
cf. *Bromus* seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (whole)	1	0	0	0	1	0	0	0	3	0	0	0	0	0
Cenchrus enchinatus seed (fragment)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Cenchrus enchinatus seed (charred, fragment)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (total)	1	0	0	0	2	0	0	0	4	0	0	0	0	0
Cenchrus sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-2 seed (whole)	27	0	0	0	0	0	0	0	1	0	**2303**	0.066	52	0
cf. *Cenchrus*-2 seed (total)	27	0	0	0	0	0	0	0	1	0	2303	0.066	52	0
cf. *Cenchrus* seed (whole)	0	0	2	0	0	0	0	0	0	0	**4**	0	0	0
cf. *Cenchrus* seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus* seed (total)	0	0	2	0	0	0	0	0	0	0	4	0	0	0
Panicum sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (whole)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Setaria sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (total)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Zea mays cob (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays cob (fragment)	0	0	0	0	17	0.428	0	0	0	0	0	0	0	0
Zea mays cob (charred fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays cob (total)	0	0	0	0	17	0.428	0	0	0	0	0	0	0	0
Zea mays kernel (whole)	0	0	0	0	0	0	0	0	4	-	0	0	0	0
Zea mays kernel (fragment)	0	0	0	0	0	0	0	0	2	-	0	0	0	0
Zea mays kernel (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (total)	0	0	0	0	0	0	0	0	6	0.035	0	0	0	0
cf. *Zea mays* kernel (whole)	0	0	0	0	0	0	0	0	0	0	**3**	0	0	0
cf. *Zea mays* kernel (fragment)	0	0	0	0	3	0.329	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (total)	0	0	0	0	3	0.329	0	0	0	0	3	0	0	0
Solanaceae														
Capsicum sp. seed (whole)	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Capsicum sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsicum sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsicum sp. seed (total)	0	0	0	0	0	0	0	0	2	0	0	0	0	0
cf. *Nicotiana* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Nicotiana* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (charred whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbenaceae														
Verbena sp. seed (whole)	18	0	1	0	0	0	0	0	0	0	0	0	0	0
Verbena sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena sp. seed (charred, whole)	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena sp. seed (total)	21	0	1	0	0	0	0	0	0	0	0	0	0	0
Other plant parts														
Unidentifiable fragments	35	0.018	0	0	118	1.117	29	0.008	100	0.088	14	0	34	0
Unidentifiable carbon fragments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident leafy frags	0	0	0	0	0	0	0	0	6	0	349	0.354	0	0
Unident furry green leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident deep red-purple leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hard brown leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plant fiber	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Leaves?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicel (whole)	0	0	0	0	2	0	1	0	0	0	8	0	0	0
Pedicel (charred, whole)	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Pedicel (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicel (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total pedicel	0	0	0	0	2	0	1	0	0	0	9	0	0	0
cf. utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. charred utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total cf. utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-plant/ processed material														
Ceramics	0	0	0	0	1	2.681	0	0	1	2.783	39	5.947	0	0
Thread (may include textile, see notes)	5	0	0	0	1	0	0	0	3	0	0	0	2	0
Wool	0	0	0	0	1	0	0	0	0	0	1	0	0	0
Shell	0	0	2	0	1	0.082	0	0	0	0	1	0	0	0
Snail shell (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snail shell (fragment)	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Snail shell (total)	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca fragments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Choromytilus chorus fragments	0	0	0	0	0	0	0	0	0	0	6	0	0	0
Crustacean fragments	0	0	7	0	185	0.611	41	0.059	122	0.351	0	0	3	0
Bone	64	0.284	1	0	2	0.43	0	0	10	0.09	64	0.635	0	0
Feather	0	0	0	0	1	0	0	0	0	0	1	0	0	0
Camelid coprolite	2	0.027	0	0	0	0	0	0	0	0	-	-	0	0
Cuy coprolite	0	0	0	0	0	0	0	0	0	0	-	-	0	0
Unident coprolite	6	0.016	0	0	0	0	0	0	0	0	**5**	0.087	0	0
Inorganic residue	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"Brown rods"	0	0	0	0	0	0	0	0	0	0	0	0	30	0
Red material (modern?)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clay piece?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Painted fragment?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insects														
Culeoptero (whole and frag)	1	0	0	0	9	0	0	0	5	-	0	0	0	0
Pupa (whole and frag)	1	0	2	0	0	0	1	0	107	0.211	0	0	35	0.055
Fly (whole and frag)	0	0	0	0	0	0	0	0	1	0	0	0	0	0

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	3085		3087		3158		3166		3167		3168		3169	
Year	2016-3		2016-3		2016-1		2016-2		2016-2		2016-2		2016-5	
Sector	A		A		A		A		A		A		A	
Unit	3		3		1		2		2		2		5	
Level	3				2		2		2		1		2	
Area	B				B		C		A		E		A	
Rasgo			1		2		1		2		3			
N	8051486		8051486				8051425		8051425		8051425		8051335	
E	314115		314115				314183		314183		314183		314105	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	20-Sept-19		20-Sept-19		20-Sept-19		16-Sept-19		18-Sept-2019		19-Sept-2019		16-Sept-2019	
Analyst	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
Beetle (whole and frag)	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Insect fragments	0	0	3	0	5	0	8	0	116	-	37	0	16	0
Insects (total- culeoptero, pupa, beetle, frags)	2	0	5	0	14	0	9	0	229	0.248	37	0	52	0.055
Insect Burrow?	0	0	0	0	0	0	0	0	0	0	0	0	1	1.236
Unidents														
Unident charred seeds	0	0	0	0	0	0	0	0	0	0	**2**	0	0	0
Unident seeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident seed fragments	0	0	0	0	0	0	0	0	**1**	0	0	0	1	0
Unident 1 (Culeoptero covering)	11	0	12	0	45	0	10	0	8	0	1	0	9	0
Unident 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (whole)	1	0	0	0	0	0	0	0	0	0	3	0	0	0
Unident 6: *Arracacia xanthorrhiza* (fragment)	0	0	0	0	2	0	0	0	0	0	17	0	1	0
Unident 6: *Arracacia xanthorrhiza* (total)	1	0	0	0	2	0	0	0	0	0	20	0	1	0
Unident 6: cf. *Arracacia xanthorrhiza* (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 22	0	0	0	0	**11**	0	**3**	0	9	0	0	0	0	0
Unident 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Unident 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 31 (whole)	0	0	1	0	0	0	0	0	0	0	12	0	0	0
Unident 31 (fragment)	0	0	0	0	0	0	0	0	0	0	5	0	0	0
Unident 31 (total)	0	0	1	0	0	0	0	0	0	0	17	0	0	0
Unident 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (whole)	0	0	0	0	0	0	0	0	0	0	12	-	0	0
Unident 39 (fragment)	0	0	0	0	0	0	0	0	0	0	4	-	0	0
Unident 39 (charred frag)	0	0	0	0	0	0	0	0	0	0	1	-	0	0
Unident 39 (total)	0	0	0	0	0	0	0	0	0	0	17	0.008	0	0
Unident 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	6	0
Unident 42 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Unident 42 (total)	0	0	0	0	0	0	0	0	0	0	0	0	7	0
Unident 43	0	0	0	0	1	0.272	0	0	0	0	0	0	0	0
Unident 44	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unident 45	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unident 46	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unident 47 (whole)	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Unident 47 (fragment)	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Unident 47 (total)	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Unident 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes					Undet 22 inclu	-	Undet 22 include	-	S. molle fruto ch	-	*cf. Cenchrus-2	-		
Questions														
Completed	ACG		ACG		MRR		MRR		MRR		?		?	
Checked	ACG		ACG		ACG		ACG		ACG		ACG		ACG	

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	3170		4066		4068		4069		4072		4076		4081	
Year	2016-5		2019-1		2019-1		2019-1		2019-1		2019-1		2019-1	
Sector	A		L		L		L		L		L		L	
Unit	5		1		1		1		1		1		1	
Level	2		4-superpiso		4-superpiso		4-superpiso		4-Superpiso		4-Superpiso		4-Superpiso	
Area	A				Rasgo		Rasgo		F		F		F	
Rasgo			R-3		R-2		R-4							
N	8051335		8052292		8052296		8052293		8052298		8052298		8052296	
E	314105		314809		314810		314811		314814		314813		314816	
Volume	0.5		0.5		0.5L		0.5L		0.5		0.5		0.5	
Date of Anlaysis	16-Sept-2019		5-Sept-2019		09/04/2019		09/01/2019		7 Sept 2019		10 Sept 2019		1 Sept 2019	
Analyst	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
Charcoal	79	1.789	248	0.557	1080	2.801	309	1.234	224	0.649	170	0.486	214	0.85
Wood	0	0	83	2.457	19	0.03	**76**	1.111	15	0	12	0.007	19	0.487
Straw	0	0	105	0.118	1	0	22	0	0	0	10	0	17	0
Charred straw	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cane	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthaceae														
Amaranthus sp. seed (whole)	0	0	**11**	0	0	0	0	0	0	0	0	0	55	0.021
Amaranthus sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Amaranthus sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. seed (total)	0	0	11	0	0	0	0	0	0	0	0	0	57	0.021
Amaranthus cf. *hybridus* utricle (whole)	0	0	1	0	0	0	0	0	0	0	1	0	0	0
Amaranthus cf. *hybridus* utricle (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (total)	0	0	1	0	0	0	0	0	0	0	1	0	0	0
Amaranthus sp. flower (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. flower (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. flower (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium quinoa seed (whole)	0	0	5	0	0	0	14	0.025	0	0	1	0	0	0
Chenopodium quinoa seed (fragment)	0	0	2	0	0	0	2	0	0	0	0	0	1	0
Chenopodium quinoa seed (charred, whole)	0	0	0	0	1	0	1	0	0	0	0	0	0	0
Chenopodium quinoa seed (total)	0	0	7	0	1	0	17	0.025	0	0	1	0	1	0
cf. *Chenopodium* sp. seed (whole)	0	0	1	0	0	0	3	0	0	0	0	0	0	0
cf. *Chenopodium* sp. seed (fragment)	0	0	0	0	0	0	2	0	0	0	0	0	0	0
cf. *Chenopodium* sp. seed (total)	0	0	1	0	0	0	5	0	0	0	0	0	0	0
Chenopodium spp. seed total (*Chenopodium quinoa*	0	0	8	0	1	0	22	0.025	0	0	1	0	1	0
			0	0										
Anacardiaceae														
Schinus molle fruit (whole)	0	0	6	0.202	1	0	12	0.423	0	0	0	0	0	0
Schinus molle fruit (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle fruit (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle fruit (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle fruit (total)	0	0	6	0.202	1	0	12	0.423	0	0	0	0	0	0
Schinus molle seed (whole)	0	0	0	0	0	0	3	0.043	0	0	1	0	0	0
Schinus molle seed (fragment)	0	0	**6**	0	6	0	6	0	0	0	0	0	6	0.006
Schinus molle seed (charred, fragment)	0	0	0	0	0	0	1	0	0	0	0	0	2	0
Schinus molle seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Schinus molle seed (total)	0	0	6	0	6	0	10	0.043	0	0	1	0	9	0.006
Asteraceae														
Sonchus asper seed (whole)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper seed (total)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Bidens sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bidens sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bidens sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cactaceae														
Echinocactus seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinocactus seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Echinocactus seed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae														
Cyperaceae seed (whole)	0	0	1	0	0	0	6	0	0	0	0	0	0	0
Cyperaceae seed (total)	0	0	1	0	0	0	6	0	0	0	0	0	0	0
Fabacaceae														
Prosopis sp. leaf (whole)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Prosopis sp. leaf (fragment)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Prosopis sp. leaf (total)	0	0	1	0	1	0	0	0	0	0	0	0	0	0
Prosopis sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prosopis sp. seed (fragment)	0	0	3	0.047	0	0	0	0	0	0	0	0	0	0
Prosopis sp. seed (total)	0	0	3	0.047	0	0	0	0	0	0	0	0	0	0
cf. *Prosopis* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. pod (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. pod (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (half)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (half)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Arachis* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Arachis* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malvaceae														
Gossypium sp. fiber	0	0	1	0	0	0	3	0.298	0	0	0	0	0	0
Gossypium sp. leaves	0	0	0	0	0	0	16	0.063	0	0	0	0	0	0
Gossypium sp. calyx	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (whole)	0	0	1	-	0	0	8	0.624	0	0	0	0	0	0
Gossypium sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (charred, fragment)	0	0	2	-	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (total)	0	0	3	0.115	0	0	8	0.624	0	0	0	0	0	0
cf. *Gossypium* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Malva* sp. seed	0	0	0	0	0	0	0	0	0	0	**2**	0	0	0
Marantaceae														
cf. *Maranta* sp. seed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae														

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	3170		4066		4068		4069		4072		4076		4081	
Year	2016-5		2019-1		2019-1		2019-1		2019-1		2019-1		2019-1	
Sector	A		L		L		L		L		L		L	
Unit	5		1		1		1		1		1		1	
Level	2		4-superpiso		4-superpiso		4-superpiso		4-Superpiso		4-Superpiso		4-Superpiso	
Area	A				Rasgo		Rasgo		F		F		F	
Rasgo			R-3		R-2		R-4							
N	8051335		8052292		8052296		8052293		8052298		8052298		8052296	
E	314105		314809		314810		314811		314814		314813		314816	
Volume	0.5		0.5		0.5L		0.5L		0.5		0.5		0.5	
Date of Anlaysis	16-Sept-2019		5-Sept-2019		09/04/2019		09/01/2019		7 Sept 2019		10 Sept 2019		1 Sept 2019	
Analyst	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
cf. *Bromus* seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (whole)	0	0	0	0	0	0	0	0	0	0	9	0	3	0
cf. *Cenchrus*-1 seed (fragment)	0	0	0	0	0	0	0	0	0	0	1	0	0	0
cf. *Cenchrus*-1 seed (total)	0	0	0	0	0	0	0	0	0	0	10	0	3	0
cf. *Cenchrus*-2 seed (whole)	22	0	0	0	1	0	0	0	0	0	0	0	1	0
cf. *Cenchrus*-2 seed (total)	22	0	0	0	1	0	0	0	0	0	0	0	1	0
cf. *Cenchrus* seed (whole)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
cf. *Cenchrus* seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus* seed (total)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Panicum sp. seed (whole)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Panicum sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum sp. seed (total)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (whole)	0	0	0	0	0	0	2	0	0	0	0	0	3	0
Setaria sp. seed (fragment)	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (total)	0	0	2	0	0	0	2	0	0	0	0	0	3	0
Zea mays cob (whole)	0	0	0	0	1	0.171	0	0	0	0	0	0	0	0
Zea mays cob (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays cob (charred fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays cob (total)	0	0	0	0	1	0.171	0	0	0	0	0	0	0	0
Zea mays kernel (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (fragment)	0	0	1	0.058	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (total)	0	0	1	0.058	0	0	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae														
Capsicum sp. seed (whole)	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Capsicum sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsicum sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsicum sp. seed (total)	0	0	0	0	0	0	2	0	0	0	0	0	0	0
cf. *Nicotiana* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Nicotiana* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (charred whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbenaceae														
Verbena sp. seed (whole)	0	0	3	0	0	0	8	0	0	0	0	0	1	0
Verbena sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena sp. seed (total)	0	0	3	0	0	0	8	0	0	0	0	0	1	0
Other plant parts														
Unidentifiable fragments	33	0	68	0.144	28	0	117	0.162	0	0	12	0	58	0.044
Unidentifiable carbon fragments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident leafy frags	9	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident furry green leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident deep red-purple leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hard brown leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plant fiber	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leaves?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicel (whole)	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Pedicel (charred, whole)	0	0	0	0	3	0	0	0	1	0	1	0	1	0
Pedicel (fragment)	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Pedicel (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total pedicel	0	0	0	0	3	0	4	0	1	0	1	0	2	0
cf. utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. charred utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total cf. utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-plant/ processed material														
Ceramics	0	0	0	0	2	6.99	1	5.676	0	0	0	0	0	0
Thread (may include textile, see notes)	0	0	0	0	1	0	1	0	0	0	0	0	0	0
Wool	1	0	1	0.042	0	0	2	0.512	0	0	0	0	0	0
Shell	0	0	0	0	11	0.045	9	0	0	0	0	0	0	0
Snail shell (whole)	0	0	0	0	0	0	0	0	0	0	0	0	1	0.036
Snail shell (fragment)	0	0	27	0.323	17	0.031	0	0	631	1.09	33	0.136	46	0.05
Snail shell (total)	0	0	27	0.323	17	0.031	0	0	631	1.09	33	0.136	47	0.086
Mollusca fragments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Choromytilus chorus fragments	0	0	1	0	0	0	0	0	0	0	1	0	0	0
Crustacean fragments	1	0	2	0	**1**	0	12	0.329	0	0	1	0	5	0.015
Bone	11	0.027	1	0	14	0.108	6	0.262	172	2.325	7	0.103	4	0
Feather	0	0	1	0	0	0	1	0.047	0	0	0	0	0	0
Camelid coprolite	0	0	0	0	0	0	0	0	12	0.964	51	1.355	8	0.295
Cuy coprolite	0	0	1	0.137	**4**	0.085	0	0	0	0	0	0	0	0
Unident coprolite	**2**	0	0	0	0	0	0	0	0	0	0	0	0	0
Inorganic residue	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"Brown rods"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red material (modern?)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clay piece?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Painted fragment?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insects														
Culeoptero (whole and frag)	0	0	10	0	3	0	44	-	0	0	0	0	19	0
Pupa (whole and frag)	2	0	3	0	1	0	1	-	0	0	1	0	15	0
Fly (whole and frag)	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	L1	L1	L1	L1	L1	L1	L1
Specimen number	3170	4066	4068	4069	4072	4076	4081
Year	2016-5	2019-1	2019-1	2019-1	2019-1	2019-1	2019-1
Sector	A	L	L	L	L	L	L
Unit	5	1	1	1	1	1	1
Level	2	4-superpiso	4-superpiso	4-superpiso	4-Superpiso	4-Superpiso	4-Superpiso
Area	A		Rasgo	Rasgo	F	F	F
Rasgo		R-3	R-2	R-4			
N	8051335	8052292	8052296	8052293	8052298	8052298	8052296
E	314105	314809	314810	314811	314814	314813	314816
Volume	0.5	0.5	0.5L	0.5L	0.5	0.5	0.5
Date of Anlaysis	16-Sept-2019	5-Sept-2019	09/04/2019	09/01/2019	7 Sept 2019	10 Sept 2019	1 Sept 2019
Analyst	ACG	ACG	ACG	ACG	ACG	ACG	ACG

COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
Beetle (whole and frag)	1	0	0	0	0	0	41	-	0	0	0	0	0	0
Insect fragments	21	0	15	0	12	0	6	-	6	0	1	0	7	0
Insects (total- culeoptero, pupa, beetle, frags)	24	0	28	0	16	0	92	0.1	6	0	2	0	41	0
Insect Burrow?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidents														
Unident charred seeds	0	0	0	0	14	0.087	0	0	0	0	0	0	0	0
Unident seeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident seed fragments	0	0	5	0	0	0	2	0.021	0	0	0	0	0	0
Unident 1 (Culeoptero covering)	0	0	133	0	14	0	182	0	1	0	1	0	42	0
Unident 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (fragment)	**3**	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (total)	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: cf. *Arracacia xanthorrhiza* (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	7	0
Unident 19 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (total)	0	0	0	0	0	0	0	0	0	0	0	0	7	0
Unident 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 22	0	0	1	0	1	0	**3**	0	0	0	1	0	0	0
Unident 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Unident 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 31 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 31 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 31 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 35	0	0	0	0	0	0	0	0	0	0	0	0	1	0.163
Unident 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 37	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Unident 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (charred frag)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 40	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Unident 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes	Arracacia xanth	-	*One of the An	-	*crustacean fra	-	*wood includse	-	*wood include:	-	*Malva sp. look	-	*Undet 35 coul	-
Questions	-													
Completed	MRR		JP		ACG		ACG		ACG		ACG		ACG	
Checked	ACG		ACG		ACG		ACG		ACG		ACG		ACG	

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	4083		4095		4096		4112		4117		4118		4119	
Year	2019-1		2019-1		2019-1		2019-1		2019-1		2019-1		2019-3	
Sector	L		L		L		L		L		L		L	
Unit	1		1		1		1		1		1		3	
Level	4-Superpiso		4-Superpiso		4-superpiso		5-superpiso		5-superpiso				4-superpiso	
Area	A		F				E		E				A-N	
Rasgo					R-6						R-5		R-4	
N	8052293		8052297		8052297		8052295		8052294		8052295		8052182	
E	314811		314810		314815		314815		314814		314815		314683	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	3 Sept 2019		26-Aug-19		20-Aug-19		6-Aug-19		7-Aug-19		20-Aug-19		18-Aug-19	
Analyst	ACG (BMG helped with 4 and 2		ACG (BMG helped with 4 and 2		ACG		ACG		ACG (BMG help w/ 4 and 2 mm)		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
Charcoal	238	0.566	45	0.066	893	5.747	561	3.709	224	0.551	412	4.928	161	0.858
Wood	12	0.029	4	0.133	27	0.724	266	1.944	21	0.327	9	0.1	4	0
Straw	33	0	0	0	23	0.018	242	0.254	557	0.838	1	0	23	0.037
Charred straw	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cane	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthaceae														
Amaranthus sp. seed (whole)	11	0	0	0	149	0.058	45	0	132	-	0	0	0	0
Amaranthus sp. seed (fragment)	0	0	0	0	5	0	9	0	7	-	0	0	0	0
Amaranthus sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. seed (total)	11	0	0	0	154	0.058	54	0	139	0.048	0	0	0	0
Amaranthus cf. *hybridus* utricle (whole)	0	0	0	0	1	0	7	0	2	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (total)	0	0	0	0	1	0	7	0	2	0	0	0	0	0
Amaranthus sp. flower (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. flower (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. flower (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium quinoa seed (whole)	1	0	0	0	**2**	0	3	0	23	0.029	0	0	0	0
Chenopodium quinoa seed (fragment)	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Chenopodium quinoa seed (charred, whole)	1	0	0	0	0	0	0	0	0	0	1	0	0	0
Chenopodium quinoa seed (total)	2	0	0	0	2	0	3	0	25	0.029	1	0	0	0
cf. *Chenopodium* sp. seed (whole)	0	0	0	0	1	0	3	0	3	0	0	0	0	0
cf. *Chenopodium* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Chenopodium* sp. seed (total)	0	0	0	0	1	0	3	0	3	0	0	0	0	0
Chenopodium spp. seed total (*Chenopodium quinoa*	2	0	0	0	3	0	6	0	28	0.029	1	0	0	0
Anacardiaceae														
Schinus molle fruit (whole)	3	0.047	0	0	2	0.057	5	0.115	7	-	0	0	8	-
Schinus molle fruit (fragment)	0	0	0	0	0	0	2	0.03	1	-	0	0	1	-
Schinus molle fruit (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Schinus molle fruit (charred, whole)	0	0	0	0	0	0	0	0	3	0	0	0	0	-
Schinus molle fruit (total)	3	0.047	0	0	2	0.057	7	0.145	11	0.251	0	0	9	0.244
Schinus molle seed (whole)	3	0.029	0	0	9	-	4	0.035	0	0	0	0	9	-
Schinus molle seed (fragment)	7	0	2	0	23	-	9	0.014	3	0	0	0	40	-
Schinus molle seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle seed (charred, whole)	0	0	0	0	1	-	0	0	0	0	0	0	0	0
Schinus molle seed (total)	10	0.029	2	0	33	0.14	13	0.049	3	0	0	0	49	0.262
Asteraceae														
Sonchus asper seed (whole)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Sonchus asper seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper seed (total)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Bidens sp. seed (whole)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Bidens sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bidens sp. seed (total)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Cactaceae														
Echinocactus seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinocactus seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Echinocactus seed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae														
Cyperaceae seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabacaceae														
Prosopis sp. leaf (whole)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Prosopis sp. leaf (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prosopis sp. leaf (total)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Prosopis sp. seed (whole)	1	0.086	0	0	0	0	1	0.07	0	0	0	0	0	0
Prosopis sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prosopis sp. seed (total)	1	0.086	0	0	0	0	1	0.07	0	0	0	0	0	0
cf. *Prosopis* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0.027
Phaseolus sp. pod (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. pod (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (half)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (whole)	0	0	0	0	0	0	0	0	1	0.156	0	0	0	0
Phaseolus vulgaris seed (half)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (total)	0	0	0	0	0	0	0	0	1	0.156	0	0	0	0
cf. *Arachis* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Arachis* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malvaceae														
Gossypium sp. fiber	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. leaves	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. calyx	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (whole)	0	0	0	0	**1**	0.026	0	0	0	0	0	0	0	0
Gossypium sp. seed (charred, whole)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (total)	0	0	0	0	2	0.026	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Malva* sp. seed	0	0	0	0	0	0			0	0	0	0	0	0
Marantaceae														
cf. *Maranta* sp. seed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae														

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	4083		4095		4096		4112		4117		4118		4119	
Year	2019-1		2019-1		2019-1		2019-1		2019-1		2019-1		2019-3	
Sector	L		L		L		L		L		L		L	
Unit	1		1		1		1		1		1		3	
Level	4-Superpiso		4-Superpiso		4-superpiso		5-superpiso		5-superpiso				4-superpiso	
Area	A		F				E		E				A-N	
Rasgo					R-6						R-5		R-4	
N	8052293		8052297		8052297		8052295		8052294		8052295		8052182	
E	314811		314810		314815		314815		314814		314815		314683	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	3 Sept 2019		26-Aug-19		20-Aug-19		6-Aug-19		7-Aug-19		20-Aug-19		18-Aug-19	
Analyst	ACG (BMG helped with 4 and 2		ACG (BMG helped with 4 and 2		ACG		ACG		ACG (BMG help w/ 4 and 2 mm)		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
cf. *Bromus* seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (fragment)	0	0	0	0	0	0	1	0	1	0	0	0	1	0
Cenchrus enchinatus seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (total)	0	0	0	0	0	0	1	0	1	0	0	0	1	0
Cenchrus sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus sp. seed (fragment)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Cenchrus sp. seed (total)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (whole)	0	0	5	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (total)	0	0	5	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-2 seed (whole)	4	0	3	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-2 seed (total)	4	0	3	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus* seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus* seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus* seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (whole)	0	0	0	0	6	0	1	0	4	0	0	0	0	0
Setaria sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (total)	0	0	0	0	6	0	1	0	4	0	0	0	0	0
Zea mays cob (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays cob (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays cob (charred fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays cob (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (fragment)	0	0	0	0	3	0.049	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (total)	0	0	0	0	3	0.049	0	0	0	0	0	0	0	0
Solanaceae														
Capsicum sp. seed (whole)	0	0	0	0	0	0	2	0	1	0	0	0	0	0
Capsicum sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsicum sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsicum sp. seed (total)	0	0	0	0	0	0	2	0	1	0	0	0	0	0
cf. *Nicotiana* sp. seed (whole)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
cf. *Nicotiana* sp. seed (total)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (charred whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbenaceae														
Verbena sp. seed (whole)	3	0	0	0	1	0	0	0	0	0	0	0	0	0
Verbena sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena sp. seed (total)	3	0	0	0	1	0	0	0	0	0	0	0	0	0
Other plant parts														
Unidentifiable fragments	50	0.03	15	0	**53**	0.058	48	0.061	54	0.064	9	0	35	0.021
Unidentifiable carbon fragments	0	0	0	0	106	0.123	0	0	0	0	8	0	3	0.015
Unident leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident furry green leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident deep red-purple leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hard brown leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plant fiber	0	0	0	0	2	0	2	0	1	0	1	0	0	0
Leaves?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicel (whole)	1	0	0	0	0	0	**4**	0	0	0	0	0	0	0
Pedicel (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicel (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicel (charred, fragment)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Total pedicel	2	0	0	0	0	0	4	0	0	0	0	0	0	0
cf. utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. charred utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total cf. utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-plant/ processed material														
Ceramics	0	0	0	0	1	0.131	3	23.856	0	0	1	2.207	0	0
Thread (may include textile, see notes)	0	0	0	0	1	0	36	0.502	0	0	0	0	0	0
Wool	0	0	0	0	0	0	1	0.401	1	0.046	0	0	1	0
Shell	0	0	12	0.035	0	0	**21**	**0.024**	**54**	0.136	0	0	74	0.424
Snail shell (whole)	0	0	0	0	1	-	0	0	0	0	4	-	0	0
Snail shell (fragment)	6	0.021	4	0.085	349	-	0	0	0	0	485	-	0	0
Snail shell (total)	6	0.021	4	0.085	350	3.848	0	0	0	0	489	1.021	0	0
Mollusca fragments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Choromytilus chorus fragments	0	0	0	0	0	0	**2**	**0.151**	0	0	0	0	0	0
Crustacean fragments	3	0.027	0	0	8	0.069	**3**	**0**	**3**	**0**	0	0	3	0
Bone	3	0	4	0.017	148	2.553	4	0.032	2	0.038	195	0.897	5	0.93
Feather	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Camelid coprolite	4	0.845	66	4.349	0	0	0	0	0	0	1	0.203	0	0
Cuy coprolite	0	0	0	0	0	0	6	0.182	2	0.061	0	0	5	0.281
Unident coprolite	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Inorganic residue	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"Brown rods"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red material (modern?)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clay piece?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Painted fragment?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insects														
Culeoptero (whole and frag)	15	0	3	0	77	-	38	0	45	0	1	0	14	0
Pupa (whole and frag)	0	0	25	0.038	19	-	9	0	3	0	0	0	0	0
Fly (whole and frag)	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	4083		4095		4096		4112		4117		4118		4119	
Year	2019-1		2019-1		2019-1		2019-1		2019-1		2019-1		2019-3	
Sector	L		L		L		L		L		L		L	
Unit	1		1		1		1		1		1		3	
Level	4-Superpiso		4-Superpiso		4-superpiso		5-superpiso		5-superpiso				4-superpiso	
Area	A		F				E		E				A-N	
Rasgo					R-6						R-5		R-4	
N	8052293		8052297		8052297		8052295		8052294		8052295		8052182	
E	314811		314810		314815		314815		314814		314815		314683	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	3 Sept 2019		26-Aug-19		20-Aug-19		6-Aug-19		7-Aug-19		20-Aug-19		18-Aug-19	
Analyst	ACG (BMG helped with 4 and 2		ACG (BMG helped with 4 and 2		ACG		ACG		ACG (BMG help w/ 4 and 2 mm)		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
Beetle (whole and frag)	1	0	0	0	1	-	0	0	0	0	0	0	1	0.018
Insect fragments	33	0	0	0	0	0	7	0	0	0	0	0	30	0
Insects (total- culeoptero, pupa, beetle, frags)	49	0	28	0.038	97	0.048	54	0	48	0	1	0	45	0.018
Insect Burrow?	0	0					0	0	0	0	0	0	0	0
Unidents														
Unident charred seeds	0	0	0	0	9	0.106	0	0	3	0	0	0	0	0
Unident seeds	0	0	0	0	**2**	0.018	0	0	0	0	0	0	0	0
Unident seed fragments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 1 (Culeoptero covering)	165	0	17	0	295	0.017	93	0	256	0	2	0	18	0
Unident 3	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (whole)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (total)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: cf. *Arracacia xanthorrhiza* (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 10	0	0	0	0	0	0	0	0	0	0	0	0	**2**	0.029
Unident 11	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Unident 12	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Unident 13	0	0	0	0	**3**	0	0	0	0	0	0	0	0	0
Unident 14	1	0	0	0	6	0	0	0	0	0	0	0	0	0
Unident 15	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Unident 16	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Unident 17	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Unident 19 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (fragment)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (total)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Unident 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 31 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 31 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 31 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 36	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (charred frag)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 48	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0
Notes			*shell- tint of purple/possibly r		*Chenopodium	- gory are correct.		- *shell-contains 3 -			be 100 percent sure; Undet 10 = seed cap or fruto			
Questions														
Completed	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
Checked	ACG		ACG		ACG		ACG		ACG		ACG		ACG	

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	4123		4127		4145		4147		4148		4153		4158	
Year	2019-3		2019-3		2019-3		2019-3		2019-3		2019-3		2019-2	
Sector	L		L		L		L		L		L		A	
Unit	3		3		3		3		3		3		2	
Level	4-superpiso		4-superpiso		4-superpiso		4-Superpiso		4-Superpiso		4-Superpiso		5-Superpiso	
Area	A-S		C-CEN		G		H		J		C-CEN		C-CEN	
Rasgo					R-6									
N	8052181		8052178		8052182		8052183		8052174		8052177		8051485	
E	314683		314682		314686		314680		314682		314682		314114	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	19-Aug-19		7-Sep-19		28-Aug-19		30-Aug-19		28-Aug-19		28 August 2019		26 August 2019	
Analyst	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
Charcoal	737	2.05	157	0.448	119	0.345	66	0.107	225	1.109	104	0.15	49	0.087
Wood	15	0.161	36	0.033	40	0.252	31	0.105	118	1.184	3	0.031	212	0.911
Straw	0	0	762	2.668	15	0	1	0	46	0.041	190	0.337	14	0
Charred straw	0	0	658	0.878	0	0	0	0	0	0	**1784**	1.982	0	0
Cane	2	0.036	2	0.186	0	0	0	0	0	0	0	0	0	0
Amaranthaceae														
Amaranthus sp. seed (whole)	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Amaranthus sp. seed (fragment)	0	0	1	0	0	0	0	0	0	0	0	0	1	0
Amaranthus sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. seed (total)	0	0	2	0	0	0	0	0	0	0	0	0	2	0
Amaranthus cf. *hybridus* utricle (whole)	0	0	1	0	0	0	2	0	0	0	1	0	0	0
Amaranthus cf. *hybridus* utricle (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (charred, whole)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (total)	0	0	2	0	0	0	2	0	0	0	1	0	0	0
Amaranthus sp. flower (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. flower (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus sp. flower (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium quinoa seed (whole)	1	0	4	0	0	0	0	0	2	0	1	0	0	0
Chenopodium quinoa seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium quinoa seed (charred, whole)	20	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium quinoa seed (total)	21	0	4	0	0	0	0	0	2	0	1	0	0	0
cf. *Chenopodium* sp. seed (whole)	0	0	0	0	0	0	1	0	0	0	0	0	3	0
cf. *Chenopodium* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Chenopodium* sp. seed (total)	0	0	0	0	0	0	1	0	0	0	0	0	3	0
Chenopodium spp. seed total (*Chenopodium quinoa*	21	0	4	0	0	0	1	0	2	0	1	0	3	0
Anacardiaceae														
Schinus molle fruit (whole)	2	0.073	1	0.018	6	0.161	0	0	4	0.188	0	0	0	0
Schinus molle fruit (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Schinus molle fruit (charred, fragment)	1	-	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle fruit (charred, whole)	2	-	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle fruit (total)	5	0.094	1	0.018	6	0.161	0	0	4	0.188	0	0	1	0
Schinus molle seed (whole)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Schinus molle seed (fragment)	7	0.012	2	0	0	0	0	0	1	0	0	0	50	0.09
Schinus molle seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle seed (total)	7	0.012	2	0	0	0	0	0	2	0	0	0	50	0.09
Asteraceae														
Sonchus asper seed (whole)	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Sonchus asper seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper seed (charred, whole)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper seed (total)	1	0	0	0	0	0	0	0	3	0	0	0	0	0
Bidens sp. seed (whole)	1	0	0	0	0	0	0	0	2	0	0	0	0	0
Bidens sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Bidens sp. seed (total)	1	0	0	0	0	0	0	0	2	0	0	0	1	0
Cactaceae														
Echinocactus seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinocactus seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Echinocactus seed	0	0	0	0	0	0	0	0	0	0	0	0		
Cyperaceae														
Cyperaceae seed (whole)	0	0	0	0	0	0	0	0	8	0	0	0	0	0
Cyperaceae seed (total)	0	0	0	0	0	0	0	0	8	0	0	0	0	0
Fabacaceae														
Prosopis sp. leaf (whole)	0	0	1	0	1	0	0	0	0	0	0	0	0	0
Prosopis sp. leaf (fragment)	0	0	0	0	2	0	4	0	0	0	1	0	0	0
Prosopis sp. leaf (total)	0	0	1	0	3	0	4	0	0	0	1	0	0	0
Prosopis sp. seed (whole)	0	0	1	0.158	0	0	0	0	1	0.119	0	0	5	-
Prosopis sp. seed (fragment)	0	0	0	0	0	0	2	0.035	0	0	0	0	2	-
Prosopis sp. seed (total)	0	0	1	0.158	0	0	2	0.035	1	0.119	0	0	7	0.358
cf. *Prosopis* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. pod (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. pod (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (half)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (whole)	0	0	0	0	0	0	0	0	3	-	0	0	0	0
Phaseolus vulgaris seed (half)	0	0	0	0	0	0	0	0	1	-	0	0	0	0
Phaseolus vulgaris seed (total)	0	0	0	0	0	0	0	0	4	0.948	0	0	0	0
cf. *Arachis* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Arachis* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malvaceae														
Gossypium sp. fiber	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. leaves	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. calyx	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	1	0.059
Gossypium sp. seed (charred, whole)	4	0.127	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (total)	4	0.127	0	0	0	0	0	0	0	0	0	0	1	0.059
cf. *Gossypium* sp. seed (whole)	1	-	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Gossypium* sp. seed (fragment)	1	-	0	0	0	0	0	0	**2**	0	0	0	0	0
cf. *Gossypium* sp. seed (charred, whole)	0	0	0	0	0	0	1	0.037	0	0	0	0	0	0
cf. *Gossypium* sp. seed (total)	2	0.023	0	0	0	0	1	0.037	2	0	0	0	0	0
cf. *Malva* sp. seed	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marantaceae	0	0												
cf. *Maranta* sp. seed			0	0	0	0	0	0	0	0	0	0	0	0
Poaceae														

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	4123		4127		4145		4147		4148		4153		4158	
Year	2019-3		2019-3		2019-3		2019-3		2019-3		2019-3		2019-2	
Sector	L		L		L		L		L		L		A	
Unit	3		3		3		3		3		3		2	
Level	4-superpiso		4-superpiso		4-superpiso		4-Superpiso		4-Superpiso		4-Superpiso		5-Superpiso	
Area	A-S		C-CEN		G		H		J		C-CEN		C-CEN	
Rasgo					R-6									
N	8052181		8052178		8052182		8052183		8052174		8052177		8051485	
E	314683		314682		314686		314680		314682		314682		314114	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	19-Aug-19		7-Sep-19		28-Aug-19		30-Aug-19		28-Aug-19		28 August 2019		26 August 2019	
Analyst	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
cf. *Bromus* seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (whole)	0	0	0	0	0	0	0	0	1	0	0	0	2	0
Cenchrus enchinatus seed (fragment)	1	0	0	0	0	0	1	0	1	0	0	0	0	0
Cenchrus enchinatus seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (total)	1	0	0	0	0	0	1	0	2	0	0	0	2	0
Cenchrus sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	**2**	0
Cenchrus sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Cenchrus sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	4	0
cf. *Cenchrus*-1 seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-2 seed (whole)	0	0	1	0	0	0	7	0	0	0	0	0	0	0
cf. *Cenchrus*-2 seed (total)	0	0	1	0	0	0	7	0	0	0	0	0	0	0
cf. *Cenchrus* seed (whole)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
cf. *Cenchrus* seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus* seed (total)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Panicum sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum sp. seed (fragment)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Panicum sp. seed (total)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Setaria sp. seed (whole)	4	0	0	0	0	0	0	0	10	0	0	0	3	0
Setaria sp. seed (fragment)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Setaria sp. seed (charred, whole)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (total)	5	0	0	0	0	0	0	0	11	0	0	0	3	0
Zea mays cob (whole)	1	0.693	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays cob (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	1	0.041
Zea mays cob (charred fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays cob (total)	1	0.693	0	0	0	0	0	0	0	0	0	0	1	0.041
Zea mays kernel (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (fragment)	0	0	0	0	0	0	0	0	9	0.515	0	0	0	0
Zea mays kernel (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (total)	0	0	0	0	0	0	0	0	9	0.515	0	0	0	0
cf. *Zea mays* kernel (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae														
Capsicum sp. seed (whole)	0	0	2	0	0	0	0	0	3	0	0	0	1	0
Capsicum sp. seed (fragment)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Capsicum sp. seed (charred, whole)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsicum sp. seed (total)	1	0	2	0	0	0	0	0	4	0	0	0	1	0
cf. *Nicotiana* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Nicotiana* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (charred whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbenaceae														
Verbena sp. seed (whole)	0	0	0	0	0	0	1	0	0	0	1	0	13	0
Verbena sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Verbena sp. seed (charred, whole)	0	0	0	0	0	0	1	0	0	0	0	0	1	0
Verbena sp. seed (total)	0	0	0	0	0	0	2	0	0	0	1	0	14	0
Other plant parts														
Unidentifiable fragments	132	0.189	0	0	0	0	0	0	6	0.71	0	0	3	0
Unidentifiable carbon fragments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident leafy frags	0	0	0	0	25	0	53	0.022	106	0.149	0	0	73	0.059
Unident furry green leafy frags	0	0	0	0	0	0	0	0	282	0.547	2	0	0	0
Unident deep red-purple leafy frags	0	0	0	0	0	0	0	0	11	0.065	0	0	0	0
Hard brown leafy frags	0	0	0	0	0	0	0	0	5	0.106	0	0	0	0
Plant fiber	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Leaves?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicel (whole)	0	0	3	0	0	0	0	0	2	0	1	0	3	0
Pedicel (charred, whole)	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Pedicel (fragment)	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Pedicel (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total pedicel	0	0	3	0	0	0	0	0	4	0	2	0	3	0
cf. utriculo	0	0	7	0	0	0	0	0	0	0	2	0	0	0
cf. charred utriculo	0	0	4	0	0	0	0	0	0	0	40	0	0	0
Total cf. utriculo	0	0	11	0	0	0	0	0	0	0	42	0	0	0
Non-plant/ processed material														
Ceramics	2	1.317	0	0	1	6.337	0	0	0	0	1	0.447	1	2.739
Thread (may include textile, see notes)	0	0	1	0	7	0	0	0	2	0	0	0	0	0
Wool	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shell	0	0	0	0	10	0	0	0	0	0	1	0	5	0.023
Snail shell (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snail shell (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snail shell (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca fragments	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Choromytilus chorus fragments	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Crustacean fragments	0	0	4	0	0	0	8	0.028	15	0.067	5	0	3	0
Bone	0	0	21	0.058	34	0.052	3	0.053	**1**	0	0	0	11	1.024
Feather	0	0	5	0	8	0	0	0	1	0	2	0	0	0
Camelid coprolite	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cuy coprolite	63	1.682	0	0	1	0.027	0	0	0	0	0	0	0	0
Unident coprolite	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Inorganic residue	91	1.9	0	0	0	0	0	0	0	0	0	0	0	0
"Brown rods"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red material (modern?)	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Clay piece?	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Painted fragment?	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Insects														
Culeoptero (whole and frag)	4	0	3	0	10	0	5	0	20	0	0	0	0	0
Pupa (whole and frag)	3	0	3	0	4	0	0	0	5	0	2	0	1	0
Fly (whole and frag)	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	4123		4127		4145		4147		4148		4153		4158	
Year	2019-3		2019-3		2019-3		2019-3		2019-3		2019-3		2019-2	
Sector	L		L		L		L		L		L		A	
Unit	3		3		3		3		3		3		2	
Level	4-superpiso		4-superpiso		4-superpiso		4-Superpiso		4-Superpiso		4-Superpiso		5-Superpiso	
Area	A-S		C-CEN		G		H		J		C-CEN		C-CEN	
Rasgo					R-6									
N	8052181		8052178		8052182		8052183		8052174		8052177		8051485	
E	314683		314682		314686		314680		314682		314682		314114	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	19-Aug-19		7-Sep-19		28-Aug-19		30-Aug-19		28-Aug-19		28 August 2019		26 August 2019	
Analyst	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
Beetle (whole and frag)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Insect fragments	5	0	6	0	0	0	3	0	2	0	7	0	6	0
Insects (total- culeoptero, pupa, beetle, frags)	12	0	13	0	14	0	8	0	27	0	9	0	7	0
Insect Burrow?							0	0	0	0	0	0		
Unidents														
Unident charred seeds	**20**	0.109	0	0	0	0	0	0	**1**	0	0	0	0	0
Unident seeds	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Unident seed fragments	0	0	3	0.117	0	0	2	0	0	0	0	0	**1**	0
Unident 1 (Culeoptero covering)	64	0	52	0	8	0	18	0	118	0	41	0	206	0
Unident 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (whole)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (total)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Unident 6: cf. *Arracacia xanthorrhiza* (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 7	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Unident 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 9 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (whole)	0	0	0	0	0	0	1	0	0	0	0	0	3	0
Unident 19 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (total)	0	0	0	0	0	0	1	0	0	0	0	0	3	0
Unident 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 22	0	0	0	0	0	0	1	0	2	0	1	0	0	0
Unident 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Unident 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (whole)	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Unident 26 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (total)	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Unident 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 29	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Unident 30	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Unident 31 (whole)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Unident 31 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 31 (total)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Unident 33	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Unident 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (charred frag)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 41	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes	*Undet carbon s -		*furry seeds- lab -				*crustacean incl -		*Capsicum is the -		*Charred straw- -		*check one of th -	
Questions														
Completed	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
Checked	ACG		ACG		ACG		ACG		ACG		ACG		ACG	

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	4159		4160		4161		4163		4165		4170		4173	
Year	2019-3		2019-3		2019-2		2019-3		2019-2		2019-2		2019-3	
Sector	A		A		A		A		A		A		L	
Unit	3		3		2		3		2		2		3	
Level	3		4 Superpiso		4-Superpiso		4-Superpiso		5-Superpiso		3		4-Superpiso	
Area	B				3-Ext W		C		A-Ext W		B		F-S	
Rasgo	R-2		1											
N	8051480		8051481		8051485		8051481		8051485		8051486		8052181	
E	314046		314047		314112		314047		314112		314114		314689	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	22 Aug 2019		1 Sept 2019		23 August 2019		26 August 2019		25 August 2019		5 Sept 2019		11 Sept 2019	
Analyst	ACG		ACG		ACG		ACG (BMG helped w/ 4 and 2 mm		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
Charcoal	401	1.516	513	1.841	46	0.15	233	0.552	168	0.731	91	0.259	350	1.894
Wood	**2037**	9.692	**1864**	10.049	151	1.35	432	1.247	481	3.815	79	0.086	744	3.914
Straw	60	0.038	59	0.024	37	0.035	63	0	43	0.082	36	0.033	12	0.005
Charred straw	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cane	1	0.879	1	0.996	0	0	0	0	12	0.079	0	0	0	0
Amaranthaceae														
Amaranthus sp. seed (whole)	1	0	1	0	3	0	0	0	**12**	0	1	0	0	0
Amaranthus sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Amaranthus sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Amaranthus sp. seed (total)	1	0	1	0	3	0	0	0	12	0	4	0	0	0
Amaranthus cf. *hybridus* utricle (whole)	1	0	0	0	0	0	0	0	10	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (fragment)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amaranthus cf. *hybridus* utricle (total)	2	0	0	0	0	0	0	0	10	0	0	0	0	0
Amaranthus sp. flower (whole)	0	0	0	0	0	0	0	0	24	0	0	0	0	0
Amaranthus sp. flower (fragment)	0	0	0	0	0	0	0	0	15	0	0	0	0	0
Amaranthus sp. flower (total)	0	0	0	0	0	0	0	0	39	0	0	0	0	0
Chenopodium quinoa seed (whole)	3	0	0	0	0	0	0	0	4	0	2	0	0	0
Chenopodium quinoa seed (fragment)	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Chenopodium quinoa seed (charred, whole)	1	0	3	0	0	0	1	0	0	0	0	0	0	0
Chenopodium quinoa seed (total)	4	0	3	0	0	0	1	0	5	0	2	0	0	0
cf. *Chenopodium* sp. seed (whole)	0	0	0	0	8	0	0	0	1	0	4	0	0	0
cf. *Chenopodium* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Chenopodium* sp. seed (total)	0	0	0	0	8	0	0	0	1	0	4	0	0	0
Chenopodium spp. seed total (*Chenopodium quinoa*	4	0	3	0	8	0	1	0	6	0	6	0	0	0
Anacardiaceae														
Schinus molle fruit (whole)	8	-	14	0.467	6	0.192	13	-	20	-	5	-	3	-
Schinus molle fruit (fragment)	2	-	0	0	0	0	7	-	6	-	2	-	1	-
Schinus molle fruit (charred, fragment)	0	-	0	0	0	0	0	0	0	-	0	-	0	0
Schinus molle fruit (charred, whole)	0	-	0	0	0	0	0	0	0	-	0	-	0	0
Schinus molle fruit (total)	10	0.274	14	0.467	6	0.192	20	0.279	26	0.674	7	0.192	4	0.077
Schinus molle seed (whole)	1	0	0	0	0	0	1	0.017	0	0	1	-	0	0
Schinus molle seed (fragment)	20	0.024	1	0	31	0.046	14	0	37	0.071	35	-	2	0
Schinus molle seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schinus molle seed (total)	21	0.024	1	0	31	0.046	15	0.017	37	0.071	36	0.086	2	0
Asteraceae														
Sonchus asper seed (whole)	1	0	4	0	0	0	1	0	0	0	8	0	0	0
Sonchus asper seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sonchus asper seed (total)	1	0	4	0	0	0	1	0	0	0	8	0	0	0
Bidens sp. seed (whole)	2	0	1	0	0	0	0	0	0	0	0	0	0	0
Bidens sp. seed (fragment)	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Bidens sp. seed (total)	2	0	4	0	0	0	0	0	0	0	0	0	0	0
Cactaceae														
Echinocactus seed (whole)	1	0	1	0	0	0	0	0	1	0	0	0	0	0
Echinocactus seed (total)	1	0	1	0	0	0	0	0	1	0	0	0	0	0
cf. Echinocactus seed	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Cyperaceae														
Cyperaceae seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabacaceae														
Prosopis sp. leaf (whole)	17	-	12	0	0	0	5	0	0	0	0	0	0	0
Prosopis sp. leaf (fragment)	17	-	17	0	0	0	16	0	0	0	0	0	23	0
Prosopis sp. leaf (total)	34	0.018	29	0	0	0	21	0	0	0	0	0	23	0
Prosopis sp. seed (whole)	5	-	9	-	6	0.402	4	-	4	-	0	0	3	-
Prosopis sp. seed (fragment)	2	-	4	-	0	0	4	-	5	-	0	0	1	-
Prosopis sp. seed (total)	7	0.375	13	0.544	6	0.402	8	0.147	9	0.629	0	0	4	0.099
cf. *Prosopis* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. pod (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. pod (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (half)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus lunatus seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (half)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phaseolus vulgaris seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Arachis* sp. seed (whole)	0	0	0	0	**1**	0.181	0	0	0	0	0	0	0	0
cf. *Arachis* sp. seed (total)	0	0	0	0	1	0.181	0	0	0	0	0	0	0	0
Malvaceae														
Gossypium sp. fiber	0	0	2	0.027	**1**	0.486	0	0	1	0	0	0	0	0
Gossypium sp. leaves	0	0	0	0	26	0.108	0	0	151	1.069	0	0	0	0
Gossypium sp. calyx	0	0	0	0	1	0.812	0	0	0	0	0	0	0	0
Gossypium sp. seed (whole)	0	0	0	0	1	0.085	0	0	1	0.101	1	0.083	0	0
Gossypium sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gossypium sp. seed (total)	0	0	0	0	1	0.085	0	0	1	0.101	1	0.083	0	0
cf. *Gossypium* sp. seed (whole)	0	0	0	0	0	0	0	-	0	0	0	0	0	0
cf. *Gossypium* sp. seed (fragment)	0	0	0	0	0	0	0	-	0	0	1	0	0	0
cf. *Gossypium* sp. seed (charred, whole)	0	0	0	0	0	0	**2**	0.019	0	0	0	0	0	0
cf. *Gossypium* sp. seed (total)	0	0	0	0	0	0	2	0.019	0	0	1	0	0	0
cf. *Malva* sp. seed	0	0			0	0	0	0	0	0	0	0		
Marantaceae														
cf. *Maranta* sp. seed	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Poaceae														

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	4159		4160		4161		4163		4165		4170		4173	
Year	2019-3		2019-3		2019-2		2019-3		2019-2		2019-2		2019-3	
Sector	A		A		A		A		A		A		L	
Unit	3		3		2		3		2		2		3	
Level	3		4 Superpiso		4-Superpiso		4-Superpiso		5-Superpiso		3		4-Superpiso	
Area	B				3-Ext W		C		A-Ext W		B		F-S	
Rasgo	R-2		1											
N	8051480		8051481		8051485		8051481		8051485		8051486		8052181	
E	314046		314047		314112		314047		314112		314114		314689	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	22 Aug 2019		1 Sept 2019		23 August 2019		26 August 2019		25 August 2019		5 Sept 2019		11 Sept 2019	
Analyst	ACG		ACG		ACG		ACG (BMG helped w/ 4 and 2 mm		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
cf. *Bromus* seed (whole)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (whole)	6	-	4	0	1	0	0	0	4	0	0	0	0	0
Cenchrus enchinatus seed (fragment)	5	-	14	0	6	0	0	0	2	0	1	0	0	0
Cenchrus enchinatus seed (charred, fragment)	1	-	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus enchinatus seed (total)	12	0.021	18	0	7	0	0	0	6	0	1	0	0	0
Cenchrus sp. seed (whole)	0	0	0	0	**3**	0	0	0	0	0	0	0	0	0
Cenchrus sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cenchrus sp. seed (total)	0	0	0	0	3	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-1 seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Cenchrus*-2 seed (whole)	0	0	0	0	0	0	0	0	0	0	123	0	2	0
cf. *Cenchrus*-2 seed (total)	0	0	0	0	0	0	0	0	0	0	123	0	2	0
cf. *Cenchrus* seed (whole)	0	0	**4**	0	0	0	0	0	0	0	11	0	0	0
cf. *Cenchrus* seed (fragment)	1	0	1	0	5	0	0	0	0	0	2	0	0	0
cf. *Cenchrus* seed (total)	1	0	5	0	5	0	0	0	0	0	**13**	0	0	0
Panicum sp. seed (whole)	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Panicum sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Panicum sp. seed (total)	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Setaria sp. seed (whole)	0	0	3	0	2	0	0	0	2	0	1	0	0	0
Setaria sp. seed (fragment)	0	0	1	0	0	0	0	0	0	0	2	0	0	0
Setaria sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Setaria sp. seed (total)	0	0	4	0	2	0	0	0	2	0	3	0	0	0
Zea mays cob (whole)	**2**	0.837	3	-	0	0	0	0	0	0	0	0	0	0
Zea mays cob (fragment)	0	0	7	-	0	0	0	0	2	0.429	0	0	79	0.73
Zea mays cob (charred fragment)	0	0	1	-	0	0	0	0	0	0	0	0	0	0
Zea mays cob (total)	2	0.837	11	3.542	0	0	0	0	2	0.429	0	0	79	0.73
Zea mays kernel (whole)	0	0	0	0	11	0.799	0	0	0	0	0	0	0	0
Zea mays kernel (fragment)	0	0	0	0	**470**	6.859	0	0	0	0	0	0	0	0
Zea mays kernel (charred, whole)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Zea mays kernel (total)	1	0	0	0	481	7.658	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (whole)	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Zea mays* kernel (total)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Solanaceae														
Capsicum sp. seed (whole)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Capsicum sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsicum sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capsicum sp. seed (total)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
cf. *Nicotiana* sp. seed (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Nicotiana* sp. seed (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (whole)	0	0	0	0	0	0	0	0	6	0	7	0	0	0
cf. *Solanum* sp. seed (fragment)	0	0	0	0	0	0	0	0	0	0	1	0	0	0
cf. *Solanum* sp. seed (charred whole)	0	0	4	0	0	0	0	0	0	0	0	0	0	0
cf. *Solanum* sp. seed (total)	0	0	4	0	0	0	0	0	6	0	8	0	0	0
Verbenaceae														
Verbena sp. seed (whole)	15	0	15	0	9	0	4	0	4	0	13	0	0	0
Verbena sp. seed (fragment)	0	0	1	0	0	0	0	0	0	0	1	0	0	0
Verbena sp. seed (charred, whole)	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Verbena sp. seed (total)	15	0	16	0	9	0	4	0	4	0	17	0	0	0
Other plant parts														
Unidentifiable fragments	6	0	**113**	0.243	309	0.699	58	0.042	89	0.55	0	0	56	0.042
Unidentifiable carbon fragments	33	0.023	8	0	0	0	0	0	0	0	0	0	0	0
Unident leafy frags	416	0.54	**?**	0.292	0	0	0	0	459	0.377	171	0.209	0	0
Unident furry green leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident deep red-purple leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hard brown leafy frags	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plant fiber	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leaves?	**3**	0.862	0	0	**1**	0	2	0	25	0.204	0	0	2	0.033
Pedicel (whole)	**5**	0	9	0	0	0	2	0	1	0	**3**	0	5	0
Pedicel (charred, whole)	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Pedicel (fragment)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Pedicel (charred, fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total pedicel	5	0	10	0	0	0	2	0	1	0	3	0	6	0
cf. utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. charred utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total cf. utriculo	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-plant/ processed material														
Ceramics	3	12.369	5	25.074	0	0	3	1.041	1	2.885	0	0	8	18.114
Thread (may include textile, see notes)	1	0	**7**	0	**3**	0.101	0	0	5	0	0	0	40	0.103
Wool	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Shell	0	0	**3**	0	0	0	1	0	**3**	0	0	0	0	0
Snail shell (whole)	0	0	0	0	5	0.017	0	0	1	0	0	0	0	0
Snail shell (fragment)	0	0	0	0	1	0	0	0	0	0	9	0	0	0
Snail shell (total)	0	0	0	0	6	0.017	0	0	1	0	9	0	0	0
Mollusca fragments	0	0	0	0	0	0	0	0	0	0	**3**	0	0	0
Choromytilus chorus fragments	0	0	0	0	0	0	0	0	0	0	**1**	0	180	1.291
Crustacean fragments	11	0.064	7	0.088	2	0	2	0	**3**	0	14	0	9	0.011
Bone	0	0	**23**	12.211	6	0.105	2	0.046	9	0.56	11	0.076	31	0.263
Feather	1	0	3	0	0	0	0	0	1	0	0	0	0	0
Camelid coprolite	6	1.017	1	0.31	0	0	0	0	3	0.44	0	0	5	0.327
Cuy coprolite	31	1.217	18	0.496	0	0	33	0.561	1	0.049	0	0	56	1.242
Unident coprolite	0	0	0	0	4	0.037	0	0	**2**	0	0	0	0	0
Inorganic residue	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"Brown rods"	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red material (modern?)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clay piece?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Painted fragment?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Insects														
Culeoptero (whole and frag)	35	0	42	0.012	19	0	50	-	36	0	4	0	8	0
Pupa (whole and frag)	2	0	0	0	9	0	7	-	23	-	12	0	0	0
Fly (whole and frag)	0	0	0	0	0	0	0	-	3	-	0	0	0	0

Site	L1		L1		L1		L1		L1		L1		L1	
Specimen number	4159		4160		4161		4163		4165		4170		4173	
Year	2019-3		2019-3		2019-2		2019-3		2019-2		2019-2		2019-3	
Sector	A		A		A		A		A		A		L	
Unit	3		3		2		3		2		2		3	
Level	3		4 Superpiso		4-Superpiso		4-Superpiso		5-Superpiso		3		4-Superpiso	
Area	B				3-Ext W		C		A-Ext W		B		F-S	
Rasgo	R-2		1											
N	8051480		8051481		8051485		8051481		8051485		8051486		8052181	
E	314046		314047		314112		314047		314112		314114		314689	
Volume	0.5		0.5		0.5		0.5		0.5		0.5		0.5	
Date of Anlaysis	22 Aug 2019		1 Sept 2019		23 August 2019		26 August 2019		25 August 2019		5 Sept 2019		11 Sept 2019	
Analyst	ACG		ACG		ACG		ACG (BMG helped w/ 4 and 2 m		ACG		ACG		ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**	**COUNT**	**WEIGHT (g)**
Beetle (whole and frag)	0	0	0	0	0	0	0	-	3	0	0	0	2	0
Insect fragments	2	0	0	0	0	0	12	-	0	0	27	0	23	0
Insects (total- culeoptero, pupa, beetle, frags)	39	0	42	0.012	28	0	69	0.03	65	0.042	43	0	33	0
Insect Burrow?	0	0	0	0	0	0					0	0	0	0
Unidents														
Unident charred seeds	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Unident seeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident seed fragments	0	0	0	0	**2**	0	0	0	0	0	**5**	0.023	0	0
Unident 1 (Culeoptero covering)	24	0	30	0	153	0	19	0	164	0	150	0	14	0
Unident 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (whole)	0	0	0	0	1	0	0	0	**9**	0	0	0	0	0
Unident 6: *Arracacia xanthorrhiza* (fragment)	0	0	1	0	0	0	0	0	0	0	11	0	0	0
Unident 6: *Arracacia xanthorrhiza* (total)	0	0	1	0	1	0	0	0	9	0	11	0	0	0
Unident 6: cf. *Arracacia xanthorrhiza* (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 7	0	0	0	0	4	0	0	0	1	0	0	0	0	0
Unident 8	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Unident 9 (whole)	0	0	0	0	2	0	0	0	1	0	2	0	0	0
Unident 9 (fragment)	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Unident 9 (total)	0	0	0	0	2	0	0	0	1	0	4	0	0	0
Unident 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (whole)	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Unident 19 (fragment)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Unident 19 (total)	0	0	1	0	2	0	0	0	0	0	0	0	0	0
Unident 20	0	0	0	0	9	0	0	0	0	0	0	0	0	0
Unident 21	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Unident 22	7	0	1	0	0	0	1	0	0	0	0	0	0	0
Unident 23	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Unident 24	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Unident 25 (whole)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 25 (total)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
cf. Unident 25	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (whole)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (fragment)	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Unident 26 (total)	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Unident 27	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Unident 28	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 31 (whole)	0	0	0	0	0	0	1	0	0	0	3	0	0	0
Unident 31 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 31 (total)	0	0	0	0	0	0	1	0	0	0	3	0	0	0
Unident 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 34	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Unident 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 38	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unident 39 (whole)	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0
Unident 39 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (charred frag)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 39 (total)	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unident 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 42 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (whole)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (fragment)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 47 (total)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unident 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Notes	*wood = mulch;	-	*Wood = mulch;	-	*Arachis = Arach	-	*cf. Gossypium c	-	*Amarathus sp.	-	*cf. cenchrus inc	-	*There's so muc	-
Questions														
Completed	ACG		ACG		ACG		ACG		ACG		ACG		ACG	
Checked	ACG		ACG		ACG		ACG		ACG		ACG		ACG	

Site	L1
Specimen number	4175
Year	2019-3
Sector	L
Unit	3
Level	4-superpiso
Area	F-S
Rasgo	
N	8052180
E	314688
Volume	0.5
Date of Anlaysis	1 Sept 2019
Analyst	ACG

COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**
Charcoal	241	0.394
Wood	395	2.911
Straw	59	0.013
Charred straw	0	0
Cane	0	0
Amaranthaceae		
Amaranthus sp. seed (whole)	0	0
Amaranthus sp. seed (fragment)	0	0
Amaranthus sp. seed (charred, whole)	0	0
Amaranthus sp. seed (total)	0	0
Amaranthus cf. *hybridus* utricle (whole)	0	0
Amaranthus cf. *hybridus* utricle (fragment)	0	0
Amaranthus cf. *hybridus* utricle (charred, whole)	0	0
Amaranthus cf. *hybridus* utricle (total)	0	0
Amaranthus sp. flower (whole)	0	0
Amaranthus sp. flower (fragment)	0	0
Amaranthus sp. flower (total)	0	0
Chenopodium quinoa seed (whole)	2	0
Chenopodium quinoa seed (fragment)	0	0
Chenopodium quinoa seed (charred, whole)	0	0
Chenopodium quinoa seed (total)	2	0
cf. *Chenopodium* sp. seed (whole)	0	0
cf. *Chenopodium* sp. seed (fragment)	0	0
cf. *Chenopodium* sp. seed (total)	0	0
Chenopodium spp. seed total (*Chenopodium quinoa*	2	0
Anacardiaceae		
Schinus molle fruit (whole)	2	0.05
Schinus molle fruit (fragment)	0	0
Schinus molle fruit (charred, fragment)	0	0
Schinus molle fruit (charred, whole)	0	0
Schinus molle fruit (total)	2	0.05
Schinus molle seed (whole)	1	-
Schinus molle seed (fragment)	8	-
Schinus molle seed (charred, fragment)	0	0
Schinus molle seed (charred, whole)	0	0
Schinus molle seed (total)	9	0.027
Asteraceae		
Sonchus asper seed (whole)	0	0
Sonchus asper seed (fragment)	0	0
Sonchus asper seed (charred, whole)	0	0
Sonchus asper seed (total)	0	0
Bidens sp. seed (whole)	0	0
Bidens sp. seed (fragment)	0	0
Bidens sp. seed (total)	0	0
Cactaceae		
Echinocactus seed (whole)	0	0
Echinocactus seed (total)	0	0
cf. Echinocactus seed	1	0
Cyperaceae		
Cyperaceae seed (whole)	0	0
Cyperaceae seed (total)	0	0
Fabacaceae		
Prosopis sp. leaf (whole)	1	0
Prosopis sp. leaf (fragment)	6	0
Prosopis sp. leaf (total)	7	0
Prosopis sp. seed (whole)	0	0
Prosopis sp. seed (fragment)	0	0
Prosopis sp. seed (total)	0	0
cf. *Prosopis* sp. seed (fragment)	0	0
Phaseolus sp. pod (fragment)	0	0
Phaseolus sp. pod (total)	0	0
Phaseolus sp. seed (whole)	0	0
Phaseolus sp. seed (total)	0	0
Phaseolus lunatus seed (whole)	0	0
Phaseolus lunatus seed (half)	0	0
Phaseolus lunatus seed (total)	0	0
Phaseolus vulgaris seed (whole)	0	0
Phaseolus vulgaris seed (half)	0	0
Phaseolus vulgaris seed (total)	0	0
cf. *Arachis* sp. seed (whole)	0	0
cf. *Arachis* sp. seed (total)	0	0
Malvaceae		
Gossypium sp. fiber	3	0.088
Gossypium sp. leaves	0	0
Gossypium sp. calyx	0	0
Gossypium sp. seed (whole)	0	0
Gossypium sp. seed (charred, whole)	0	0
Gossypium sp. seed (charred, fragment)	0	0
Gossypium sp. seed (total)	0	0
cf. *Gossypium* sp. seed (whole)	0	0
cf. *Gossypium* sp. seed (fragment)	0	0
cf. *Gossypium* sp. seed (charred, whole)	0	0
cf. *Gossypium* sp. seed (total)	0	0
cf. *Malva* sp. seed	0	0
Marantaceae		
cf. *Maranta* sp. seed	0	0
Poaceae		

Site	L1
Specimen number	4175
Year	2019-3
Sector	L
Unit	3
Level	4-superpiso
Area	F-S
Rasgo	
N	8052180
E	314688
Volume	0.5
Date of Anlaysis	1 Sept 2019
Analyst	ACG

COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**
cf. *Bromus* seed (whole)	0	0
Cenchrus enchinatus seed (whole)	3	0
Cenchrus enchinatus seed (fragment)	0	0
Cenchrus enchinatus seed (charred, fragment)	0	0
Cenchrus enchinatus seed (total)	3	0
Cenchrus sp. seed (whole)	0	0
Cenchrus sp. seed (fragment)	0	0
Cenchrus sp. seed (total)	0	0
cf. *Cenchrus*-1 seed (whole)	0	0
cf. *Cenchrus*-1 seed (fragment)	0	0
cf. *Cenchrus*-1 seed (total)	0	0
cf. *Cenchrus*-2 seed (whole)	5	0
cf. *Cenchrus*-2 seed (total)	5	0
cf. *Cenchrus* seed (whole)	0	0
cf. *Cenchrus* seed (fragment)	0	0
cf. *Cenchrus* seed (total)	0	0
Panicum sp. seed (whole)	0	0
Panicum sp. seed (fragment)	0	0
Panicum sp. seed (total)	0	0
Setaria sp. seed (whole)	0	0
Setaria sp. seed (fragment)	0	0
Setaria sp. seed (charred, whole)	0	0
Setaria sp. seed (total)	0	0
Zea mays cob (whole)	0	0
Zea mays cob (fragment)	8	0.456
Zea mays cob (charred fragment)	0	0
Zea mays cob (total)	8	0.456
Zea mays kernel (whole)	0	0
Zea mays kernel (fragment)	0	0
Zea mays kernel (charred, whole)	0	0
Zea mays kernel (total)	0	0
cf. *Zea mays* kernel (whole)	0	0
cf. *Zea mays* kernel (fragment)	0	0
cf. *Zea mays* kernel (total)	0	0
Solanaceae		
Capsicum sp. seed (whole)	0	0
Capsicum sp. seed (fragment)	0	0
Capsicum sp. seed (charred, whole)	0	0
Capsicum sp. seed (total)	0	0
cf. *Nicotiana* sp. seed (whole)	0	0
cf. *Nicotiana* sp. seed (total)	0	0
cf. *Solanum* sp. seed (whole)	0	0
cf. *Solanum* sp. seed (fragment)	0	0
cf. *Solanum* sp. seed (charred whole)	0	0
cf. *Solanum* sp. seed (total)	0	0
Verbenaceae		
Verbena sp. seed (whole)	0	0
Verbena sp. seed (fragment)	0	0
Verbena sp. seed (charred, whole)	0	0
Verbena sp. seed (total)	0	0
Other plant parts		
Unidentifiable fragments	1	0
Unidentifiable carbon fragments	0	0
Unident leafy frags	160	0.09
Unident furry green leafy frags	0	0
Unident deep red-purple leafy frags	0	0
Hard brown leafy frags	0	0
Plant fiber	0	0
Leaves?	0	0
Pedicel (whole)	1	0
Pedicel (charred, whole)	0	0
Pedicel (fragment)	0	0
Pedicel (charred, fragment)	0	0
Total pedicel	1	0
cf. utriculo	0	0
cf. charred utriculo	0	0
Total cf. utriculo	0	0
Non-plant/ processed material		
Ceramics	2	3
Thread (may include textile, see notes)	**2**	0.125
Wool	0	0
Shell	3	0
Snail shell (whole)	0	0
Snail shell (fragment)	0	0
Snail shell (total)	0	0
Mollusca fragments	0	0
Choromytilus chorus fragments	1	0
Crustacean fragments	0	0
Bone	5	0.04
Feather	0	0
Camelid coprolite	0	0
Cuy coprolite	1	0.038
Unident coprolite	0	0
Inorganic residue	0	0
"Brown rods"	0	0
Red material (modern?)	0	0
Clay piece?	0	0
Painted fragment?	0	0
Insects		
Culeoptero (whole and frag)	12	0
Pupa (whole and frag)	0	0
Fly (whole and frag)	0	0

Site	L1	
Specimen number	4175	
Year	2019-3	
Sector	L	
Unit	3	
Level	4-superpiso	
Area	F-S	
Rasgo		
N	8052180	
E	314688	
Volume	0.5	
Date of Anlaysis	1 Sept 2019	
Analyst	ACG	
COUNT ___ WEIGHT (g)	**COUNT**	**WEIGHT (g)**
Beetle (whole and frag)	0	0
Insect fragments	26	0
Insects (total- culeoptero, pupa, beetle, frags)	38	0
Insect Burrow?	0	0
Unidents		
Unident charred seeds	0	0
Unident seeds	0	0
Unident seed fragments	0	0
Unident 1 (Culeoptero covering)	45	0
Unident 3	0	0
Unident 6: *Arracacia xanthorrhiza* (whole)	0	0
Unident 6: *Arracacia xanthorrhiza* (fragment)	0	0
Unident 6: *Arracacia xanthorrhiza* (total)	0	0
Unident 6: cf. *Arracacia xanthorrhiza* (fragment)	0	0
Unident 7	0	0
Unident 8	0	0
Unident 9 (whole)	0	0
Unident 9 (fragment)	0	0
Unident 9 (total)	0	0
Unident 10	0	0
Unident 11	0	0
Unident 12	0	0
Unident 13	0	0
Unident 14	0	0
Unident 15	0	0
Unident 16	0	0
Unident 17	0	0
Unident 19 (whole)	1	0
Unident 19 (fragment)	0	0
Unident 19 (total)	1	0
Unident 20	0	0
Unident 21	0	0
Unident 22	**1**	0
Unident 23	0	0
Unident 24	0	0
Unident 25 (whole)	0	0
Unident 25 (fragment)	0	0
Unident 25 (total)	0	0
cf. Unident 25	0	0
Unident 26 (whole)	0	0
Unident 26 (fragment)	0	0
Unident 26 (total)	0	0
Unident 27	0	0
Unident 28	0	0
Unident 29	0	0
Unident 30	0	0
Unident 31 (whole)	0	0
Unident 31 (fragment)	0	0
Unident 31 (total)	0	0
Unident 33	0	0
Unident 34	0	0
Unident 35	0	0
Unident 36	0	0
Unident 37	0	0
Unident 38	0	0
Unident 39 (whole)	0	0
Unident 39 (fragment)	0	0
Unident 39 (charred frag)	0	0
Unident 39 (total)	0	0
Unident 40	0	0
Unident 41	0	0
Unident 42 (whole)	0	0
Unident 42 (fragment)	0	0
Unident 42 (total)	0	0
Unident 43	0	0
Unident 44	0	0
Unident 45	0	0
Unident 46	0	0
Unident 47 (whole)	0	0
Unident 47 (fragment)	0	0
Unident 47 (total)	0	0
Unident 48	0	0
Notes	*One of the "thre -	
Questions		
Completed	ACG	
Checked	ACG	

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