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La Chichera y El Patrón: Chicha and the Energetics of Feasting in the Prehistoric Andes

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ABSTRACT

Although archaeologists have recognized the importance of feasting in past societies, there has been little systematic work examining the high preparation costs of these events. I suggest that elites faced substantial hurdles in accumulating sufficient land and labor to underwrite feasts. By analyzing the production sequence for the food and drink consumed at these occasions, we can better understand some of the hurdles and how they were overcome. This chapter, a case study for an energetics approach to feasting, details certain aspects of *chicha* (maize beer) production and consumption in the central Andes and its role in Andean feasts. In particular, I consider the amount of maize needed to brew chicha, the amount of labor and equipment that it takes to brew this beer, and the amount of chicha consumed at an event. I argue that the greatest barrier to throwing feasts in the prehistoric Andes was likely bottlenecks in the brewing process rather than the production of adequate maize.

Keywords: **chicha, brewing, drinking, energetics, food production**

Over the past decade, archaeologists have increasingly come to the conclusion that feasts played an immensely important role in the social, economic, and political arenas of ancient cultures (Blitz 1993; Clark and Blake 1994; Dietler 1990, 1996, 2001; Gero 1992; Gumerman 1997, 2002; Hayden 1990, 1996, 2001; Joffee 1998; Junker 2001; Knight 2001; LeCount 2001; Schmandt-Besserat 2001). The work of these scholars has made it possible not only to identify the scale and type of past feasting events (Hayden 2001:46–58) but also to study the dynamics of the social processes that occurred during these occasions (Dietler 2001:80–88). Among other findings, feasting has been identified as a "domain of political action" that was often critical to the development and maintenance of political complexity in a wide variety of societies (Dietler 2001:66). Leaders often vied for power, and rulers often sustained their power, by sponsoring lavish banquets at which prodigious amounts of food and drink were consumed (Dietler 1996:92–97; Earle 1991:3; Perodie 2001:187). Since sponsors who hosted larger feasts than their rivals would often accrue social prestige and further their own interests (Perodie 2001:210), it was in the best interest of these individuals to acquire both more resources and greater means to convert these resources into the food and drink offered at feasts.

Power in these societies was based in part, therefore, on an individual's access to sufficient land and labor to provide the resources needed for a feast (Feinman 2001:159). Investment into feasts could be substantial, taking up a sizable portion of a region's resources, plunging individuals and communities into servitude and debt, and capturing the imagination and perspiration of numerous individuals over the course of many months or several years (Dietler 1990:361–362, 2001:81–82; Earle 1997:169–170; Kirch 1991:131). The impact of feasting practices on a culture's political economy could be immense, and with such a clear link between feasting and production it is surprising that there has been little interest in deriving estimates for the outlays of food, drink, and labor that underlie feasts in different cultural settings.

I suggest that energetics, the study of the energy relations within a system (Banathy 1982:120), is a fruitful avenue for analyzing the costs of feasting within a society. Used in anthropology to study the flow of labor, materials, and ideas within a society (Odum 1971), energetics approaches

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have provided archaeologists, for example, with a "provisional idealization" (Zeitlin 1991:384) of the time, labor force, organizational apparatus, and resources needed to build monumental architecture (e.g., Abrams 1989; Abrams and Bolland 1999; Trigger 1990; Verner 2001:64–98) and of the size and structure of ancient trade networks (Drennan 1984; Malville 2001; Sanders and Santley 1983; Zeitlin 1991). Although an energetics approach is invariably reductionist in its treatment of complex social facts (de Ruijter 1981:613), I believe that the approach is an important first step toward a better understanding of the true costs of feasting.

This chapter considers certain aspects of chicha production and consumption in the central Andes and its role in Andean feasts (Figure 13.1). *Chicha* is an umbrella Spanish term for any indigenously brewed alcoholic beverage in the Americas, and there are a wide variety of plants, such as manioc and peanuts, that can be used to brew chicha (Gómez Huamán 1966:49–50; Nicholson 1960:290–291; Vázquez 1967:266–270). Chicha is made most often of maize in the Andes, however, and I will use the word *chicha* to refer only to maize beer in this chapter. By calculating approximate rates of chicha consumption and production rates in the Andes today, I hope to shed light on the amount of maize and labor needed to supply the chicha for feasts in the prehistoric central Andes. The figures demonstrate that the greatest barrier to throwing feasts was likely bottlenecks in the brewing process rather than the production of adequate maize. Although these bottlenecks could in part be circumvented by changes in the scale or duration of chicha production, the harnessing of sufficient labor for a feast, and of the pots that these laborers might provide, would have been the chief stumbling block for sponsors. Since women have traditionally brewed chicha and men have tended to hold higher political offices, male elite power was often built in no small part on female work.[1]

Reciprocity, Feasting, and Chicha in the Andes

Reciprocity is the backbone of the traditional Andean economy (Allen 1988:91; Isbell 1978:167; Mayer 2002). The most common form of exchange is delayed reciprocal labor exchange between members of a community. In these exchanges, the sponsor of an event is generally responsible for

Figure 13.1. A 19th-century lithograph depicting a group of men drinking chicha in Cuzco (Hield 1883:31).

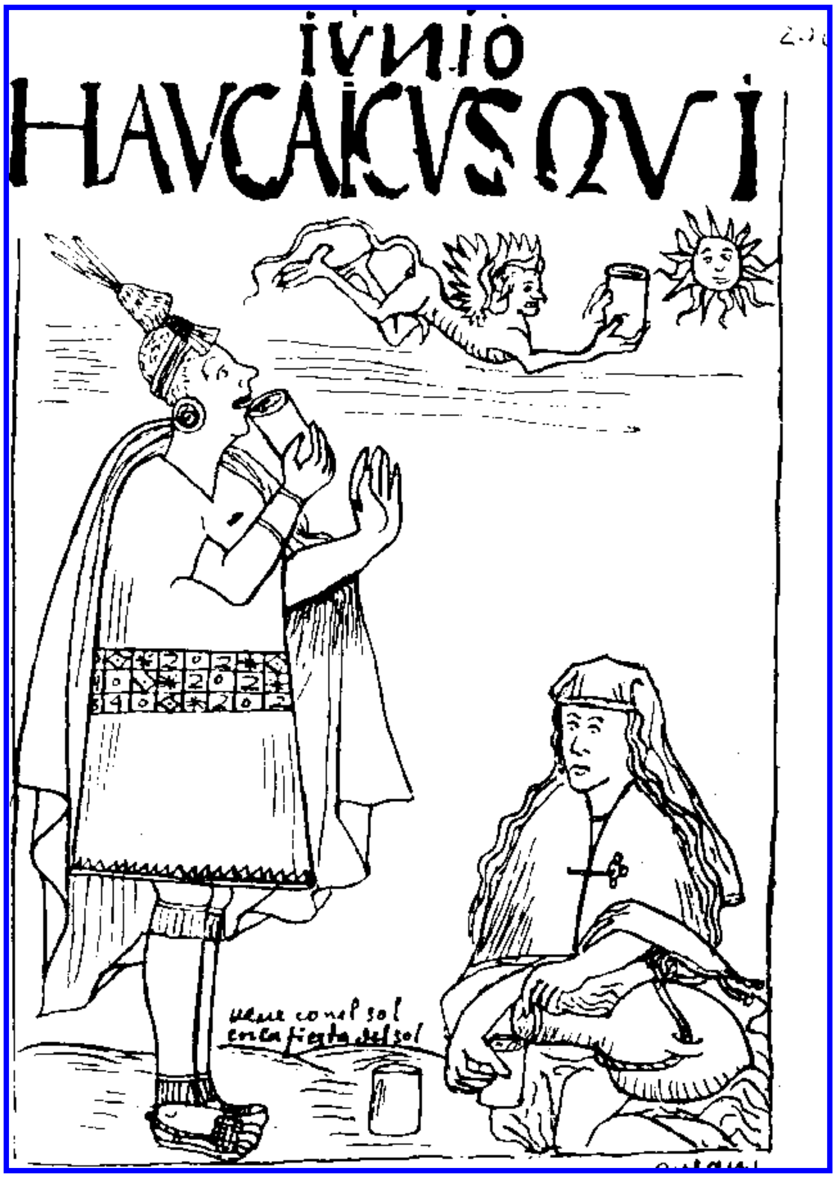

Figure 13.2. Guaman Poma de Ayala's (1936:folio 246) depiction of a woman serving chicha and the Inca emperor drinking chicha at the Festival of the Sun.

providing food and drink for invited laborers. However, in larger communal projects, or for work for the church or state, the sponsor is not obligated to repay these workers with his or, more rarely, her own labor at a later date. Instead, the host must throw a feast for his or her workforce as payment for their labor (Allen 1988:116–118; Isbell 1978:167–177; Mayer 1974, 2002:108–112). If the sponsor fails to provide sufficient food and drink, the workers will not work as hard or may not work at all (Isbell 1978:177). This study deals primarily with the preparation of work-party feasts.

Work-party feasts have long been significant in the Andean political economy and the consumption of chicha (or *aqa* in Quechua) has been an essential part of these events (Allen 1988:140; Cavero Carrasco 1986; Hastorf and Johannessen 1993; Morris 1979; Murra 1960; Saignes 1993). For example, the Inca provided copious amounts of food and drink to his guests at a number of great feasts throughout the year (Figure 13.2) (Murra 1960). At these events, the Inca was able not only to fulfill his reciprocal duties for the labor service rendered to the state but also to reaffirm his position of power by putting laborers in his debt by the sheer quantity of food and chicha that he provided (Bray 2003:18–19; Hastorf and Johannessen 1993:118–119; Moore 1989:685; Morris 1979:32). Chicha was fundamental to Inca power and the ability of the Inca to draw on immense stores of both maize and cloistered women allowed the empire to brew the millions of liters of chicha that were consumed annually (Morris 1979:32).

Archaeological evidence from earlier cultures, such as the Chimu, Moche, Recuay, Tiwanaku, Wanka, Wari, and possibly Chavín, suggests chicha production and feasting were important aspects of social relations and political power in some regions by perhaps the Early Horizon (900–200 B.C.) (Burger and Van Der Merwe 1990; Cavero Carrasco 1986:23–30; Gero 1990, 1992; Hastorf 1991; Hastorf and Johannessen 1993; Lau 2002; Moore 1989; Morell 2002; Shimada 1994; Stanish 1994). If leaders in these cultures chose to sponsor feasts, it is unlikely that many would have had access to the resources that the Inca had at his disposal. Instead, the scope of their power may have been limited by the amount of material or labor that each leader was able to obtain.

By understanding both how chicha is brewed in the Andes today and how much chicha is consumed at modern-day fiestas, I suggest that we can begin to comprehend the production hurdles faced by elites who sponsored feasts in the past. The methods of preparing chicha that are used today are similar to methods described in the detailed accounts from the 18th to the early 20th century (Anonymous 1961:13; Camino 1987:39–42; Gómez Huamán 1966:43–44; Hocquenghem and Monzon 1995:112; Llano Restrepo and Campuzano Cifuentes 1994:24–25; Ruiz 1998:81; Tschiffely 1933:48–49; Wiener 1993:731–732). Although we have no recipes for chicha from before the Spanish conquest, similarities in the technologies of production strongly suggest that chicha has been made in a similar fashion since at least the Early Intermediate Period (200 B.C.–A.D. 750) (Gero 1990, 1992; Moore 1989). An understanding of the energetics of chicha brewing in the Andes today therefore is an important first step in unraveling the energetics of chicha in the prehistoric Andes.

Preparation of Chicha

Although gender roles are often fluid in the Andean household (Hamilton 1998:148), chicha brewing is primarily a female activity (Allen 1988:179; Camino 1987:39–42; Cutler and Cardenas 1947:37; Gómez Huamán 1966:35; Holmberg 1971:200; Orlove and Schmidt 1995:276; Perlov 1979; Rodríguez O. and Solares S. 1990:31; Skar 1993:41). The preparation and serving of chicha, like all food, is central to women's identity (Weismantel 1988:28), and for women who sell chicha (*chicheras*) the drink offers "considerable social power and autonomy" that they aggressively defend (Perlov 1979:13). Men and children sometimes do help in the brewing process (Allen 1988:179; Valderrama et al. 1996:55), but women remain firmly in control of the process. The brewing of chicha appears to have been primarily a female activity from at least the 15th century onward (Hastorf 1991; Marcoy 1873:57; Morris 1979:28; but see Rostworowski 1977:241 for a description of males on the prehispanic north coast of Peru who specialized in making chicha).

Chicha's alcoholic content by volume is generally low (less than 5 percent) but can vary between 1 and 12 percent depending on production method (Cavero Carrasco 1986:17; Moore 1989:685; Steinkraus 1979:42; Vázquez 1967:267). There is an incredible variety of recipes for chicha and the merits of different ingredients and cooking methods can be the subject of heated exchanges between indigenous brewers today (Moore 1989:686; Nicholson 1960; Perlov 1979). While these differences can significantly affect taste, they are minor variations on a common recipe (Moore 1989:686). To make chicha, one must convert some of the unfermentable starches in the maize to fermentable sugars. Amylase, the enzyme that breaks down the starches into sugar, is added to the maize via human saliva or induced by germination. Chicha is made by either masticating maize flour or by allowing the maize to germinate and then grinding it into flour (Figure 13.3).

Both methods appear to have been used in the prehistoric Andes (Cutler and Cardenas 1947:34; Moore 1989:686). Hugh Cutler and Martin Cardenas vividly describe the mastication method:

> The maize grains are usually ground by hand, often with a half-moon-shaped stone rocker (*maran uña*) on a flat stone (*maran*) as has been done for centuries. The flour is then mixed with saliva. On some of the larger haciendas it is still the custom to have women and children gather in groups to do this. The flour is moistened very slightly with water, rolled into a ball of convenient size and popped into the mouth. It is thoroughly worked with the tongue until well mixed with saliva, after which it is pressed against the roof of the mouth to form a single mass, then shoved forward with the tongue and removed with the fingers . . . The salivated morsels are dried in the sun and sacked for storage and shipment. They roughly resemble sets of false upper teeth [1947:41].

The germination method is more complicated and time-consuming. The process begins by soaking shelled maize in water for 12–18 hours. The maize is then removed from the water and spread out in a five- to seven-centimeter-thick layer in a dark, dank place. After the maize has sprouted (after about three days), it is sometimes heaped into a pile, covered with a cloth, and allowed to sit for two days. The germinated maize is then spread out under the sun in a thin layer to dry for two to five days depending on weather conditions.

Figure 13.3. A 19th-century lithograph depicting women chewing maize to make chicha in the town of Combapata, Peru (Marcoy 1872:146).

The maize is then ground into flour (Nicholson 1960:295; Sillar 2000:109–110).

After flour is produced using either method, it is placed in a pot with water and boiled at a low temperature over the fire (Figure 13.4). Depending on the recipe, this mixture is alternately heated and cooled over the course of one to three days (Cutler and Cardenas 1947:45–47; Gillin 1947; Manrique Chávez 1997:308–309; Nicholson 1960:296). Water is constantly added during the process as evaporation takes place. During this phase of the process, certain parts of the mixture are removed to make other products. In some cases, the mixture is allowed to completely cool in order for it to separate into three layers. The uppermost liquid layer, *upi*, is transferred into another pot; the middle, jelly-like layer, the *misqui kketa*, is largely consumed as a tasty treat but is also used to sweeten the upi; and the grainy third layer, *hanchi*, is usually fed to the pigs (Cutler and Cardenas 1947:45–46).

In other cases, the mixture is not allowed to cool completely and instead is strained through a cloth or basketry sieve into another pot. The brewer's family or animals consume the dregs caught in the sieve (Nicholson 1960:296–297). The chicha in the second pot is often boiled again and further refined by separation or sieving. Small amounts of flavoring ingredients, such as sugar, cinnamon, orange leaves, peanuts, and sesame seeds, are added to the mixture at this point (Cavero Carrasco 1986:116; Cutler and Cardenas 1947:47; Perlov 1979:7). The mixture is transferred to another jar to cool and then ferment. Since the jars are not washed between batches of chicha, fermentation is initiated from the yeasts in the jars.

The liquid begins to ferment quickly and it can begin to bubble violently after a few hours. The fermentation occurs in one to six days depending on elevation and environment (Cutler and Cardenas 1947:47), although three to four days is typical (Figure 13.5). Chicha does not store well and tends to sour in less than seven days. Therefore, the brew needs to be consumed soon after it completes fermentation (Cutler and Cardenas 1947:47; Moore 1989:688; Nicholson 1960:297). Since chicha cannot be stockpiled over several weeks or

Figure 13.4. A 19th-century lithograph depicting women brewing chicha in the town of Arequipa, Peru (Marcoy 1872:56).

months, the days preceding a feast are often spent frenetically brewing sufficient quantities (e.g., Allen 1988:179; Sillar 2000:115–116; Skar 1993:41).

Although there are a number of material inputs in chicha production (Perlov 1979:7), this study considers aspects of only two of the most substantial investments in the brewing process: the amount of maize needed to provide chicha at feasts and the labor needed to convert that maize into chicha. In order to calculate the amount of maize needed for a feast, one must first know the amount of maize needed to make a certain amount of chicha. Limited data provide some tentative answers to this question. G. Edward Nicholson's work in the Moche Valley of the north coast of Peru, for example, suggests that a 100-pound sack of shelled maize makes "some 14 to 15 gallons of chicha" (1960:296). This ratio of maize to chicha, 1.16 to 1.25 liters of chicha per kilogram of maize, is slightly lower than the ratios obtained by brewers in the United States. For example, Wendy Aaronson and Bill Ridgely (1994:35–36, personal communication 2002) followed Andean recipes and came up with a ratio of 1.6 liters for each kilogram of maize. In an ancient food production class that I taught, my students and I also brewed several batches of chicha and achieved numbers ranging between 1.16 and 1.6 liters. Diane Perlov (1979), however, suggests that the standard recipe among the brewers in Cochabamba, Bolivia, is 6.44 liters of chicha per kilogram of maize.

The wide differences between these numbers may reflect different production goals. The amounts of maize used to make chicha reported by Nicholson and verified by the brewing experiments of Aaronson, Ridgely, and my course were based on recipes used by women brewing chicha for daily consumption (e.g., Cutler and Cardenas 1947; Hocquenghem and Monzon 1995:112; Manrique Chávez 1997:308–309). In my own experience in the Cotahuasi Valley of highland Peru, chicha produced for typical household consumption is generally thicker, while chicha produced for consumption at work parties or other feasts is somewhat thinner. The thicker chicha is thought of as a *refresco* and will often serve as both food and beverage for people working several hours herding or farming. In beer taverns that I visited in Ayacucho, the chicha was even thinner still and was much more honey-colored than Cotahuasi's creamy white chicha (Cotahuasi's thick and thin brews share a similar color). Thinner chichas, like those brewed by the chicheras observed by Perlov, are both cost effective, in that they use less maize, and less filling. Since people at feasts and beer

Figure 13.5. A husband and wife standing beside jars of fermenting chicha in the village of Cahuana, Peru.

halls often drink to get drunk (see below), these thinner brews help both brewer and client reach their goals. I suspect that the amount of maize used to make chicha for prehistoric feasts likely fell between the low and high estimates for liters of chicha per kilogram of maize. I will use both estimates in my calculations later in this chapter.

Chicha Consumption

In order to estimate the costs of preparing chicha for a feast, we need to first understand more about chicha consumption patterns. In many parts of the Andes today, chicha is only consumed on special occasions (Orlove and Schmidt 1995; Weismantel 1988:96). This is a recent phenomenon, however, tied to the replacement of chicha in many contexts with cane alcohol, beer, and other alcoholic beverages over the past 100 years (Doughty 1971:190; Orlove and Schmidt 1995:275). Nonetheless, chicha continues to be woven into the fabric of daily lives in many places and is routinely consumed at home, at work, and at public gatherings (Allen 1988:133–157; Holmberg 1971; Simmons 1962). Chicha is often brewed at home (Sillar 2000:115) but is also obtained from beer halls (Orlove and Schmidt 1995:276; Perlov 1979) or via regional exchange (Bastien 1978:47–48).

Daily consumption of chicha, even in those locations where it continues to be regularly consumed, is declining (Bastien 1978:48), but estimates of consumption rates in Moche from the 1940s (Gillin 1947:46) and from Cochabamba in the 1930s (Bejarano 1950:57) suggest that the daily adult consumption was about two to three liters in the first half of the twentieth century. This figure is likely typical of the Andean past and accords well with historic accounts of daily chicha consumption by most people from the period of the Inca Empire until the turn of the twentieth century (Cobo 1979:28; Betanzos 1996:57; Llano Restrepo and Campuzano Cifuentes 1994:28–41; Markham 1910:127–128).

The consumption rate at work-party feasts is considerably higher. At these events, guests expect to be served copious amounts of food and alcohol. If the host fails to provide an adequate supply of chicha and other beverages, he or she risks losing respect in the community. Most guests drink heavily, and many become intoxicated to one degree or another (Doughty 1971:194; Holmberg 1971:201). Since

Figure 13.6. After drinking several glasses of chicha, the author (in straw hat) and a campesino *dance at the feast following the cleaning of the main canal in the village of Calles Nuevas, Peru.*

social pressures to drink are enormous at these events, anthropologists often find themselves hopelessly drunk at these fiestas and thus unable to quantify the amount drunk by the participants at these events (i.e., Bunker 1987; Isbell 1978:6). Nonetheless, there are some limited data available. Paul Gelles (personal communication, 2002), for example, observed dozens of sowing ceremonies in the Colca Valley at which the only beverage was chicha. Men typically drank at least 9–12 liters of chicha and women drank at least 6–9 liters at these events. In answer to my inquiries on this topic in the Cotahuasi Valley, I was told that the average consumption at chicha-only feasts was 15 liters of chicha (Figure 13.6).

If we take the average of these two estimates, then typical consumption may be estimated at 12 liters of chicha per person. Even to archaeologists, this number may appear high, but one must remember that chicha typically has a low alcohol content and that this consumption usually takes place over the course of a long day of eating (e.g., Bunker 1987:336; Meyerson 1990:86–87; Valderrama et al. 1996:129). For heavy drinkers who have developed both metabolic and cellular tolerance to ethanol, these numbers are not unreasonable (Jones 1999). In case these numbers are still too large for some readers, I will also use a more conservative estimate of 6 liters per person in the calculations below, a number more in keeping with heavy beer-drinking estimates for the United States (Rogers and Greenfield 1999; Vik et al. 2000).

Although undoubtedly biased by racism, travelers' accounts suggest that similar amounts of chicha were consumed at Andean feasts during the 19th and early 20th centuries (Figure 13.7) (De Botmiliau 1947:16–17; De Sartiges 1947:193; Grubb 1930:43, 69; Stevenson 1929:217). Excessive drinking was also likely a common occurrence at Inca feasts (Morris 1979). As Bernabé Cobo suggested of these feasts, "the principal activity is to drink until they cannot stand up" (1979:28). If consumption patterns have remained broadly similar over the past few centuries, then more recent data for the rates of consumption per day and at special events can be used as proxy measurements for prehistoric periods: 2.5 liters and 6–12 liters, respectively (Table 13.1). To provide enough chicha for a guest to drink at a feast, a host would use between 0.93 and 8.70 kilograms of maize per person. This amount of maize would be in addition to the 0.39 to 1.81 kilograms of maize needed to provide the

Figure 13.7. A 19th-century lithograph of the celebration of the Dawn of the Dead in Cuzco (Marcoy 1872:172).

Table 13.1. Kilograms of maize needed to produce chicha consumed at feasts and in daily use.

Consumption	Kilograms Maize/Person
Low Estimate (1.38 liters of chicha per kilogram of maize)	
Daily consumption (2.5 liters)	1.81
Low feast consumption (6 liters)	4.35
High feast consumption (12 liters)	8.70
High Estimate (6.44 liters of chicha per kilogram of maize)	
Daily consumption (2.5 liters)	0.39
Low feast consumption (6 liters)	0.93
High feast consumption (12 liters)	1.86

two to three liters of chicha drunk by adults as part of their daily routine.

Investments in Maize and Labor

If there is a significant degree of similarity between modern and prehistoric agricultural yields, then we can begin to compare the cost of producing maize to the cost of producing chicha from that maize. From 1948 to 1990, annual maize production in Bolivia averaged 1,295 kilograms per hectare, while production in Peru averaged 1,618 kilograms per hectare during the same years (Manrique Chávez 1997:20–22). Although maize production numbers vary considerably across the central Andes depending on precipitation, temperature, altitude, type of fertilizer, type of maize, farming method, and other factors, the production numbers quoted above agree in broad stroke with those reported by anthropologists and agronomists working in the central Andes (Brush 1977:174; Convenio de Cooperación Técnica 1964:13; Couto and King 1969:36; Knapp 1991:44; Mitchell 1991:77–81; Salis 1997:350; Sepúlveda Lozano 1967:67–70). To simplify the calculations below, I use the average of the Bolivian and Peruvian yields, 1,456 kilograms per hectare.

If the average household contains 2.2 adults (Figueroa 1984:14), then approximately 312 (low estimate) to 1,452 kilograms (high estimate) of maize is needed each year to handle the daily chicha needs of each household. If a typical subsistence farmer works 3.5 hectares (Deere and de Janvry 1981:349; Guillet 1992:39–40; Trawick 1994:131), then the maize from 0.2 hectare to 1 hectare of this land would be dedicated to chicha production. Maize, of course, is not the only crop grown by these farmers today nor was it during

Table 13.2. Estimates for the amount of maize and the amount of land needed on the coast and sierra to provide chicha at feasts in the central Andes.

Number of Guests	Kilograms of Maize[a]		Hectares of Maize[a]	
Low Estimate (1.38 liters of chicha per kilogram of maize)				
25	109	218	0.08	0.15
50	218	435	0.15	0.30
100	435	870	0.30	0.60
200	870	1,740	0.60	1.20
500	2,175	4,350	1.50	3.00
High Estimate (6.44 liters of chicha per kilogram of maize)				
25	23	47	0.02	0.03
50	47	93	0.03	0.06
100	93	186	0.06	0.13
200	186	373	0.13	0.26
500	466	932	0.32	0.64

[a]Left column = low feast consumption estimates; right column = high feast consumption estimates.

the course of prehistory (Popenoe et al. 1989; Zimmerer 1996:10). In parts of the sierra, for example, maize is typically only planted on one-third of the fields (Gade 1975:94–95; Morlon et al. 1992:282). Moreover, different varieties of maize have long been used in a variety of dishes, such that a significant percentage of the maize crop would not be made into maize beer (Bray 2003:6–7; Guillet 1992:72; Nicholson 1960:292; Pearsall 1994). Nonetheless, these figures do suggest that subsistence farmers in the Andes could typically grow the maize needed to make chicha for daily consumption.

The data further suggest that the availability of cultivable land was not a significant barrier to those seeking to sponsor a feast. Even taking the highest estimate for both consumption at feasts (12 liters/person) and highest chicha to maize ratios (1.38 liters/kilogram, the average of the Nicholson and Aaronson and Ridgely estimates), the amount of extra land needed to sponsor a feast was low (Table 13.2). To provide chicha for 100 guests, for example, someone only needed to gain access to the maize harvest of 0.6 hectares. With the yield from three hectares, a host could invite 500 guests. If one uses the lowest estimates in both categories (6 liters/person and 6.44 liters/kilogram), then 0.06 hectares of maize would be sufficient for 100 guests and 0.32 hectares would provide enough chicha for 500 guests.

Securing the labor needed to produce the amount of chicha consumed at feasts was likely a far more daunting hurdle for local leaders. Since most types of chicha sour within a few days (Cutler and Cardenas 1947:47; Nicholson 1960:297), the chicha for a feast must be prepared in the two weeks preceding the event (Sillar 2000:115–116). Production before a feast is therefore feverish, as labor as well as

Table 13.3. Estimates for the overproduction rate of chicha if typical brewing practices were used to prepare a feast.

Number of Guests	Overproduction Rate[a] Low Consumption	Overproduction Rate[a] High Consumption
25	27	55
50	55	109
100	109	218
200	218	436
500	545	1,091

[a]Times over the daily consumption figure of 5.5 liters per household.

firewood, water, and cooking vessels are gathered together and households devote all of their energies to preparations (Allen 1988:179; Sillar 200:115–116). If we take 5.5 liters of chicha as the typical daily household production rate (the typical consumption rate [2.5 liters of chicha per person] multiplied by the average number of people per household [2.2]), then we can get some idea of the amount of labor needed to host a feast by looking at the increase in the amount of chicha needed for feasts of different sizes (see Table 13.3). For just 25 people, a host would have to provide between 150 liters (low consumption estimate) and 300 liters (high estimate) of chicha—27 to 55 times the typical production rate. In a feast of 500, a host would have to produce between 3,000 and 6,000 liters of chicha—545 to 1,091 times the daily household rate of production.

These numbers are undoubtedly inflated since a family could easily produce more than the normal daily consumption. Women generally do not produce as much chicha as they can, just what is necessary for the next week. Nonetheless, the figures suggest that a single family pursuing typical brewing practices would not be able to support even a modest feast. In addition, these data show that it is equally unlikely that pooling together chicha from the production of several families would yield sufficient beer, if all of the chicha was being brewed as part of women's daily domestic routine. Instead, feasting events necessitate a significant shift in production strategy.

Labor-Saving Production

To produce the massive amounts of chicha consumed at a feast, a group of women (with the occasional support of men and children) must gather together to focus almost exclusively on chicha production for two to four weeks (Cutler and Cardenas 1947; Sillar 2000:116). The first few days in this process are consumed with the germination or mastication of the maize to be brewed. Using the germination method, only a few women can accomplish the work necessary to soak, sprout, and then dry out the maize. This method, however, takes between 6 and 12 days to prepare the maize for milling. The mastication method is quicker, but more women (and children) need to come together in order to masticate the maize flour into morsels (regrettably, I have no data on morsel production rate). In both cases, it takes an additional couple of days to grind the maize kernels by hand into flour.

Although these preliminary steps are often taken immediately before brewing begins (Cutler and Cardenas 1947:41), they can also be done ahead of time. Both salivated morsels and flour from germinated grains can be stored for future use (Cutler and Cardenas 1947:41) and most professional chicha makers in the Andes buy prepared maize from specialists (Nicholson 1960:295; Perlov 1979:7). This portion of the production process, therefore, could be done weeks or months before a feast is held. The shelf life of the flour, however, is limited because it is harder to guard against insect attack and it goes rancid more quickly than grain.

Chicha brewing must be done in a concentrated effort in the days directly preceding an event. Chicha brewing usually takes place over the course of three to four days, with an additional three to four days needed for the brew to complete fermentation. Since the chicha will sour in about 7 days, two consecutive batches of chicha cannot be made because the first batch will begin to sour by the time the second is ready to drink. Since all of the chicha must be made at one time, a large number of pots must be assembled in one place and at one time. For example, a chichera in Bolivia requires "a 225 liter metal vat, three 450 liter pottery vats, three 170 liter pottery p'unus, two or three 17 liter pots, and a number of drinking glasses" to produce each batch (Perlov 1979:7). To prepare chicha for a feast in the Cuzco region for Santiago Day, a patron assembled eight large cooking drums, 17 large open-mouthed jars, and 28 large narrow-mouthed jars (Sillar 2000:116). Since the chicha often cools for a day in the open-mouthed jars and ferments for several days in the narrow-mouthed jars, most of these vessels must be available to the brewer for the bulk of the production cycle.

A single woman cannot brew a batch alone because several tasks require the assistance of at least one or two other people: "there is too much heavy work involved, too many continual hours of labor, and too many awkward tasks" (Perlov 1979:20). Some procedures, such as the straining of the liquid into the wide-mouthed jars (Nicholson 1960:296), require three people to do properly. Two examples provide data on the number of brewers needed to brew a particular amount of chicha. In the feast for Santiago Day in Cuzco, it took at least 15 women to brew a batch of less than 1,200 liters (Sillar 2000:116, 177).[2] If this figure can be taken as a guide, then each woman involved in the brewing for a feast could produce 80 liters of chicha. In a second example, professional brewers in highland Bolivia can brew about 170 liters of chicha per person working in the brewery (Perlov 1979; see also Orlove and Schmidt 1995:276; Vázquez 1967:268). The difference between these figures is likely related to the size of the vessels used to make chicha. In the Santiago Day festival, for example, the women used wide- mouthed jars that held approximately 70 liters of chicha (Sillar 2000:177), while the Bolivian chicheras use enormous wide-mouthed jars that hold about 170 liters each (Perlov 1979:7). The volume of the wide-mouthed jars used in chicha brewing therefore roughly reflects the amount of chicha that one person can brew for a feasting event.

The size of the batch is therefore strongly determined not only by the amount of labor a host can gather but also by the size of the vessels that are at his or her disposal. If a sponsor is unable to recruit a large labor force, more chicha can still be made if bigger pots are used. In the prehistoric Andes, the sizes of the pots would have been limited by both ceramic technology and also the ability of people to transport and lift the pots. In cases where pots are obtained through reciprocal exchanges, the pots cannot exceed the carrying capacity of a person bringing the pots to the brewing site (i.e., Sillar 2000:111). Larger pots can only be used in places where they do not need to be moved across large distances.

The number of women needed to support a feast can be estimated by using the approximate production rates of 80 liters per brewer and 170 liters per brewer (Table 13.4). To supply the chicha for 100 people (1,200 liters using the high consumption rate and 600 liters using the low consumption rate), a patron using commonly available pots would need to have between 8 and 15 women working almost exclusively on chicha brewing for at least one week. If the chicha was made in the larger pots, four to seven people could brew this amount of chicha. For a feast of 500, the host would need to

Table 13.4. Number of brewers, organized for mass production, needed to produce chicha for feasts of varying sizes.

Number of Guests	Number of Brewers Needed	
	Low Consumption	**High Consumption**
Production using typically available pots (80 liters of chicha) per brewer)		
25	2	4
50	4	8
100	8	15
200	15	30
500	38	75
Production using very large pots (170 liters of chicha per brewer)		
25	1	2
50	2	4
100	4	7
200	7	14
500	18	35

harness the labor of 38–75 women if only typical pots were available. With the largest pots, 18–35 women could brew this amount of chicha.

In the archaeological record for the Andes, there is evidence for both the intensification and centralization of chicha brewing and its associated activities (Chapdelaine 1997:32; Earle 2001:305; Gero 1990:53; Hastorf and Johannessen 1993:127; Knobloch 2000:398; Morris 1979:28; Shimada 1994:221–222; Valdez 2002; Valdez et al. 2000). This evidence suggests intensive chicha production, but this production was likely episodic and not a full-time activity (Moore 1989:692; Shimada 1994:224). Even the cloistered women, or *mamakunas*, of the Inca Empire who brewed the chicha for state feasts did other tasks much of the time (Brundage 1963:149; Silverblatt 1987:82). Since chicha could not be stored over long periods of time and production for daily consumption was handled in the household (Moore 1989:690), there was no need for full-time specialization. Nonetheless, there do seem to have been specialized facilities where chicha was produced and stored, at least in the Inca and Mochica states (Chapdelaine 1997:32; D'Altroy and Hastorf 1992:265; Morris 1979:28, 32; Shimada 1994:144, 169, 208, 222). The size of the vessels used in chicha production varied across time and space in Andean prehistory and may reflect shifts in the organization of chicha brewing. In most cases, vessel size does not generally rival in size the enormous pots, often made of metal, used by some chicheras today (Costin 2001:235; Morris and Thompson 1985:90; Shimada 1994:222–224). In some cases, however, prehistoric vessels were even larger. The largest of the open-mouthed jars that the Inca used for brewing could hold perhaps as much as 364 liters (Chattfield and McEwan, personal communication, 2003) and jars likely used for similar purposes among the Wari were only slightly smaller (Cook and Glowacki 2003:179–182). As seen in Table 13.4, the ability of these cultures to fire such large vessels would have substantially lowered the amount of laborers needed on the eve of a feast.

Summary

Around the world, feasting has long been a fundamental means to mobilize labor, redistribute goods, build political power, and maintain social differences (Dietler and Hayden 2001). Therefore, an understanding of the various costs of feasting is essential for understanding important aspects of the emergence and maintenance of political complexity in many societies. In the Andes, reciprocal exchanges were, and continue to be, fundamental to the region's economy. Feasting is played out within an idiom of reciprocity—in return for labor, leaders sponsor lavish feasts. Until recently, chicha was the principal beverage at these events and thus one's ability to brew large quantities of chicha was closely related to one's ability to govern.

By tracking the energetics of chicha production, this chapter begins to explore the costs of sponsoring a feast in Andean prehistory. The data collected in this study suggest that the ability to gather enough maize to provide sufficient chicha for a small to medium-sized feast was likely to have been within the reach of a typical farmer. A fraction of a hectare would yield sufficient corn, and a farmer could rely on minimal reciprocal labor arrangements throughout the year to work this land (e.g., Allen 1988:75; Gose 1994:7–13; Isbell 1978:167–168). This farmer, however, would find it impossible to convert this maize into chicha within normal household production regimes. Instead, sufficient chicha could only be brewed by mobilizing large amounts of labor and equipment for intensive production over a few days. The ability to mobilize these resources in large part determined the largess of a feast's sponsor.

Women brew chicha today in the Andes, and women own, or at least control the use of, the equipment used in brewing (e.g., Perlov 1979:7; Valderrama Fernández et al. 1996:55). Women therefore constitute the "productive base" upon which sponsors rest their aspirations (Dietler and Herbich 2001:255). Without a woman's hands, her head, and her pots, the sponsor would be left with a pile of maize. For a large feast, scores of pots and dozens of women need to be gathered. Increasing the size of the pots used in chicha production could reduce labor demands significantly, but a large number of women would need to be gathered no matter how big the pot. In the Inca Empire, the ruler could draw on the production of cloistered women to brew maize beer, but it is likely that most leaders in the prehispanic Andes could only brew sufficient chicha by drawing on the labor of multiple wives, relatives, exchange partners, rival elites, and servants (e.g., Isbell 1978:171–176; Mayer 2002:92–93, 97). The social dynamics of how brewing was done in the past and how it changed through time is a topic of immense importance that we are only now beginning to explore (e.g., Gero 1992; Hastorf 1991, Moore 1989; Shimada 1994). One social transformation of particular importance to me is the relationship between women and the means of chicha production (pots, maize, wood, water, and so on) during political transformations (see Hastorf 1991) .

This chapter is only a first step toward understanding the costs of producing chicha for feasts in the Andes. There are other significant costs to brewing chicha, such as manufacturing the large number of pots needed during the brewing process and collecting sufficient firewood, brush, and dung to fuel the fire (Mayer 2002:85–69; Sillar 2000:55–81), and a consideration of these other costs is an important next step in the study of the energetics of modern chicha production. Another important step is to begin to compare the *chaîne opératoire* (operational chain or sequence) of modern chicha recipes against material evidence from prehistoric periods. Similarities between ancient and modern pots and strainers suggest a similar operational sequence, but small differences in how chicha was made could cause significant shifts in production costs. With several colleagues, I am beginning to analyze the chemical signatures of the products from the different stages of modern chicha manufacture, and it is hoped that we may be able to later test these signatures against residues found on prehistoric pots. Finally, differences in the volume of brewing pots and the creation of specialized brewing and fermentation facilities may reflect changes in the organization of production and the size of feasting events. I am now beginning a cross-cultural comparison of chicha brewing in the prehistoric Andes that I hope will more clearly elucidate the relationship between feasting and political economy.

Feasting presents incredible logistical challenges for leaders in the Andes today, and it is likely that these challenges were just as daunting in the centuries before the Spanish conquest. The data on chicha production and consumption suggest that in some cases the accumulation of surplus goods may *not* have been a significant barrier to those who sought to sponsor a feast. Instead, the ability to command enough labor and materials to convert these surplus goods into huge quantities of perishable food and drink in a short time may have been a far more limiting factor. In other cases, however, a leader's struggle lay largely in stockpiling sufficient goods. For example, llamas take years of care to reach maturity, but the amount of labor and resources needed to kill and butcher a llama is relatively minor. The costs of producing the goods consumed at a feast are quite different and a complete energetics of feasting must explore the production of each of these goods. Only after exhaustive study of the energetics of feasting can we hope to understand the full impact of feasting on the political economy of the ancient Andes.

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Notes

1. While women could wield significant political power in the Inca Empire (D'Altroy 2002:103–106), men still tended to dominate the higher echelons of politics. Feasting, however, is a tool that was, and still is, used at all levels of politics from the family to the state. Irene Silverblatt (1987) has demonstrated that the scope of women's political power in local arenas in the Andes was de-emphasized and obfuscated by the Spanish, and it is likely that archaeologists often underestimate women's power, especially in local politics. In the highlands today, women occasionally host smaller scale feasts, and it is likely that women organized such events in the past. I therefore suggest there is a *tendency* toward male organization of feasts, as suggested in this chapter's title, but I employ gender-neutral terms such as host, patron, and individual to suggest that there is no sharp gender divide in hosting.

2. This is my estimate based on Bill Sillar's (2000) description of the number of women brewing, the amount of jars used at the feast, and the average capacity of these jars.

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