

CIRCULAR AND RECTANGULAR FOLK SILOS IN THE ANDES OF
SOUTHERN BOLIVIA

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ABSTRACT

This paper documents the presence, characteristics, and distribution of folk silos (crop storage structures) in the southern portion of the department of Cochabamba, Bolivia. Known locally as *trojes* or *silos*, these silos are constructed in circular and rectangular plans from adobe and local plant materials. Circular silos are used primarily to store corn, while a wider variety of crops, including potatoes, peanuts, wheat, and barley are stored in the rectangular silos. A review of the literature on crop storage structures in the Andean region suggests that the design and use of these present-day silos is likely of Inca origin.

INTRODUCTION

The landscape of the Andes offers much to the cultural geographer. A rich combination of human-environmental relationships play out over the region, produced in part because of the tremendous geographical diversity exhibited over comparatively short distances. Gade (199?: 31-37) has set out an excellent research agenda for cultural geography in Peru. The basic parameters of this agenda can be readily applied to the Andean regions of other South American countries –Colombia, Ecuador, Bolivia, Chile, and Argentina. Among the seven areas of research identified by Gade (199?: 33), is the examination of “visible cultural elements of in the humanized landscape”. He notes as an example the presence of relic water powered grist mills in the *sierra* of Peru introduced by the Spanish in the colonial period (Gade, 1971). While apparently few studies of this kind have been undertaken or published, there are many extant elements of the cultural landscape that merit attention. In many cases the simple documentation of their presence, distribution, and characteristics is an essential first step in understanding their significance and importance.

This note describes the presence and characteristics of one such landscape element, the circular and rectangular silos, or *trojes*, in the southern Andes of the department of Cochabamba, Bolivia. It examines briefly the relationship of

these grain storage structures to others described in Bolivia and adjacent Andean countries and speculates on the origin of silo construction in this region of the Andes.

THE SOUTHERN ANDES OF COCHABAMBA, BOLIVIA

The rural landscape of the southern portion of the department of Cochabamba, Bolivia, in the provinces of Campero and Mizque, is similar to that of many rural regions of Latin America. Indeed, the landscape of this semi-arid area appears much like many areas which characterize the Andes –drought resistant grasses and shrubs and a xeric thorn-forest which provide low quality grazing during most of the year. The cultivated land on the valley floors and at lower elevations is usually restricted to that which can be irrigated, while there is limited rainfed cropping at higher elevations where temperatures are cooler and moisture slightly more abundant.

The settlement patterns are varied. Rural settlement generally follows a dispersed pattern, with most rural residents living on or adjacent to their land. There are also some small nucleations of agricultural households, as well as several small villages, which are exclusively agricultural. Even the region's two urban settlements, Aiquile and Mizque, are closely linked to the agricultural sector and many of their residents are farmers or agricultural laborers. Aiquile is the largest of the two towns and is economically the most diversified offering a range of agricultural services as well as services related to transportation and trade.

Rural farmsteads are generally unremarkable. Adobe is the predominant building material and red tile still dominates as the principal roofing material, although some tin is used. Most are single story and have of one or two rooms. Besides the residence, sometimes small outbuildings for animals and corrals comprise part of the rural farmstead. However, another small outbuilding often is seen on farmsteads in southern Cochabamba, the silo (*silo* or *troje*). The storage of agricultural products in silos or other types of storage structures on individual farmsteads is common throughout Bolivia (Hatch, 1982). But, the type of structure which dominates in southern Cochabamba, a circular silo with a conical roof, is unusual and does not appear to be found in other parts of the department or the country (Figs. 1 and 2). This paper documents the presence, characteristics, and distribution of the circular silo as well as a rectangular silo also found in this region.

The author documented the presence of the silos on three different visits to the provinces of Mizque and Campero in the southern portion of the department

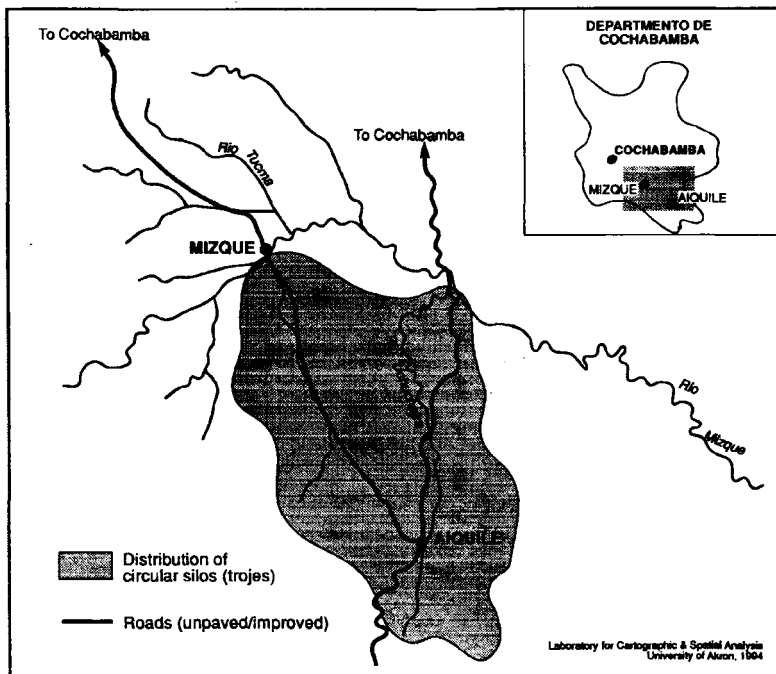


Fig. 1. Distribution of circular and rectangular silos in southern Cochabamba, Bolivia

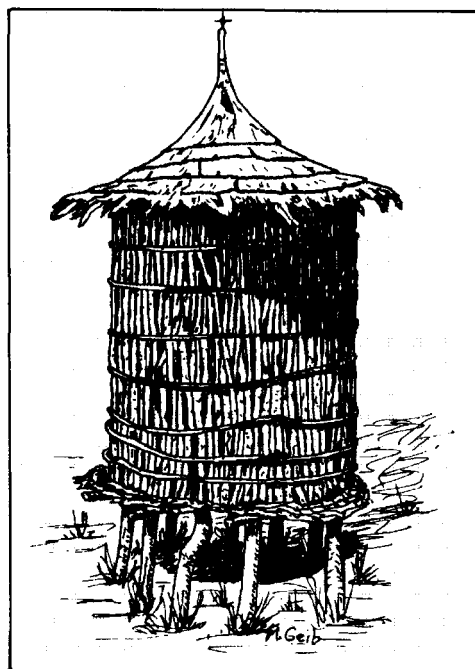


Fig. 2. A circular silo near Aiquile, Campero Province, Cochabamba

of Cochabamba. The visits occurred in March 1987, May 1990, and August 1991. The drawings included in this paper are based on photos taken in 1987 and 1990 and the interviews with peasant farmers on the uses and construction of the silos took place in 1990.

THE CIRCULAR SILO

Called either *silos* or *trojes* the dimensions of the circular silo appear to be fairly consistent throughout the region. Silos stand approximately 4 m high to the beginning of its conic shaped straw roof. It is raised off the ground about .3 to .5 m. Its width is approximately 2 m. On the side of the silo, up to a height of about .6 m is covered with mud to protect the walls of the silo from grazing and foraging animals, which might destroy the plant material of which the silo is constructed. Pigs were mentioned as particularly problematic. A small opening about 15 cm square is found on the side of the silo level with the silo floor. Most of the time this opening is filled with a rock or rocks and covered with mud, but is opened periodically to remove the food stored in the silo.

These silos may function for as long as 10 to 15 years, depending on how well they are maintained. The circular silos are used primarily to store corn. The corn is dried, usually by hanging it in the open air with its husks pulled back, and then it is dumped into the top of the silo for storage. The conic straw roof is removable/movable, and it is pushed off center slightly when corn is to be stored, and the corn is dumped in. When the farmer wants to remove some of the corn, which has been stored, the mud and rock covering the small opening along the base of the silo is removed.

The silo is constructed from a wide variety of local plant materials. The limbs and trunks of a variety of locally available trees are used for the posts, which are used to make the base, or floor, of the silo and its uprights. These include *nakna* (*Escallonia millegrana*), *duraznillo* (*Prunus capollin* and *Ocotea sp.*), *melindre* (*Gochnatia palosanto*), *kachakacha* or *quebracho blanco* (*Aspidosperma sp.*), and *soto* (*Schinopsis haenkeana*). The wooden base of the silo is covered with an adobe type of material. This is sometimes referred to as simply *barro* (mud) or *turo*. *Turo* like adobe is basically a mixture of mud, chopped up straw, and manure.

The vertical siding material is comprised of the stalks of either or both of two types perennial shrubs-*sunchu* (*Viguiera lancedata*) and *chakatea* (*Dodonaea viscosa*). The stalks of these plants are pulled together and held in the circular shape which characterizes this silo, by the flexible stalks of the *lanza* (*Prosopis*

kuntzei) (about 1cm in diameter). A thinner and even more flexible stalk from twinning vine-like plant *mora-mora* (*Clematis hilarii*) is used to secure the vertical stalks of the *sunchu* and *chakatea* to the horizontally running *lanza* (Fig. 3). The sides of the silo, up to about .6 m, are plastered with mud or *turo* to protect them from the ravages of grazing or foraging animals that might destroy them. Foraging pigs would apparently be particularly problematic if it were not for this mud or adobe plastering.

The roof of the circular silo, apparently called *chuku* in Quechua, has a conic shape. A light wooden frame for the roof is built first using the same construction techniques and materials which are used for constructing the sides of the silo. The frame is then covered with mud or an adobe-like mix called *turo*. This is then covered with a thatch made of *ichu* grass (*Stipa* sp.). The *ichu*-thatch is held in place with the leaves of another grass *siwinq,illa* (*Festuca* sp.). Often the roof is topped with a small tuft of grass at its peak forming a cross.

THE RECTANGULAR SILO

A rectangular silo is also found on farmsteads in this region. It is often found in association with the circular silo and indeed many farmsteads have both types (Fig. 4). The rectangular silo is reported to be used to store different crops. While the circular silo is used principally for storing corn, the rectangular silos are used to store potatoes, wheat, barley, and/or peanuts.

There are two different approaches with respect to the use of building materials for the construction of the rectangular silos. Some are constructed of adobe and use tile roofs, while others are constructed on the same kinds of plant materials used in the construction of the circular silos. Regardless of the building materials utilized the general dimensions of the rectangular silos are the same. They measure somewhere between 3 and 4 m square and stand about 2.5 to 3 m in height. The roof has a low pitch and may be covered with *ichu*-thatch or red tiles. Those constructed from adobe are built directly on the ground, while those constructed using local plant materials are raised off the ground about the same height as the circular silos. Indeed, those silos constructed from plant materials seem to use essentially the same plant materials and in the same fashion as in the construction of the circular silos. The lower one or two feet of their exteriors are also plastered with adobe or *turo* to protect them from the browsing of domestic livestock (Fig. 4).

The rectangular silos are often divided internally into either two or four different chambers with each being used for a different crop or different grades

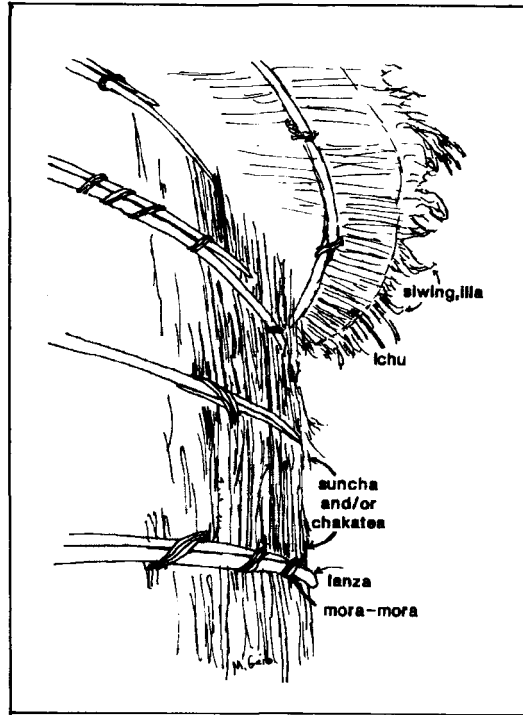


Fig. 3. Roof and side construction detail on a circular silo near Aiquile, Campero Province, Cochabamba

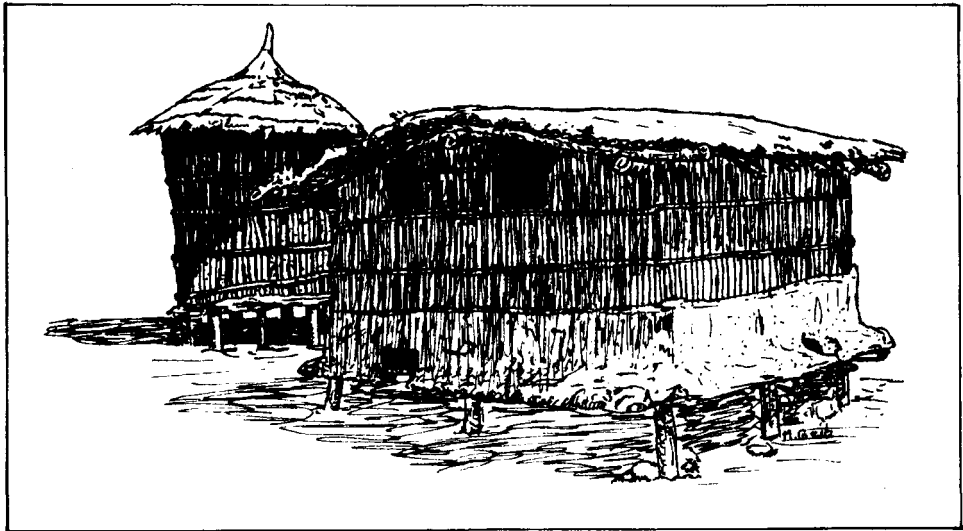


Fig. 4. Rectangular silos and a circular silo near Mizque, Mizque Province, Cochabamba

of the same crop. The latter situation probably occurs most frequently with the storage of potatoes. Square openings, the number depending on the number of internal chambers, are located at a height of about 2 m. These are used to deposit the crops to be stored into the silo. Small openings, measuring about 15 by 30 cm, are located at the base of the silo to facilitate removal of the crops. Both the “windows” at the top of the silo and the small openings at its base can be covered with either rocks or pieces of wood and then sealed with mud or *turo* when the silos are filled with crops to prevent the entry of birds, rodents, insects, or human hands.

CONCLUSIONS

In the department of Cochabamba the presence of circular folk silos coincides with the area of the department’s southern provinces –Misque and Aiquile, as does the distribution of the rectangular folk silos also documented here. In the more densely settled and intensively cultivated agricultural areas of the department, the *Valles Altos*, *Central*, and *Abajo* these unique silos are absent. The rustic character of these structures suggests that their origins are at least colonial, and indeed perhaps even pre-colonial. This could help explain their absence from the *Valles* region. Since the region is extensive and comparatively well endowed agriculturally, it quickly surpassed Misque as an important focus of Spanish colonial settlement. Misque had become a backwater by the middle of the colonial period and has remained so to the present. Aiquile’s role as a transportation entrepot between Sucre, Cochabamba, and Sucre has not been much brighter. By comparison, the Spanish more profoundly affected the towns and agricultural landscapes of the *Valles* region. After independence from Spain, and until the agrarian reforms of the early 1950s, large haciendas owned by elites controlled most of the arable lands. Since then the *Valles* region has modernized more rapidly than the more remote southern provinces. While many culture traits of pre-Hispanic origin survived in the *Valles* region, including the widespread use of the Quechua language, many others, perhaps including the construction and use of circular silos, have disappeared.

Few sources document the presence of folk silos and grain storage structures or their characteristics in other parts of Bolivia. Hatch (1982, 60-63) reports on several types of provisional and permanent silo types from the *altiplano* in the department of La Paz. The provisional silos described by Hatch have little in common with those described in this paper. However, some characteristics of the *pirwa*, a permanent structure used for long-term crop storage, bear some resemblance to the grain storage structures in Cochabamba. Described as a “small, narrow house”, it is constructed from adobe with a thatch roof. Small

square openings for ingress and egress of the harvested crops are found at the top and the bottom of the structure. The *pirwa* measures about 1.5 m on each side. The structure does not appear to have internal divisions.

In the department of Chuquisaca another type of folk silo finds widespread use at the present. On the upland plains between the cities of Sucre and Potosi where wheat, corn, and other grains are intensively cultivated many farmers construct square and rectangular adobe enclosures measuring between 3 and 5 m on a side. These storage structures stand about 2 to 2.5 m high and appear to be used principally to store livestock fodder. During the harvest period, fodder is layered into the enclosure. When it is full, the silo enclosure is "sealed" with a thin layer of adobe applied to the top layer of the fodder like a cap. During the post-harvest period, when the fodder is needed, the adobe cap is broken open and the feed can be removed.

Nordenskiold (1920:1-6) reported the existence of maize-barns among the Chan'e and the Chiriguano peoples in the department of Santa Cruz. A photograph of a Chiriguano maize-barn included in Nordenskiold's account bears a strong resemblance to the rectangular silos found in Mizque and Aiquile. A significant difference, however, is that the Chiriguano silo is raised off the ground on pilings some 1 to 1.5 m. This is considerably higher than those in Cochabamba. Nordenskiold suggests that these buildings are of indigenous origin and do not represent a culture trait borrowed from Europeans.

In northern Peru, in the department of Cajamarca, simple grain storage facilities have been reported by Carranza (1992). These are no more than log platforms raised about 1 to 1.5 m off the ground, covered with a pitched roof made of thatch and enclosed on one end. A ladder provides access to the storage platform.

The literature on contemporary agriculture in the Andes provides few clues about the origins of the circular and/or rectangular silos found in the southern portion of department of Cochabamba. At the present, the construction of circular structures is unusual in the Andes. Given the predilection of colonial Spanish authorities for right angles and square and rectangular construction, the origins of the circular silo may indeed be pre-Hispanic.

Consequently, it is perhaps somewhat surprising that circular construction forms are not especially widespread or common in the region's archaeological record. Sunken circular plazas are found in sites dating from the Moche period (400 BC to 600 AD) along the central and north coast of present-day Peru. However, only 30 some sunken plazas sites have been excavated and these are

only linked to the Moche culture dominant during this period. Monumental circular towers, known as *chullapas*, are found on the *altiplano* of Peru and Bolivia, in the departments of Puno and La Paz respectively. These towers, some which reach heights that exceed 10 m, date from the pre-Inca period (1000-1400 AD). Constructed of both adobe and stone, these structures served as burial chambers for regional elites.

Other evidence of circular construction dates from the Inca period. It strongly suggests that both the circular and rectangular silos described here, are likely of Inca origin. In the introduction to a masterful volume summarizing the state of knowledge on Inca storage systems, LeVine (1992:3) notes:

“During the 100-year period they dominated the Andes, the Inka built storage structures, known as *qollqa*, in storage centers distributed, north and south, over 4,500 km of rugged highland terrain. They constructed these circular and rectangular *qollqa* where the natural climatic conditions of high elevation locations in the Andean mountains aided in protecting and preserving contents.”

D’Altroy and Hastorf (1992:274-281) studied an Inca storage center in the Mantaro Valley of Peru. They excavated both circular and rectangular storage facilities and tested the botanical remains found in them. The structures they mapped and excavated bear a clear resemblance to those folk silos found today in southern Cochabamba. Limestone masonry characterizes the construction of both the circular and rectangular storage structures and both are typified by carefully prepared rock and earthen floors. The circular storage facilities, measuring about 4 m in diameter, are somewhat larger than those found in Cochabamba, but the rectangular structures are roughly similar in their dimensions. There is also some evidence, based on the macrobotanical remains found at other sites where both circular and rectangular storage structures are found, that circular structures stored maize and rectangular structures held tubers (Earle, 1992 :339). Peasant farmers in southern Cochabamba describe precisely the same division of crop storage today between circular and rectangular silos.

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