

THE DYNAMICS OF THE RAYA-RAYA FARMING SITE IN THE OCCUPATIONAL HISTORY OF ONE SECTOR OF THE QUEBRADA DE HUMAHUACA (JUJUY, ARGENTINA)

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INTRODUCTION

In agro-ceramic¹ societies such as those that occupied the Quebrada de Humahuaca during the past two millennia, agricultural practices tightly framed daily activities within a space that included both cultivated fields and settled areas (Korstjé and Quesada 2010). In this sense, the detailed analysis of an agricultural area turns out to be relevant for increasing our understanding of the daily activities and beliefs of social actors as complete social acts (Mauss 2009 [1925]). In this article, I present an architectural analysis of the agricultural structures and their configuration at Raya-Raya, with the aim of understanding their role in the broader occupational history of the south-central sector of the Quebrada de Humahuaca, taking into account distinct periods of construction and use. Raya-Raya is one of the agricultural sites of the greatest importance in the Quebrada de Humahuaca and the only one with a complete plan that permits the study of its spacial configuration. The current use of the site by the Aboriginal Community of Finca Tumbaya is depicted, and some future perspectives with regard to the study of Raya-Raya are presented.

The analysis presented here examines a range of indicators (Albeck 2005) that allow one to propose an hypothesis on the periods of construction and use of Raya-Raya's agricultural structures. These include technological and cultural indicators; their joint analysis allows one to establish distinct periods for the construction of the structures, to compare them one to another, and to establish a sequence for their construction and use. The results obtained are relevant in that they contribute to an understanding of Andean agro-ceramic societies, while also offering elements to verify the validity of the indicators used in the study of farming sites.

The use of diverse lines of evidence that allow one to establish a sequence of the use and relative chronology of the agricultural structures turns out to be of the highest importance in that studying a farming site presents special challenges, different from those faced when investigating other types of archaeological sites. The absence of clear contexts that can be dated, together with the reuse and reconditioning of agricultural structures over time, complicate the task of dating them in absolute terms, clouding the possibilities of discerning the sequence of the site's use and exploitation. The dating of an agricultural site has always been problematic, in that soils are open systems, in constant contact with the rest of the environment and the climate, and also in that they are periodically reused (Korstanje *et al.* 2010).

¹ *Translator's note:* This translation renders the technical archaeological term “agroalfarero/a”, used in Northwestern Argentina and Northern Chile to denote the period from roughly 500 B.C. to A.D. 650.

THEORETICAL AND METHODOLOGICAL PERSPECTIVES

When one considers that Andean agriculture is a way of life, more than a set of efficient techniques (Calderón 2003), one must include in one's studies, not only environmental aspects, but also the ways in which societies that occupied the prehispanic Andes behaved and felt (Korstanje 2011). Thus, the study of the architecture and spacial configuration of an agricultural site must not lose sight of the fact that this place corresponds to a social space that is culturally constructed, that is to say, a human product that utilizes a given reality: the physical space, to create a new reality to which one assigns significance (Criado Boado 1999; Mañana Borrazás *et al.* 2002).

Various scholars (Arkush 2008:11; Martínez 1989; Murra 1972; Platt 2010) have pointed out that in the Andean world, space is perceived as starting from discontinuity, in which each community occupies spaces interdigitated with those of other groups, distributed across the wide range of ecologies that exist in the Andes. It is thereby possible to exploit diverse and complementary resources. Thus, space establishes itself as a kind of dynamic network, within which settlements and productive sites are nodes connected with one another.

From this perspective, the agricultural work performed by ancient societies turned Raya-Raya into one node within a dynamic web, linking it to distinct settlements over time. To frame this study, I consider a series of indicators proposed by Ester Albeck (2005) that are relevant to particular and detailed studies of agricultural areas, in that they let one recognize distinct types of structures and propose different sectors and construction sequences. Albeck notes that these same indicators, which are valid on a local scale, should be taken together to evaluate the sequence of occupation of an

agricultural site. These can be categorized as cultural and technological indicators.

The cultural indicators correspond to the elements of material culture (movable or fixed) that appear associated with the agricultural constructions. This type of indicator can be diagnostic of the group that constructed or used the structures, and includes cultural materials found on the surface, in the agricultural area, such as ceramics (even if infrequent and eroded) and lithic instruments, along with shelters and living spaces scattered among the agricultural structures. These indicators include enclosures associated with agricultural structures and cultural materials.

Technological indicators include: the type of agricultural land, location, modes of construction, irrigation systems, and labor systems. These are bound directly to the agricultural technology used in the conditioning and management of the land. The type of agricultural land is tied to factors such as the physical space in which it lies, the type of agriculture practiced, the irrigation technology employed, and erosive and climatic phenomena. For Northwest Argentina, Albeck considers two broad categories: long rectangular surfaces transverse to the main drainage kept level by small walls which she calls *terrazas* (terraces); and surfaces with perimeter walls (*pircas*) known as "enclosed fields" (*canchones*). As for placement, this is tied to mastery of the technology and the expansion of areas of cultivation within the broader Agro-Ceramic Period. For its analysis, one must consider the geomorphological features upon which the agricultural site is placed, its slope, and its height above sea level, elements that can mark an occupational sequence. As has been set out, architecture presupposes the creation of a socio-cultural space, beginning from shared modes of acting and feeling. From there one's analysis will allow one to distinguish specific moments of construction or the presence of agriculturalists

of distinct origins. The same happens with labor systems, represented, in this case, by the accumulation of small piles of stones resulting from the clearing of sectors for cultivation. Practices such as these are also tied to modes of action, in that diversity in the manner of field clearance can mark distinct techniques at the time of preparing the land for cultivation. In the north of Chile, studies in the cultivated areas of Topaín and Paniri (Malim 2009; Parcerou-Oubiña *et al.* 2016) of technological aspects such as those proposed here have allowed researchers to establish differences between nearby cultivated fields, considering that the different modes of construction and types of layout will reveal differing sequences of use. The interlacing and superposition of agricultural structures with differing modes of construction indicate a gradual increase over time for the structures tied to irrigation network R1, while those tied to R2, of smaller size and uniform construction, result from a more confined use in time.

THE PREHISPANIC TRAJECTORY OF THE QUEBRADA DE HUMAHUACA

The Quebrada de Humahuaca (Figure 1) is a narrow valley that extends for 120 kilometers in the center of the Province of Jujuy (Northwest Argentina) and is bounded by high mountain chains that run in a north-south direction. This valley presents great natural heterogeneity (Reboratti 2003), resulting from the combination of its sub-tropical location, the geological complex, the mountainous massifs that surround it, and its pronounced slope that leads to the contiguous presence of diverse ecological settings.

The region consists of two climatic zones: semi-arid and arid, both of which are mesothermal regions (*ibid.*). The difference between them is due to the variability in precipitation along the valley; rainfall declines towards the north as a consequence of the height of the

mountain chain that borders the valley to the east.

The Quebrada de Humahuaca is one of the most intensively studied zones in the archaeology of Argentina. Below I lay out its prehispanic occupation during the Agro-Ceramic Period. In the Quebrada the earliest evidence for it dates to the beginning of the first millennium A.D.

The beginnings of the agro-ceramic occupation

The process of domestication of plants and animals carried out by hunter-gatherer communities who lived in Northwest Argentina permitted the rise of consolidated groups within an agro-pastoral economy that led to a fully agrarian life based on stable residence during the first millennium A.D. (Albeck 2000). Research carried out up to now in Northwest Argentina allows one to highlight certain shared characteristics from the beginning of the Agro-Ceramic Period in this part of the Andes, such as sedentarism, agricultural and herding practices, the locations of habitation sites in relation to cultivated fields, and the development of new technologies such as pottery, textiles, and metallurgy (Albeck 2000; Olivera y Palma 1997; Tarragó 1992).

The first-millennium occupations in Northwest Argentina have been characterized as installations with a variable relationship between productive and habitation structures that proceeds from the spatial association of both, to the separation of residential spaces and cultivated fields (for a synthesis of the current state of knowledge of this period see Korstanje *et al.* 2015). This situational diversity allows one to think that Formative societies would have had a more dynamic character than previously proposed (Lema 2014).

In the Quebrada de Humahuaca (Albeck 2000; Tarragó 1992) researchers have identified

settlements where the residential spaces appear to be dispersed and directly associated with cultivated fields marked out by *canchones* (large quadrangular or irregular enclosures built with stone walls), such as Antumpa, Estancia Grande, and Alfarcito. These same enclosures are located in sectors that are transitional between different environments found in the quebradas that are transversal to the río Grande, the main river bed in the Quebrada. These are considered as strategic points, in that they would have permitted the best use of products from distinct ecological zones and participation in the interchange of goods.

The beginning of the second millennium and the pre-Inca populations

Various authors (Núñez Regueiro 1974, Tarragó 2000, among others) are in agreement that at the beginning of the second millennium there were observable changes in the pre-hispanic societies of the South-Central Andes. These changes have been related to new demographic, political, and economic processes, themselves linked to the intensification of agriculture in comparison to previous periods, based on the irrigation and expansion of agricultural sites, the exploitation of intensive herding, and the control of different ecological zones, in the context of growing conflict between populations.

There was a population increase in the Quebrada de Humahuaca during this period, as shown by the increasing sizes of sites and by the concentration of the population, a situation that gave rise to the emergence of large conglomerated population centers located principally on high places that were hard to reach (Nielsen 2001; Tarragó 2000).

Traditionally, scholars have considered that the process of progressive sociopolitical integration tied to the emergence of conglomerated

settlements led to centralized political entities with an observable hierarchy in and among the settlements. This process was marked by episodes of conflict and shifting alliances that generated diverse relations among the political entities (Albeck 1992; Nielsen 1997, 2001; Tarragó 1994).

In current scholarship, there have emerged alternative views that examine the traditional vision of political centralization and institutionalized inequalities in the Quebrada de Humahuaca and other Andean regions, and propose the existence of corporate societies based on regional integration (Acuto 2007; Leoni and Acuto 2008; Nielsen 2006; Vasquer 2010).

The annexation of Quebrada de Humahuaca to Tawantinsuyu

In the middle of the second millennium, the Quebrada de Humahuaca became part of Collasuyu, the southern province of the Inca empire. As various authors have noted (D'Altroy *et al.* 2007; González 1980; Nielsen 2001; Williams 2000) there is plentiful evidence of this conquest in the Quebrada, such as the presence of various Inca artifacts and the network of roads, garrisons, and tambos. Inca political organization was flexible, as shown by the notable variations between distinct conquered regions in that the state administrations were built on preexisting political systems, employing an ideology of reciprocity and the local redistribution of resources to legitimize the new economy. In this fashion, the empire established different conquest strategies, which included diplomacy as much as conquest, and strategies for the consolidation of power, tied to the integration of subject groups (Williams 2000).

The intensification of agriculture is viewed as one of the strategies for domination employed by the Inca in the Quebrada de Humahuaca and elsewhere in Northwest Argentina (D'Altroy *et*

al. 2007; Williams 2000). Evidence of this intensification in the Quebrada has been recovered from the pre-Inca sites of Coctaca-Rodero (Albeck 1998, 2001) and Alfarcito (González 2009), which were expanded through the installation of new cultivated areas and irrigation systems. Thus, new sites were created nearby, planned with the aim of controlling agricultural works.

RAYA-RAYA IN THE CENTRAL-SOUTHERN SECTOR OF THE QUEBRADA DE HUMAHUACA

The central-southern sector of the Quebrada de Humahuaca (Figure 1) is bounded to the north by the Quebrada de Purmamarca and to the south by the Arroyo de Medio. It is also marked by the proximity of the environmental and geomorphological units of puna, quebrada, and *yungas*¹ due to the declining height of the mountain chains that border the Quebrada to the east and west. This location gives access to a great variety of resources in a short distance.

The agricultural site of Raya-Raya extends for more than 81 hectares on a river terrace, at between 2360 and 2700 masl, within the small Quebrada of Raya-Raya, which forms part of the basin of Tumbaya Grande. The terrace on which the site is built has an average slope of 12 percent from east to west, rising to the west to the lower slopes of a high peak.

Most of the agricultural structures are found facing east to avoid the unevenness of the slope, and extend from the foot of the mountain to the west to the central part of the terrace. Between them were found accumulations of stones cre-

ated during the cleaning of fields for agricultural use, along with sub-circular and rectangular enclosures with straight or curved corners (Figure 2).

THE INDIGENOUS COMMUNITY AND RAYA-RAYA TODAY

In 2004, the Indigenous Community of Finca Tumbaya set up a community plant nursery in Raya-Raya, before the beginning of systematic archaeological research in the zone. This project included the cleaning, reconditioning, and reuse of two hectares of prehispanic agricultural terraces in the north-eastern part of the site (Figure 3). The plant nursery was created to recover Andean cultivars and produce seeds, although while these activities were being carried out, the importance of recovering traditional agricultural practices also became obvious. Prior to these works, the site had remained relatively unchanged, with only sporadic looting of some structures, as it was on privately held land.

Throughout our fieldwork in the area, we interviewed members of the community, especially the person in charge of the plant nursery. Thanks to these individuals, we came to know that to begin with, the community's objective was to recover the "ancestral cultivars" that were more or less missing from this zone, such as various species of potatoes, or maize, or quinoa. During this first stage, experiments were conducted with different cultivars to learn which species flourished best in the microclimate of Raya-Raya. Techniques of cultivation were not a concern at this point, as all that was done was to reconstruct a few terraces, creating rectangular fields similar to those used in the present day, based on the reconstruction of archaeological walls, reusing stone blocks found on the site. Thus, in this first stage, a few houses were built in the vicinity of the agricultural area, and a water system was set up, based on a series of

¹ The puna is part of the Andean Altiplano, a plateau at a height of more than 3000 masl, with a dry and cold climate, while *yungas* is the local term for the high mountain rainforest that extends along the eastern side of the Andean foothills.

pipes used to irrigate the plant nursery and to supply the families who had established themselves in the area.

Subsequently there arose among members of the community—which was tied directly to the activities of the plant nursery—a desire to learn traditional methods of cultivation, along with the history of the agricultural site and how it was used over time. These questions were the trigger for the interest in the archaeological investigations that we later carried out in the area. A clear example of this is the setup of the irrigation canals for carrying water to the plant nursery. After gaining the support of an international project that provided them with the economic resources needed to set up the irrigation system, the community decided not to follow the guidelines provided by the engineers who had developed the system for international use, as on the one hand it did not address the particular problems of Raya-Raya, and, on the other, community members were interested in developing an irrigation system more in accordance with Andean traditions.

Nevertheless, interchanges with members of other communities from various parts of the Andes led to the recovery of aguaymanto (*Physalis peruviana*), an Andean fruit that currently is found in its wild form in the zone of Tumbaya, and whose cultivation had completely disappeared from the Quebrada de Humahuaca. This was recognized by a knowledgeable farmer from Bolivia who gave a training session in Raya-Raya on traditional agricultural practices. Currently, aguaymanto is grown only in Raya-Raya, and various sweets and other edible products are made from it.

Following our observations in Raya-Raya, we were also able to record the ritual events of the *challa*. During these, persons brought together at either the start, or the end, of the agricultural cycle made offerings at the mouth of a well near

the cultivated fields, in which they offered the earth (*Pachamama*) traditional food and drink, especially chicha, and burned aromatic herbs. This showed not only use with the intent of current profit, but also an appropriation of Raya-Raya within the meaningful spaces that make up the landscape of the people who live in Tumbaya.

The activities carried out by the Indigenous Community in Raya-Raya reveal the dynamism presented by various archaeological sites in the Andes, as was noted by Monica Barnes (2015) for Huánuco Pampa. While we do not have records of the use of Raya-Raya for agriculture during the colonial or earlier republican periods, the current use of the site by the indigenous community is of great interest for the study of Andean agricultural practices.

ARCHITECTURAL ANALYSIS AND SPATIAL CONFIGURATION

Starting from the cultural and technological indicators proposed by Albeck (2005), we approach the analysis of the architecture and spatial configuration of Raya-Raya as an approximation of the chronology and cultural attribution of the agricultural site. In Table 1 I present the indicators I have identified.

Raya-Raya's technological indicators

At Raya-Raya, the predominant form of agricultural land is terraces (Figure 4); that is, vertical stone walls of varying heights filled with earth so as to create horizontal levels. Less commonly, there are also enclosed fields and rustic terraces. The former correspond to enclosed spaces with perimeter walls (Figure 5) that, in some cases, use very large stones set on edge. The walled fields are very large enclosures in which agricultural work is carried on; it has been suggested that these enclosures protect the cultivars inside them from camelids and other

herbivores, in the case of domestic units that manage both agricultural and pastoral tasks from the same residential base (Albeck 2000). The rustic terraces (Figure 6) are terraced spaces without stone walls, or with walls that are very low and irregular, a peculiarity that gives the ground surface a “wavy” appearance. The types of agricultural land we have identified appear along the river terrace, with an observable concentration of walled fields in the west-central sector of the area. The rustic terraces are found in the southeastern sector, while there is no preferred arrangement of the terraces.

To analyze the nature of the construction of the structures we considered the wall types, noting a predominance of single walls and a lower proportion of double walls, that is, structures whose two walls were packed with earth and small stones between them (Figure 7). Structures that combined both types of walls we have mentioned, or that had no stone elements, were rare; these last are found in association with the rustic terraces. For construction, shale, quartzite, and slate were used (Figure 8), in most cases in some combination. Some structures consisted entirely of quartzite blocks with their faces smoothed. The blocks used varied in shape, size, and characteristics (see the details in Table 1).

We identified three ways of bonding the stone blocks: regular, irregular (*sensu* Tolaba 2011), and keyed in. In regular bonds (Figure 9) the blocks have a well arranged layout, while in the case of the irregular bonds (Figure 10), the blocks were adjusted as the structure was being built. In general, regular or irregular bonds with quadrangular or rectangular blocks with smoothed faces predominated, while walls built of keyed bonds (Figure 11) were rare.

There are few piles of waste stones and these appear in the western sector. Most of them consist of very small stones (<5 by 9 centime-

ters) and are elongated and up to a meter in height. In accordance with what Albeck (2001) found at Rodero and Coctaca, the piles of stones, elongated and made up of small stones, termed “piles of small waste stones” would have been fashioned during the Inca Horizon. According to Albeck, these indicate a technology different from that used in prior periods, which has led to the proposal of the existence of ways of sifting or raking the soil, given the reduced sizes of the accumulated stones. One waste stone pile was found that differed from those mentioned above by its irregular shape and by being made up of stones of middling size. On the basis of its association with the enclosed fields, it is considered to be earlier than the aforementioned piles.

The cultural indicators

The Raya-Raya enclosures were recorded during a systematic surface survey. The enclosures were of circular or rectangular layout with square or rounded corners. The circular enclosures had varying diameters (between 1.60 meters and 3.8 meters) and were dispersed among the agricultural structures. They could also be contained in the walled fields or within the rectangular enclosures with square corners. Surface material associated with these enclosures was scarce, and it was not possible to make test pits in them, given the presence of looters' pits within them. Because of this, we were not able to establish their function, although we do not rule out that the enclosures were living spaces, in accordance with what has been found in other agricultural sites in the region (Albeck 2001; González 2009).

We recorded a single rectangular enclosure with filled double walls and rounded corners that was isolated among the agricultural structures. The constructional characteristics of this enclosure allowed us to link it to two important settlements in the central-southern sector of the

Quebrada: Pucara de Volcán and El Poblado. In these settlements, the most relevant constructional characteristics were the enclosures in this form, corresponding to houses and patios.

The enclosures with square corners are also found scattered among the structures, and one of them has a circular structure inside it; this is a unique case corresponding to an enclosure with an internal division. It is possible that these enclosures had been used as refuges or houses, especially in the case of that with one division. The walls of the rectangular enclosures were made of small and medium-sized blocks with smoothed faces. The rectangular enclosures with square corners are a characteristic construction of the Inca Horizon in the sector and, coincidentally, were recorded in the Inca settlements of Esquina de Huajra and Las Ventanitas.

There was little cultural material recovered from the surface, and what there was consisted primarily of ceramic fragments and, to a lesser extent, flakes and projectile points (Tables 2 and 3). The great majority of the ceramics showed no type of surface treatment or finish (ordinary), and were probably fragments of closed vessels with thick walls (Figure 12a). Less numerous were smoothed vessels with red or purple slip (Figure 12b), polished brown, pink, red, and black (Figure 12c), Yavi-Chicha fragments (Figure 12d), Casibindo Painted (Figure 12e), and Humahuaca Black-on-Red (Figure 12f).

Both the ordinary ceramics and the smoothed fragments with undecorated slip and polish correspond to types identified in the local ceramic repertory of the Quebrada de Humahuaca in later periods, as does the Humahuaca Black-on-Red, dating from approximately the beginning of the thirteenth century A.D. (Cremonte 2006; Nielsen 2001; Otero 2013; Runcio 2009; Scaro 2019). For their part, the Yavi-Chicha fragments (Ávila 2005, 2008; Krapovickas 1965, 1973, 1975, 1977) and Casabindo

Painted (Albeck 2001; Zaburlín 2012) come from the highlands, with the first style originating in the puna of Jujuy and the south of Bolivia, while the second was recovered in the puna of Jujuy. While both have greater chronological depth in their places of origin, in the Quebrada de Humahuaca Yavi-Chicha appeared at the start of the second millennium, and increased its presence during the Inca period, while Casibindo Painted did not appear before the arrival of the Incas (Cremonte 2006; Scaro 2015a).

We recovered ceramic fragments (Figure 12g) belonging to the San Francisco Tradition (Scaro 2017a, 2017b). The San Francisco Tradition (600 B.C.–A.D. 600) was recorded in the flanks of the eastern sides of the sub-Andean ranges, centered in the valley of the San Francisco River (Dougherty 1974). It has been proposed (Ortiz 2007) that the groups that occupied this zone had an economy based on hunting, gathering, farming, and fishing, with a moderate degree of residential mobility. The ceramics that were characteristic of this tradition (Dougherty 1974) had a macroregional range, accentuated from the beginning of the first millennium, when a process of greater mobility has been observed (Ortiz 2007).

As for lithics, the principal materials recovered were flint and obsidian flakes, along with a few broad and stemmed projectile points made from obsidian and flint. The presence of points of this type is a reminder of discoveries made at sites from the first millennium A.D. in Northwestern Argentina, like those recovered at the site of Lozano, associated with Ordinary and San Francisco Tradition ceramics (Fumigalli and Cremonte 2002), and at the sites of Alfarcito (Zaburlín *et al.* 1996), Estancia Grande (Palma and Olivera 1993), Antumpa (Leoni and Hernández Llosas 2012), Til 22 (Rivolta and Albeck 1992), and Til 20 (Mendonça *et al.* 1991), where points like these were linked to Alfarcito Grey Polished Ware, Chestnut Brown

Polished, Black-on-Red, and Tricolor wares, and fragments of ceramic pipes, platters, hoes and spades of stone and wood, and milling tools. Similarly, in some villages in the Quebrada del Toro (Province of Salta) corresponding to the same period, obsidian and quartzite stemmed points were recorded (Álvarez Soncini and De Feo 2010).

Correlation of the identified indicators

The identification and combination of the distinct technological and cultural indicators at Raya-Raya has permitted the definition of five different construction groups (Figure 13, Table 4) that would correspond to specific moments of the use of the agricultural area.

Group A corresponds to the terrace-type structures (Figure 14) built of quartzite blocks of quadrangular and rectangular shape with their faces smoothed (naturally or slightly worked) and of both large and small sizes. The bonding is regular. The enclosures associated with these constructions are circular or rectangular with square corners with construction characteristics similar to those seen in the terraces. The piles of waste stones are elongated and of varying heights, and consist of small stones. These structures are grouped in the western part of the site, a placement that leads one to think they were built at one time, occupying a marginal sector of the area, in that to the west the slope becomes more abrupt, given the presence of a high peak. This group was also identified across the entire extent of the agricultural area, which could result from a reworking of the space, indicating that its construction was later than the rest. Starting from the characteristics of the structures in this group, taken together with the spatial associations of those with waste stone piles of small stones (*sensu* Albeck 2001), we propose that the structures of Group A would have been built after the annexation of the zone to the Inca empire.

The ceramics recovered from surfaces associated with the constructions of Group A are principally ordinary, with small quantities of Pucos Interior Black Polished, polished and smoothed reds, polished pinks and browns, and also Yavi-Chicha. The brown and pink polished wares and the Yavi-Chicha appear recurrently in the ceramic contexts of Inca sites (Cremonte 2006), reinforcing the idea that this sector was constructed at that time.

Group B (Figure 15) includes structures of the enclosed field type that, in some cases, have been reworked. These same structures are associated with circular enclosures and with large stones intentionally incorporated, forming parts of the walls or in nearby sectors. Some enclosed fields have an entrance marked by two large stones fixed in a vertical position that appears to be “closed” by smaller blocks.

The structures are made up of blocks of different sizes from middling to large arranged in an irregular manner, or built into the ground surface. The blocks are of quartzite, shale, and slate, without any observable homogeneity in the raw materials, as is seen in the case of Group A. We identified one waste stone pile associated with this group, of irregular form, consisting of stones of medium size.

The structures in Group B are not well preserved and are concentrated in Raya-Raya's west-central sector, although we observed some dispersed through the east-central sector. In this latter sector we recorded a major remodeling, in that enclosed fields that are partially preserved appear to be particularly associated with walls of different groups. Some of the structures in Group B had been dismantled, and we observed small stretches of isolated walls associated with structures of differing characteristics. This could indicate that at a time following the prehispanic use of Raya-Raya, the enclosed fields were

remodeled, with their walls being used to make terraces.

The presence of enclosed field structures like those recorded for Group B relates to other sites are thought to date from the first millennium A.D. in Quebrada de Humahuaca (Albeck 2000; Tarragó 1992). Furthermore, the presence of stemmed points, similar to those recovered from other first millennium sites in Northwest Argentina, and of ordinary ceramics with large white inclusions and those of the San Francisco Tradition speak to the occupation of Raya-Raya during this period. On the other hand, the reuse and reconditioning of the structures of this group reveal the use of the site some time after the abandonment of the enclosed fields.

Although for the first millennium C.E. scholars have proposed that the characteristic settlement pattern was of households dispersed between the cultivated fields set in zones that were at lower elevations and were easy to access (Albeck 2000), the presence of these structures on a higher terrace some distance away from the bottom of the valley could be related to the existence of the “Tumbaya Volcano Paleo-Lake” (Solís and Rivero 1994) that would have limited the lands available for cultivation at the bottom of the valley.

In third place we identified Group C, which included terraces consisting of one course of irregular, half-buried blocks of slate, sandstone, and quartzite that stand a few centimeters above the present surface (Figure 16). This group was recorded in the east-central sector of the area linked to walls with varying constructional characteristics, but some isolated constructions were observed to the east, next to the sector where the experimental nursery had been established by the Aboriginal Community de Finca Tumbaya. In association with Group C, primarily ordinary ceramics, slipped and polished red fragments and, in lesser amounts, small pieces

with polished black and brown interiors were recovered. The presence of polished brown fragments could indicate that perhaps these terraces were utilized during the Inca Horizon. However, this is not to say that they were constructed at this point, especially if one keeps in mind the differences in construction methods from Group A.

The difficulty in establishing an estimated chronology for the structures in Group C leads to some questions: could the low height of the structures have had a special function? Could they be contemporary with others, given that there are very few constructions in this group? Also, and with regard to the current modifications of the agricultural site, it is possible to think that these structures could result from the dismantling of the walls, so that the stone blocks could be used in other constructions.

Group D corresponds to the so-called rustic terraces (Figure 17), structures that are hard to see on the surface because of their small, discontinuous walls, or because they are not built of stone. These terraces are grouped towards the southeast of the site and are associated especially with the terraces of Group E. As with the preceding group, it was difficult to establish a relative chronology due to the almost complete absence of stone walls; however, the spatial association exclusively with structures of Group E let us think that they could have been contemporaneous with, or perhaps earlier than, these same structures. The ceramics recovered in association with Group D were very scarce and consisted of ordinary fragments.

Finally, we identified a fifth unit we named Group E (Figure 18), whose constructions were marked by single walls of quadrangular and rectangular blocks of quartzite, shale, and slate, laid out in a regular manner. The ceramics recovered in association with Group E are primarily ordinary and, to a lesser extent, pol-

ished and slipped red, polished pink, Corrugated and Humahuaca Black on Red. The terraces of Group E appear across most of the site, with the exception of the concentration of terraces of Group A in the western sector of the area. The similarities of these structures to those observed at El Poblado, dated to the thirteenth century (Greco 2017; Scaro 2015a, 2015b, 2017c) allows one to think that they correspond to the second millennium, having been constructed before the annexation of the zone by the Inca empire.

DISCUSSION

One can add the agricultural area of Raya-Raya to the highly productive zones of the Quebrada de Humahuaca such as Coctaca, Rodero, and Alfarcito, which mark the culmination of a process of spatial segregation of the residential and productive zones. As noted by Albeck (1992, 2001), the geological specificities of the Quebrada de Humahuaca offer, on its western slope, friable soils that have been intensively furrowed by water action, leaving few pieces of land suitable for agriculture. This situation is very relevant to Raya-Raya, the largest agricultural site in the south-central sector of the Quebrada with evidence of continued use for most of the past two millennia.

The identification and characterization of the constructional groups at Raya-Raya has allowed us to establish hypotheses concerning the sequence of construction and the use of the agricultural structures. The earliest utilization of Raya-Raya is shown by the presence of enclosures for cultivation (Group B), which are ascribed to the cultural activities of the first millennium in the Quebrada de Humahuaca. This occupation is set out in accordance with a pattern of dispersed settlement, in which each dwelling is surrounded by its cultivable fields (Figure 19).

The dwellings at Raya-Raya were circular in plan and the cultivable fields were delimited by enclosures. Other villages from this period in Quebrada de Humahuaca with settlement patterns like those described are Estancia Grande in the basin of Purmamarca and Alfarcito in the area of Tilcara. For Alfarcito, dates of 2020 ± 100 BP and 1970 ± 70 BP have been obtained (Zaburlín *et al.* 1996), while Estancia Grande has been dated to 1900 ± 60 BP and 1510 ± 70 BP (Palma and Olivera 1993); in other words, from about two thousand years ago agro-ceramic groups have been established in a pattern of dispersed villages and enclosed fields in distinct sectors of the Quebrada. As in Alfarcito and Estancia Grande, Raya-Raya yielded stemmed points and primarily ordinary ceramics, while there was an absence of fragments of polished grey or bicolor wares. The similarities in the settlement patterns and in the material recovered could indicate that the villages of Estancia Grande and Alfarcito were contemporaneous with Raya-Raya.

To the evidence from the first millennium we add the presence of San Francisco Tradition pottery, similar to that recovered from beneath the late occupation at Pucara de Volcán (Fumagalli and Cremonte 2002; Scaro 2017b). These finds indicate that in the south-central sector of the Quebrada de Humahuaca groups coming from the basin of the San Francisco River would have settled there during the first millennium. The similarities observed in the ceramic types present, at the level of surface treatment and finishing and also of manufacture (Scaro 2017a) permit us to think that both occupations were linked, and were contemporaneous, developing at the beginning of the first millennium, in accordance with the dates obtained from Pucara de Volcán (Fumagalli and Cremonte 2002).

We consider, following Ortíz (2007), that from two thousand years ago, the groups in the basin of the San Francisco River would have

started a process of expanding their territories that included the establishment of alliances and routes for interchange with highland groups and the effective appropriation of new territories through settlements in surroundings that were different from those of their central area. In this sense, the zone's potential for agriculture and animal husbandry probably played an important role in the choice of the installations at Raya-Raya and Pucara de Volcán, along with the possibilities for interaction with groups based in the western highlands, given the easy access to this zone by way of the Tumbaya Grande Quebrada.

During the second millennium A.D. (Figure 20), the Formative enclosures were partially reused, while, at the same time, the agricultural space would have been expanded by the construction of new terrace-type structures (Group E). At this same moment "rustic terraces" (Group D) would have been built; their architectural specifics could be related to a system of water management that was different, or perhaps for the cultivation of other species. The agricultural exploitation of Raya-Raya would have been linked to the provisioning of the pre-Inca settlements of Pucara de Volcán, El Poblado, La Silleta, and Agua Bendita (Scaro 2015a). In other agricultural areas of the Quebrada de Humahuaca, such as Coctaca, Rodero (Albeck 2001), and Alfarcito (González 2009), were found cultivation terraces that were transverse to the riverbed with a spatial configuration similar to that observed at Raya-Raya.

Following the annexation of the zone to the Inca empire (Figure 13) Raya-Raya would have been remodeled and expanded as shown by the presence of terraces of Grupo A over the whole site, reconditioning the space created by the structures from earlier periods. Thus, the western sector of the area, integrally formed of structures of this group, would indicate the

extension of the agricultural space being utilized. This, together with the presence of pink and polished brown fragments without decoration, would reveal its use during this period. The presence of these special vases, along with fragments of Yavi-Chicha ware—even though in very small quantities—could indicate its participation in agrarian rites that would have been performed at Raya-Raya, such as the *challa*.

The Inca extensions of Raya-Raya marked the utilization of marginal spaces that had not been used in the prior period by the local inhabitants. I agree with the proposal of Williams *et al.* (2011) that this situation was in response to a strategy that sought to diminish the impact on the agricultural productivity of the inhabitants of the zone.

The constructional characteristics of the Inca monuments observed at Raya-Raya appear in other agricultural sites in Northwestern Argentina, as in the middle Calchaquí Valley (*ibid.*), Alfarcito (González 2009), or Coctaca and Rodero (Albeck 2001). The most striking characteristic is the presence of elongated piles of waste stones that extend following the slope beside the agricultural terraces, described as being of small stones by Albeck (2001). However, at Raya-Raya, these piles of waste stones did not have retaining walls like those found at the above-mentioned agricultural sites.

The task of reconditioning and expanding the agricultural site could have been related to the Inca administration's policy of occupation of the south-central sector of the Quebrada de Humahuaca, which would have been linked with installations such as Esquina de Huajra and Las Ventanitas and the major development of Pucara de Volcán. This expansion could correspond to a process of agricultural intensification as part of a state-level strategy, as has been suggested for other parts of Northwest Argentina (Williams 2000; Williams and

D'Altroy 1998; Williams *et al.* 2011). Thus, for example, in the Calchaquí Valley, evidence of state-level production could be provided by the association of agricultural constructions with Inca settlements, just as by the presence of canals that irrigated some of the agricultural sites (Williams *et al.* 2011). The case of Coctaca and Roderó in the Quebrada de Humahuaca is similar, where in addition to extensive cultivated areas, there were Inca settlements that were directly associated with the agricultural structures (Albeck 2001).

At Raya-Raya we did not record Inca Horizon usage of the space as intense as that observed at Coctaca, Roderó, or Alfarcito, where waste stone piles were numerous and very large, being associated with a great quantity of hillside terraces called *andenes* by archaeologists working in Northeastern Argentina. The observed difference in the intensity of the state-level administration's use of the agricultural areas between the south-central sector and the sectors more to the north of the Quebrada could be in response to distinct interests of the Inca state (Scaro 2015a).

CONCLUSIONS: RAYA-RAYA AND AGRICULTURE OVER TIME

The correlation of the indicators used at Raya-Raya allows us to define differences in the constructional methods and associated surface materials. Just as in the Atacama region (Malim 2009; Parcera Oubiña *et al.* 2016), the differences indicate a prolonged use over time of the agricultural area, allowing us to propose a sequence of construction and use for them.

In the earliest times of use of Raya-Raya, an occupation could have been established at the start of the first millennium by quebrada groups, who built their circular dwellings in association with the cultivated enclosed fields. This early occupation would have been contemporaneous

with the installations at San Francisco that we have already discussed. The situation we have proposed for Raya-Raya would indicate that there were two different cultural traditions sharing the same space. Thus, the daily experiences of the inhabitants of the south-central sector of Quebrada de Humahuaca at that moment would have included, from the circulation of persons and objects, zones that were both some distance away and environmentally different such as the basin of San Francisco as well as Quebrada de Humahuaca (Scaro 2017b).

During the second millennium A.D., Raya-Raya formed part of a new network that included the settlements of El Poblado, Pucara de Volcán, and possibly La Silleta and Agua Bendita (Scaro 2015a). The use of Raya-Raya at this time is shown by the presence of ceramics similar to those from El Poblado, and of agricultural terraces and isolated enclosures with constructional characteristics similar to those at that settlement. It is then that the Formative enclosed fields were partially reused, at the same time as the agricultural space was expanded with new terraces. It is probable that the so-called rustic terraces were built at this time, given their spatial association with the terraces thought to be from this period. These terraces were not found in other agricultural areas of the Quebrada, and could be related to a different kind of irrigation management, or perhaps to the cultivation of different plants. Currently, sediment analysis is being undertaken to try to learn more about these possibilities.

Raya-Raya may also have been remodeled and extended during the Inca Horizon as shown by the presence of structures with constructional characteristics different from those that we consider to be pre-Inca. These structures were found all over the agricultural area, reconditioning the earlier terraces and enclosed fields. Likewise, the site's western sector is entirely composed of Inca constructions. The changes at

Raya-Raya reveal the interest of the imperial administration in an intensification of farming activity as part of a state-level policy faced with a demographic increase and with the objective of sustaining the local administrative apparatus (González and Tarragó 2005). The intensification of agricultural production could also have been part of a strategy for the production and administration of goods and services through control of productive space (Williams *et al.* 2011).

The analysis of the agricultural structures of Raya-Raya has allowed us to determine that this agricultural site was a significant node in the social space in the south-central sector of the Quebrada. Over the past two millennia, Raya-Raya has been a productive site of great importance, tied to the sector's different settlements that functioned at distinct moments in the history of its prehispanic occupation.

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<i>Technological indicators</i>		<i>Independent chronological indicators</i>	
Landscape type	Terraces	Lichens	Abundant
	Enclosed fields		Scarce
	Rustic terraces		Absent
Location	Ancient fluvial terrace		One to three species
Wall type	Double	Sediments between blocks	Abundant
	Single		Scarce
Raw material	Quartzite		Absent
	Phyllite (Shale)		
	Slate		
Characteristics of blocks	Regular faces	Cultural indicators	
	Irregular faces		
Forms of blocks	Rectangular	Surface materials	Ceramics
	Quadrangular		Lithic materials
	Irregular	Enclosures	Circular
Sizes of blocks	Big (>30cm)		Rectangular with square corners
	Medium (20–30cm)		Rectangular with rounded corners
	Small (<20cm)		
Arrangement of blocks	Regular		
	Irregular		
	Fastened		
Waste stone piles	Lengthy with small stones		
	Irregular with medium stones		

Table 1: Indicators employed in the analysis of Raya-Raya.

Group	Ordinary	Smoothed red slip	Smoothed purple slip	Polished red	Polished purple	Polished red-brown	Polished pink	Polished grey/ brown	Black on smoothed red	Black on polished red	Yavi- Chicha	Casabindo painted	Pucos interior black polished	San Francisco Tradition
A	61	11		5							28	1	2	
B	168	15	1	6	1	1	1		1	2			4	1
C	18	3			1	1		1					2	
D	4													
E	475	35		16		3	7	4	1	2			2	

Table 2: Ceramics recovered from surface collections at Raya-Raya.

Group	Obsidian flake	Flint flake	Obsidian blank	Point - no tang	Point with tang
A	1		1		
B	4		4	1	1
C					
D					
E	25	1	7		2

Table 3: Lithic materials recovered on the surface of Raya-Raya.

Group	Technological indicators								Cultural indicators		
	Terrain type	Wall type	Raw material	Block characteristics	Block shape	Block sizes	Block disposition	Waste stone piles	Enclosures	Surface material	Relative chronology
A	Terraces	Double- Simple	Quartzite	Regular faces	Quadrangular / rectangular	Small to big	Regular	Elongated with small stones	Circular, rectangular with square angles	See Tables 2 & 3	Inca
B	<i>Canchones</i>	Simple	Quartzite, Phyllite, Slate	Irregular faces	Irregular	Medium to big	Rammed	Irregular with medium stones	Circular	See Tables 2 & 3	First millennium A.D.
C	Terraces	Simple	Quartzite, Phyllite, Slate	Irregular faces	Irregular	Medium	Irregular	Absent	Absent	See Tables 2 & 3	Second millennium A.D.
D	Rustic platforms							Absent	Absent	See Tables 2 & 3	Second millennium A.D.
E	Terraces	Simple	Quartzite, Phyllite, Slate	Regular faces	Quadrangular / rectangular	Medium to big	Regular	Absent	Rectangular with rounded angles	See Tables 2 & 3	Second millennium A.D.

Table 4: Characteristics of the construction groups identified at Raya-Raya.

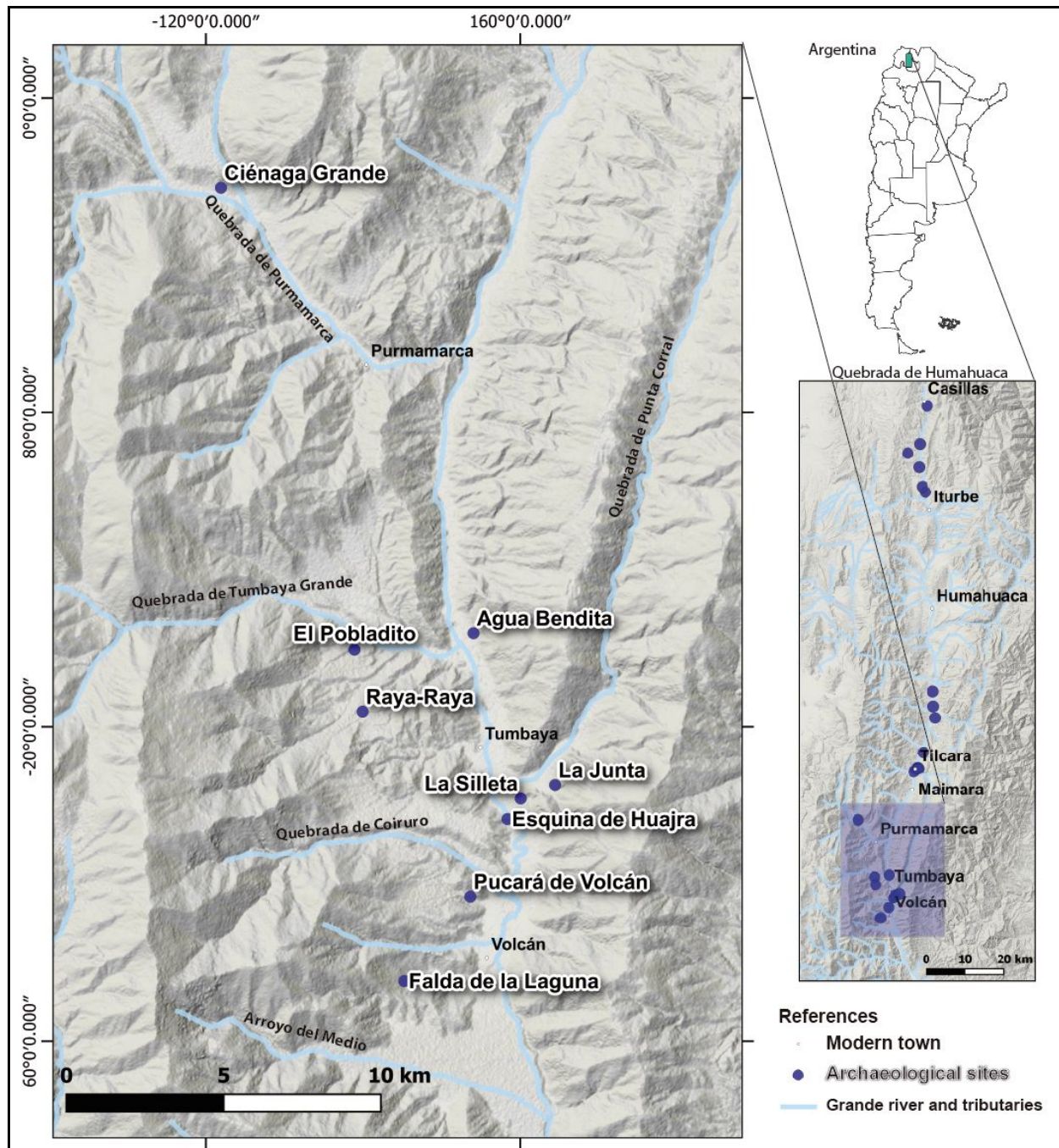


Figure 1: Map of the south central sector of the Quebrada de Humahuaca.

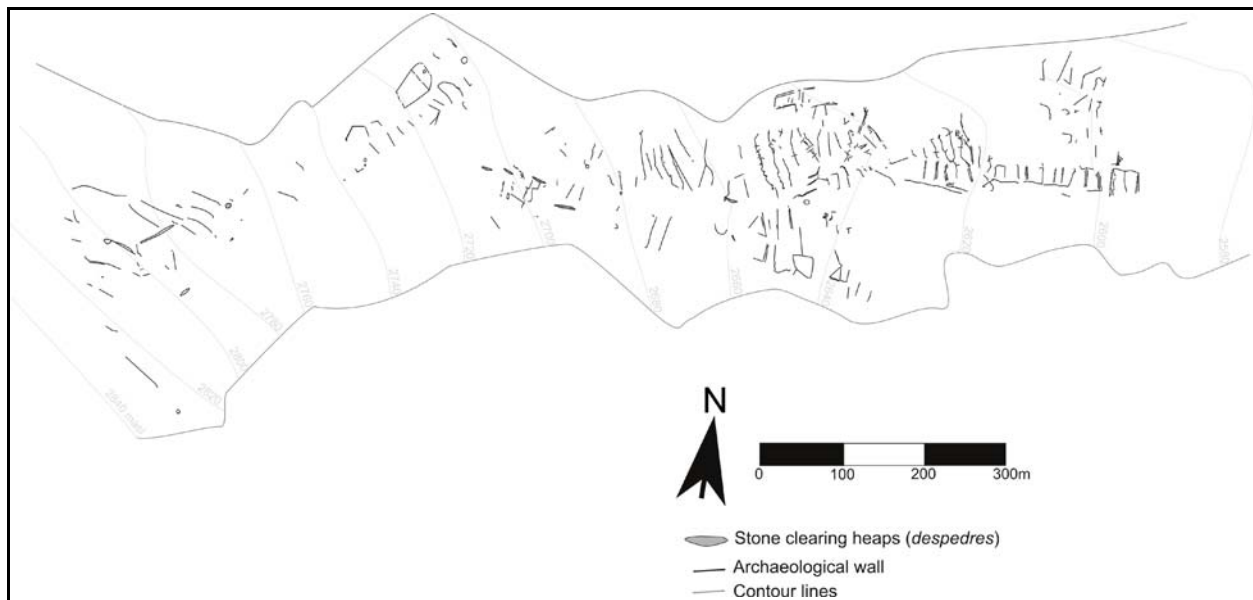


Figure 2. Plan of the Raya-Raya agricultural area.



Figure 3. The present-day planting fields at Raya-Raya.



Figure 4. Terraced fields in the central sector of Raya-Raya.

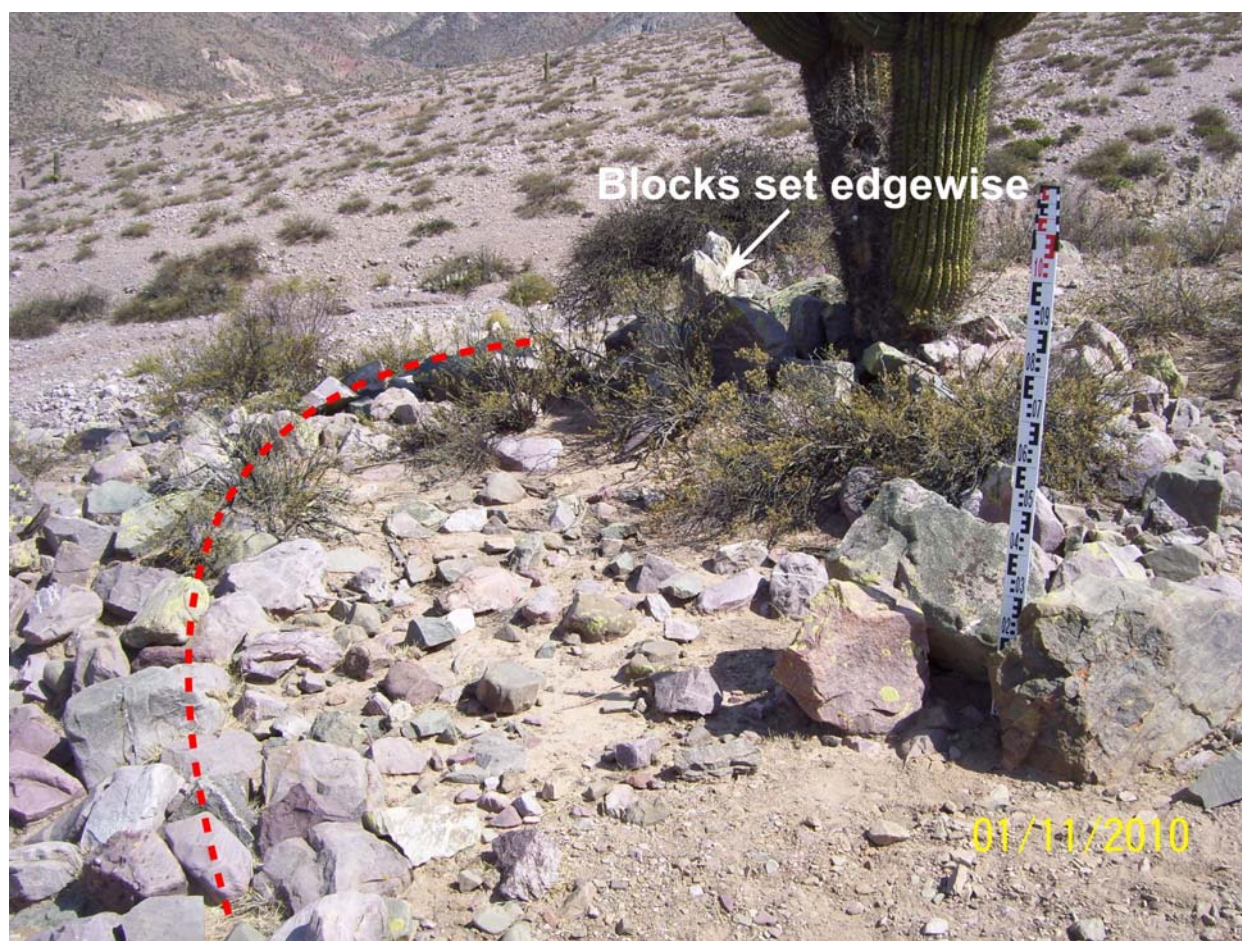


Figure 5. Enclosed field with a tenoned block of stone.
The dotted red line indicates the perimeter wall.



Figure 6. Rustic terraces.



Figure 7. Types of walls found at Raya-Raya. Left: double wall. Right: simple wall.



Figure 8. Raw material used in the structures of Raya-Raya.
Left: wall constructed entirely of quartzite. Right: wall made with various raw materials.



Figure 9. Blocks laid in a regular manner.



Figure 10: Wall made of irregular blocks.



Figure 11: Keyed blocks.

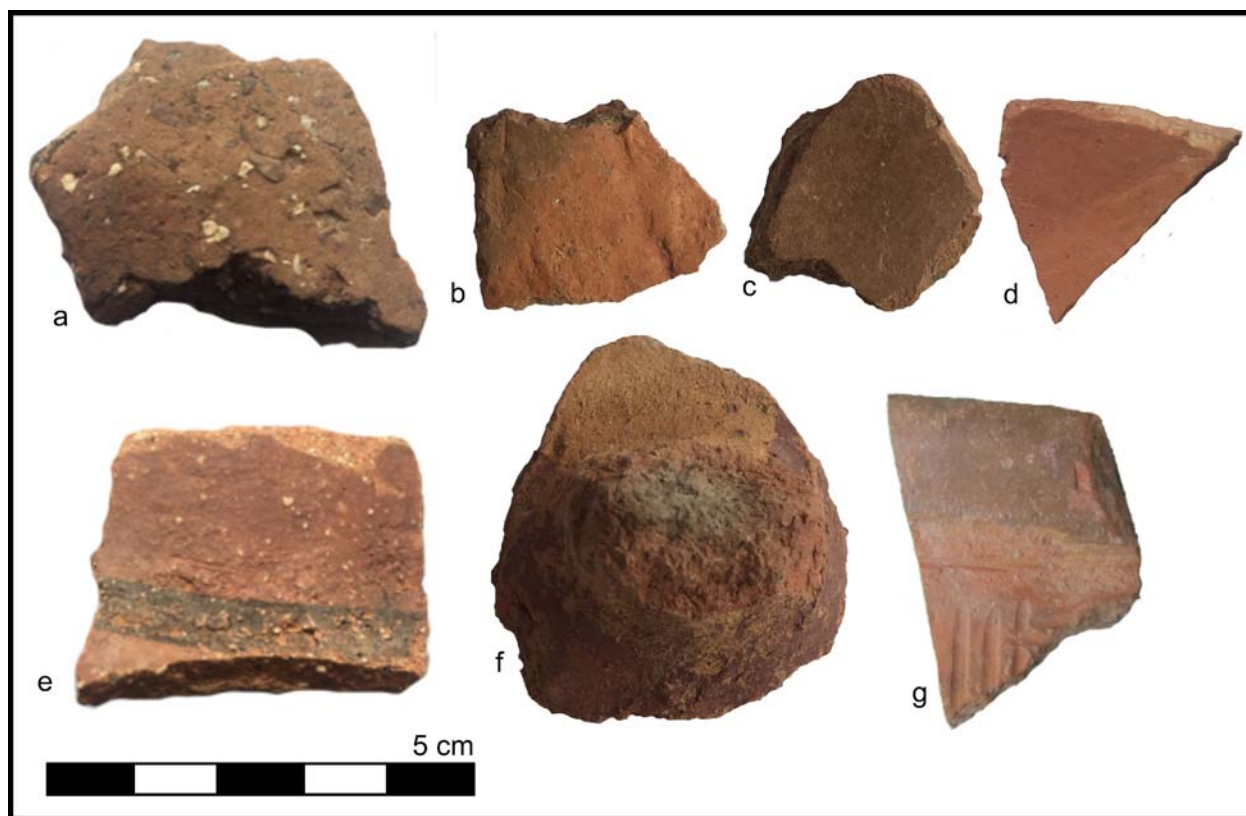


Figure 12. Ceramics found on the surface of Raya-Raya: a) ordinary; b) smoothed with a red slip; c) smooth polished brown ware; d) Yavi-Chicha; e) Casabindo painted; f) Humahuaca Black-over-Red; g) San Francisco tradition.

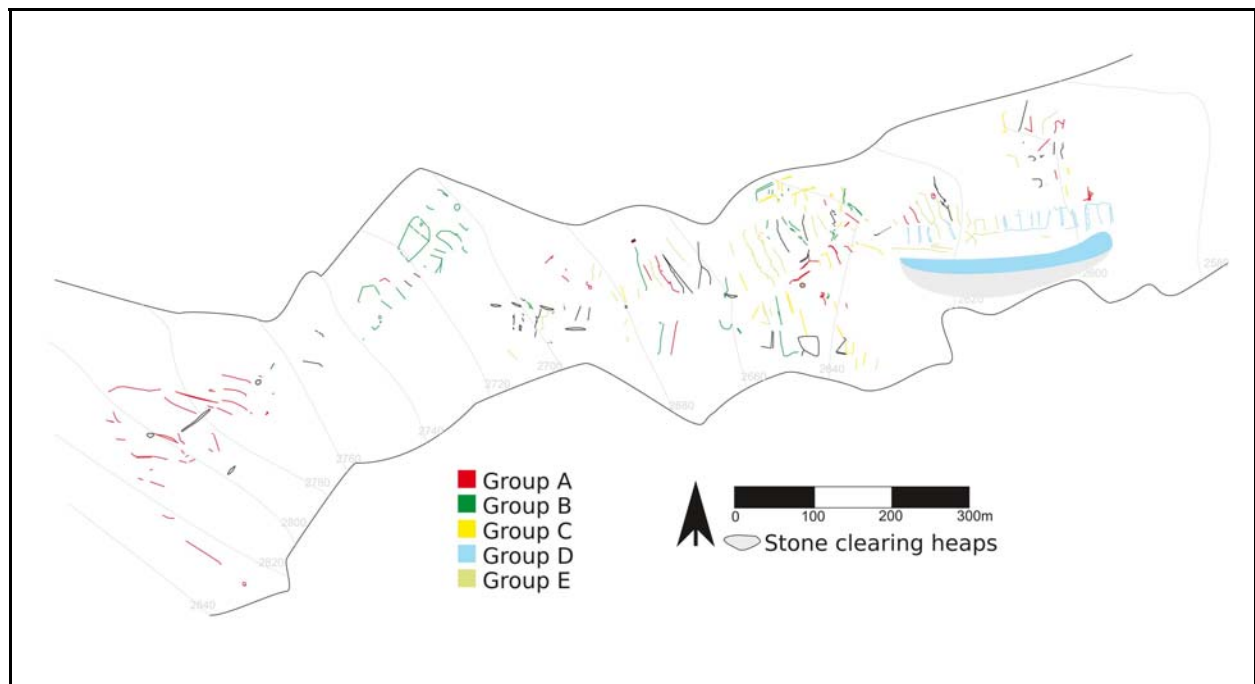


Figure 13. Plan of Raya-Raya on which groups of structures are identified.



Figure 14. Example of a terrace in Group A.



Figure 15. Example of a structure in Group B.



Figure 16. Example of a structure in Group C.



Figure 17. Rustic terraces recorded at Raya-Raya, part of Group D.



Figure 18. Example of a structure in Group E.

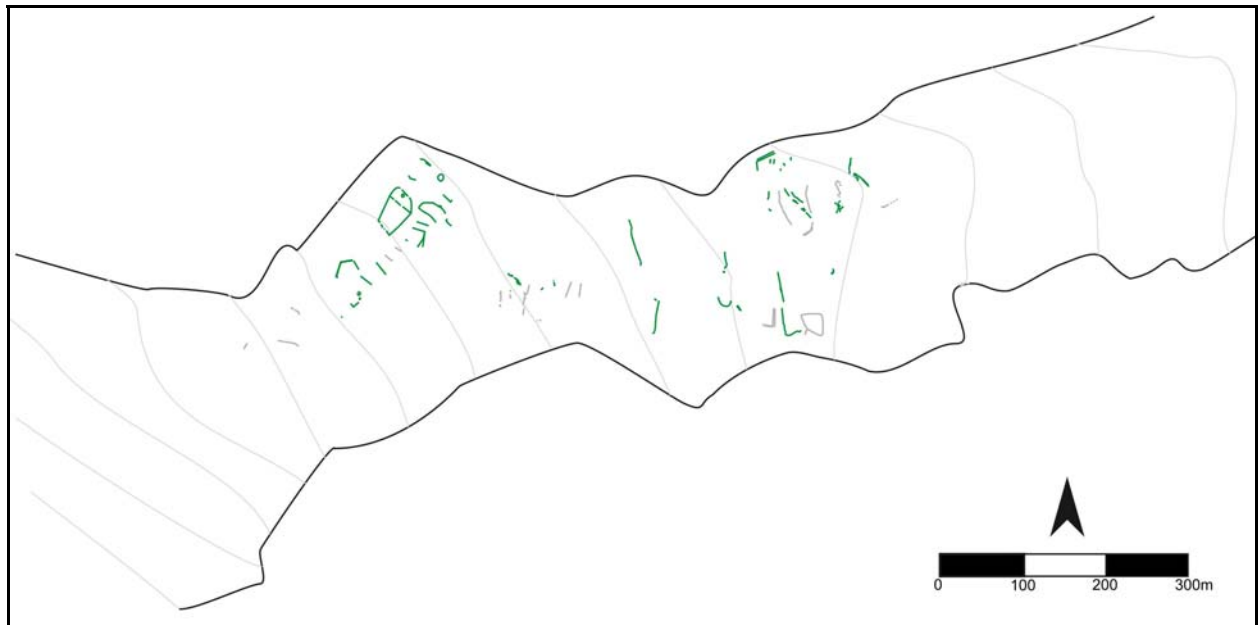


Figure 19. Enclosed field structures that may have been built during the first millennium A.D. (indicated by green lines). The gray lines represent structures that could not be identified, but which, based on their spatial configuration, could have been in use at this time.

