Tepeaca Kiln Project

Research Year: 2003
Culture: Aztec
Chronology: Pre-Classic
Location: Puebla-Tlaxcala Basin, Central México
Site: Tepeaca

Table of Contents

Summary

The Tepeaca Kiln Project is concerned with the evolution of pottery production and distribution and the processing of lime in the central highlands of México. From 1994-

1998, the Acatzingo-Tepeaca Project (PAT) found evidence of dense prehispanic settlement in the central Puebla-Tlaxcala Basin, including the remains of hundreds of ancient kilns. The Tepeaca Kiln Project is focused broadly on the investigation of these features and has three major objectives: (1) locating the features discovered by PAT and determining whether or not they represent ancient kilns, (2) ascertaining the function of the kilns, and (3) characterizing the level of organization (household vs. non-household) and the degree of craft specialization associated with the use of the kilns. In the summer of 2003, the project concentrated on a 3.2 km^2 area to the north of the town of Tepeaca, in which a total of 86 kilns were located, most believed to date to pre-Contact times. Both kilns believed to have been associated with ceramic production and kilns that apparently functioned in lime processing were found in the survey. Three lime kilns were excavated, one of which dates to the early Middle Formative Period, another to the early 20th century; to date, radiocarbon dating has not been done on material from the third excavated kiln. Although speculative at this time, low intensity production representing at best a part-time level of specialization is suggested by the available data for Middle Formative lime processing.

Resumen

El Proyecto de los Hornos de Tepeaca se refiere a la evolución de la producción y distribución de la cerámica y el proceso de la cal en el Altiplano Central de México. A partir de 1994-1998, el Proyecto Acatzingo-Tepeaca (PAT) encontró evidencia de asentamiento prehispanico denso en la Cuenca de Puebla-Tlaxcala central, incluyendo los restos de los centenares de hornos antiguos. El Proyecto de los Hornos de Tepeaca se enfoca ampliamente en la investigación de estes rasgos y tiene tres objetivos importantes: (1) localizar los rasgos descubiertos por PAT y determinar si o no ellos representen los hornos antiguos, (2) determinar la función de los hornos, y (3) caracterizar el nivel de la organización (casa contra no-casa) y el grado de especialización artesanal asociado con el uso de los hornos. En el verano de 2003, el proyecto concentró en un área de 3.2 km^2 al norte del pueblo de Tepeaca, en el cual un total de 86 hornos fue encontrado, el más creído para fechar a tiempos pre-Contactos. Ambos hornos creídos para haber sido asociados a la producción de alfarería y los hornos que funcionaron al parecer en el proceso de la cal fueron encontrados en el recorrido. Tres hornos de cal fueron excavados, uno de los cuales fecha al Período Formativo Medio temprano, otro al siglo XX temprano; hasta la fecha, el fechamiento radiocarbonico no se ha hecho en el material del tercer horno excavado. Aunque es especulativo en este momento, la producción de intensidad baja que representa por lo más un nivel de especialización de medio tiempo es sugerida por los datos disponibles para el proceso de cal durante el Período Formativo Medio.

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Figure 1. The Puebla-Tlaxcala Basin showing the location of the Acatzingo-Tepeaca Project survey area, 1994-98 (shaded).

Introduction

At the time of the Conquest, central Mexican society was characterized by a highly stratified social organization, state-level political structures, interlocking regional market systems, and a tremendous degree of economic specialization. These cultural attributes evolved over thousands of years beginning in the Formative Period (2000 B.C. to A.D. 300), although their early development and the dynamics of their evolution remain poorly understood. The Tepeaca Kiln Project is concerned with the development of two aspects of Mesoamerican economy, the production/distribution of pottery and the processing of lime. Dense prehispanic settlement was documented by the Acatzingo-Tepeaca Project (PAT) in the Tepeaca area from 1994 to 1998 (see Castanzo *in prep*) in the central Puebla-Tlaxcala Basin (Figure 1, shown above). This region can be described as temperate/semi-arid and has an average annual temperature of 16-17º C (see Aeppli and Schönhals 1975:7). It is characterized principally by ranges of low hills separated by flat expanses that are continuous with the vast plain of the rest of the basin (Castanzo 2002:96-100). Today, many hillsides in the area are heavily eroded

and large swaths of *tepetate* (a hardened calcareous substrate of volcanic origin) are exposed at the surface. Most of the local land is under cultivation, maize being the most common crop (ibid.).

The identification of pottery production in archaeological contexts has generally been based on artifactual evidence such as high densities of ceramics of particular types or forms or the presence of wasters (see Curet 1993; Rice 1987:179-180; Santley *et al*. 1989). The finding of actual firing facilities themselves is rare in Mesoamerican archaeology. Pit kilns have been found at Middle Formative Puebla-Tlaxcala sites (Abascal 1996[1975]) and at Classic Period Ejutla in the Valley of Oaxaca (Balkansky *et al*. 1997; Feinman 1999). Updraft kilns dating to the Classic Period have been found at Monte Albán (Feinman and Balkansky 1997; Payne 1982) and at Matacapan, an apparent Teotihuacán enclave in Veracruz (Pool 2000, 1997). Examples of lime production at Mesoamerican archaeological sites are even rarer (see Abrams and Freter 1996; MacKinnon and May 1990; Winter 1984), although the Tepeaca area is known to have paid a portion of its tribute to the Aztec Empire in the form of lime (Berdan and Anawalt 1992:100).

Hundreds of features considered to be the remains of prehispanic kilns were discovered in the PAT survey (see Castanzo 2002:301-308) and the Tepeaca Kiln Project is focused broadly on the investigation of these features. The 2003 season of this project had three major objectives:

1. Locating the features found in the PAT survey and determining if they are, in fact, kilns.

2. Determining the function of these kilns (lime processing, ceramic production, etc.) through excavation and an evaluation of surface remains and artifacts.

3. Characterizing the level of organization of production (household vs. non-household) and the degree of economic specialization.

Survey

A revisiting of all areas in which kilns were found in the PAT survey in the mid-1990s was found not to be feasible. Instead, efforts were focused on one area with a particularly high density of identified remains: 3.2 km^2 on the southern faces of Cerro Tlaquexpa and Cerro Atlacuilo (Figure 2). Using satellite images, aerial photography, and topographic maps, all kilns located by PAT in the mid-1990s were sought out through pedestrian survey. A number of kilns could not be located in 2003, while others were found and determined not to be the remains of ancient kilns. In several instances, kiln remnants were found that were not registered by PAT, although a general survey of the area searching for here-to-fore undiscovered features was beyond the scope of the Tepeaca Kiln Project in its first season, which involved a two-person surface

reconnaissance. In all, the remains of 86 kilns were found (Figure 3), of which 37 are believed to have been used in lime processing (three of these were excavated). A total of seven others is believed to be associated with Formative Period pottery production. All of the kilns were described, plotted, and, with two exceptions, photographed. In several cases, pieces of carbonized tepetate were removed for future radiocarbon dating. Ceramic and limestone samples were also taken for instrumental neutron activation analysis (INAA) at the Smithsonian Institution facility in Gaithersburg, Maryland.

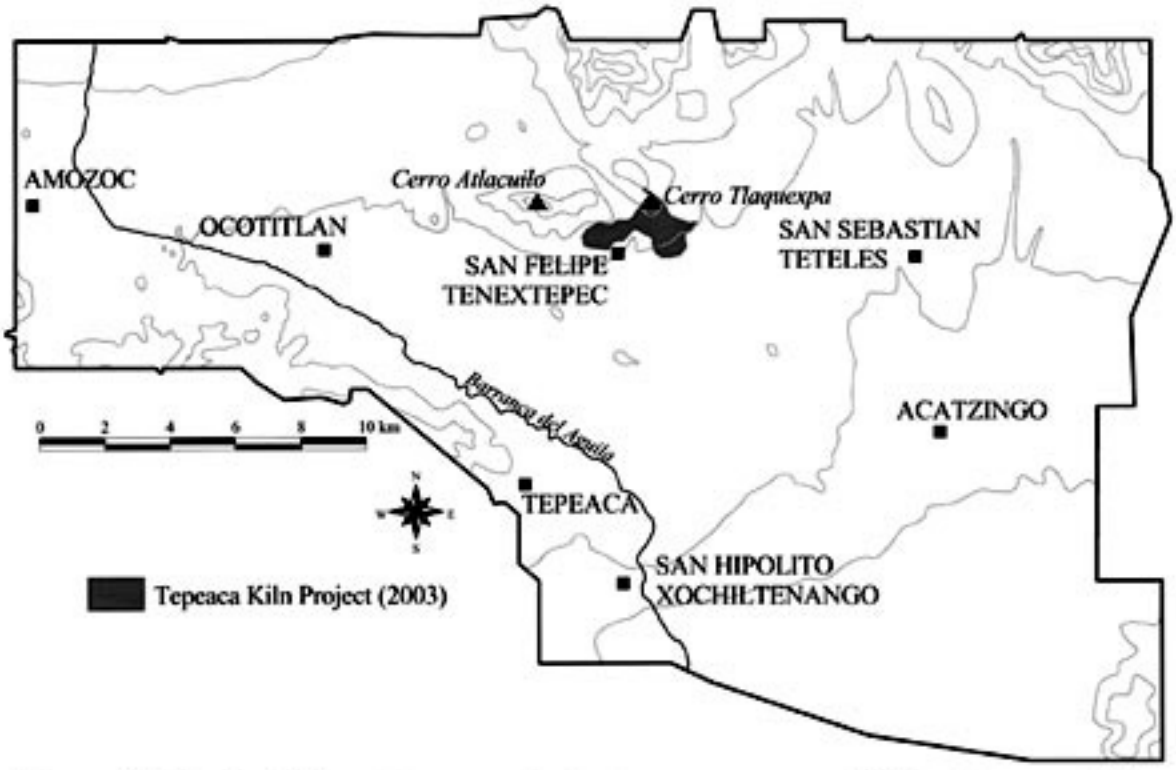

Figure 2. The Acatzingo-Tepeaca Project survey area with the Tepeaca Kiln Project coverage in 2003.

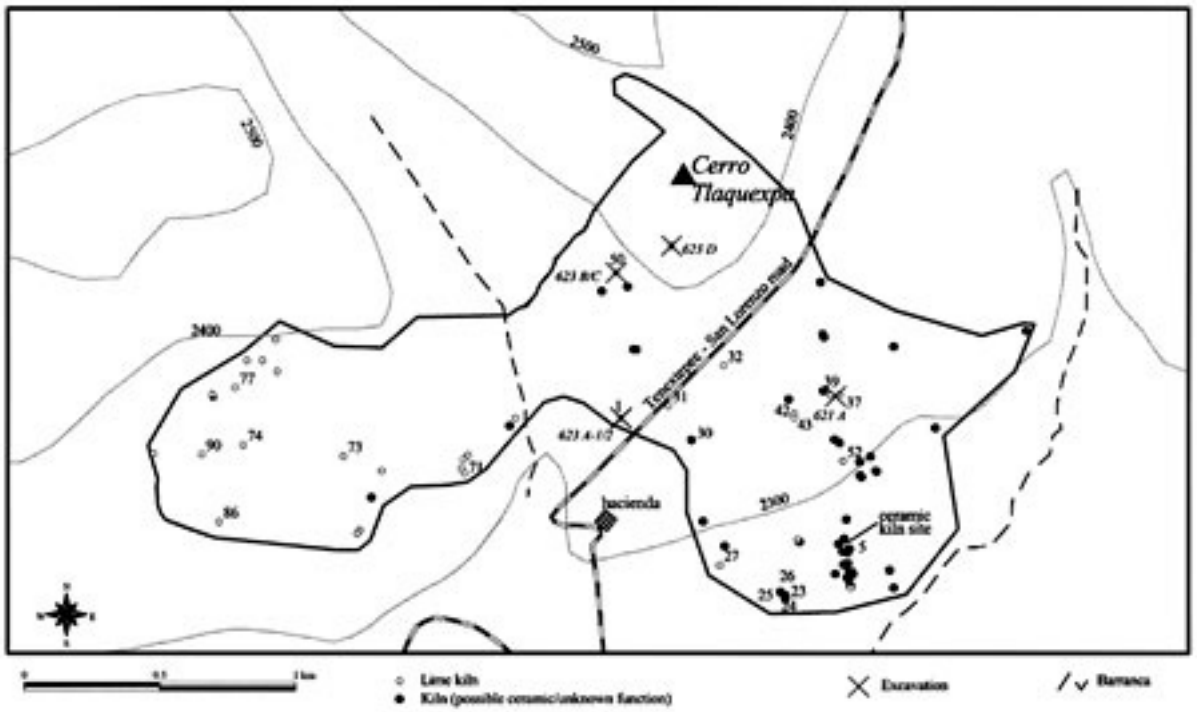

Figure 3. The Tepeaca Kiln Project in 2003 showing the locations of kilns and excavation units. The identification numbers of kilns with dated pottery are shown.

With the exception of a large historic lime kiln on Cerro Atlacuilo, all of the kilns found are believed to have been pit kilns excavated directly into the underlying *tepetate*. Kiln remains were identified typically on the basis of sections of oxidized or carbonized *tepetate* ranging from perhaps just a few centimeters to the virtual entirety of the kiln rim. These prehispanic pit kilns were generally oval or circular and 1-2 m in diameter. Surface collections of ceramics were made in 24 cases (including 17 apparent lime kilns) where collections were possible and material was recovered dating to Formative, Classic, Postclassic, and Colonial times (Table 1, shown below). Dating the kilns based on small numbers of sherds was found to be problematical, however. Fortunately, the group of kilns believed to be associated with Formative Period pottery manufacturing is associated with very high densities of potsherds (hundreds per m^2 in places) allowing for much firmer preliminary dating of these features.

Table 1. Results of Analysis of Ceramics from Excavated and Surface Contexts: 2003 Season	
Surface collections made at kilns are given the prefix "K". Time periods represented in the assemblages are presented: Formative = F, Classic = C, Postclassic = PC, and Colonial = COL.	
Context*	**Periods represented**
621 A-1-a	F-PC
621 A-1-b	F-PC
621 A-1-c	F
621 A-1-d	F
621 A-1-e	F
623 A-1-a	C-PC
623 A-1-b/c	F-C
623 A-1-d	F-C-PC-COL
623 A-1-f	C-PC-COL
623 A-1-g	C-PC
623 A-1-h	C
623 A-1-i	C-PC
623 A-1-j	C
623 A-1-k	C-COL
623 A-1-l	C
623 A-1-m	C
623 A-1-n	C
623 A-1-o	F-C
623 A-2-b	C
623 A-2-d	C
623 A-2-e	C
623 A-2-f	C-PC-COL
623 A-2-g	C
623 A-2-h	C
623 A-2-i	F-C
623 A-2-j	F-C
623 A-2-k	C-PC
623 A-2-l	C
623 A-2-m	C
623 A-2-n	C
623 A-2-o	F-C
623 A-2-p	C
623 A-2-q	C-PC
623 A-2-s	C-PC
623 A-2-t	C-PC-COL

623 A-2-u	C-PC
623 A-2-v	C-PC-COL
623 C-1-a	C-PC
623 C-1-c	PC
623 C-1-e	C
623 A-1-e	F-C-PC-COL
K5	FC
K23	F-C-PC
K24	F-C
K25	FC
K26	FC
K27	PC-COL
K30	COL
K31	F-PC
K32	PC
K37	PC
K39	PC
K42	F
K43	F
K50	F-C-PC
K52	F
K71	F
K73	F
K74	F-C
K77	F
K86	F
K90	F-C
***Note:** Only contexts with datable material are shown.	

Excavations

A total of six units were excavated involving three kilns and three areas associated with kilns on the Cerro Tlaquexpa hillside. Five units were placed within the limits of PAT site 623 and one was placed in PAT 621; PAT site numbers were used to designate these excavations. All were within 700 m of the road between San Felipe Tenextepec and San Lorenzo. From a number of contexts, ceramic and limestone samples were taken for INAA analysis at the Smithsonian Institution.

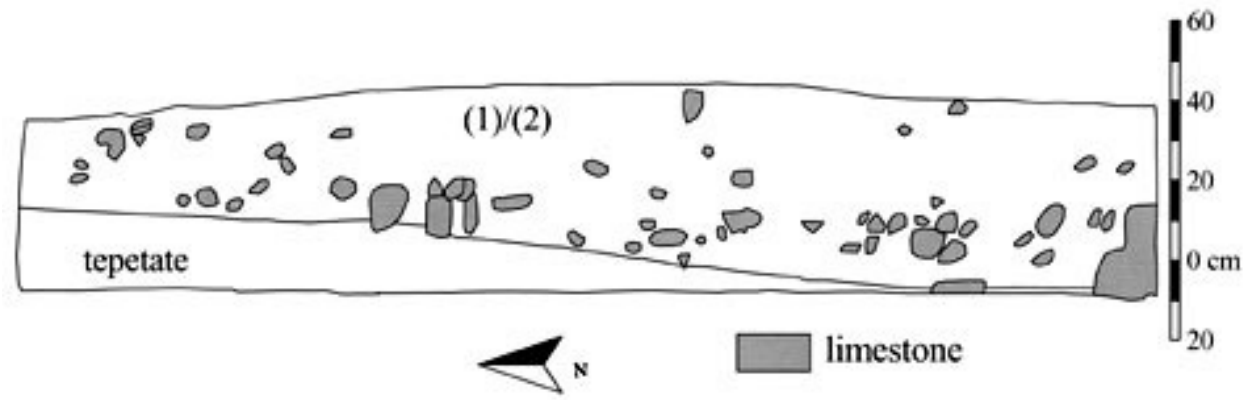

Figure 4. Excavation 621-A, east profile.

Operation 621-A

This excavation consisted of a 3 × 1 m unit situated approximately equidistant (20 m) from kilns K37 and K39 in an area with dense mounded limestone rubble at the surface (Figure 4, shown above). The excavation proceeded to *tepetate*, encountered throughout the pit first in the northern area (at approximately +10 cm, relative to the datum) and eventually in the southern area (at approximately -10 cm). The natural/cultural stratigraphy is divided into two contexts:

1. Lot a; silty-sandy earth several cm thick (10yr 4/1), 45-28 cm to 38-23 cm above the datum; root zone, but otherwise appears to be same matrix as context [2]; very rich in ceramics; limestone chunks frequent; ceramic material both Formative and Postclassic.

2. Lots b, c, d, e, f; appear to be continuous with context [1]; silty-sandy earth 19-46 cm thick (10yr 4/1), 38-23 cm above to 10 cm below datum; all lots were very rich in ceramics; limestone chunks frequent; lot b contained a very minor presence of Postclassic Period ceramic material, otherwise apparently entirely Middle Formative.

Figure 5. Photograph of the excavation 623 (Suboperations A-1 and A-2).

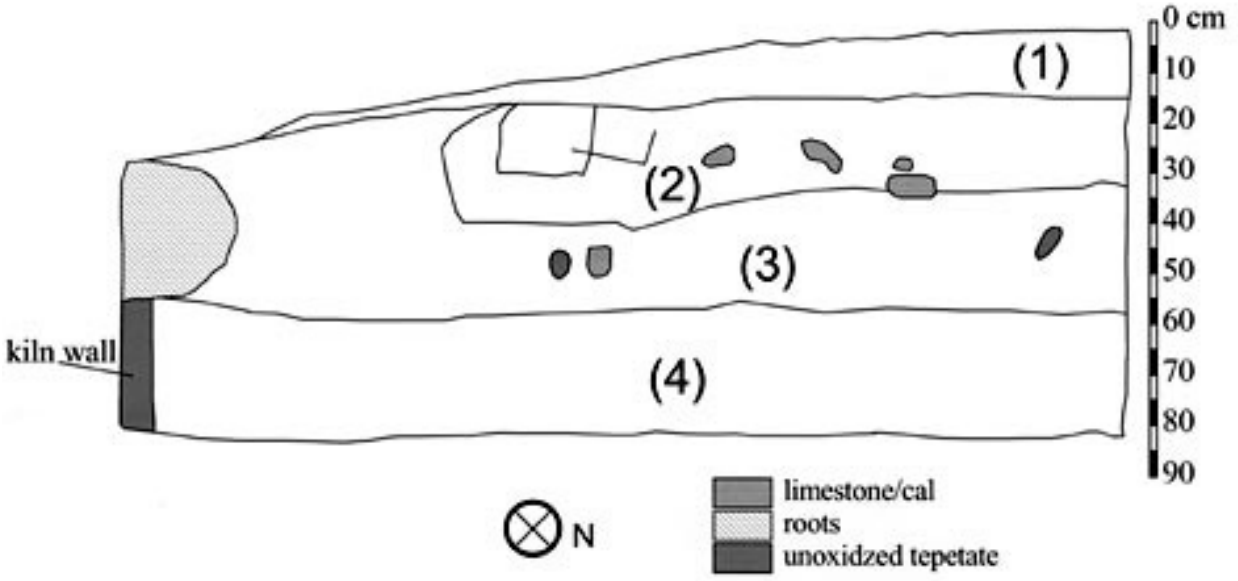

Figure 6. Excavation 623-A-1, north profile.

Operation 623-A

Suboperation A-1 consisted of a 2 × 2 m unit directly above and approximately to the east of kiln K1, at the edge of a large earth island on the exposed *tepetate* (Figure 5). The surface of the island within the unit ranged from 2 cm below the datum (situated near the northeast corner) at the northeast corner to approximately 50 cm below the datum in the southwest corner. The unit was eventually excavated to 80 cm throughout (Figure 6). The cultural/natural stratigraphy in the unit is divided into four contexts:

1. Lots a, b, c, d, g, i; 2-15 cm of loose earth (10yr 5/2) of the root zone, 2-62 cm below datum; cultural material dates to the Classic, Postclassic, Colonial, and possibly Formative periods.

2. Lots f, h, j, k; 12-23 cm of silty, more compact earth (5y 2.5/2), 2-48 cm below datum; cultural material is reflective of Classic Period occupation, although some Postclassic and Colonial material was uncovered; chunks/masses of lime common.

3. Lots e, l, m, n, o; 15-42 cm of looser silty earth (5y 4/2), 17-68 cm below datum; cultural material is reflective of Classic Period occupation, although there appears to be significant mixing in lot e (Postclassic and Colonial material found) possibly at least in part due to the significant root intrusion in the northwest corner of unit; chunks/masses of lime common.

4. Lot p; 8-34 cm of sterile tepetate with frequent veins of lime (10yr 4/4 with white streaks), 68-80 cm below datum.

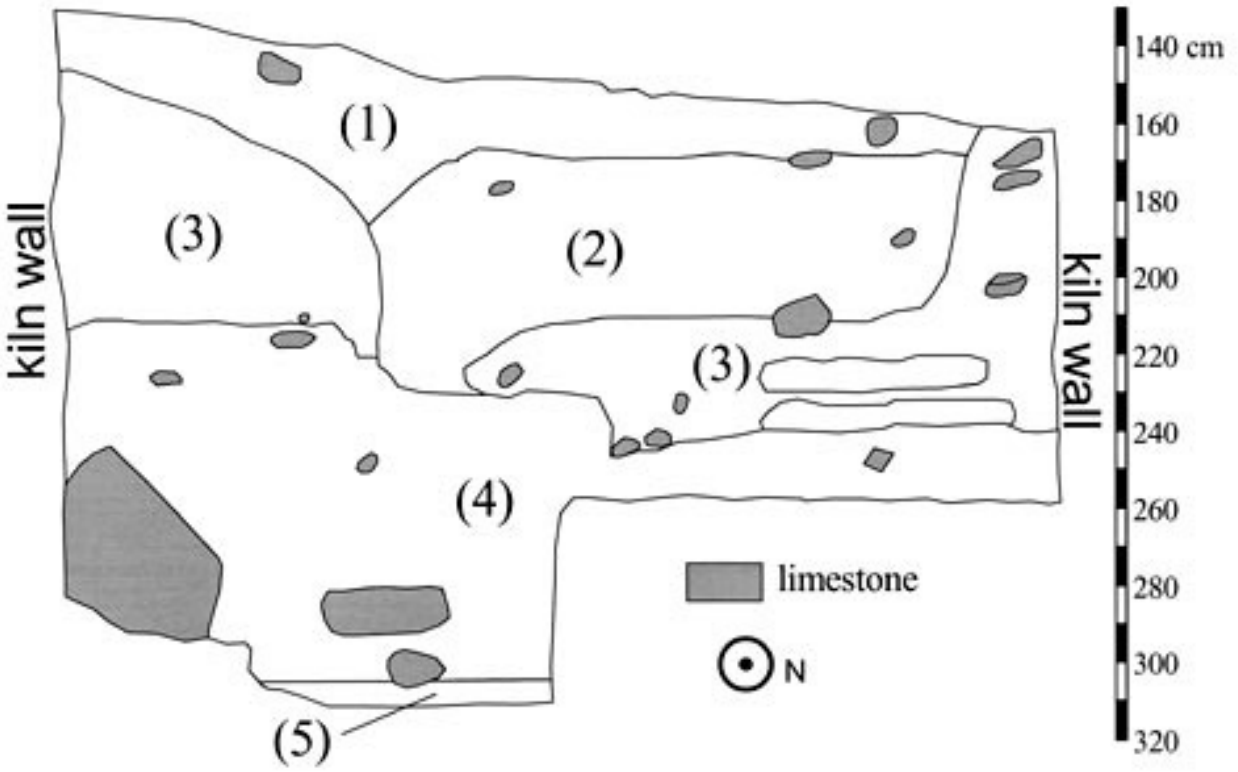

Figure 7. Excavation 623-A-2, south profile.

Suboperation A-2 consisted of the northern one-half of kiln K1 lying just off the western edge of the large earth island (below Suboperation A-1). A few meters further west lies a small channel formed by local seasonal run-off. The ground surface within the portion of the kiln wall visible above ground is 131-161 cm (sloping away from the island) below the datum. Ultimately, the excavation proceeded to the base of the kiln, 311 cm below the datum (Figure 7). Beginning at a depth of about 260 cm, excavation was conducted only in the eastern half of the unit (a one-quarter section of kiln). The walls of the kiln are comprised of highly oxidized *tepetate* (reddish-orange in color) approximately 20 cm thick. The floor of the kiln is composed of oxidized or blackened *tepetate* with frequent white (lime) inclusions. The fill within K1 is a combination of alluvium resulting from the actions of the ephemeral stream that runs today just to the west and soil eroding from the island itself. Chunks of limestone were common throughout. The natural stratigraphy is divided into five contexts:

1. Lots a, b, c; 10-40 cm of silty, sandy earth of the root zone (10yr 3/2), 131-185 cm below datum.

2. Lots d, e, h, i, j, l, n, o; 40-60 cm of clayey soil (10yr 2/1), 169-231 cm below datum; generally in center of the kiln.

3. Lots f, g, k, m, p; 36-78 cm of sandy soil, 147-245 cm below datum; ranges from courser/more frequent chunks of oxidized *tepetate* (10yr 2/1 with reddish inclusions) in the western area of kiln to somewhat finer earth (5y 3/1) in eastern area; essentially wraps around central, more clayey soil in center of kiln; some deposits of sand were also found in southern area of this context approximately 220-240 cm below the datum.

4. Lots q, r, s, t, u, v; very sandy soil about 100 cm thick (10yr 3/3) in the excavated one-quarter area taken to the kiln base, extending 211-306 cm below the datum; extends down to oxidized/blackened *tepetate* near the kiln wall and context [5] in the center of the kiln; limestone chunks are frequent throughout as are masses of lime near and on the kiln floor.

5. Lot w; high charcoal content 4-7 cm thick (N 2.5/), 306-311 cm below the datum; removed from circular pit (approximately 160 cm in diameter) dug into the center of the floor of the kiln as part of kiln construction (Figure 8, shown below).

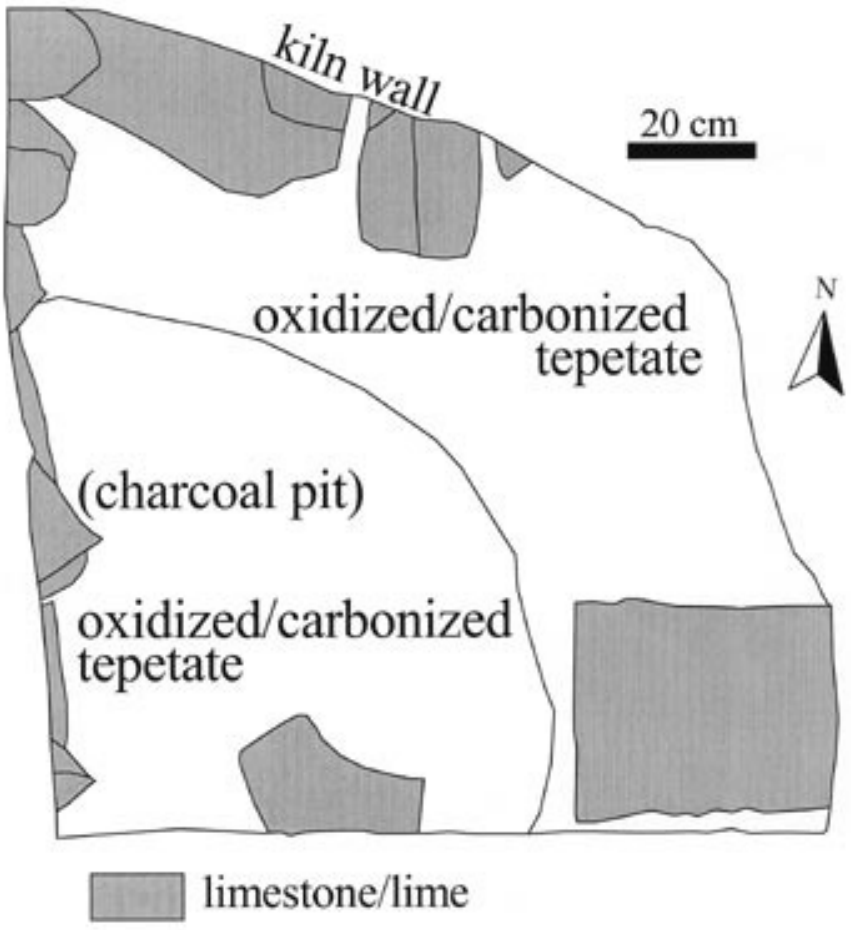

Figure 8. Excavation 623-A-2, plan (kiln floor).

Charcoal from lot w was radiocarbon-dated to A.D. 1913±50 (uncalibrated). Thus, the kiln is not at all associated with the prehispanic (Classic Period predominating) site excavated above in 623-A-1, although this site was undoubtedly the source of much of the fill within the kiln. At least some of the larger chunks of limestone (one was 50 cm on its long axis) probably lined the edges of the original kiln opening and subsequently tumbled into the kiln after it went out of use. Thus, the kiln was essentially a cylindrical pit almost 3 m in depth. It was into the prehispanic site that the historic lime kiln (K1) was constructed early in the 20th century probably in association with construction or renovation at a nearby hacienda, the ruins of which lie approximately 400 m to the southeast (bricks were found as part of context [4] identical to those of the hacienda).

Figure 9. Kiln K50 (facing east) as it appeared prior to excavation.

Operation 623-B

This operation was the excavation of an oval pit kiln (approximately 2 × 2.5 m), designated K50 (Figure 9, shown above), in a 2 × 2 m unit. A small section of the kiln edge was visible at the surface. On the surface of the mounded limestone rubble,

sherds dating to the Postclassic Period were found. A pile of limestone rubble filled the kiln to a height of 31 cm above the level of the *tepetate*. The level of the *tepetate* ranged from +5 cm in the northeastern corner of the unit to -28 cm in the southeastern corner (measurements relative to the datum). The dish-shaped pit was dug directly into the *tepetate* substrate down to a depth of approximately 40 cm (55 cm below the datum) at the center; the walls of the pit were lined with large pieces of limestone (Figure 10 and Figure 11).

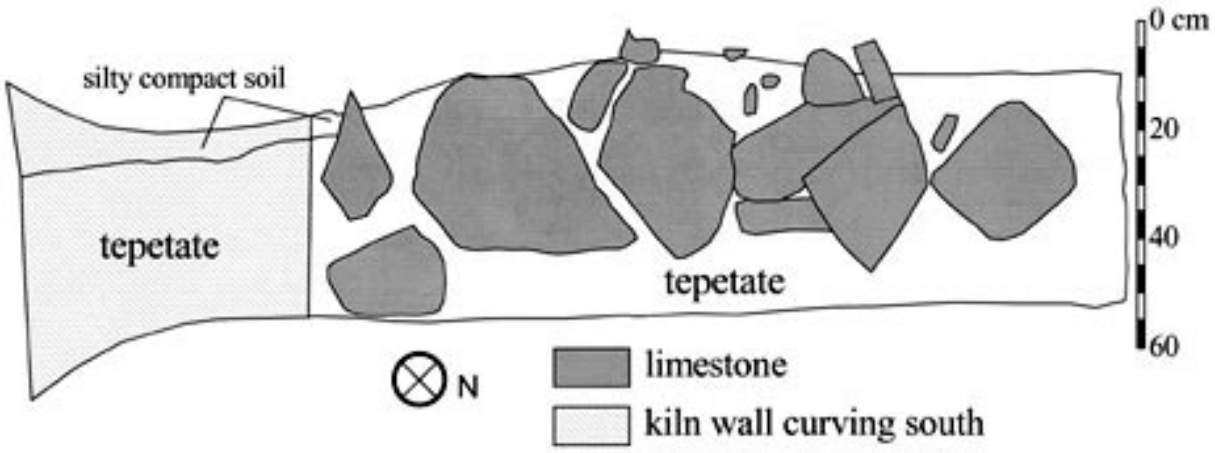

Figure 10. Excavation 623-B, north profile.

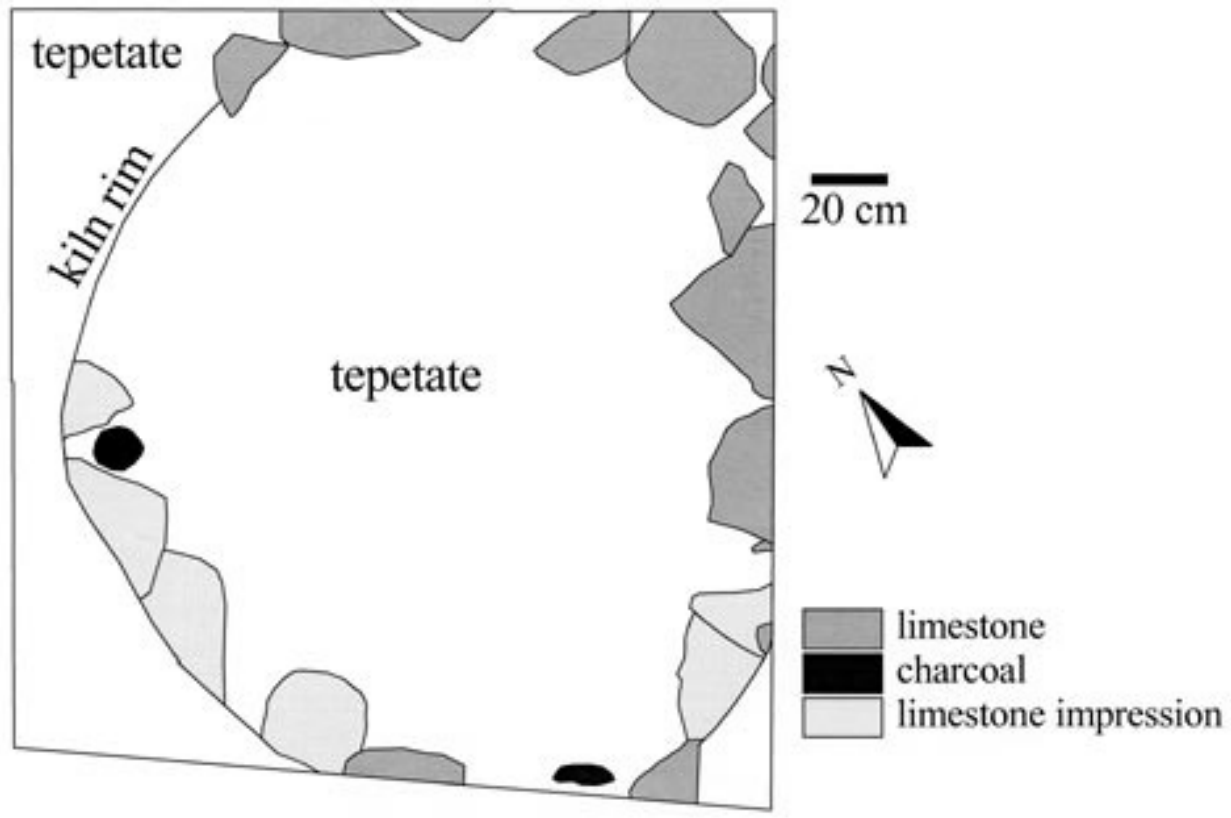

Figure 11. Excavation 623-B, plan.

The fill within the pit was mostly limestone chunks (some over 40 cm on their longest axis) together with silty to clayey-silty soil. The fill can be divided into two contexts:

1. Lots a, b, c, d, e; 55 cm of mostly limestone rubble (the size of which increased with depth) together with medium to dark brown silty soil (from 24 cm above to 31 cm below the datum); a small amount ceramic material was recovered. In lot b was found a Terminal Formative-Classic Period rim sherd.

2. Lots f, g; 24 cm of mostly limestone rubble together with darker, somewhat more clayey silt (31-55 cm below the datum); more frequent charcoal and lime pieces than matrix above.

K50 is interpreted as having functioned as a lime-processing kiln. Charcoal recovered in lot f was radiocarbon-dated to 1000 B.C. (1200-850 B.C. at 95% probability), lying on the cusp of local Early and Middle Formative periods. The Terminal Formative-Classic sherd found in lot b, the virtual entirety of which lay above (and outside of) the pit itself, is therefore an intrusive element along with probably most or all of the soil recovered with the limestone rubble (believed to have been deposited as a single event).

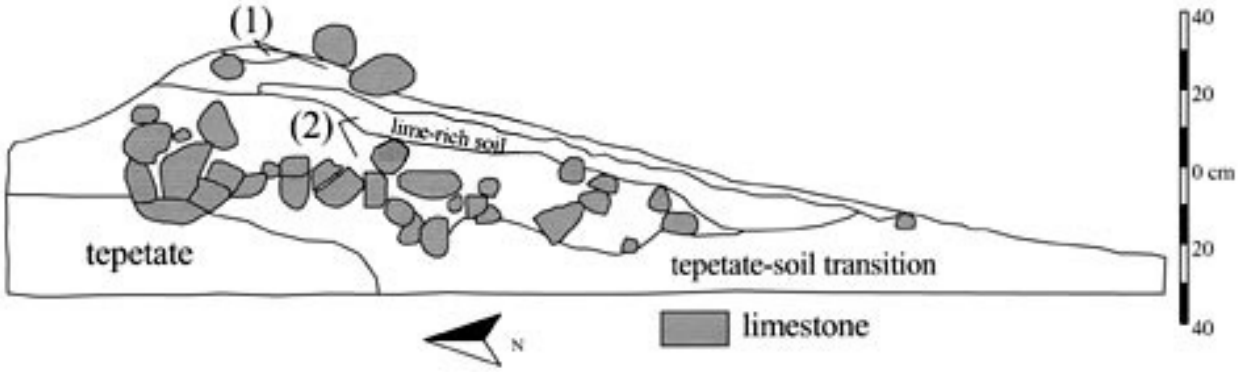

Figure 12. Excavation 623-C, east profile.

Operation 623-C

This 1 × 3 m unit was excavated a few meters to the southwest of the 623-B unit (K50) in limestone rubble similar in character to that of 623-B, although no kiln rim was visible at the surface (Figure 12, shown above). Limestone chunks in addition to some charcoal and lime pieces were found throughout. This area may have been associated with the operation of nearby K50. The stratigraphy is divided into two contexts:

1. Lots a, e; 10-20 cm thick top layer of sandy-silt soil/rubble (2.5 4/1), 28 cm above to 31 cm below the datum; a small amount of Postclassic Period ceramics was recovered.

2. Lots b, c, d; sandy-silty 30 cm thick (8 cm above to 22 cm below the datum); small amount of Classic and Postclassic ceramics recovered; somewhat more lime and charcoal pieces than above.

Figure 13. Kiln K51 (facing west) as it appeared prior to excavation.

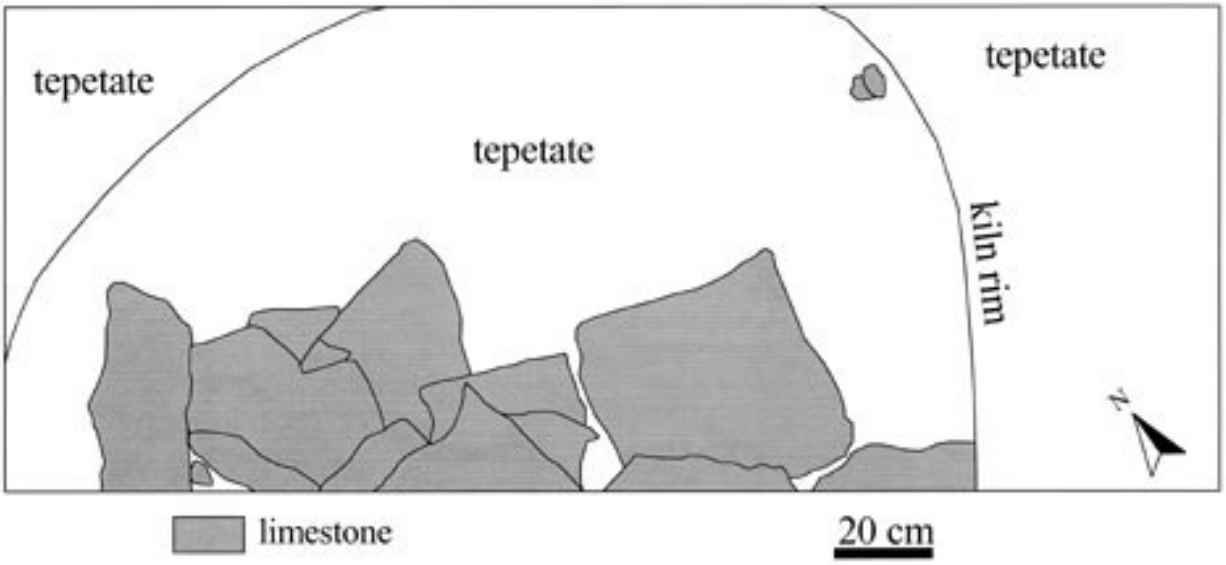

Figure 14. Excavation 623-D, plan.

Operation 623-D

This excavation consisted of a 1 × 2.5 m unit that bisected K51, an approximately circular (2 × 2 m) lime pit kiln excavated directly into the sloping *tepetate* of Cerro Tlaquexpa (Figure 13 and Figure 14). Most of the kiln rim was visible at surface. No material was recovered on the surface of this site, but it is very similar in character to K50 (and many of the other apparent lime kilns) in that it consists mainly of mounded limestone rubble (approximately 25 cm above the level of *tepetate* and 15 cm below the datum at its highest point). The fill within the pit was comprised mostly of limestone chunks (and masses of lime) together with sandy-silty soil (Figure 15).

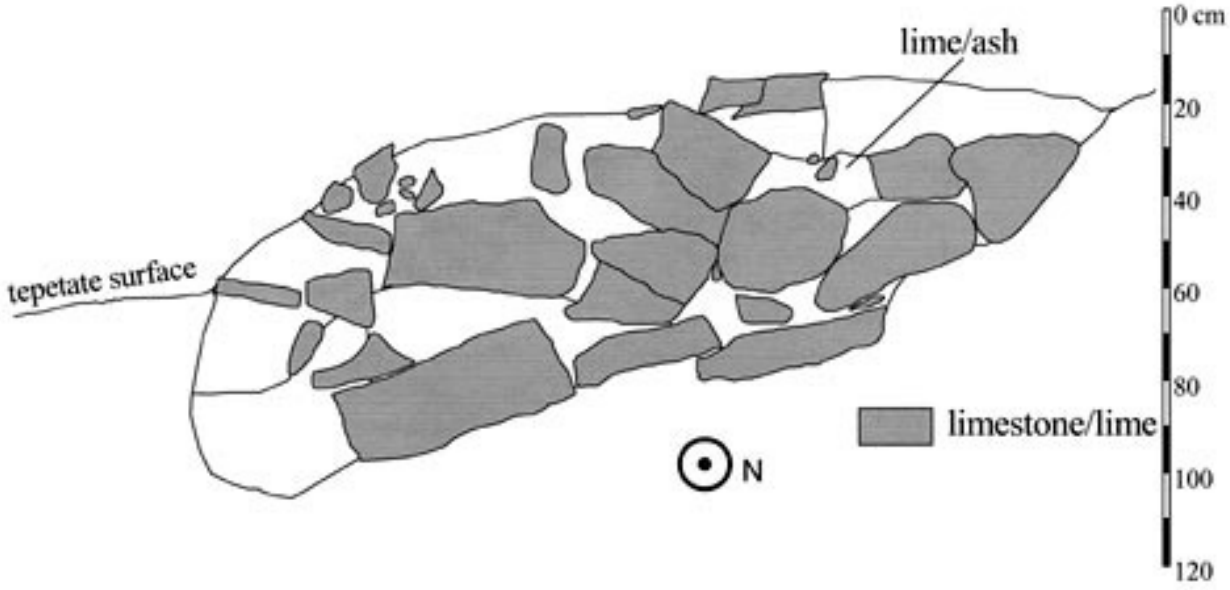

Figure 15. Excavation 623-D, south profile.

Several carbon samples were recovered, but none has been analyzed to date. The excavation continued to the *tepetate* floor of the kiln 105 cm below the datum at its deepest at its eastern edge (the furthest down slope). In its center, the floor of the kiln lies approximately 55 cm below the level of the *tepetate* (100 cm below the datum). Although some changes in soil color and texture were evident, the limestone rubble fill in the pit is believed to have been deposited in one event designated context [1]:

1. Lots a, b, c, d, e, f; sandy-silty earth approximately 75 cm thick at its maximum, 25-105 cm below the datum; frequent limestone chunks getting larger with increasing depth (one was 45 × 45 × 20 cm).

Discussion

Scores of features initially discovered by the Acatzingo-Tepeaca Project survey (most during its 1995 season) could be confirmed as being the remains of kilns, many of which probably date to pre-Contact times, although at least three large historic kilns were found. With the exception of one large historic updraft lime kiln (3.6 m in diameter), these kilns appear to have been pit kilns, oval/circular in shape, generally 1-2 m in diameter. Based on the excavations performed, it is believed that the floor of these pit features is typically approximately 0.5 m below the level of the *tepetate*. In 37 cases, lime processing is believed to have been the major function of the kilns. This function was confirmed for the three kilns that were excavated, one of which was radiocarbon-dated to the early 20th century, another to the early Middle Formative Period. Pottery production has been inferred for a group of several kilns on the lower slopes of Cerro Tlaquexpa preliminarily dated to the Formative Period.

Unfortunately, the heavily eroded nature of the area of the Middle Formative kiln made any characterization of the organization of lime processing in prehispanic México impossible. Likewise, questions surrounding the development of craft specialization must remain speculative at this time. However, the relatively small size of K50 would arguably mitigate against a very intensive level of production or high degree of specialization. A household level of production with, at best, part-time specialization is suggested by the available data.

Conclusion

The results of the first season of the Tepeaca Kiln Project demonstrate the great promise of the study of kiln remains in the Tepeaca region. Many features can easily be confirmed as being pit kilns probably dating to prehispanic times. However, many more kilns were apparently used in lime processing as opposed to ceramic production than thought prior to the 2003 season (although this is not surprising given the known sources of lime in the immediate vicinity) and these kilns have very little if anything in the way of surface artifacts. A sensible approach to the future study of local lime kilns would be to use radiocarbon dating on carbonized *tepetate* prior to excavation so that valuable field time is not wasted on potentially post-Contact features.

Funding is currently being sought for the extensive excavation of the Formative Period ceramic production site located on Cerro Tlaquexpa in the summer of 2004. Time was not available in the 2003 season to adequately investigate or excavate this site. The site is an approximately 2,000 m2 island of earth, approximately 50 cm in depth, on the exposed tepetate of the hillside. The remains of seven kilns (Figure 16) have been found at the edges of this island in addition to very high densities of Formative Period potsherds (Figure 17). In one instance (K63), half of the kiln rim is exposed, the other half still buried beneath 50 cm of earth. In addition to the excavation of the Formative Period pottery production center, funding is also being sought for INAA on sherds collected by PAT now being curated in Puebla, México, by the Instituto Nacional de

Antropología e Historia (INAH), to be carried out in 2004-2005. The INAA of sherds obtained in the 2003 field season are providing preliminary data for this larger, more comprehensive study of prehispanic ceramic production and exchange in the Tepeaca area.

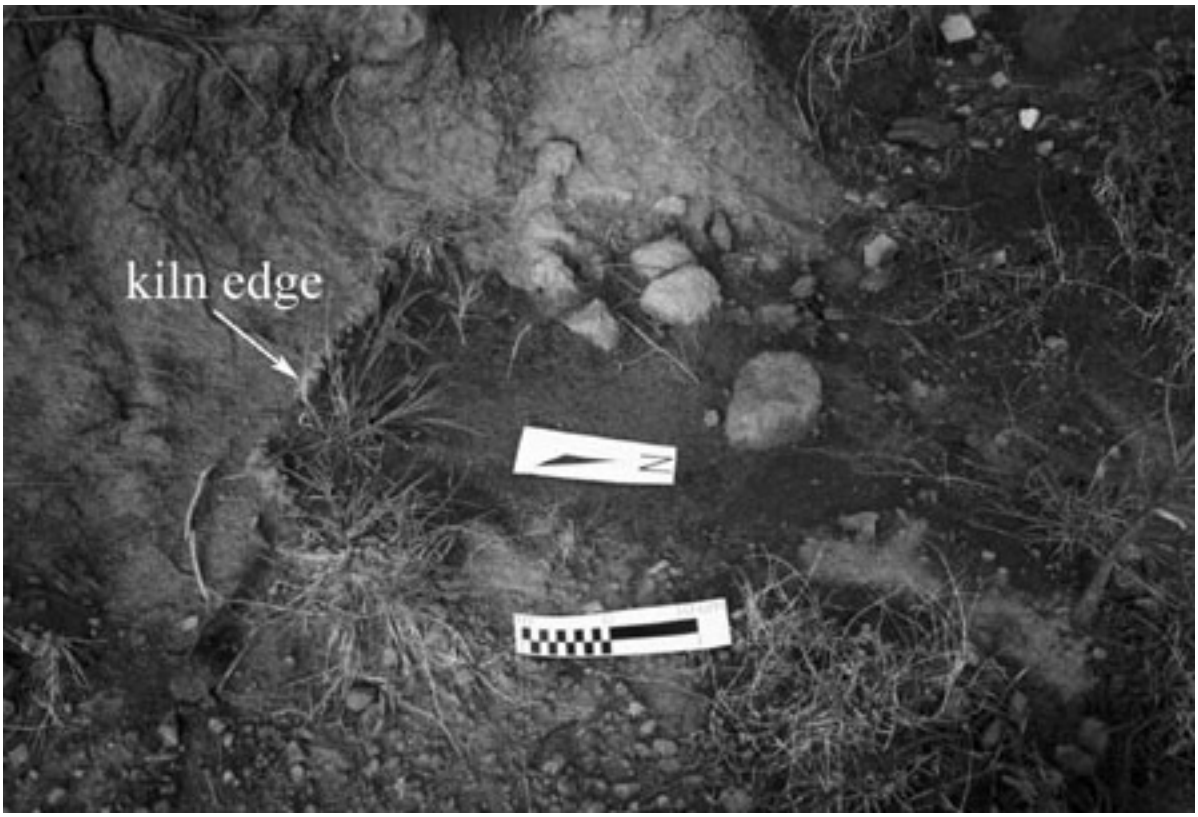

Figure 16. Remains of an oval pit kiln at the Formative Period site at which excavations are planned in 2004.

Figure 17. Formative Period ceramic kiln site facing east; a very dense concentration of sherds can be seen in the foreground as well as a small pothunter's pit in the upper left at the edge of the earth island.

Acknowledgements

I would like to thank the Foundation for the Advancement of Mesoamerican Studies, Inc., (FAMSI) for funding this research. As always, the people of the Instituto Nacional de Antropología e Historia (INAH) of México, both in México City and at the Regional Center in Puebla, were generous in their assistance and support. Ken Hirth provided me with invaluable advice in designing and implementing this research. The Smithsonian Institution has provided me with considerable resources and support in analyzing and integrating these data. Heath Anderson's experience and efforts formed an integral part of the field season. Lastly, I need to thank the people of Tepeaca and San Felipe Tenextepec for their generosity and helping to make the first year of the Tepeaca Kiln Project a success.

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