Rethinking southeast Maya agriculture: A view from the manioc fields of Joya de Cerén, El Salvador

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Mesoamerican scholars have recently modified normative, over-simplified reconstructions of ancient Maya agriculture by seeking multiregional perspectives, which account for variations in micro-environments and ecologies, edaphic conditions, soil chemistry, agricultural strategies, and the complexities of community and individual cultivation choices [Beach et al, 2002; Dunning, 1989, 1992, 1996; Fedick, 1996; Fedick and Ford, 1990; Killion et al., 1989; Robin, 1999, 2003, 2006; Webb et al., 2004; Wingard, in press]. The Mesoamerican triad of maize, beans, and squash remains central to these updated reconstructions, however the significant role of a variety of other cultigens and agricultural strategies are becoming apparent as methods of recovery are advanced and interpretations are revised [Fedick, 1996]. Questions remain unanswered about ancient Maya subsistence, particularly the role that root crops such as manioc (*Manihot sp.*) played. Lack of material evidence for Classic Period Maya (AD 250-800) agriculture has been identified as one of the key restricting factors in advancing our understanding of these practices [Murtha, 2002]. Thus, the evidence for cultivation from Cerén, El Salvador affords a remarkable opportunity to examine ancient Maya agriculture and to produce a more accurate reconstruction of this community's subsistence system. This paper specifically focuses on the latest data and interpretations of ma-

nioc cultivation at a Classic Maya site.

The ancient Maya village of Cerén is located in west-central El Salvador and is situated on a terrace west of the Río Sucio in the Zapotitán Valley [Sheets, 2006]. The Cerén village was rapidly abandoned when the nearby Loma Caldera volcanic vent erupted approximately 1500 years ago (c. AD 590 SD 90). Within a few days to one week, the entire site was buried under multiple meters of volcanic ash, resulting in the unparalleled preservation of a Classic Maya site [Sheets, 2002]. Since 1978 extensive archaeological research has been conducted at Cerén and the extraordinarily preserved structures, artifacts, and agricultural fields continue to profoundly contribute to understandings of ancient Maya commoners [Sheets, 2002]. In addition to the agricultural ridges, furrows, and beds themselves, the impressions of plants have been preserved in the Loma Caldera ash at Cerén, so that precise replicas of the plants can be made by filling hollows with plaster [Sheets, 2002]. Thus, individual plaster casts of plants document fine-grained detail such as root size and shape, corn kernels, plant stalks, and even some leaves [Sheets, 2002, 2009]. The plants that were grown at Cerén include malanga (*Xanthosoma sp.*), maize (*Zea mays*), manioc (*Manihot sp.*), squash (*Cucurbita sp.*), cotton (*Gossypium hirsutum*), nance (*Brysonima crassifolia*), chile peppers (*Capsicum annuum*), hackberry (*Celtis sp.*), calabash fruit (*Crescetia sp.*), cacao (*Theobroma cacao*), and others [Lentz et al., 1996; Sheets and Woodward, 2002]. The emphasis here is on one cultigen, manioc, and the fields where it was grown south of the Cerén village center.

Manioc is a bush that produces large roots with approximately five to ten tubers per plant. The plant favors areas with good drainage and less compacted soils [Cock, 1985; Hansen, 1983]. The cultivation of manioc has long been hypothesized as potentially significant to ancient Maya diets for a variety of reasons: it has a high caloric content, it is relatively undemanding on the soil, and it tolerates droughts well [Bronson, 1966]; Research involving the role of manioc in Classic Maya subsistence has suffered from the scarcity of direct evidence for its cultivation [Crane, 1996; Flannery, 1982; Pohl et al., 1996; Pope et al., 2001; Miksieck, 1991: 180]. Given the ease with which manioc can be cultivated and its particular tolerance of poor soils and

droughts, it is likely this was utilized in various regions throughout the dynamic and varied Maya agriculture landscape. The Cerén research affords valuable insights into manioc production at one Classic Period village.

The initial 2007 discovery of regularly spaced and well-constructed beds found 200 meters south of the site center, combined with the size of tuber casts, indicated the extent of manioc production at Cerén was much greater than previously recorded [Dixon, 2007; Sheets et al., 2009] (Figure 1). Interestingly, all of the fields were harvested, while in a few areas partially replanting had occurred. As is typical of many root crops, manioc rots within one to two weeks of removal from the ground, so a large harvest suggests that processing also occurred. One typical way to process manioc consists of removing the external cortex (or skin) of the tubers, cutting the tuber into small pieces, drying these in the sun, and then grinding them into a flour, referred to as almidón in the Cerén area today [Quezada Perla personal communication, 2009].

Three distinct manioc plots have been identified at Cerén to date (Figure 2). It was grown in large beds approximately 20 cm wide, 22 cm in height, and spaced 1 meter from ridge-top to ridge-top. These separate plots of manioc growth were identifiable by clear boundaries between the manioc beds and areas of open spaces, maize fields, and other manioc fields [Dixon, 2009].

Differences in ridge height, spacing, and of course the plant casts all make it possible to readily distinguish manioc from maize fields (Figure 3). One boundary, the eastern boundary of Manioc Field 1 is marked by a separation of a maize field in the north and Manioc Field 2 in the south and this boundary provides an interesting look at the relationship between maize and manioc cultivation in this area. The northern ridges of this maize field are typical in height and spacing for maize, however, in the southern area the maize ridges gradually increase in size and in ridgetop to ridgetop spacing between beds-becoming more typical of manioc fields. Maize plants that were present at the time of the eruption document that these ridges were dedicated to maize production, however, it appears a portion of this field might have been used at one time to cultivate manioc given the size and spacing of the ridges and beds. This type of crop rotation illustrates the dynamic

Figure 1

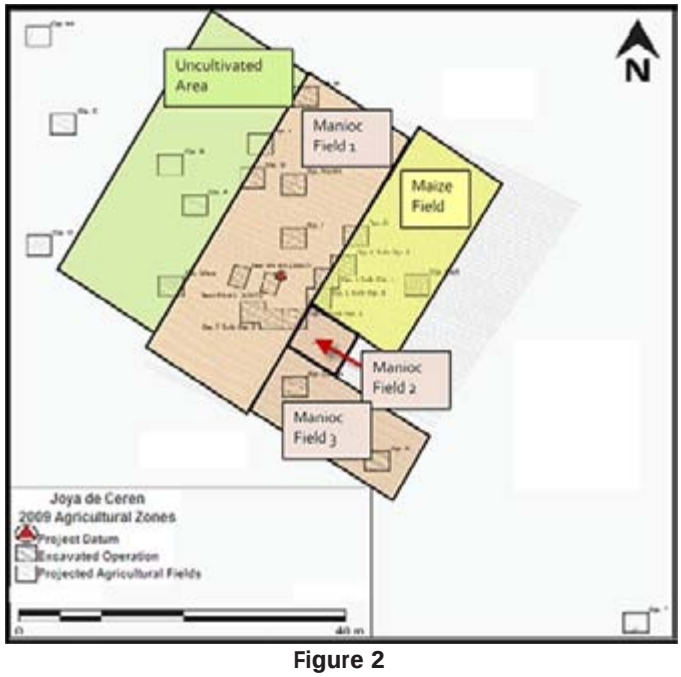

Figure 2

nature of farming choices including the shifting from one cultigen to another in the same location. Additionally, all of the maize fields previously excavated at Cerén were planted in ridges perpendicular to slope in order to maximize water infiltration [Sheets, 2002]. The maize located east of the manioc field was planted parallel to the ground slope with no physical separation between manioc and maize. This organization of fields maximizes water drainage, which creates a beneficial environment for manioc growth. While in a maize-centric perspective we might expect to see maize cultivation dominating the layout for agricultural fields, in this case it is clear that manioc needs were prioritized over maize.

Along Manioc Field 1's eastern boundary, the southern portion is marked by the staggered orientation of manioc beds to the west and those to the east, both of which are constructed with the same style, height and spacing. Given that good drainage is important for manioc growth, it seems unlikely that this transitional area is related to drainage or erosion control. It is more likely that this boundary is marking a change in land tenure, perhaps even different land ownership [Dixon, 2010].

Manioc Fields 1 and 2 and Manioc Field 3 have very different bed constructions [Dixon, 2009, 2010] (Figure 4). The beds of Manioc Fields 1 and 2 were constructed with broad, flat tops and well-packed almost vertical walls, while the beds of Manioc Field 3 are distinctive in their hyperbolic shape and greater height and width. This field is almost twice the height of the other manioc beds at the site.

The stylistic differences between manioc beds were likely either a strategy to mitigate excess run-off and/or the material expression of how different farmers envision proper manioc planting. The larger, hyperbolic-shaped beds might represent an adaptive response to the issue of erosion; however, the ground slope in Manioc Fields 1, 2, and 3 shows no significant variation. Paleotopographic studies further upslope from these fields would allow more in-depth assessment of whether this change in bed construction was related to controlling runoff. From current analysis, neither advantages nor disadvantages to either construction style are apparent in these adjacent fields. If topographic reasons for different types of manioc fields are ruled out, then it very well may be that these stylistic differences

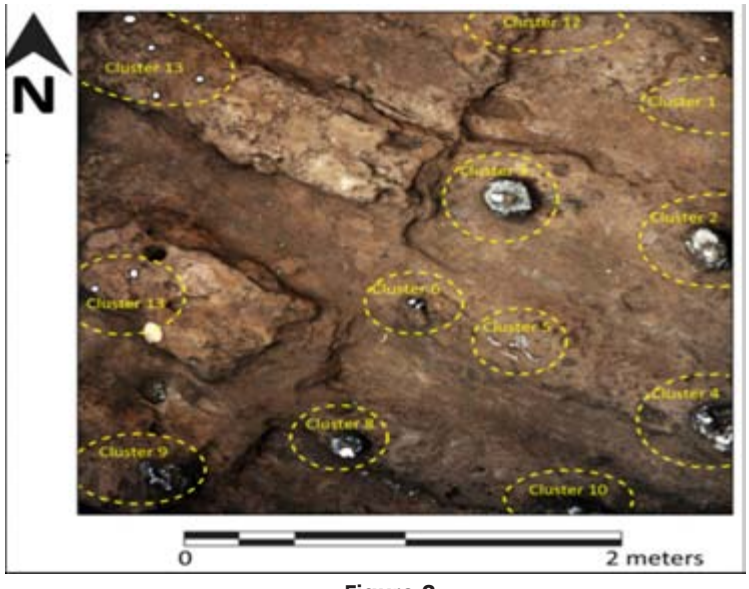

Figure 3

Figure 4

Figure 5

represent the autonomous choices and practices of different Cerén farmers [Dixon, 2009, 2010; Sheets, 2009]. Despite the stylistic differences, the manioc beds shared several characteristics which indicate an overarching field organization for the region: 1) their overall orientation is 120° east of magnetic N, 2) all manioc fields drain towards the Rio Sucio, 3) the field boundaries between plots are consistently aligned to 120° and 30° east of magnetic North, and 4) all of these beds had been harvested just prior to the Loma Caldera eruption [Dixon, 2009; Sheets, 2009].

Prior to our 2007 discovery of separate manioc fields, a few unharvested manioc plants were found within the Cerén village center, such as the manioc found in the kitchen-garden of Household 1 [Sheets, 2002]. The small number of manioc plants found and their location in domestic contexts, like the kitchen garden, suggested that manioc was not a main crop but used to supplement the diet. It is likely that these manioc plants were utilized in a manner similar to that of its use in Joya de Cerén today. Namely, the roots were harvested only when immediately needed for household consumption, and otherwise remained in natural storage growing in the garden [Sharer, 2002, 2006]. The differences in the kitchen garden manioc located in the center of the village and the full-fledged manioc fields to the south leads one to hypothesize that there were very different functions of each and perhaps conceptual differences as well. The intensive manioc fields appear to be employed well beyond simple household consumption. It is possible that inhabitants were involved in the production of flour (almidón) beyond their own needs, something which can be considered to be intermittent crafting or multi-crafting, following Hirth [2009]. Further research into the quantity of manioc grown at Cerén will facilitate an assessment of the distribution, production, and consumption of manioc. Questions about distribution, whether manioc was confined to the household economy, exchanged within the village, or distributed far beyond the village will enlighten us about the domestic economy of the inhabitants. The nature of consumption also needs to be considered, since manioc foodstuffs may have been eaten or drunk in massive feasts and/or as part of quotidian meals. Just like other foods, such as maize and animals, manioc may have been consumed in mundane and sa-

cred contexts [Nancy Gonlin personal communication, 2011; Gonlin and Lohse, 2007; Masson, 1999]. The fine-grained chronology provided by the Loma Caldera eruption affords a high degree of accuracy in assessing events at Cerén. It is highly likely that harvesting of the manioc fields and a ritual feast within the village [Sheets, 2002] coincided. Cerén's ritual feasting evidence near Structure 10 included the remains of a deer-skull headdress [Brown, 2001; Sheets, 2002], surely a ceremonial artifact. Ethnographically, the white-tailed deer is still utilized in the cuch ceremony of modern Maya groups to ensure a successful harvest [Pohl, 1981]. Harvest rituals and feasts have been documented as important aspects of many cultures both past and present [Dietler and Hayden, 2001]. Agricultural production is directly connected with feasting in that agricultural products are the basis for such community events and the organization of production and labor are vital elements of hosting a successful feasting event. Taken together, the deer-skull headdress, the massive quantity of harvested manioc, the coordinated manioc and maize harvests, and time of the year all suggest that the villagers were on the verge of a major cultural event when the earth shook and the sky filled with lava and ash.

As Nancy Gonlin and I have discussed elsewhere, the maize-centric views of Mesoamerican researchers might be biasing us to ignore the significant contributions of other crops to ancient Maya diets, culture, and ideology [Gonlin and Dixon, 2011]. Consider the possibility that Cerén is in fact similar to many other sites in the Maya region both in terms of dietary consumption and production. An interesting shift then occurs in our perception of ancient Maya cultivation and culture. While undoubtedly maize fields grew throughout the Maya area, perhaps other intensively cultivated crops, in particular manioc, were much more prevalent than our previous reconstructions have included. It is hoped that recent lithic analysis will aid in correcting at least part of this conception [Heindel, 2011; Sheets, 2011].

Assessing the quantity of manioc production at Cerén will be a key aspect to examining staple crop production at the site and reanalysis of previously collected geophysical data might aid in this process. One potential area of additional manioc cultivation has already been identified at the site, to the west of the Cerén village center where manioc beds were

discovered in a road cut in 2009 (Figure 5). In light of the manioc field discoveries, reassessment of previous geophysical and drilling investigations from 2005 also suggests that there might be further manioc fields in this region.

Continued research at Cerén will provide better data from which to assess the role of manioc at the site. Whether it was one component in a diverse agricultural system, a staple crop produced for village consumption, or a specialized cultigen traded in the Zapotitán Valley remains to be determined. We are only now beginning to understand how the villagers themselves organized manioc production, processed and consumed manioc, and even how they might have perceived of manioc in terms of mundane and ritual uses. To ascertain the role of manioc at Cerén will require further documentation of the extent of cultivation and the interpretation of evidence pertaining to rituals. What is clear at present is that these data are providing a link between agriculture and ritual in the Maya area and that the manioc fields of Cerén continue to change our view of the agricultural landscape of Classic Period Maya.

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