
10 **EVALUATING ANCIENT MAYA SALT PRODUCTION AND THE DOMESTIC ECONOMY: THE PAYNES CREEK SALT WORKS AND BEYOND**

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The organization of production and distribution of salt in the Maya area was an important part of the Maya economy since sources of salt were localized along the coasts. Was salt produced as part of the domestic economy by Maya householders who also controlled the production and distribution of salt? Alternatively, was there state control of salt production and/or distribution by control of the resource, control of the means of production (labor), and/or control of the means of distribution? The distinction often made in discussions of ancient craft specialization between prestige goods made by attached specialists in the political economy and subsistence goods made by independent specialists in the domestic economy can obscure our understanding of the production process and of changing values of commodities. The place of salt in the domestic economy of the ancient Maya will be addressed using a case study of the Paynes Creek Salt Works within a broader context of ancient Maya salt production and distribution in Maya prehistory. Comparisons are made with salt production in ancient China where texts add valuable information to the archaeological record.

Introduction

The daily biological need for some salt by the ancient Maya is not in question. The control of this geographically restricted resource, the labor to produce salt, and the control of its distribution throughout Maya prehistory are unresolved. The distinction often made in discussions of ancient craft specialization between prestige goods made by attached specialists in the political economy and subsistence goods made by independent specialists in the domestic economy (Brumfiel 1987; Costin 1991) can obscure our understanding of the production process and of changing values of commodities (Flad 2011; Hirth 2009; Inomata 2001; Rochette 2009). Was salt produced as part of the domestic economy by Maya householders who also controlled the production and distribution of salt? Alternatively, was there state control of salt production and/or distribution by control of the resource, control of the means of production (labor), and/or control of the means of distribution? The place of salt in the domestic economy of the ancient Maya will be addressed using a case study of the Paynes Creek Salt Works within a broader context of ancient Maya salt production and distribution in Maya prehistory (McKillop 2002, 2005a, 2009, 2010; McKillop et al. 2014; Robinson and McKillop 2013, 2014; Sills and McKillop 2013; Watson et al. 2013). Comparisons are made with salt production in ancient China where texts add

valuable information to the archaeological record (Flad 2011; Li and von Falkenhausen 2006).

Access to salt is rarely a problem in modern Western society where highly-processed foods contain alarming amounts of sodium chloride (Weeks 2009). However, salt often is limited or lacking in non-Western and ancient cultures with plant-based diets. As a daily biological human necessity, the mechanics of salt production and distribution are basic to understanding ancient economies, particularly those based on agriculture such as the ancient Maya. In addition, salt has many other uses in ritual, medicine, as a food preservative, and as a flavor enhancer in cuisine. At times, ancient states directly controlled the production and/or distribution of salt. Soldiers in the Roman Empire were allocated salt as part of their salary (providing the derivation of the word, salt). Salt taxes underwrote significant portions of the central government in ancient China (Adshead 1984). The Aztecs included salt in their tribute demands.

The organization of production and distribution of salt in the Maya area was an important part of the Maya economy since sources of salt were localized along the coasts. The inland Maya at large Classic period cities in the southern lowlands needed dietary salt. An image of a salt person, along with the glyph for salt, painted on the exterior of a Late Classic building at Calakmul (Carrasco et al. 2009: Fig.

6b), acknowledge the urban Maya interest in salt, but it is not clear if salt was procured through trade, tribute, or in the market place. Seafood remains at inland Maya cities such as Tikal, Lubaantun, and Altun Ha, required salting fish on the coast for inland transport (McKillop 1984; see also Graham 1994; Valdez and Mock 1991). As a flavor enhancer in food (and one of the four taste sensations on the human tongue), the ancient dynastic Maya likely imported this addictive additive for food, which played a central role in feasting events associated with the political economy depicted on painted pictorial vessels. Coastal and inland salt sources were utilized at various times in Maya prehistory as part of the domestic economy and at times as part of the political economy with direct elite administration.

Production in the Domestic Economy and the Political Economy

Ancient craft production in the contexts of the domestic and political economies often is evaluated using Costin's (1991) criteria of intensity, concentration, constitution, context, and scale. *Intensity* of production refers part-time to full-time work—including seasonal, periodic, occasional, and intermittent work, and considers whether other productive activities are also carried out, such as farming. *Concentration* includes dispersed to nucleated locations of producers within a region—often related to the distribution of resources (such as the high-quality chert outcrops at Colha or the super-saline, coastal lagoon waters around the Yucatan). *Constitution* describes the composition of the workforce, from kin-based to industrial. Flad (2011:23) suggests the relationships among workers should not be described as a continuum since there are qualitative differences among wage labor, labor duty, slave labor, and clan-based production. *Context* refers to independent or attached specialists, with independent specialists making utilitarian goods for widespread use, whereas attached specialists make prestige goods for more limited use by elites (see also Brumfiel 1987). *Scale* refers to the size of the labor force.

In the Maya area, the political economy comprises the production and distribution of prestige commodities and resources for the

dynastic leaders (Masson and Freidel 2002). These goods helped underwrite and maintain the political and social hierarchy. Prestige goods typically were made in elite households of royal courts by skilled workers. They painted pictorial scenes and glyphic records on pottery vessels and codices; carved jadeite, marine shell, bone and wooden objects; and carved images and text on stelae, altars, building facades, and wooden lintels; and painted murals and masks on public buildings.

In contrast, the domestic economy includes the production, distribution, and use of subsistence and ritual resources and goods for household use, as well as production for exchange outside the household. Production in domestic workshops often is referred to as carried out by “independent specialists” since they did not work for the state (see Costin 1991). The products of domestic production by independent specialists generally are regarded as destined for use by the common folk. However, the dichotomy often made between attached and independent specialists in workshop production can obscure our understanding of the ancient Maya economy. Inomata (2001) reports elite householders at Aguateca crafting goods for the dynastic Maya leaders as attached specialists, but also making finely-made commodities for others as independent specialists. In some cases, the products of household production were incorporated into the political economy, such as the extraction of jadeite at Motagua Valley outcrops (Rochette 2009), one of the highly-sought wealth items of the dynastic and other elite Maya. Following the attached vs independent dichotomy, independent specialists are actually “attached” to the political economy of the dynastic Maya and royal court if they pay taxes or tribute or if the state otherwise controls the production and or distribution of their products (see Flad 2011: 25-29).

The ancient Maya domestic economy included large-scale production with products distributed regionally or even farther from the household workshops. For example, stone tools produced in household workshops at Colha (Shafer and Hester 1983) were distributed regionally to Cerros, Santa Rita, and other communities in northern Belize. In some cases, partly-finished objects were transported, such as

large pre-form “blank” chert blades made from distinctive Colha chert that were recovered from the trading port at Moho Cay in the mouth of the Belize River (McKillop 2004). In other cases, distribution of subsistence goods was well beyond the region: Chert stone tools made from Colha chert were recovered from Early Postclassic household middens at Wild Cane Cay and Frenchman’s Cay in southern Belize (McKillop 2005b), as well as at the nearby Paynes Creek Salt Works during the Classic period. These examples attest to wide distribution of goods produced in household workshops as part of the domestic economy in the Maya area. The production and distribution were outside the dynastic control of the urban Maya who controlled the political economy.

Sources of Ancient Maya Salt

Salt sources in the Maya area include sea salt from coastal lagoons, brine from inland salt springs, and salt obtained from plants and animal meat (McKillop 1996, 2002). Methods of salt production include solar evaporation of salty water and evaporation of brine in pots over fires. Inland salt springs at Salinas de los Nueve Cerros were exploited during the Classic period, using pots over fires to evaporate the brine (Dillon et al. 1988). The historic production of salt at Sacapulas in the Guatemalan highlands provides a model for ancient salt production using pots over fires, as at Salinas de los Nueve Cerros and along the coast of Belize (Reina and Monaghan 1981). Solar evaporation was common historically (Andrews 1983) and was reported during the sixteenth century by de Landa and others (Tozzer 1941). Solar evaporation in ponds created by stone walls or wooden posts was common in the northern Yucatan where there is a reliable, long dry season. Major salt evaporation areas were located near Xcambo near the Celestun salt flats on the northwest Yucatan coast (Sierra 2004) and by Emal on the Rio Lagartos on the north coast of the Yucatan (Kepecs 2003). Other coastal lagoons along the Yucatan coast were exploited for salt (Andrews 1983), including Oxtankah on the north shore of Chetumal Bay in Quintana Roo (de Vega et al. 2010).

Farther south along the Yucatan coast in Belize where the dry season is shorter, salt was

produced by evaporation in pots over fires, producing briquetage. At the Paynes Creek Salt Works, the salt content of brine was enriched by pouring it through salty soil before the evaporation process, as evidenced by earthen mounds (McKillop 2002; Watson et al. 2013). Recovery of a pipe connector is evidence that brine was piped to brine evaporation locations as described for the Sichuan province of China (McKillop 2010). The Paynes Creek Salt Works, salt works along the shores of Placencia Lagoon, Moho Cay and Wits Cah Ak’al near Belize City, and Northern River Lagoon include pots that were supported by solid clay cylinder vessel supports. Thin-walled, open platters of the type “Coconut Walk Unslipped” are reported from Colson Point near Dangriga and from Ambergris Cay (Graham 1994; Graham and Pendergast 1989). Perhaps salty water was evaporated in the shallow pans to form salt.

The Place of Salt in the Ancient Maya Domestic Economy

As was the case worldwide, access to salt became a concern for the ancient Maya with the rise of agriculture. The earliest Paleoindian and later Archaic occupants of Belize obtained dietary salt from eating meat, and possibly seafood. At some point during the Preclassic period, with increasing population size and density of Maya communities, the search for salt began. Perhaps not in the Early Preclassic at Cuello or Cahal Pech, but certainly a quest for salt emerged with the rise of complex polities by the Late Preclassic. Salt was surely in demand with the Late Preclassic rise in population, agricultural subsistence, reduced meat diet, and community labor requirements beyond the household. Late Preclassic Maya at Butterfly shell midden site on the south coast of Belize (McKillop 1996) likely had enough salt in their diet from seafood. Coastal sites along the Mexican coasts of Campeche, Yucatan, and Quintana Roo may have included salt production (Eaton 1978).

The rise of Classic Maya civilization in the southern lowlands meant a dramatic increase in demand for dietary salt, but also likely for salt as a flavor enhancer in the royal dynastic diet and for feasting events, for salted fish from the coasts, and for medicinal and other uses. Salt

works expanded along the coast of Belize, at the inland salt springs at Salinas de los Nueve Cerros, and along the Yucatan coast in Mexico. The coastal salt works in Belize and Mexico served nearby inland markets through regional trade, extending far up rivers in Belize and by overland trails. Salinas de los Nueve Cerros likely supplied nearby inland cities with salt. The height of salt production along the coasts of Belize and Campeche was during the Late and Terminal Classic periods, coinciding with the largest inland populations of lowland city states. The demand for salt collapsed with the abandonment of most inland Maya cities in the southern lowlands over the course of some 150 years beginning about A.D. 750. The Paynes Creek Salt Works were abandoned when the nearby inland cities of Lubaantun and Nim li Punit in Belize and Seibal and Altar de Sacrificios in adjacent Guatemala were abandoned (McKillop 2002).

Without the inland demand for the Paynes Creek salt, there was no market for salt. However, the nearby coastal communities of Wild Cane Cay and Frenchman's Cay were not abandoned. The Maya at these island trading ports continued to make salt during the Postclassic as part of the domestic economy of household production, as evidenced by briquetage in household middens (McKillop 2002). The dietary need for salt at Wild Cane Cay may have been met by the salt from seafood, the remains of which were abundant in household middens (McKillop 2005b). The Wild Cane Cay Maya may have developed a taste for salt in cuisine, as well as use of salt for preserving fish, manatee, sea turtle, and mainland animal meat, the bones of which were recovered in household middens.

The emergence of Chichen Itza as a powerful city in the Early Postclassic coincided with the expansion of the nearby Emal salt works on a coastal lagoon (Kepecs 2003). In the Late Postclassic, the Emal salt works were owned by various families who maintained salt pans and harvested salt. Eye-witness accounts in the sixteenth century by Bernal Diaz, Davila, and de Landa report salt from the northern Yucatan was transported by canoe traders to the Bays of Campeche and Honduras. Davila encountered a trading canoe containing Yucatec

salt on the north shore of Honduras near the mouth of the Rio Dulce, evidently the destination for the salt.

Salt Production and Distribution in Ancient China

Discussion of salt production in ancient China is relevant to an understanding of ancient Maya salt economics for the following reasons. First, the same techniques of evaporating brine in pots over fires and of solar evaporation were used in both areas, on a large scale. Secondly, evaporation of brine in pots over fires provided vast quantities of salt in inland areas in China, which underscores that this method should not be considered second rate in quantity or quality to salt from solar evaporation, as has been argued for the Maya area (Kepecs 2003; MacKinnon and Kepecs 1989). Third, the Chinese state developed various strategies to obtain salt for dietary purposes as well as to underwrite significant portions of the state budget. During the late Tang period (A.D. 618-907), the state purchased all salt and sold it to merchants who were responsible for collecting salt taxes, which by A.D. 779 comprised half of state revenue (Flad 2011: 36). Fourth, the archaeological record of salt production in China is enhanced by documents pertaining to production and distribution, related to the state's interest in salt and taxation.

At various times historically and prehistorically, the Chinese state took a direct role in controlling the production and distribution of salt produced from solar evaporation along coastal areas, evaporation in pots over fires of brine from dug, bored, or drilled wells at inland areas, variations of solar and fire evaporation, and extraction of rock salt from below the ground surface. Research in Shandong province (southeast of modern Beijing) by Shuicheng Li and others revealed large rectilinear salt pans for solar evaporation as well as salt works where brine was evaporated in pots over fires, resulting in briquetage (personal observation, 2010). By 685 B.C., the Qi state in Shandong province had a monopoly on sea-salt production: Government officials bought all salt from private producers, transported the salt to state warehouses, and sold it at a profit (taxation) to salt merchants

(Adshead 1984:40; Flad 2011:35). Still, at various times, small-scale salt production continued without state intervention. Sometimes the salt administration directly controlled salt resources that were concentrated, as with saline ponds in Shanxi, in which case attached workers were used (Flad 2011:51). With more dispersed small drilled wells in Sichuan province, the salt administrators controlled distribution or supervised production without direct control.

In Ningchang Township, before state consolidation of salt production, individual families piped brine in bamboo pipes to workshops from a natural well where brine seeped from a rock face (Flad 2011: 43-46). Remnants of 22 holes for bamboo pipes are visible in a wooden beam at the entrance to a temple constructed over the well. Before the brine was evaporated in pots, impurities were removed in wooden basins by scooping, filtering through five layers of sand, mixing lime into the brine, and by saturating terra-cotta slabs with salt and then dissolving them in other brine. Families sold all salt to a government salt administrator or paid a salt tax to him.

Excavations at the Zhongba salt works in Sichuan province revealed millennia of briquetage—the pots used to evaporate brine over fires (Flad 2011; Li and von Falkenhausen 2010). Most salt produced in Sichuan, using the method of evaporating brine from wells over fires, was used in food preparation—especially as a flavor enhancer and preservative, including popular fish sauce. There were different grades of salt, including prestige salt for rituals or for guests, produced in different locations and also by varying techniques at specific salt works (Flad 2011: 52). By the eleventh century, some bored wells (with bamboo tubes) reached over 1 km in depth, accessing brine and natural gas deposits, the latter used as fuel in the brine evaporation process. Brine was variously transported in containers or by bamboo pipes, sometimes at great distances, from the source to pans in brine-evaporation workshops. This method of salt production was still used in Sichuan province in the twentieth century (von Falkenhausen 2006).

Who Controlled Maya Salt Production and Distribution?

Salt was produced as part of the domestic or political economies depending on state demands for salt, the accessibility of salt sources, technology of transportation, and other factors. The switch from hunting and gathering to an agricultural diet low in sodium marked the initial demand for salt, but early use of salt sources in the Maya area is unknown. Salt was produced in households and household workshops as part of the domestic economy during the Early and Middle Preclassic, during the Postclassic along the coast of Belize, and variously during the Classic period, such as at Northern River Lagoon. Coe and Flannery (1967) report the salt works associated with earthen mounds by the shores of coastal estuaries at Salinas la Blanca on the Pacific coast of Guatemala. Although some Usulután pottery provides a Terminal Preclassic date for some of the Salinas, they are largely undated, although consist of thick-walled, crude vessels with coarse paste that Coe and Flannery assign to salt production. They also report solid clay vessel supports that they compare with salt making elsewhere (Coe and Flannery 1967: 91-92, 99, 102, Fig. 50, Plate 28 p-s).

The Preclassic rise of social complexity and population increase included salt production by coastal estuaries in the Yucatan and Belize, notably Komchen and Cerros in the Late Preclassic. The Late Preclassic rise of aggrandizing elites at Cerros included acquisition of prestige goods that were highly-crafted and of imported material such as jadeite. As at Zhongba in Sichuan Province, China, the Late Preclassic emerging Maya elite may have included salt in their suite of preciosities, as a flavor enhancer for feasting, for salt-drying fish or meat for feasts. The elite Maya may have controlled coastal and inland salt trade.

The increased demand for salt during the Classic period in the southern lowlands was associated with a tremendous growth in salt production along the Belize and Campeche coasts and trade to nearby inland cities and other inland Maya who needed, craved, liked, or wanted salt. Early Classic coastal salt works are few in number, but are known at Moho Cay and at the Paynes Creek Salt Works from briquetage.

indicating salt was produced by evaporating in pots over fires. The funnel under an Early Classic canoe at one of the Paynes Creek Salt Works—the Eleanor Betty Site—documents that the salt content of brine was enriched by pouring salty water through salty soil, as was common world-wide, such as in ancient China (Flad 2011) and France (Weller and Desfosses 2002), for example. At the Eleanor Betty site, the canoe was likely filled with salty soil, with salty water then poured through and saltier brine collected below the canoe, which was held in place by wooden posts. Any mounds of salt-depleted soil (as reported ethnographically elsewhere, Flad 2011; Reina and Monaghan 1981), would have been washed away when sea-level rise submerged the Paynes Creek Salt Works there were on dry land when in use. The only remaining examples of earthen mounds are preserved due to their location in the mangrove swamp (McKillop 2002; Watson et al. 2013).

During the Late Classic in the southern Maya lowlands the dynastic Maya had a state interest in maintaining a regular supply of salt. Salt production expanded along the coast of Belize during the Late Classic and extending through the Terminal Classic. Oxtankah produced salt on the north shore of Chetumal Bay in Quintana Roo (de Vega et al. 2010). The nature of salt production on Ambergris remains to be described more fully by researchers, but includes Coconut Walk Unslipped pottery, also found at Colson Point near Dangriga in southern Belize (Graham 1994). The thin-walled platters may have been used for solar evaporation by placing the platters with brine in the sun, as reported elsewhere (Kepecs 2003). The Coconut Walk platters lack associated solid clay cylinder vessel supports found at most other Belize salt works, so a different salt production technology evidently was in use. Salt production at Northern River Lagoon was part of the domestic economy since briquetage was recovered from household middens (Andrews and Mock 2003). Valdez and Mock (1991) suggest that salt was produced at Northern River Lagoon to salt fish for inland transport. Briquetage from Moho Cay includes a jar and a solid clay cylinder vessel support from a burial (McKillop 2004). Salt production at Wits Cah Ak'al included similar briquetage to the Paynes Creek material (Murata

2010). Salt production at Placencia Lagoon sites (MacKinnon and Kepecs 1989) was similar to the Paynes Creek briquetage. Celestun emerged as a Late Classic salt production locale on the Campeche coast of Mexico. Solar evaporation in salt ponds was extensive at Celestun. Solar evaporation in salt pans to harvest salt beside Emal evidently began in the Late Classic, since Classic pottery was found at Emal (Kepecs 2003). Emal flourished as a salt production and distribution site in the Early Postclassic.

A state interest in salt also occurred in the Postclassic and was evident with sixteenth century eye-witness accounts of salt transport in sea-going canoes. State control may have included: 1) sending a state administrator to oversee production and/or distribution, taking a state tax in salt, as in ancient China (Flad 2011); 2) sending a state administrator with seasonal workers to obtain salt and transport it inland—similar to family-owned salt works at Emal during the Late Postclassic (Kepecs 2011); 3) exacting tribute from salt works, as in Shandong province in China (Flad 2011) and in line with tribute payments made to dynastic Maya of other commodities such as chocolate; and 4) establishing alliances with coastal elite to obtain salt through trade, similar to what is described by Flad (2011) for Zhongba in China and a model I proposed for the Paynes Creek Salt Works (McKillop 2009).

The Classic Maya at the trading port on Wild Cane Cay may have established alliances with nearby inland Maya. They wanted to procure salt, seafood, and ritual items such as stingray spines, as well as obsidian and other commodities obtained from farther away through sea trade with Wild Cane Cay (McKillop 2005b, 2009). The coastal Maya obtained status goods and ritual items such as ocarinas of interest to the coastal elite. In contrast, there was evidently direct administrative control of salt production in the Early Postclassic on the Yucatan coast by elite at Emal, located beside the salt pans (Kepecs 2003). State administration of salt production and distribution has been attributed to the rise and prominence of Chuchucmil during the Late Classic, for Komchen during the Late Preclassic, and for the north coast of the Yucatan during the Late Postclassic. The expansion of the Late

Postclassic coastal canoe trade around the Yucatan linked the Gulfs of Honduras and Campeche and beyond the Maya area and included long-distance trade of north Yucatan coastal salt.

Conclusions

Viewing the ancient Maya society from the perspective of a dichotomy between attached specialists crafting prestige items as part of the political economy versus independent specialists crafting utilitarian items as part of the domestic economy is not useful for understanding ancient Maya salt production and trade. As in ancient China, salt was a desired commodity by Maya leadership, particularly during times of high population and due to the limited geographic availability of salt sources. Salt works associated with super-saline estuaries along the Yucatan coasts of Mexico and Belize produced salt by solar evaporation and by heating brine in pots over fires. At times, salt production was likely carried out by independent workers who negotiated with inland dynastic leaders who needed/wanted salt, salted fish, and stingray spines, as in southern Belize with the Paynes Creek Salt Works (McKillop 2009). In contrast, state control of the Emal salt works on the north coast of the Yucatan is evident from the public architecture adjacent to the solar evaporation ponds (Kepecs 2003).

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