

5

This study explores the gendered division of labor in pottery manufacture and salt production during prehistory at Ban Non Wat, in northeastern Thailand. Our analysis relies on three principal sources of data: (1) ethnographic observations on the organization of pottery and salt production in contemporary northeastern Thai communities, (2) archaeological data on ceramic and salt manufacture at Ban Non Wat, and (3) surveys of raw materials used in pottery and salt manufacture. We interpret the production of contemporary and prehistoric pottery and salt making using as a guide Cathy Lynne Costin's (2000) four parameters: context, concentration, scale, and intensity.

This discussion is presented within a broader context of human activity, where the actions of daily life—such as food cultivation, processing, preparation, and consumption—require the production of various material items, such as pottery, that accompany and facilitate these activities. All productive behaviors, either primary or secondary to meeting basic subsistence needs, take place within specific social contexts (McClure 2007:3; Wallis 2011:4). We argue that how these processes are organized and managed, what role gender plays in task allocation, and how to identify the organization of production in artifact data sets should be addressed more frequently in archaeological research. Most importantly, prehistorians must recognize that these processes change through time, and identifying and understanding shifts in the organization of

Gendered Labor in Pottery and Salt Production in Northeast Thailand

ALISHA HALLIWELL,
ANDREA YANKOWSKI,
AND NIGEL CHANG

DOI: 10.5876/9781607324836.c005

production can lead to a better understanding of how labor was structured in prehistory. As Sarah B. McClure (2007:3) notes, gender is a “social category, based only partially on biological sex, and therefore can vary tremendously among societies and through time” (see also Conkey and Spector 1984; Kessler and McKenna 1989; Martin and Voorhies 1975; Ortner and Whitehead 1981; Walker and Cook 1998). As such, gender and other social relations inherently structure production activities to varying degrees.

By studying production activities such as pottery and salt making, we have the opportunity to explore not only the technological and economic aspects of these economic activities but also how gender and social roles play out in the organization of production and the daily lives of individuals.

GENDER AND CRAFT PRODUCTION IN NORTHEASTERN THAILAND

Research devoted to better understanding the gendered division of labor in craft activities in the region remains in its infancy. This study, therefore, represents an effort to explore these issues further with extant data. We hope that this analysis will inspire future research that explores the role of gender in the allocation of tasks both within and outside of the household.

The archaeological record rarely provides tangible evidence of how labor was organized. Even if artifactual or stratigraphic indications of workshops are present, prehistorians are often reluctant to interpret or assign gendered divisions, as establishing a relationship between prehistoric artifacts and the organization of labor—whether around gender or otherwise—in prehistoric communities is problematic (Vincentelli 2000:14). Ethnographic analogies can also be challenging if not used carefully and are often more indicative of our own modern gender biases rather than of the prehistoric reality (Conkey and Spector 1984). Even a sound methodological approach does not make the endeavor of drawing a connection between past and present much easier (DeBoer 1984:562, see also Arnold 2000). Having said this, gender needs to be recognized as an important social category, and by failing to ask the question we risk misunderstanding the dynamics of prehistoric communities. Research over the past decade suggests the results that can be gained by exploring this field are well worth overcoming its perceived obstacles (Arnold 2000; Vincentelli 2000; Claassen 2001; Hurcombe 2000; Joyce 2001; McClure 2007; Mills 2000; Nelson, Glowacki, and Smith 2001; Peterson 2002; Senior 2000; Lefferts and Cort 1999, 2008; Stark 2003; Wallis 2011).

In this study, we use ethnographic and comparative data as a heuristic device, to help elicit a range of possible interrelationships between gendered tasks and production activities in the past. One outcome that has become apparent is that patterns of sexual division of labor are not absolute; rather, they are dependent on other social and ecological factors that impact the organization of production activities. With this in mind, we have focused on a task-oriented approach (Conkey and Spector 1984; Spector 1983), which examines the nuanced ways in which specific tasks may be gender-centric under particular circumstances.

POTTERY AND SALT

This study compares two industries that have been persistently important to the residents of the Mun River valley—pottery and salt. Individually, each of these industries has been important to the economy of the region for millennia. Beautifully made pottery and tools for pottery making such as clay anvils are found in archaeological sites dating back to the Neolithic Age, demonstrating the presence of highly skilled potters in the region. Likewise, large-scale salt making activities are believed to be over 2,000 years old (Higham and Higham 2009) and, as with pottery, possibly supported other secondary industries (Cawte and Bongsasilp 2009). Today, both of these traditional industries still exist, providing us the opportunity to observe them ethnographically as well as archaeologically.

The relationship between pottery manufacture and salt making is intriguing. These two industries are often intricately linked in ethnographic populations as well as in ancient societies (Chen 2004; Hua and Xianlong 2006; Rowan et al. 2009; Yankowski 2007, 2008, 2010). Comparative research has demonstrated that pottery can serve a number of different technological functions in the salt making process. In some cases, brine was boiled and traded in small earthenware pots (Yankowski 2010, 2007; Aymonier 2000). In other cases, large boiling pans were made from fired clay (Brown 2010) and porous earthenware pots were used as molds for draining and drying salt (Hopkinson 1975) and for storage. Today, earthenware pottery is no longer used in salt making in the region due to the introduction of metal pans. The relationship between pottery production and salt making, the types of pots, and the specific technological function(s) of pottery are part of our ongoing study.

In order to examine the gendered division of labor in both pottery and salt manufacture during prehistory at the site of Ban Non Wat, we rely on strategic comparisons between archaeological and ethnographic data. We contend that the distribution of resources around the site, seasonal weather patterns

that influence agricultural schedules, and demand for pottery and salt, are three principal factors that influenced the organization of pottery and salt manufacture at Ban Non Wat. It is likely that these factors have been important throughout the occupation history of the site despite some change in the intensity of seasonal weather shifts (Boyd and Chang 2010).

We begin by introducing the social and environmental context of Ban Non Wat and the Mun River valley. We then present ethnographic data on pottery manufacture and salt production. Archaeological data on ceramic and salt making during prehistory is then compared to the ethnographic data under each section heading. Finally, we discuss the role that gender identities may have played in the organization of craft production at Ban Non Wat.

ARCHAEOLOGICAL RESEARCH AT BAN NON WAT

Ban Non Wat is a moated prehistoric site located on the edge of the Mun River floodplain of the Khorat Plateau in northeastern Thailand (figure 5.1). Rainfall is less reliable than in other regions of Thailand, contributing to a more arid environment and less fertile soils despite some replenishment through seasonal flooding (Polthanee and Marten 1986). It has been contended that this area may have been wetter in prehistory, attracting early Neolithic farmers to settle in the region around 4,000 years ago (Boyd, McGrath, and Higham 1999; Boyd and McGrath 2001; Higham 2002). The livelihoods of most modern-day inhabitants of the Mun River valley focus on rice cultivation, in part influenced by the country's role as a major rice exporter. The availability of other natural resources such as clay and salt may have also influenced long-term settlement in the region.

Ban Non Wat is among the most extensively investigated prehistoric sites in Thailand. Eleven seasons of archaeological excavation at the site have uncovered a wealth of artifacts that contribute to a greater understanding of the early communities of Thailand. Over 1,100 square meters of horizontal area has been excavated and at least 3,500 cubic meters of sediment has been removed from the site. In addition, these excavations have recovered almost 700 individual interments that date to periods from the Neolithic to the Iron Age (Domett et al. 2015). Excavations at the site were initiated by Charles Higham and Rachanie Thosarat (Higham and Thosarat 2006), while current excavations are directed by Nigel Chang, Kate Domett, Warrachai Wiriyaromp, Amphan Kijngam, and William Boyd (Domett et al. 2015). The breadth of the excavations and the ongoing research on the associated finds have contributed to a greater understanding of the region as a whole (Higham and Higham 2009;

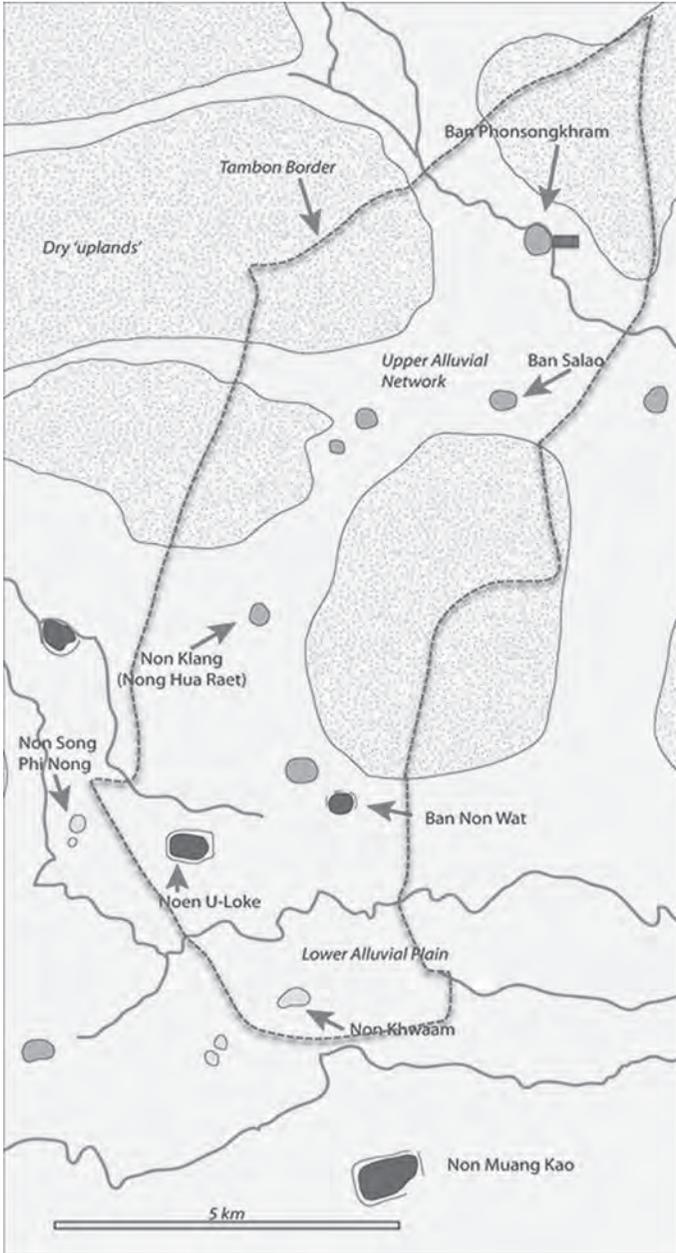


FIGURE 5.1. Location of Ban Non Wat on the Mun River floodplain of the Khorat Plateau in northeastern Thailand. Map by N. Chang.

Higham 2011; Higham, Higham, and Kijngam 2011). Recent research has also emphasized community engagement in the project.

Archaeological investigations at Ban Non Wat suggest that the settlement was intensively occupied for at least 2,500 years, possibly as long as 4,000 years. Despite an increase in archaeological research in Southeast Asia over the last decade, the sequence and timing of technological change through prehistory remains intensely debated, as do archaeological interpretations of sociopolitical organization in any particular time in the past. The application of terms such as *chiefdom* is tentative in many cases (Domett et al. 2015; see also White and Hamilton 2009 and Higham, Higham, and Kijngam 2011, among others).

Despite ongoing debate, most archaeologists generally agree on a basic progression from mobile hunter-gatherer occupations to subsequent Neolithic, Bronze Age, Iron Age, and state development phases, at least in the main river valleys of the region. However, most would also agree that uncritical use of this terminology should be avoided, as it can disguise important subtleties at both the local and regional levels and imply unwarranted associations with sequences in other parts of the prehistoric world. When considering the sequence at a single site, we are perhaps on safer ground. As a result of a groundbreaking radiocarbon dating project at Ban Non Wat, the earliest cultural phase has been identified as a pre-Neolithic hunter-gatherer occupation (Higham and Higham 2009; Higham et al. 2011). This phase remains to be dated. The first permanent settlement at the site occurs during the Neolithic period (beginning about 1650 BC). Occupation at Ban Non Wat continues through the Bronze Age (1000–400 BC). The Iron Age (400 BC–AD 600) presented the first challenges to the residents of Ban Non Wat, with subsequent shifts toward state development beginning in the Late Iron Age. (Higham and Higham 2009; Boyd and Chang 2010).

POTTERY MANUFACTURE IN NORTHEASTERN THAILAND: PRESENT AND PAST

How labor was organized for pottery manufacture and production in prehistory remains poorly understood, and the current research model investigates, first, whether factors such as the effort required to process materials or seasonal workloads can influence those gender roles, and second, if the local environmental factors impacted or influenced ceramic manufacture at the site.

We rely on three principal sources of data to identify the organization of ceramic manufacture at Ban Non Wat: (1) ethnographic data on pottery

production from local communities, (2) archaeological data from Ban Non Wat, and (3) experimental data on pottery manufacture using local materials.

ETHNOGRAPHIC OBSERVATIONS ON POTTERY MANUFACTURE

An ethnographic survey was initiated to better understand contemporary applications of “traditional” pottery making techniques in the region, including how contemporary potters utilize their local resources, their forming techniques, and the role gender plays in each aspect of the pottery making process. The first phase of the study sought to determine the level of local knowledge of regional pottery production among potters, local residents, and village elders. A clay survey accompanied the ethnographic study to capitalize on local familiarity with clay sources (figures 5.2–5.4). We do not contend that contemporary ceramic manufacture is identical to pottery production during prehistory, nor do we assert that experimenting with local materials will “reconstruct” prehistoric processes. However, we argue that both sets of potters have been influenced by many of the same conditions and that the experimental processes may assist in clarifying causal factors attributed to pottery production in the archaeological record. Our study was inspired by similar efforts to make targeted parallels between rich ethnographic traditions and ancient practices (see Voelker 2002, 2007).

CONTEXT AND CONSERVATISM

Male and female potters and those with knowledge of pottery making in their village were observed throughout the survey, with potters from two sites contributing to the study in depth. The women from Ban Ta Ko Go and Ban Talad were intimately familiar with the materials they used and were often unable to explain their reasoning behind why they did the things they did. One important observation, particularly apparent when we asked the potters to work with the Ban Non Wat community (and their local clay) was that the potters were uncomfortable working with new clays and materials and resisted experimenting with new vessel forms and decoration. Vincent (1991:4) observes, “potters are technically conservative partly because their craft involves complex processes.” The survey also revealed that primarily women produce small-scale household pottery, however, male family members do contribute to the process.

Noncommercial production of pottery in the region varies slightly in nature, with evidence for both autonomous individual households (as at

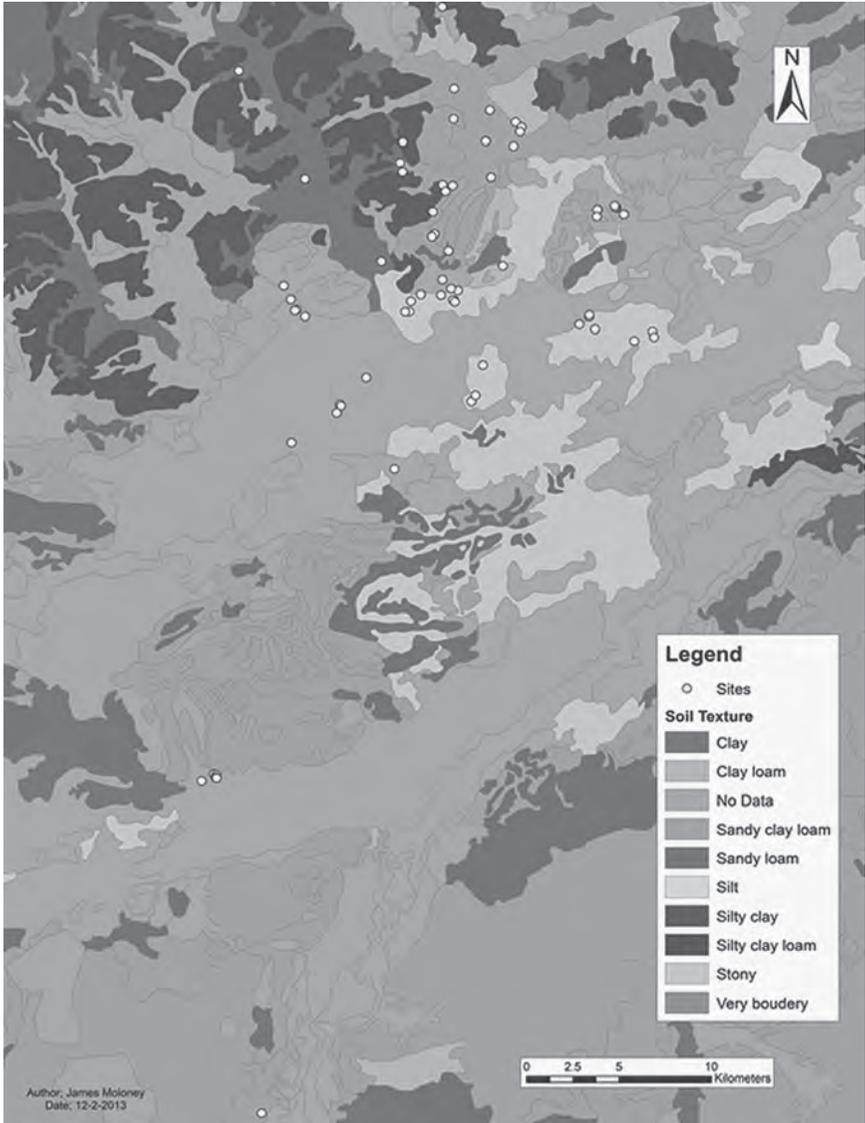


FIGURE 5.2. Regional sediment map. Map by James Maloney, James Cook University.

Ban Ta Ko Go and Ban Talad) as well as community-wide specialization. Although few active potters remain, both groups of potters rely on tourism to make the effort of pottery production worthwhile. The women from Ban Ta Ko Go and Ban Talad indicated that it was no longer financially viable



FIGURE 5.3. *Clay sources in agricultural field. Photo by A. Halliwell.*

to produce pottery and sell full time on a local scale. However, pottery is produced on a localized scale when there is demand (often from researchers) (figure 5.5).

CONCENTRATION

Although it is likely that individual households may have produced pottery in prehistory, not all villages would have specialized in the production of pottery. In the contemporary setting, the production of pottery has undergone significant changes during the last century. Technological advances, the introduction of cheap materials, the shift in economic centers, and new work opportunities have influenced the change in demand of locally produced pottery.

Of the communities that no longer made pottery or did not have a history of making pottery, there still remains a strong social memory among older members of the population. They were often able to describe in detail how women in the past (whether from their own village or a nearby community) formed vessels as well as their techniques, the types of equipment they used, and where they sourced their clay. These memories were consistent between individuals and villages and conformed to observed regional practices. The



FIGURE 5.4. *Clay exposed in excavated sediment. Photo by A. Halliwell.*

clay survey complemented the findings from the interviews. Many of the sites that were indicated as historic clay sources used by potters were in fact the most suitable clay sources that we were able to locate within a useful distance of a village.



FIGURE 5.5. *Local pottery manufacture in Ban Ta Ko Go and Ban Talad. Photo by A. Halliwell.*

INTENSITY

Presently, few individual and independent household-scale producers of pottery remain in the region. Those who do continue to make pottery are consistently women. The intensity of their production is linked to seasonal commitments, other household tasks, and the availability of resources.

In addition, access to resources is seasonally dependent. The Khorat Plateau is more arid than the remainder of Thailand due to unreliable rainfall, and the region of our study consists of shallow sandy loams and increasingly saline soils that tend to be low in fertility; although higher fertility alluvial loams are present along tributaries of the Mekong River such as the Mun River (Polthane and Marten 1986:103). In the area of Ban Non Wat, rice paddies are typically planted in May, in anticipation of the rainy season, and this marks the beginning of the agricultural cycle. From June to October, all being well, floods bring nutrient-rich sediments to the rice crops. Throughout this period, canals are maintained, often with the aid of cattle and, increasingly, machinery. The rice crop is usually harvested toward the end of November, followed by the beginning of the dry season. It is during this seasonal hiatus from rice

cultivation that many local residents earn additional income from traditional craft activities such as pottery and salt production. It is likely that this would have been the case in prehistory (Yankowski and Kerdsap 2013).

SCALE

Where household production occurs, it is often a domestic endeavor. Women frequently make pottery with the assistance of family members, and men distribute the end product (Vincent 1984:649). However, localized small-scale production is declining. A contributing factor to the demise of small-scale pottery production in the region is the availability of a greater variety of cheaper vessels from the commercial potting village of Dan Kwian, located 50 kilometers to the south. The village produces pottery on a large scale, having both a shop front where consumers can purchase pottery on-site and commissions to supply pottery to markets across the region. It is difficult for other local potters to compete. Although a commercial venture, employees live on-site. The village is partitioned into workshop areas, including clay processing, vessel forming, decoration, firing, and distribution. The nature of these partitions also highlights gendered divisions of labor at the site, which is discussed below (figure 5.6).

GENDER AND POTTERY IN THE ETHNOGRAPHIC RECORD

Here, we briefly highlight several notable trends in the gendered division of labor that have emerged from our survey and discuss whether or not we would expect these labor arrangements to have existed during prehistory.

VARIATION IN GENDER ROLES IN POTTERY AND POTTERY TOOL MANUFACTURE

Leedom Lefferts and Louise A. Cort have conducted extensive ethnographic research across the broader region, identifying the roles of men and women in contemporary pottery production (Lefferts and Cort 1997; see also Lefferts 2005; Lefferts and Cort 1999, 2003, 2008). They note, “throughout Northeast Thailand (and mainland Southeast Asia in general), pottery production and distribution is women’s work” (Lefferts and Cort 1999:1). Although women are more often potters than men in the region, the gendered division of labor in ceramic manufacture can vary from household to household, depending on skill, familial dynamics, and other work-related commitments. In addition,



FIGURE 5.6. Pottery production in the commercial potting village of Dan Kwian. Photo by A. Halliwell.

the gendered division of labor in pottery manufacture is sometimes directly related to the intensity and scale of production. For instance, at Dan Kwian, men typically process the clay and form the vessel while women decorate the pottery. As Rita P. Wright (1991:196) notes, men are more often the potters when production is full time and intended for commercial sale.

Wheel-produced pottery is another sign of intensification in pottery manufacture and is linked with a shift from female production to male production (Wright 1991:196). Although “males are more likely to produce wheel-thrown ceramics than females” (Arnold 1985:220–21; see also Kramer 1985:79), our observations of pottery manufacture in the study area suggest that this is not always the case. Female potters from Ban Ta Ko Go, for example, intermittently use a slow wheel, where the wheel is turned manually.

The manufacture of pottery production tools also varies from male to female in our study area. Observations by Alisha Halliwell indicate that potters of both sexes typically manufacture their own anvils. Potters often choose to make their own paddles because they can select the wood they prefer to work

with and carve the shape to suit their needs (figure 5.7). Many potters also used paddles that were family heirlooms. However, our survey suggests that there are distinct familial traditions in pottery tool production in the region that vary from this norm. In selected communities, paddle production was a male task. Male members of households who produced pottery were responsible for both for the selection of the wood and the pattern carved into the paddle's surface.

MULTI-AUTHORING OF POTTERY

In addition to variation in the gender identities of potters in northeastern Thailand, the pottery production process often involves both male and female labor. The “multi-authoring” of pottery has been noted in ethnographic research in other areas of the world (Lefferts and Cort 1999:1; Kramer 1997:50–51; see also Wright 1991:198; Arnold 1985:79; Crown 2007:677–90). In these cases, both men and women complete different tasks related to ceramic manufacture. The roles that men and women take in the pottery production process can depend on the requirements of the vessel, the skills of the potter, or specific labor divisions at a particular site (Arnold 1985:202, 2000:4; Rice 1987:129).

Lefferts and Cort (2008) highlight the varying practices in gender roles in contemporary potting communities in northeastern Thailand. Thai-Korat women potters, for instance, “delegate aspects of production and distribution to their husbands and children” (Lefferts and Cort 1999:1). Initial ethnographic observations by Alisha Halliwell indicate that the process is a shared and, in some cases, communal activity. Both men and women can undertake each aspect of the pottery making process, from clay selection and collection, clay and temper processing, vessel formation, decoration, and firing (Kramer 1985:79; Mohr Chavez 1992:73, Nicholson and Patterson 1985:227). Our observations indicated that, at least in recent times, women were responsible for processing the raw materials for ceramic manufacture and forming and decorating the pots. Men assisted with the collection of raw materials and the firing of prepared vessels (figures 5.8–5.9).

Interestingly, in communities with a strong connection to or history of pottery making, non-potters demonstrated their contribution to the pottery making process when required. At Ban Ta Ko Go, women who had no professional experience forming vessels contributed successfully to the experimental pottery making projects initiated by A. Halliwell. These women were unable to explain their ability to make pottery other than they are familiar with the materials and accustomed to witnessing the pottery making process.



FIGURE 5.7. *Handmade wood paddles used for pottery manufacture. Photo by A. Halliwell.*

GENDER AND POTTERY MANUFACTURE IN THE ARCHAEOLOGICAL RECORD

Examination of the association between artifactual finds and the gendered division of labor in the organization of pottery manufacture is a challenge for



FIGURE 5.8. *Man digs clay for pottery production. Photo by A. Halliwell.*



FIGURE 5.9. Men assist with the firing of prepared vessels. Photo by A. Halliwell.

all archaeologists and requires caution (Kent 1984; Higham and Thosarat 1998; Vincentelli 2000). Where no written record exists, determining production areas at prehistoric sites is based not only on evidence of features and artifact distribution but on comparisons with ethnographic observations, as the role gender plays in activities performed is almost never directly apparent (Kent 1984:2). The validity of any interpretation, then, must depend on the quantity and quality of both archaeological and ethnographic evidence. Evidence of the sexual differentiation of labor in pottery production activities at prehistoric sites in Thailand is fragmentary and research is continuing.

Thus, it follows that a detailed understanding of the organization of pottery manufacture at Ban Non Wat remains elusive; direct archaeological evidence is limited. Current research explores the relationship between the gender of individuals and the presence or absence of pottery production implements in their graves. Remarkably, few tools associated with pottery manufacture have been recovered from the site despite the ubiquity of ceramic sherds. Higham (2009:218) identified burnishing stones and clay anvils in female burials at Ban Non Wat, however “few anvils were associated beyond doubt with a deceased as a mortuary offering.” One explanation for the limited number of pottery

making tools amidst the plethora of finished pottery wares is the deterioration or decomposition of the materials used to construct these tools. In addition, pottery manufacturing implements may have been recycled for other uses. Ceramic anvils may have been ground up to use as grog temper. Finally, though unlikely, the low numbers of tools associated with pottery production may indicate that at least some of the prehistoric potters did not use tools to manufacture ceramics. Forming techniques may have been entirely by hand or only minimally relied on the paddle and anvil. However, it may simply be that key evidence for pottery production is located outside of the excavated area.

Dougald J.W. O'Reilly (1998) examined the spatial distribution of artifacts at the site of Nong Nor to determine areas of activity. Anvils and burnishing stones were found throughout the site. Five distribution clusters were identified for both artifact groups, with two clusters corresponding, suggesting that potters may have been forming and decorating vessels at the same location (O'Reilly 1998:145). Although the distribution of artifacts suggested that areas were used for specific activities, their dispersal could not identify the role gender played in the allocation of labor.

The site of Ban Na Di has revealed evidence of complex ceramic traditions, and research by Brian Vincent has shown broad scale changes in ceramic traditions at the site, with the earliest indigenous pottery tradition being replaced by another (Vincent 1998:218). Located 20 km from Ban Chiang, the long period of occupation at Ban Na Di has produced an abundance of ceramic material. While artifactual evidence suggests production centers were present on-site, how male and female labor was organized at Ban Na Di remains uncertain. Of the 23 anvils uncovered, none could be confidently linked with burials (Vincent 1988:165).

At the central Thai site of Khok Phanom Di, which was a coastal settlement when occupied, analyses of items excavated from prehistoric burials suggest a link between certain craft activities, such as pottery making and wealth. At this site, several "artifact rich" female burials were excavated that contained pottery tools, suggesting a link between the craft of making pots and social wealth. The body of a particularly rich female was covered with clay cylinders and pottery vessels, over 120,000 shell disk beads, a clay anvil, and two burnishing stones (Higham 2002:211–12). This suggests, at this site at least, that potting is associated with (wealthy) women. Similarly clear evidence is yet to be identified at Ban Non Wat.

It is perhaps pertinent to note here that evidence for high-status potters in Thai prehistory stands in direct contrast to the expectations of the Agricultural Marginality Model, which suggests that unequal access to resources for

subsistence production forces certain people to engage in specialized craft production (e.g., Arnold 1985, 1993; Durrenberger and Tannenbaum 1992; Stark 1991). In these cases, craft producers tend to be poor people who do not have access to agricultural land. Recently, Karen G. Harry (2005) argued that the economic conditions of some prehistoric societies might not match the expectations of the Agricultural Marginality Model. Prehistoric pottery producers in Thailand may be among the exceptions to this theory, and further excavations and analyses of sites such as Ban Non Wat will help to test this theory.

CONCENTRATION AND SCALE

The scale and intensity of pottery production in prehistory is difficult to assess, as a relatively small amount of pottery manufacturing effort can result in an extensive archaeological expression (O'Reilly 1998). It is the aim of this study to better understand the driving influence behind the factors of concentration and scale. We argue for certain parallels between the modern-day economy in the Khorat Plateau surrounding Ban Non Wat and the prehistoric economies that thrived at this site for millennia. In particular, we argue that the emphasis on rice production in both cases suggests that time was likely allocated in similar ways throughout the year.

Intensity

The question of whether pottery manufacture was a full-time or seasonal task in prehistory likely depends on two components: environmental factors such as weather patterns and seasonal flooding and the pressures of other domestic responsibilities such as farming (Arnold 1985:168). During the wet season, clay would have been either inaccessible or difficult to acquire, and temper and firing materials would have been unsuitable for use in pottery manufacture, effectively limiting pottery production to a seasonal activity. However, as the population grew, the organization of labor could have shifted to meet an increase in demand for pottery vessels. While a tentative hypothesis, the high volume of ceramics present in the archaeological record at Ban Non Wat may indicate that a more permanent workforce could have been required for certain periods in prehistory.

GENDERED DIVISION OF LABOR

Although gender differences have been widely noted and discussed in ethnoarchaeological studies of pottery manufacture (Arnold 2000:4), research on

prehistoric labor divisions often remains genderless. Neill J. Wallis (2011:2) notes that traditional academic interpretations of the gendered division of labor in pottery production in prehistoric communities typically refer to women as contributing to the domestic economy (meaning the production of utilitarian objects for household use, which are not necessarily subject to long distance exchange). In contrast, men are seen as producers of specialized “prestige” items that were traded, often having been made from rare or difficult to acquire materials from far away (Malinowski 1922; Weiner 1976:11–19). This research bias contributes to the perception that men focused on managing and influencing the political and economic operations of the community while women focused on the household (Malinowski 1922; Wallis 2011:2; Weiner 1976:11–19). However, as Wallis (2011:2) notes, “there is nothing inherent in an object that determines its value for exchange” (cf. Hayden 1995, 1998), as objects that are considered “domestic” or for the household, such as “cooking, storage, and serving vessels . . . can and do circulate widely” (Arnold 2000:5). This challenges the perception that pottery produced by women is exchanged infrequently and within a limited area (Wallis 2011:2). The ongoing analysis of the clays and tempers used to make pots at Ban Non Wat will eventually allow a better assessment of the extent of their exchange over short and long distances. A closer analysis of grave goods interred with men and women at the site may also provide further clues as to the authors of these artifacts. It is still unclear if the rich women potters of Khok Phanom Di are the rule or the exception in Thai prehistory.

FUTURE WORK

Ceramics are a common occurrence in the archaeological record, and they provide tangible evidence of human activities (Arnold 1985:1). Their analysis is an integral part of archaeological research and can help us understand the social and economic organization of past communities. Research is ongoing in order to better understand the role of pottery production at Ban Non Wat. Preliminary archaeological surveys have identified possible clay sources and current research aims to better understand the dynamic between people and their environment and how labor was organized in prehistory.

This research is in the early stages and each component—the ethnographic survey, experimental archaeology, and analysis of both modern and archaeological pottery—is ongoing. As a means of expanding on information gleaned from the ethnographic survey, the chemical and mineralogical characterization of our data set is being tested using petrographic and X-ray fluorescence

analysis to establish whether a correlation can be identified between the materials collected and used in a contemporary setting to those from the archaeological record.

SALT MANUFACTURE IN NORTHEASTERN THAILAND

Salt production has been an important economic activity in northeastern Thailand throughout much of its prehistory up to the present. Salt processing “mound” sites are found scattered throughout the region, with some believed to be 2,000 years or older (Rivett and Higham 2007; Nitta 1997; Cawte and Bongsasilp 2009). In addition, salt making still occurs in many rural Thai communities, providing us modern-day insights into this traditional industry. Our ongoing ethnoarchaeological field research (2009–2012) at Ban Non Wat and the surrounding Khorat Plateau examines the organization of modern salt production, highlighting some of the unique cultural and environmental factors that have shaped this industry. We have conducted detailed ethnographic interviews with salt makers, observational studies on the salt making technologies and processes, and surveys of present-day and abandoned salt sites and known archaeological salt sites in the region. This research has been compared to archaeological data to posit some hypotheses about this ancient industry. The findings from this field research and the aims of future research are discussed below.

What brought the original settlers to the Khorat Plateau? It has been suggested that the fertile lands and rivers attracted early Neolithic farmers to settle in the region around 4,000 years ago (Higham 2002). Other natural resources, like salt, were also likely to have played a role in the development of the social and economic landscape of the region as people learned to actively manage the available resources and adapt to their local environment. The Korat Basin sits upon an ancient seabed, with salt deposits at depths of 30–300 meters below the ground surface. During the wet season, much of the region is inundated by floodwaters, drawing up the salts. Then, as the floodwaters recede and the land dries out, saline soils are left behind. Ancient inhabitants learned to exploit this natural resource, leaching it from the soil and developing it into an important local industry.

Rice farming and salt making continue to be key economic activities in the region. As already discussed, rice farming forms the backbone of the economy, but because of its seasonal nature, many people seek additional income from traditional craft activities and/or seasonal employment in urban areas during the dry season. This type of economic diversification is typical of



FIGURE 5.10. *Clay-lined basins are used to leach salt out of soils. Photo by A. Yankowski.*

subsistence-based economies, where a single economic activity is generally not sufficient to provide for household livelihood (Nelson, Glowacki, and Smith 2001:129–30). This tends to be even more pronounced in seasonally based subsistence economies, where a primary economic activity can only be carried out for part of the year. In this case, salt making serves as a complementary seasonal activity to rice farming, with rice farming occurring during the wet season, followed by salt making in the dry season.

Salt production happens yearly during the dry season, generally January through April or May. The local method for making salt is a two-step process. First, the salt is leached out of the sandy, saline soils by soaking the soils in water and then filtering/draining off the brine. In this region, this is usually done in clay-lined basins dug into the earth (figure 5.10), but there are other variations locally and in surrounding regions. Second, this brine is slowly boiled in a metal pan over an open fire to evaporate the water and recrystallize the salt (figure 5.11). It is then put in baskets to drain and dry and is typically stored in large stoneware jars.

CONTEXT AND SPECIALIZATION

Salt making is generally a household activity, with husband and wife, or other available adult members of the family all actively participating. However,



FIGURE 5.II. *The brine is boiled to evaporate the water and recrystallize the salt. Photo by A. Yankowski.*

single individuals, including widowed or unmarried women, also make salt for personal use and consumption or for trade or cash wages. Similar to potting, this type of production for extra-household exchange is done by independent specialists who supply this commodity to a market based on demand and supply. Today, the demand for this specialized product is not as great as it was in the past. Inexpensive factory salt is readily available to the local population and promoted by local health officials because it is enriched with iodine, unlike locally made salt, which is lacking this important mineral. However, locally made salt is preferred over factory salt for making *palat*, a fermented fish product that is a staple part of the local diet. This culinary preference is likely to be one of the primary reasons why people of this region continue to make their own salt rather than buy readily available commercial salt, as is now done in so many other places that once had this traditional industry. Individuals with limited economic means also prefer to make their own salt, participating in an exchange-based (i.e., salt for rice) rather than a cash economy.

CONCENTRATION AND SCALE

The concentration and scale of salt making is largely dictated by the availability of resources. There are a number of geological, environmental, and



FIGURE 5.12. *Ideal soils for salt making include vegetation-free sandy soils that have not been developed for agricultural purposes. Photo by A. Yankowski.*

cultural factors that impact the degree of soil salinity during the dry season. This includes the depth of the underlying salt-bearing rocks, the land topography and water table, and the soil conditions and vegetation, or lack thereof (Mongkolsawat and Paiboonsak 2006). The ideal conditions often exist at the edges of the floodplains and in vegetation-free sandy soils that have not been developed for agricultural purposes (figure 5.12). Oftentimes, unused public lands—for example, along railway tracks or near community temples—are used for salt making. Some private lands are also maintained for salt making, either with or without a fee; however, changes in land ownership often lead to the development of these lands for other purposes, resulting in modification of the landscape, potentially obscuring or destroying evidence of salt sites.

Areas with saline soils are usually community resources shared among families from surrounding villages. This is true for both small-scale and large-scale sites. For example, in a town adjacent to Ban Non Wat, several families share the local saline soils and a single salt-processing basin and make salt in succession throughout the dry season. However, at larger sites with more intensive production (i.e., beyond what is needed for household use), it is common for many families to work side-by-side making salt in a communal fashion (figure 5.13). Each family works independently; they have their own salt-processing



FIGURE 5.13. *Salt-producing families work in close proximity. Photo by A. Yankowski.*

basins for leaching the soils, stoves and huts for boiling the brine, and generally collect soils from the vicinity of their huts (figure 5.14). Year after year the same families tend to return to the site to engage in this activity together.

ORGANIZATION OF PRODUCTION AND GENDERED DIVISION OF LABOR

The organization of salt production varies. In some areas, it is common for families to commute daily to the salt sites and return home at night. Other families process the soil into brine at the salt site but then transport the brine back to their homes, where it is boiled until the water evaporates and salt crystals form. This structure facilitates a division of labor among family members, often with the husband in charge of processing the soil and the wife responsible for boiling the brine while taking care of other household duties. This division of labor is fluid, depending on the structure of the individual household. For example, we met an unmarried woman who makes brine and then transports it back to her house, where her mother and sister complete the boiling process. We also met husbands and wives who shared in all the facets of the work. Furthermore, the choice to transport the brine from the salt sites back to households is probably a modern phenomenon. The weight



FIGURE 5.14. *Families tend to collect soils near to their huts. Photo by A. Yankowski.*

of the brine, combined with travel distances, probably would have made this impractical in the past.

Today, most families commute back and forth to the salt sites each day, but there are still some families that choose to reside at the salt sites throughout the salt season. One family we interviewed makes salt at a site approximately 3 km from their home for two to three months each year, where they maintain a small, temporary residence. We have been told that this was a common practice in the past, and only with the advent of modern transportation have people chosen to travel back and forth to the sites each day. This likely would have created a more closely knit community of salt makers and left archaeological evidence of distinct living spaces alongside the salt making activities.

INTENSITY AND SCALE OF PRODUCTION

Due to the seasonal nature of salt making, the intensity of production during the dry season is often full time, but only for three to four months each year. Approximately 50 km north of Ban Non Wat, a small village of salt makers produces salt year-round, but the amount produced during the off-season is minimal. Saline soils and salt, sometimes sourced from local factories with



FIGURE 5.15. *Six individual basins used in a “mass production line” for producing brine. Photo by A. Yankowski.*

evaporation ponds, are collected and stored to facilitate year-round production. Perhaps this would have been more common in the past, if conditions necessitated high and continual demand. Today, the demand is seasonal, as most families purchase enough salt to last throughout the year.

The scale of production tends to vary from site to site. In places where families are producing quantities beyond what is needed for personal use and consumption, it is typical to have multiple basins for processing soil and one large boiling pan. At one site we visited, all salt makers maintained six individual basins, essentially creating a “mass production line” (Costin 1991:16) for producing the brine (figure 5.15). Sites with more intensive production—including full-time, albeit seasonal, specialists—also tend to have more labor investment. For example, it is typical for workers to set up small seasonal work huts that are used to shield themselves from the sun and/or their stoves from the wind (figure 5.16).

Today, salt is primarily sold or traded in surrounding villages. It is usually transported by truck, but in the recent past, via handcarts as well. Historical records note that salt was widely traded in the early nineteenth century (Aymonier 2000), often to the provincial capital of Korat. In earlier times, it was probably traded along the ancient road systems connecting the Angkorian capital to the rest of the region (Welch 1998; Hendrickson 2007:224–27). If this was indeed the case, it suggests a much larger scale of production by the early second millennium AD, if not earlier.



FIGURE 5.16. *Small seasonal work huts constructed by salt-producing workers. Photo by A. Yankowski.*

GENDER AND SALT PRODUCTION IN THE ARCHAEOLOGICAL RECORD

The large size and dense distribution of prehistoric salt sites in the region supports the idea that salt production was much more prolific in the past. These sites are identified by the small mounds that form due to an accumulation of soils. These mound sites are often clustered together, and the individual mounds generally range from 50 to 150 m in diameter. Archaeological evidence of salt production activities includes ash deposits, potsherds, and sometimes remnants of clay-lined basins as well as the mounds themselves.

SCALE OF PRODUCTION

In 1992 and 1997, a salt mound was excavated by Eiji Nitta (1997) at Nong Tung Pie Pong, just north of the current study area (Nitta 1997; Rivett and Higham 2007). This site closely parallels the layout and density of a modern village-level salt site, where multiple households gather to share the saline-rich soil resources. The mound site measured approximately 120 m × 73 m and was 5.5 m in height. A 5 × 15 m trench was laid down the slope of the mound. Features identified included what appear to have been clay-lined water storage

tanks, clay- and rice straw-lined filtration troughs in groups of two to three each, one hearth, several fire pits, and postholes from temporary dwellings. Pottery was identified as roughly made, cord-marked, round-bottom bowls made by paddle and anvil measuring between 20 and 30 centimeters in diameter and approximately 15 centimeters deep. Animal bones were also recovered, probably the workers' meals.

Recent excavations at Ban Non Wat have also noted the presence of clay-lined basins, similar to the leaching basins used by contemporary salt makers, in occupation layers dating to the Iron Age (Duke, Carter, and Chang 2010). This suggests that there could have been some small-scale household production happening parallel to large-scale, specialized production and that these various scales of production probably occurred simultaneously, as we know is the case today.

ORGANIZATION OF PRODUCTION

Due to the limited amount of archaeological research on salt making sites in the region, the nature of the organization of production, spatially and temporally, is not well understood. Preliminary research suggests that production was organized similarly to today, with independent rather than state or "attached" specialists and a trade system based on supply and demand. Future excavations will be key to developing a clearer picture of the possible variations and/or fluidity of this industry throughout time. However, it is important to note that, to date, we lack evidence of any type of large-scale, centralized prehistoric salt sites, as have been identified and excavated elsewhere in Asia (Chen 2004; Reinecke 2010). Archaeological evidence of large-scale production would likely include dedicated work areas with large-scale soil processing basins, brine boiling stoves and/or kilns, and much larger quantities of sherds. Based on current evidence, it is more likely that our study area included communities of independent specialists, sharing resources in communal salt making zones.

Today, pottery is no longer used in salt making, but archaeological and historical evidence indicate that earthenware pottery was traditionally used for boiling brine and transporting salt in the region (Aymonier 2000). Little is known about the types of pots that were used, but during periods of large-scale production, we would expect to find standardized forms and sizes that were probably produced by specialized potters, as has been noted at salt production sites elsewhere in Asia (Flad et al. 2009; Yankowski 2008, 2010). The salt makers probably relied on a local community of potters that specialized in making

salt pots. It will be interesting to learn about the spatial and social relationship of these communities of craft specialists and their interdependence.

INTENSITY (PART TIME OR FULL TIME)

We cannot say with any certainty whether salt production was a part-time or a full-time activity in prehistory. However, given the seasonality and complementarity of production activities such as rice farming and salt making, it is likely that it was a full-time activity during the dry season, when resources (i.e., saline soils) would have been plentiful. Some part-time production may have been possible during the rest of the year on a limited basis, as is seen today, but it is most likely that other economic activities also supported households throughout the year.

Future excavations of salt sites should help us determine if production could have been full time year-round. This likely would have required large-scale storage of soils suitable for salt making, the procurement of large supplies of dry wood or other fuel sources for boiling brine, and the construction of sheltered areas for salt making and storage. Rather, ethnoarchaeological evidence suggests that salt making functions best as an intensive seasonal activity within current local ecological conditions. Large quantities of salt can be made within a period of several months and stored for use and distribution throughout the year, thereby freeing up the rest of the year for other economic activities. Ongoing socio-environmental studies (Boyd and Chang 2010) should help clarify the specific environmental and climatic conditions that shaped or constrained these production activities during the prehistoric occupation.

CONCENTRATION AND SCALE

Preliminary archaeological surveys by Paul Rivett, Charles Higham, and the authors have noted differential concentrations of salt sites across the region (Rivett and Higham 2007). This may indicate that there were nucleated production areas for salt making in the past or it may be reflective of the availability of resources, differential population densities, or other economic or cultural factors. Future surveys and excavations of mound sites should help clarify the organization and scale of salt production in the past and if the industry has maintained a decentralized character over time.

Similarly, much more research is required on the extent of the prehistoric salt trade. One would expect a direct correlation between the scale of production and the extent of trade. By the fifteenth century, a well-established road

system linked the regional political center of Phimai with the capital of Angkor, providing an important political and economic link. However, it is difficult to determine the extent of trade unless we can identify some specific material culture related to salt production—such as pottery—that can be identified, sourced, and traced. This is complicated by the fact that we know ethnographically and historically that salt pots tend to crack open when the salt is consumed. It is also difficult to know how far back in time these extensive trade routes might have existed. Marine shell, for example, was traded across Southeast Asia from the Neolithic period. Could salt have been transported along the same routes?

The importance of fermented fish to the local economy in the past has probably been underestimated (Yankowski, Kerdsap, and Chang 2015). Without access to modern commercial flavor enhancers such as soy sauce and fish sauce, this would have been an important addition to prehistoric diets. Further, it would have been a crucial way to store abundant wet season protein (fish) for use during a hard dry season. Excavation and dating of more salt production sites may reveal a coincidence between their appearance and the onset of more strongly seasonal weather patterns during the Iron Age (Boyd and Chang 2010). It is important that more excavation-based studies of these production sites are carried out.

GENDERED DIVISION OF LABOR

We do not have any direct archaeological evidence for women's or men's participation in salt production in the past; however, both were likely involved in one or more aspects of salt manufacture, as they are today. The cooperative and seasonal nature of work in Thailand, which is based around the household unit, encourages the participation of all family members. Specific tasks are often assigned to different members of the family, often based on other household responsibilities or physical abilities. There are no strict divisions of labor.

Women are the primary users of salt in contemporary Thai communities and probably in the past as well. They are intimately involved in the cooking and preparation of food products such as salt-dried and fermented fish. The importance of salt in food preparation should not be underestimated and needs further consideration.

Furthermore, it is believed that salt may have been used in many secondary industries (Cawte and Bongsasilp 2009), such as fabric dyeing and leather curing, which may prove significant when studying other possible gender-centric activities or industries. Further research will need to focus more closely on other possible activities.

SUMMARY AND CONCLUSION

The systematic study of traditional craft activities such as pottery and salt making can provide a wealth of information on how labor was organized in prehistory. Both pottery and salt manufacture have been practiced in north-east Thailand over the past 2,000 to 4,000 years. It is likely that the production and trade of these items played a pivotal role in the development of prehistoric economic and trade systems and shaped the social organization of people's daily lives, including the gendered division of labor

Our ongoing study relies heavily on ethnoarchaeological and experimental data to explore present-day pottery and salt production technology and organization for critical comparative analysis to the archaeological record. We argue that this methodological approach will allow us to improve our interpretations and “open up new areas of inquiry” (Skibo and Schiffer 1995:90), including more gender-focused studies. This approach has also been important in helping us understand the interrelationship between craft production and present-day ecological, environmental, and climatic conditions. The manufacturing of pottery and salt is intrinsically linked to the distribution of clay and salt on the landscape and closely tied to the seasonal nature of work. Understanding the relationship of these modern-day conditions to production activities allows us to better understand factors that would have impacted prehistoric production decisions and activities.

The archaeological record has helped us examine ancient potting technologies and the development of specific techniques through time. Further archaeological research is needed to help us better understand similar aspects of the salt making industry and the link between the two industries. Interesting questions to address are if individual communities each had their own potters and salt makers or if specialization among communities required local trading networks to be established and maintained. Our surveys of raw material resources have begun to address this question from a feasibility perspective, and the geological and chemical analysis of the clays and archaeological ceramics will specifically address the source of the materials actually used in the past.

In addition, although our discussions here have primarily focused on household and some village-based production, archaeological evidence suggests that both the salt and pottery industries may have reached a grander scale and intensity involving long-distance trade of these goods to distant communities at certain points in the past. If this was the case, the organization of craft production could have involved full-time, year-round specialists—as has been noted ethnographically for salt making—on a very a limited scale. An increase

in the scale and intensity of craft manufacture may have impacted women's and men's level of participation in these activities. Changes in manufacturing techniques, such as the standardization of process, is often indicative of changes in the social organization of production (Rice et al. 1981) and can impact the level of participation of one gender or another. We intend to continue to address the issue of intensity, scale, and gender participation in these industries in our future research.

Lastly, our study attempts to understand the organization of pottery and salt production in northeast Thailand over the *longue durée*. We have brought together ethnographic, historical, experimental, and archaeological data to cross-examine various social aspects of the organization of these two ancient industries. Underlying this is the recognition that changes in technologies and/or the organization of production is often representative of adaptive behaviors to specific ecological, economic, or social opportunities or constraints (Redman and Kinzig 2003). Through the analyses of these two industries, we hope to identify some of the root causes of shifts in the organization of production through time.

ACKNOWLEDGMENTS

This research is part of a larger ongoing project substantially funded by the Earthwatch Institute, and we would like to thank the Institute and all the associated volunteers. The project is in association with the Fine Arts Department of Thailand, and the National Research Council of Thailand. James Cook University, Macquarie University, Southern Cross University, Kasetsart University, and Nakhon Ratchasima Rajabhat University have all contributed in kind or by otherwise supporting researchers and students. Particular thanks go to the community at and around Ban Non Wat. Jitlada Innanchai, Pimpicha Bannanurak, Puangtip Kerdsap, and Pattayaraj Thamwongsa have been central to the research reported here. We also thank James Moloney for creating one of the maps. Any errors, of course, remain with the authors.

REFERENCES

- Arnold, Dean E. 1985. *Ceramic Theory and Cultural Process*. Cambridge: Cambridge University Press.
- Arnold, Dean E. 1993. *Ecology and Ceramic Production in an Andean Community*. Cambridge: Cambridge University Press.

- Arnold, P. J., III. 2000. "Working Without a Net: Recent Trends in Ceramic Ethnoarchaeology." *Journal of Archaeological Research* 8 (2): 105–33. <http://dx.doi.org/10.1023/A:1009452310915>.
- Aymonier, Étienne. (1895) 2000. *Isan Travels: Northeast Thailand's Economy in 1883–1884*. Bangkok: White Lotus Press.
- Boyd, William E., and Nigel Chang. 2010. "Integrating Social and Environmental Change in Prehistory: A Discussion of the Role of Landscape as a Heuristic in Defining Prehistoric Possibilities in Northeast Thailand." In *Altered Ecologies—Fire, Climate and Human Influence on Terrestrial Landscapes*, edited by S. J. Haberle, J. Stevenson, and M. Prebble, 273–97. Canberra: ANU Press.
- Boyd, W. E., and R. J. McGrath. 2001. "The Geoarchaeology of the Prehistoric Ditched Sites of the Upper Mae Nam Mun Valley, Northeast Thailand, III: Late Holocene Vegetation History." *Palaeogeography, Palaeoclimatology, Palaeoecology* 171 (3–4): 307–28. [http://dx.doi.org/10.1016/S0031-0182\(01\)00251-6](http://dx.doi.org/10.1016/S0031-0182(01)00251-6).
- Boyd, W. E., R. McGrath, and C.F.W. Higham. 1999. "The Geoarchaeology of the Prehistoric Ditched Sites of the Upper Mae Nam Mun Valley Northeast Thailand, II: Stratigraphy and Morphological Sections of the Encircling Earthworks." *Bulletin of the Indo-Pacific Prehistory Association* 18:169–79. <http://dx.doi.org/10.7152/bippa.v18i0.11712>.
- Brown, Ian. 2010. "The Archaeology of Salt Springs in the Eastern Woodlands of the United States," In *Salt Archaeology in China*. Vol. 2, *Comparative Studies*, edited by Shuicheng Li and Lothar von Falkenhausen, 375–409. Beijing: Kexue Chubanshe (Science Press).
- Cawte, H., and B. Bongsasilp. 2009. "An Ethnoarchaeological Investigation of Household Salt Making in Northeast Thailand: A Scalar Hypothesis for Prehistoric Production." Paper presented at the 19th Indo-Pacific Prehistory Association Congress Conference, Hanoi, November 29–December 5.
- Chen, Pochan. 2004. "Salt Production and Distribution from the Neolithic Period to the Han Dynasty in the Eastern Sichuan Basin, China." PhD diss., University of California, Los Angeles.
- Claassen, Cheryl. 2001. "Mothers' Workloads and Children's Labor during the Woodland Period." In *In Pursuit of Gender: Worldwide Archaeological Approaches*, edited by Sarah Milledge Nelson and Myriam Rosen-Ayalon, 225–34. Walnut Creek, CA: AltaMira.
- Conkey, Margaret W., and Janet D. Spector. 1984. "Archaeology and the Study of Gender." In *Advances in Archaeological Method and Theory*, vol. 7, edited by Michael Brian Schiffer, 1–38. New York: Academic Press.

- Costin, Cathy Lynne 1991. "Craft Specialization: Issues in Defining, Documenting, and Explaining the Organization of Production." In vol. 1, *Archaeological Method and Theory*, edited by Michael B. Schiffer, 1–56. Tucson: University of Arizona Press.
- Costin, Cathy Lynne. 2000. "The Use of Ethnoarchaeology for the Archaeological Study of Ceramic Production." *Journal of Archaeological Method and Theory* 7 (4): 377–403. <http://dx.doi.org/10.1023/A:1026523023550>.
- Crown, Patricia. 2007. "Life Histories of Pots and Potters: Situating the Individual in Archaeology." *American Antiquity* 72 (4): 677–90. <http://dx.doi.org/10.2307/25470440>.
- DeBoer, Warren. 1984. "The Last Pottery Show: System and Sense in Ceramic Studies." In *The Many Dimensions of Pottery*, edited by Sander Ernst van der Leeuw and Alison C. Pritchard, 527–71. Amsterdam: University of Amsterdam.
- Domett, Kate, Jennifer Newton, Alana Colbert, Nigel Chang, and Sian Halcrow. 2015. "Frail, Foreign or Favoured? A Contextualized Case Study from Bronze Age Northeast Thailand." In *The Routledge Handbook of Bioarchaeology in Southeast Asia and the Pacific Islands*, edited by Marc Oxenham and Haillie R. Buckley, 68–94. New York: Routledge.
- Duke, Belinda Joy, Alison K. Carter, and Nigel J. Chang. 2010. "The Excavation of Iron Age Working Floors and Small-Scale Industry at Ban Non Wat, Thailand." *Papers from the Institute of Archaeology* 20:123–30. <http://dx.doi.org/10.5334/pia.345>.
- Durrenberger, E. Paul, and Nicola Tannenbaum. 1992. "Household Economy, Political Economy, and Ideology: Peasants and the State in Southeast Asia." *American Anthropologist* 94 (1): 74–89. <http://dx.doi.org/10.1525/aa.1992.94.1.02a00050>.
- Flad, Rowan, Wu Xiaohong, Lothar von Falkenhausen, Li Shuicheng, Sun Zhibin, and Pochan Chen. 2009. "Radiocarbon Dates and Technological Change in Salt Production at the Site of Zhongba in the Three Gorges, China." *Asian Perspectives* 48 (1): 149–82.
- Harry, Karen G. 2005. "Ceramic Specialization and Agricultural Marginality: Do Ethnographic Models Explain the Development of Specialized Pottery Production in the Prehistoric American Southwest?" *American Antiquity* 70 (2): 295–319. <http://dx.doi.org/10.2307/40035705>.
- Hayden, Brian. 1995 "The Emergence of Prestige Technologies and Pottery." In *The Emergence of Pottery*, edited by William K. Barnett and John W. Hoopes, 257–66. Washington, DC: Smithsonian Institution Press.
- Hayden, Brian. 1998. "Practical and Prestige Technologies: The Evolution of Material Systems." *Journal of Archaeological Method and Theory* 5 (1): 1–55. <http://dx.doi.org/10.1007/BF02428415>.

- Hendrickson, Mitch. 2007. "Arteries of Empire: An Operational Study of Transport and Communication in Angkorian Southeast Asia (9th to 15th centuries CE)." PhD thesis, University of Sydney, Department of Archaeology.
- Higham, Charles. 2002. *Early Cultures of Mainland Southeast Asia*. Bangkok: Art Media Resources.
- Higham, Charles. 2009. *The Origins of the Civilization of Angkor (Vol. III): The Excavation of Ban Non Wat*. Part One: Introduction. Bangkok, Thailand: Fine Arts Department of Thailand.
- Higham, Charles. 2011. "The Bronze Age of Southeast Asia: New Insight on Social Change from Ban Non Wat." *Cambridge Archaeological Journal* 21 (3): 365–89. <http://dx.doi.org/10.1017/S0959774311000424>.
- Higham, Charles, and Thomas Higham. 2009. "A New Chronological Framework for Prehistoric Southeast Asia, Based on a Bayesian Model from Ban Non Wat." *Antiquity* 83 (319): 125–44. <http://dx.doi.org/10.1017/S0003598X00098136>.
- Higham, Charles, Thomas Higham, and Amphan Kijngam. 2011. "Cutting a Gordian Knot. The Bronze Age of Southeast Asia: Origins, Timing and Impact." *Antiquity* 85 (328): 583–98. <http://dx.doi.org/10.1017/S0003598X00067971>.
- Higham, Charles, and Rachanie Thosarat, eds. 1998. *The Excavation of Nong Nor: A Prehistoric Site in Central Thailand*. Studies in Prehistoric Anthropology no. 18. Oxford: Department of Anthropology, University of Otago.
- Higham, Charles, and Rachanie Thosarat. 2006. "Ban Non Wat: The First Three Seasons." In *Uncovering Southeast Asia's Past: Selected Papers from the 10th International Conference of the European Association of Southeast Asian Archaeologists*, edited by Elisabeth A. Bacus, Ian C. Glover, and Vincent C. Pigott, 98–104. Singapore: National University of Singapore.
- Higham, Thomas, Charles Higham, Roberto Ciarla, Katerina Douka, Amphan Kijngam, and Fiorella Rispoli. 2011. "The Origins of the Bronze Age of Southeast Asia." *Journal of World Prehistory* 24, no. 4: 227–74.
- Hopkinson, Beatrice. 1975. "Archaeological Evidence of Saltmoulding at Important European Saltsites and its Relationship to the Distribution of Urnfielders." *Journal of Indo-European Studies* 3 (1): 1–52.
- Hua, Sun, and Zeng Xianlong. 2006. "Pointed Base Pottery Cups and Scalloped Rim Cauldrons [Fu]: Simultaneous Explanation of the Yangzi Gorge Area Pre-Qin Fishing and Salt Industries." In vol. 1, *Landscape Archaeology and Ancient Salt Production in Sichuan and Adjacent Regions: Preliminary Studies*, edited by Li Shuicheng and Lothar von Falkenhausen, 287–315. Beijing: Kexue Chubanshe (Science Press).

- Hurcombe, Linda. 2000. "Time, Skill and Craft Specialization as Gender Relations." In *Gender and Material Culture in Archaeological Perspective*, edited by Moira Donald and Linda Hurcombe, 88–109. New York: Palgrave Macmillan.
- Joyce, Rosemary A. 2001. *Gender and Power in Prehispanic Mesoamerica*. Austin: University of Texas Press.
- Kent, Susan. 1984. *Analyzing Activity Areas: An Ethnoarchaeological Study of the Use of Space*. Albuquerque: University of New Mexico Press.
- Kessler, Suzanne J., and Wendy McKenna. 1989. *Gender: An Ethnomethodological Approach*. Chicago: University of Chicago Press.
- Kramer, Carol. 1985. "Ceramic Ethnoarchaeology." *Annual Review of Anthropology* 14 (1): 77–102. <http://dx.doi.org/10.1146/annurev.an.14.100185.000453>.
- Kramer, Carol. 1997. *Pottery in Rajasthan: Ethnoarchaeology in Two Indian Cities*. Washington, DC: Smithsonian Institution Press.
- Lefferts, Leedom. 2005. "Sticky Rice, Fermented Fish, and the Course of the Kingdom: The Politics of Food in Northeast Thailand." *Asian Studies Review* 29: 247–58.
- Lefferts, H. Leedom, Jr., and Louise A. Cort. 1997. "Little Things Mean a Lot: Pots and Cloth in Northeast Thailand." *Journal of the Siam Society* 85 (1/2): 9–15.
- Lefferts, Leedom, and Louise A. Cort. 1999. "Women at the Center of an Industrializing Craft: Earthenware Production in Northeast Thailand." *Museum Anthropology* 23(1): 21–32.
- Lefferts, Leedom, and Louise A. Cort. 2003. "A Preliminary Cultural Geography of Contemporary Village-Based Earthenware Production in Mainland Southeast Asia." In *Earthenware in Southeast Asia: Proceedings of the Singapore Symposium on Premodern Southeast Asian Earthenware*, edited by John N. Miksic. Singapore: Singapore University Press.
- Lefferts, Leedom, and Louise A. Cort. 2008. "Gender and Ethnicity in Contemporary Village-Based Ceramics Production in Thailand." In *Humanity and Ceramics: From Past to Present*, edited by Korakot Boonyalop, 153–200. Bangkok: Princess Maha Chakri Sirindhorn Anthropology Research Centre.
- Malinowski, Bronislaw. 1922. *Argonauts of the Western Pacific*. New York: E. P. Dutton.
- Martin, M. Kay, and Barbara Voorhies. 1975. *Female of the Species*. New York: Columbia University Press.
- McClure, Sarah B. 2007. "Gender, Technology, and Evolution: Cultural Inheritance Theory and Prehistoric Potters in Valencia, Spain." *American Antiquity* 72 (3): 485–508. <http://dx.doi.org/10.2307/40035857>.
- Mills, Barbara J. 2000. "Gender, Craft Production, and Inequality." In *Women and Men in the Prehispanic Southwest: Labor, Power, and Prestige*, edited by Patricia L. Crown, 301–43. Santa Fe: School of American Research Press.

- Mohr Chavez, Karen L. 1992. "The Organization of Production and Distribution of Traditional Pottery in South Highland Peru." In *Ceramic Production and Distribution: An Integrated Approach*, edited by George J. Bey III and Christopher A. Pool, 49–92. Boulder: Westview.
- Mongkolsawat, C., and S. Paiboonsak. 2006. "GIS Application to Spatial Distribution of Soil Salinity Potential in Northeast Thailand." Khon Kaen: Geoinformatics Center for the Development of Northeast Thailand, Khon Kaen University.
- Nelson, Margaret C., Donna M. Glowacki, and Annette Smith. 2001. "The Impact of Women on Household Economies: A Maya Case Study." In *In Pursuit of Gender: Worldwide Archaeological Approaches*, edited by Sarah Milledge Nelson and Myriam Rosen-Ayalon, 125–54. Walnut Creek, CA: AltaMira.
- Nicholson, Paul T., and Helen L. Patterson. 1985. "Pottery Making in Upper Egypt: An Ethnoarchaeological Study." *World Archaeology* 17 (2): 222–39. <http://www.jstor.org.elibrary.jcu.edu.au/stable/124512>.
- Nitta, Eiji. 1997. "Iron-Smelting and Salt-Making Industries in Northeast Thailand." *Indo-Pacific Prehistory Association Bulletin* 3 (16): 153–60.
- Ortner, Sherry B., and Harriet Whitehead. 1981. *Sexual Meanings: The Cultural Construction of Gender and Sexuality*. Cambridge: Cambridge University Press.
- O'Reilly, D. J. W. 1998. "The Spatial Analysis." In *The Excavation of Nong Nor: A Prehistoric Site in Central Thailand*, edited by Charles Higham and Rachanie Thosarat, 145–59. Studies in Prehistoric Anthropology no. 18. Oxford: Department of Anthropology, University of Otago.
- Peterson, Jane. 2002. *Sexual Revolutions: Gender and Labor at the Dawn of Agriculture*. Walnut Creek, CA: AltaMira.
- Reinecke, Andreas. 2010. "Early Evidence of Salt-Making in Vietnam: Archaeological Finds, Historical Records, and Traditional Methods." In *Salt Archaeology in China. Vol. 2, Comparative Studies*, edited by Shuicheng Li and Lothar Falkenhausen, 137–59. Beijing: Kexue Chubanshe (Science Press).
- Rice, Prudence M., William Y. Adams, Joseph W. Ball, Whitney M. Davis, Timothy Earle, Robert E. Fry, Ian Hodder, L.R.V. Joesink-Mandeville, Charles C. Kolb, Masae Nishimura et al. 1981. "Evolution of Specialized Pottery Production: A Trial Model." *Current Anthropology* 22 (3): 219–40. <http://dx.doi.org/10.1086/202661>.
- Rice, Prudence M. 1987. *Pottery Analysis: A Sourcebook*. Chicago: University of Chicago Press.
- Rivett, P., and C.F.W. Higham. 2007. "The Archaeology of Salt Production." In *The Origins of the Civilization of Angkor. Vol. 2, The Excavation of Noen U-Loke and Non Muang Kao*, edited by C.F.W. Higham, A. Kijngam, and S. Talbot, 589–94. Bangkok: Fine Arts Department of Thailand.

- Polthance, A., and G. Marten. 1986. *Traditional Agriculture in Southeast Asia: A Human Ecology Perspective*. Boulder: Westview.
- Redman, Charles L., and Ann P. Kinzig. 2003. "The Resilience of Past Landscapes: Resilience Theory, Society, and the *Longue Durée*." *Conservation Ecology* 7 (1): 14. <http://www.ecologyandsociety.org/vol7/iss1/art14/>.
- Rowan, Flad, Xiaohong Wu, Lothar von Falkenhausen, Shuicheng Li, Zhibin Sun, and Pochan Chen. 2009. "Radiocarbon Dates and Technological Change in Salt Production at the Site of Zhongba in the Three Gorges, China." *Asian Perspective* 48 (1): 148–80.
- Senior, Louise M. 2000. "Gender and Craft Innovation: Proposal of a Model." In *Gender and Material Culture in Archaeological Perspective*, edited by Moira Donald and Linda Hurcombe, 71–87. New York: Palgrave Macmillan.
- Skibo, James M., and Michael Brian Schiffer. 1995. "The Clay Cooking Pot: An Exploration of Women's Technology." In *Expanding Archaeology*, edited by James M. Skibo, William H. Walker, and Axel E. Nielsen, 80–91. Salt Lake City: University of Utah Press.
- Spector, Janet. 1983. "Male/Female Task Differentiation Among the Hidatsa: Toward the Development of an Archeological Approach to the Study of Gender." In *The Hidden Half: Studies of Plains Indian Women*, edited by Patricia Albers and Beatrice Medicine, 77–99. Washington, DC: University Press of America.
- Stark, Miriam T. 1991. "Ceramic Production and Community Specialization: A Kalinga Ethnoarchaeological Study." *World Archaeology* 23 (1): 64–78. <http://dx.doi.org/10.1080/00438243.1991.9980159>.
- Stark, Miriam T. 2003. "Current Issues in Ceramic Ethnoarchaeology." *Journal of Archaeological Research* 11 (3): 193–242.
- Vincent, Brian. 1988. *Prehistoric Ceramics of Northeastern Thailand: With Special Reference to Ban Na Di*. BAR International Series 461. Oxford: British Archaeological Reports.
- Vincent, Brian. 1984. "The Analysis of Prehistoric Pottery from Ban Na Di, Northeast Thailand." In *Southeast Asian Archaeology at the XV Pacific Science Congress*, edited by D. Bayard, 50–59. Dunedin: University of Otago Studies in Prehistoric Anthropology.
- Vincent, Brian. 1991. "Ceramic Technology in Thailand." *Bulletin of the Indo-Pacific Prehistory Association* 10 (1): 341–48.
- Vincent, Brian. 1998. "Khok Phanom Di Pottery Processing Scheme." In *Southeast Asian Archaeology 1996: Proceedings of the 6th International Conference of the European Association of Southeast Asian Archaeologists, Leiden, 2–6 September 1996*, 1–12. Kingston upon Hull: University of Hull.

- Vincentelli, Moira. 2000. *Women and Ceramics: Gendered Vessels*. Manchester: Manchester University Press.
- Voelker, J. C. 2002. "Ceramic Production in Northeast Thailand." Unpublished PhD diss., State University of New York at Buffalo.
- Voelker, J. C. 2007. "The Ceramics." In *The Origins of the Civilisation of Angkor*. Vol. 2, *The Excavation of Noen U-Loke and Non Muang Kao*, edited by C.F.W. Higham, A. Kijngam, and S. Talbot, 487–93. Bangkok: Fine Arts Department of Thailand.
- Walker, Phillip L., and Della Collins Cook. 1998. "Brief Communication: Gender and Sex: Vive la Difference." *American Journal of Physical Anthropology* 106 (2): 255–59. [http://dx.doi.org/10.1002/\(SICI\)1096-8644\(199806\)106:2<255::AID-AJPA11>3.0.CO;2-#](http://dx.doi.org/10.1002/(SICI)1096-8644(199806)106:2<255::AID-AJPA11>3.0.CO;2-#).
- Wallis, Neill J. 2011. *The Swift Creek Gift: Vessel Exchange on the Atlantic Coast*. Tuscaloosa: University of Alabama Press.
- Weiner, Annette. 1976. *Women of Value, Men of Renown: New Perspectives in Trobriand Exchange*. Austin: University of Texas Press.
- Welch, David J. 1998. "Archaeology of Northeast Thailand in Relation to the Pre-Khmer and Khmer Historical Records." *International Journal of Historical Archaeology* 2 (3): 205–33. <http://dx.doi.org/10.1023/A:1027320309113>.
- White, Joyce, and Elizabeth Hamilton. 2009. "The Transmission of Early Bronze Technology to Thailand: New Perspectives." *Journal of World Prehistory* 22:357–97.
- Wright, Rita P. 1991. "Women's Labor and Pottery Production in Prehistory." In *Engendering Archaeology: Women and Prehistory*, edited by Joan M. Gero and Margaret W. Conkey, 194–223. Oxford: Blackwell.
- Yankowski, Andrea. 2007. "Asinan—Documenting Bohol's Traditional Method of Salt Production and the Importance of Salt in the Region's Early Economy." *Philippine Quarterly of Culture and Society* 35 (1/2): 24–47.
- Yankowski, Andrea. 2008. "Earthenware Production and Trade: Using Ethnographic Data and Petrographic Analyses to Compare Prehistoric and Contemporary Pottery Traditions from the Island of Bohol, Philippines." *Bulletin of the Indo-Pacific Prehistory Association* 28:1–5. <http://dx.doi.org/10.7152/bippa.v28i0.12010>.
- Yankowski, Andrea. 2010. "Traditional Technologies and Ancient Commodities: An Ethnoarchaeological Study of Salt Manufacturing and Pottery Production in Bohol, Central Philippines." In *Salt Archaeology in China*. Vol. 2, *Comparative Perspectives*, edited by Shuicheng Li and Lothar von Falkenhausen, 161–81. Beijing: Kexue Chubanshe (Science Press).
- Yankowski, Andrea, and Puangtip Kerdsap. 2013. "Salt-Making in Northeast Thailand—An Ethnoarchaeological Study in Tambon Phan Song Khram, Nakon

Rachasima Province, Northeast Thailand.” *Journal of Social Sciences, Humanities and Arts, Silpakorn University* 13 (1): 231–52.

Yankowski, Andrea, Puangtip Kerdsap, and Nigel Chang. 2015. “Please Pass the Salt’—An Ethnoarchaeological Study of Salt and Salt Fermented Fish Production, Use and Trade in Northeast Thailand.” *Journal of Indo-Pacific Archaeology* 37 (2015): 4–13.