

PRELIMINARY ANALYSIS OF EARTHENWARE PRODUCTION FROM THE SHWE CREEK EXCAVATION IN BAGAN

Saw Tun Lin,¹ Khin Kyi Phyu Thant² & Moe Sat Wathan³

ABSTRACT—This article analyzes earthenware sherds from Shwe Creek (Operation 315a, Unit 315a-1) in Bagan, Myanmar, as part of the IRAW@ Bagan project. Focusing on diagnostic rim sherds from the 2019 excavation season, the research employs typological classification and seriation to establish a preliminary chronological framework. Findings suggest a high degree of standardization in pottery production, particularly for utilitarian ceramics, and highlight both elite-controlled (attached) and market-driven (independent) production modes. Despite limited data, this preliminary archeological report provides a foundation for future ceramic research and relative dating of historical sites, emphasizing the need for continued analysis of Bagan's earthenware traditions.

KEYWORDS: Bagan; Earthenware; Myanmar; Pottery Production; Shwe Creek; Typology

Introducing IRAW

Bagan, located in Myanmar's central arid region on the eastern side of the Ayeyarwady River, was established around the middle of the 9th century CE (Hudson 2004: 220, 265–66). It prospered as the capital of a prominent political entity from the 11th to the 14th centuries, exerting control over large parts of modern-day Myanmar (Higham 2001: 134; Hudson 2004: 183; Stadtner 2013:

14, 18). Following this prosperous era, Bagan underwent significant socio-political changes and evolved into a provincial capital and a hub for pilgrimage (Hudson 2004: 234–245; Stadtner 2011: 215–216). Today, the site of Bagan is marked by the remains of more than 3,800 structures, including temples, monasteries, and reservoirs (Myo Nyunt Aung 2018: B23).

The IRAW@Bagan research project aims to investigate the social and ecological history of residential patterning, agricultural practices, and water management at the classical Burmese (Bama)

¹ Corresponding author. SEAMEO SPAFA, Bangkok.
Email: saw@seameo-spafa.org.

² SOAS–University of London (Alumna).

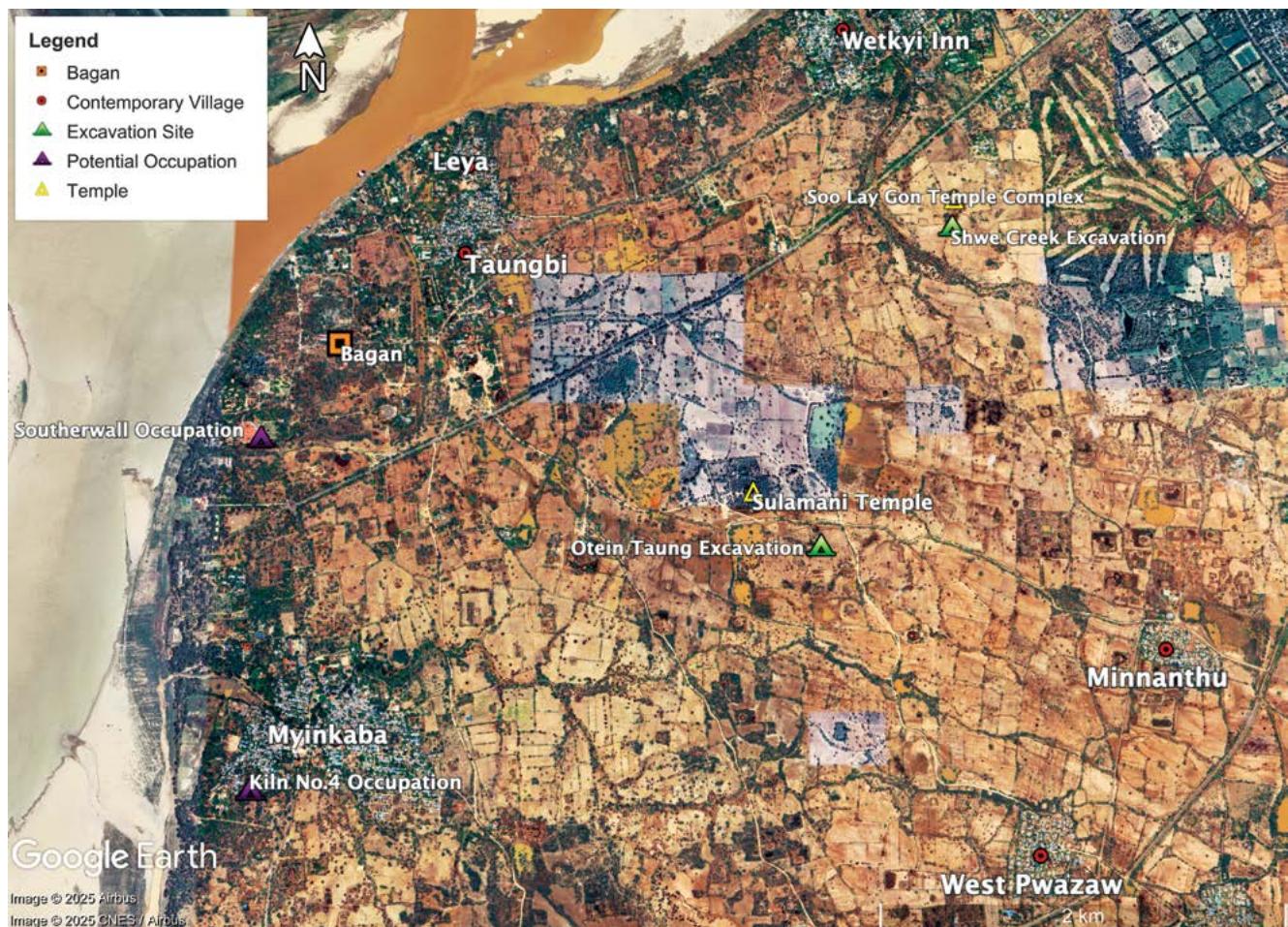
³ Myanmar Archaeology Association (MAA), Yangon.

capital of Bagan, Myanmar, from the 11th to 14th century CE. As part of the 2019 field season, quadrant-base surface collection and four test excavation units were carried out in Shwe Creek and Otein Taung (Operation 748) occupation sites (Iannone et al. 2019). Shwe Creek (Operation 315a) is situated 3 km northwest of old Bagan and about 1 km south of Wetkyi Inn village, near the Soo Lay Gon temple group and close to the Anawrahta Road, the main east-west road between Nyaung-U and Bagan [MAP 1]. Surface reconnaissance by IRAW@Bagan during the 2017 field season revealed a high quantity of ceramic scatter, suggesting that Shwe Creek was a possible residential settlement (Iannone, Pyet Phyoe Kyaw & Macrae 2019: 13). Operation 315a was chosen for its location at the center of significant ceramic scatter. Unit 315a-1, an excavation unit measuring 1 m x 4 m, revealed six distinct levels and three features. Due to time constraints, the excavation did not reach bedrock (Tamura & Cheong 2019). Hundreds of thousands of earthenware sherds were exposed from the excavation and they were systematically recorded in context. The preliminary identification of excavated earthenware began with diagnostic sherds from Operation 315a, as we were not able to carry out a study of form variation of the sherds from all four surface collections and their associated test units, given the vast quantities of sherds recovered.

At both Shwe Creek and Otein Taung, numerous artifacts were found, including abundant ceramics across various layers, clay anvils, *kendi* spouts, freshwater shells, and fragments of charred animal bones. The discovery of a clay spacer at

Shwe Creek suggests possible earthenware production at the site, similar to Otein Taung (Rivera & Cheong 2019). Excavations by the IRAW@Bagan team indicate that Shwe Creek likely served as an earthenware production site, supporting the McIntosh (1991: 206–211) model which posits urban clustering where specialized communities, such as earthenware specialists, provided services to a larger region. This will be discussed in greater detail later in the article.

In considering the importance of earthenware production in Bagan, previous research indicates that both upper class and ordinary people at Bagan extensively used earthenware in their daily lives, ritual ceremonies, and building materials, reflecting their socio-economic and religious characteristics and technological development (Fraser-Lu 1994: 187–220; Than Tun 2005: 105–110; Stadtner 2013: 50–52). No systematic documentation and detailed examination of archeologically excavated earthenware has ever been conducted in Bagan, except by IRAW. Our first attempts examined variation in vessel forms within the sherd sample recovered during the surface collection and excavations at the Shwe Creek site (Operation 315a). This research is crucial for Myanmar archeology because earthenware, especially pottery, from settlement sites offers opportunities to reconstruct historical events and variation in terms of the development of ceramic production, the history of the settlement, and the possible identification of ethnic diversity, as well as religious, cultural, social and economic exchange. Addressing these topics has been hampered by lack of detailed



**MAP 1: Initial four settlement testing areas and 2019 excavation sites—
Shwe Creek (Op. 315) and Otein Taung (Op. 748) © Saw Tun Lin**

chronologies for sites which cannot be dated using inscriptions or other forms of stratigraphy. Although the IRAW research project provides absolute dating to aid in chronology building, this study attempts to provide a preliminary chronological seriation of earthenware to help develop relative dating for other historical sites in the region. This article will also briefly situate the pivotal role of earthenware in the daily lives, rituals, ceremonial practices, and religious activities of Bagan society.

Previous Research on Bagan Ceramics

With regard to the Bagan ceramics, several scholars have sought to identify the history of the role of glazed ceramics in religious and socio-economic aspects of Bagan. The first archeological excavation to investigate ceramic productions was conducted by Sergio Della Strologo and U Kyaw Nyein in 1963 at the south-east of Myinkaba village in Bagan. Unfortunately, they made no explicit statement as to whether this was a kiln to produce glazed architectural tiles for

temples and monasteries or whether it was for glazed ceramic production (Strologo & Kyaw Nyein 1963). To solve this question, six more kilns were subsequently excavated. Aung Kyaing, retired Director of the Department of Archaeology, Bagan branch, suggested that these kilns were used to manufacture glazed-wares and decorative tiles for the Buddhist monuments as well (Aung Kyaing 1999). Don Hein and W. Ross H. Ramsay (2014), based on a re-examination and re-excavation of kiln structures and evidence of glass beads, wasters, and jar crucibles involving mass glass in the immediate vicinity, made the more plausible explanation that these Myinkaba furnaces manufactured glass. Moreover, they suggested that these furnaces may have also produced glazed tiles for Buddhist monuments (Hein & Ramsay 2014). Nevertheless, scholars still questioned where the vast number of earthenware sherds found on the surface of Bagan were manufactured.

As noted, although glazes were extensively used in decorative architectural tiles at Bagan, there is less evidence of their use in pottery and domestic ware. However, an extensive amount of unglazed earthenware survives as a witness to its daily use in the lives of Bagan people. The identification of Bagan historic earthenware is not a popular subject in Myanmar for either archeologists or art historians, due to the relative scarcity and lack of systematic archeological excavation throughout the region. Most scholarly contributions in the field of Bagan ceramics have focused on general descriptions of terracotta and glazed

plaques depicting Jātaka stories of the historical Buddha. Additionally, *kendi* or libation jars have been the favourite subject discussed as ritual pottery used in the Buddhist ceremonies (Brown 1977: 99-112; Guy 1989: 6-10; Fraser-Lu 1994: 187-220).

With the aim of discovering the earthenware production sites at Bagan, Bob Hudson and Nyein Lwin excavated from 1999 to 2001 two mounds locally called Otein Taung (Pottery Hill). This site was also tested by the IRAW@Bagan team in 2019 as Operation 748. According to the radiocarbon dates and results from excavation, the site operated from 9th to 14th century. As the main purpose of the excavation was for dating and general characteristics, no detailed analysis of pottery typology and decoration was conducted (Hudson et al. 2001: 48-74; Hudson 2004: 207-212). Hudson and Nyein Lwin also discovered potential pottery production sites and residential areas with earthenware sherds in Bagan and its peri-urban zone during excavation and surveys of the legendary 19 founding villages of Bagan between 2001 and 2003 (Hudson et al. 2002). Except for analysis of apparent fabric and surface treatment techniques of pottery, no significance determination was carried out.

In Southeast Asia, types of pottery are traditionally determined based on the whole vessels (Bayard 1977; Sawang 2003: 61). Distinctive collections of burial urn types were recorded from the excavations of Pyu cities dating from about 1st CE to 9th CE in Myanmar (e.g., Aung Thaw 1968). Typological analysis of the pottery in Bagan is entirely absent

due to the scarcity of complete pottery, although some chance finds are displayed in the Bagan Archaeological Museum. Many surface finds and excavations expose 99% of earthenware sherds, which are not recorded systematically in any database. The archeological evidence from two palace site excavations in Bagan during the 1990s, 2001–2002, and 2003 exposed some complete pottery and large amounts of sherds which are now in storage in the museum storeroom (Department of Archaeology 2003a, 2003b). Unfortunately, no systematic records during the excavations were undertaken. The initial examination of the ceramics from these two palace excavations and random surface collections of materials from Bagan vicinity were carried out by John Miksic and Goh Geok Yian between 2008–2011 and 2013–2014 (Yian 2018: 187–188). This was done under the auspices of “The Myanmar–Singapore Archaeology Training–Research Project” (MSATP) which is a collaborative initiative aimed at gathering data on life in the ancient royal palace of Bagan and training Myanmar scholars and students in advanced archeological techniques. Conducted in cooperation with the Myanmar Ministry of Culture and the University of Yangon, the project focused on joint research, capacity building, and disseminating information through publications and conferences. Initially intended to conduct fieldwork from 2014 to 2020 at Bagan, the MSATP inventoried a total of 24,310 sherds weighing a total of 1,094,789.72 grams over multiple phases from 2014 to 2016 (Yian & Miksic 2019). No research

outcome has been released since the project’s inception, except a brief overview of the project in a web page⁴ and a brief book chapter analyzing some Chinese porcelain sherds and locally produced glazed wares found in Bagan (Yian 2018: 179–197).

Methods

For this project, the IRAW@Bagan team focused on the preliminary assessment of formal variation of earthenware, based mainly on diagnostic fragments including rims, bases, handles, spouts, and decorated body sherds, from one 1 m x 4 m excavation unit (Unit 315a–1) at the Shwe Creek Site (Operation 315a). Eventually, quantification is used to establish the relative frequency of different ceramic types in the assemblage. The main methods of quantification are sherd counts, sherd weight in grams, rim and base diameters, and measurement of thickness, lengths, and widths. The detail data of each sherd and completed pottery is recorded in the IRAW ceramic recording forms.⁵

Seriation, the principal technique for ordering assemblages and pottery types to create relative chronological order (Orton & Hughes 2013: 226–231) is used in this study. This can, however, be achieved only after the complete classification of earthenware sherds in all excavation units. To accomplish this task, a traditional method, termed

⁴ See: <https://epress.nus.edu.sg/sitereports/msatp>.

⁵ However, we could not make a detail record using this form for our created type series during the 2019 field season (see recording form in Iannone et al. 2019: 381–384).



FIGURE 1: Preliminary assessment of rim sherd variations by the IRAW team, with each bag containing examples of an identified rim form from different occupation levels, 2019 © Saw Tun Lin

unstructured “Form type Series” is applied to classify the variation in pottery forms (Orton & Hughes 2013: 83–84). “Attribute based seriation” approach is also used, especially for plain body sherds, in order to understand techniques and symbolic contents of patterns as this technique can allow a high percentage of sherds from a particular site to be diagnosed (Sawang 2003: 61).

During the 2019 field season, the ceramic analysis was initiated using the unstructured method of “form type

series”. In this way, we started by observing the first specimen rim sherd and named it Form 1. Then the next specimen is compared with the first and if different was assigned it to Form 2. If a new specimen was closely similar to the previously created form, it was made into sub-form, for instance, Form 1-a, Form 1-b, etc. The entire Unit 315a-1 diagnostic sherd assemblage was evaluated based on the shape of rims. As the subjective nature involved in the typological assignment of a sherd to a form

TABLE 1: Non-diagnostic and diagnostic sherd count of all excavated units in 2019

Site	Unit	Non-Diagnosed	Diagnosed	Total
Shwe Creek	315a-1	7,473	1,912	9,385
Shwe Creek	315a-2	2,814	671	3,485
Otein Taung	748a-1	4,960	1,050	9,495
Otein Taung	748a-2	2,868	689	3,557
Total		18,115	4,322	25,922

was influenced by personal experience (e.g., Plog 1978: 159; 1983: 136), to reduce substantial discrepancies in form identification we worked together in groups of two or three persons; before assigning a new form we had to double check to ensure both accuracy and agreement [FIGURE 1].

Results

Most of the sherds from the excavation were too fragmented to be assigned to a specific vessel form. Therefore, sherds excavated from all four units excavated in 2019 at Shwe Creek and Otein Taung were divided into two groups: (1) non-diagnostic sherds⁶ (body), and (2) diagnostic sherds (rims and bases). A total of 25,922 earthenware sherds, including 18,115 non-diagnostic sherds and 4,322 diagnosed sherds, were excavated from the four test excavation units at Shwe Creek and Otein Taung sites during the 2019 field season

[TABLE 1]. Due to insufficient time for assessment, only 1912 diagnostic sherds from Shwe Creek (Unit 315a-1) could be

classified into forms. It is noted that 99% of the diagnostic sherds are rim sherds and not all diagnostic sherds can be assigned into forms because some of them are irregular shapes which are hard to reliably assess.

The classification of earthenware during the 2019 field season can be divided into three forms: (1) special forms which provide potentially chronological sequence, (2) common forms, and (3) isolated forms. The detailed result of each form will be discussed in the respective sub-categories. Almost all diagnostic sherds from Shwe Creek (Unit 315a-1) were classified into 151 forms including sub-forms. Unfortunately, the data from Level 5a from Unit 315a-1 were inadvertently mixed with another level due to confusion when cataloging during the laboratory process. Furthermore, we cannot at this time provide the data of fabric, temper inclusion, sherd count, and weight of each form in this research.

It is worth mentioning that the proportion of the total number of sherds in each occupation layer may reflect the density of pottery usage in the population. According to the stacked bar [FIGURE 2], a total of 1,874 non-diagnostic and 534 diagnostic sherds were excavated from Level 4, 2,274 non-diagnostic and 630 diagnostic sherds

⁶ Although body sherds are called non-diagnostic sherds, the identification of decorated and plain body sherds is important to understand ceramic chronology and variation in style and decoration in pottery of different periods. The analysis of non-diagnostic sherds may be conducted in the future.

TABLE 2: The stratigraphic/temporal occurrence of each special form within the Unit 315a-1 assemblage

Form	Level 2	Level 3	Level 4a	Level 4b	Level 5a	Level 5b	Level 6a	Level 6b	315a-1 F/8
1b									
1e									
1f									
2d									
2f									
2h									
2i									
2j									
10									
11									
12a									
13a									
13b									
13g									
14b									
18d									
18e									
19									
21a									
23i									
24a									
31c									
32a									
32b									
33b									
36a									
37a									
39a									

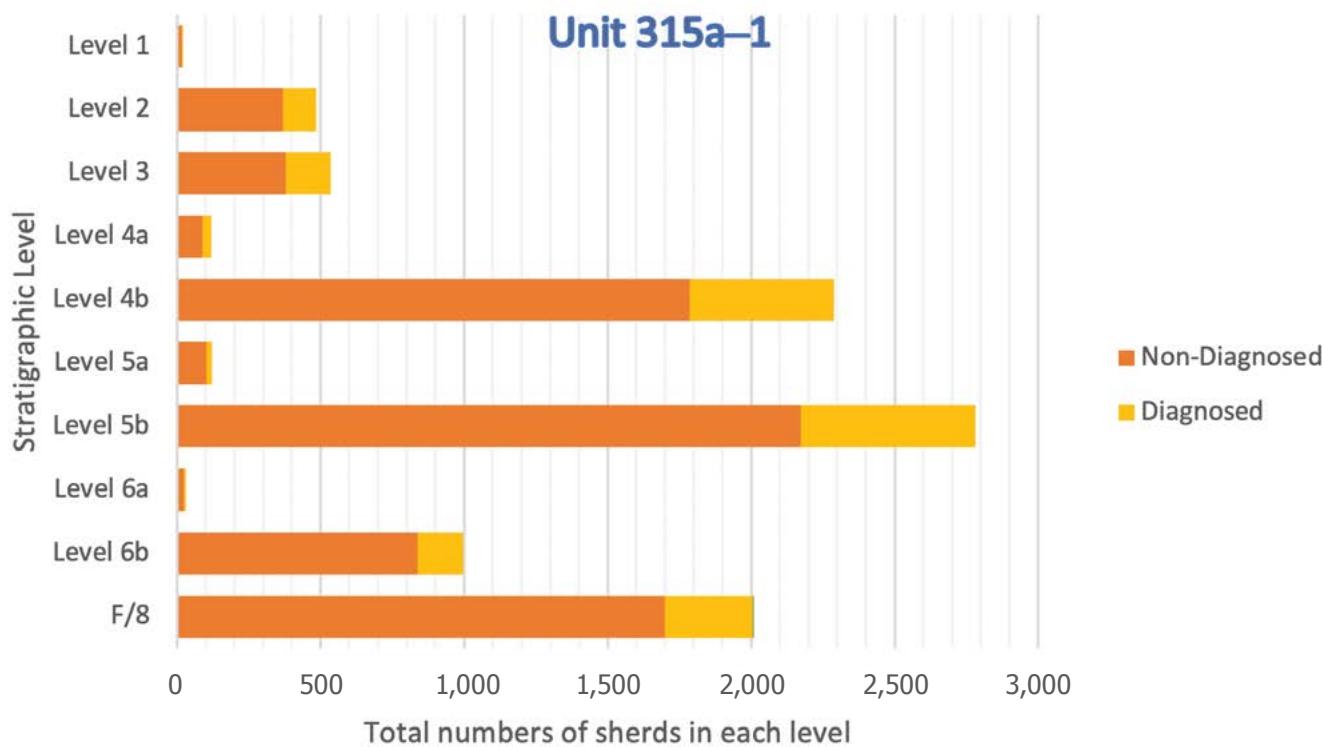


FIGURE 2: Number of sherds excavated from Unit 315a-1 with the successive layers from bottom to top © Saw Tun Lin

from Level 5, and 2,562 and 472 sherds from Level 6 and the associated pit feature (315a-F/8). The overall sherd counts from occupation Level 6, including sherds from the pit-fill, are much higher than those from other levels in the assemblage. This may simply reflect variations in the degree of fragmentation of certain sherds in Level 6 in comparison with other levels.

Special Forms

Special forms can be defined as a particular type of pottery which was frequently used in certain periods of time and stopped being used after that period or, in other words, a form that seems to be an indicator of chronology. They mostly occur in one cultural layer

followed by another. The present data base consists of 28 special forms tentatively recognized during the preliminary assessment of the diagnostic rim sherds from the Unit 315a-1 [TABLE 2]. These special forms can be regarded as significant for their occurrence in the 9 excavation layers in Unit 315a-1. The profile drawings of all special forms of the rim sherds can help us in future classification of sherds in other assemblages [FIGURE 3]. Nevertheless, in this preliminary study we cannot provide details of the exact rim shape, for example, exterior thickened or interior folded.

For absolute dating of occupation levels, two reliable radiocarbon dates are available from Unit 315a-2 at Shwe Creek; these can help us in dating the

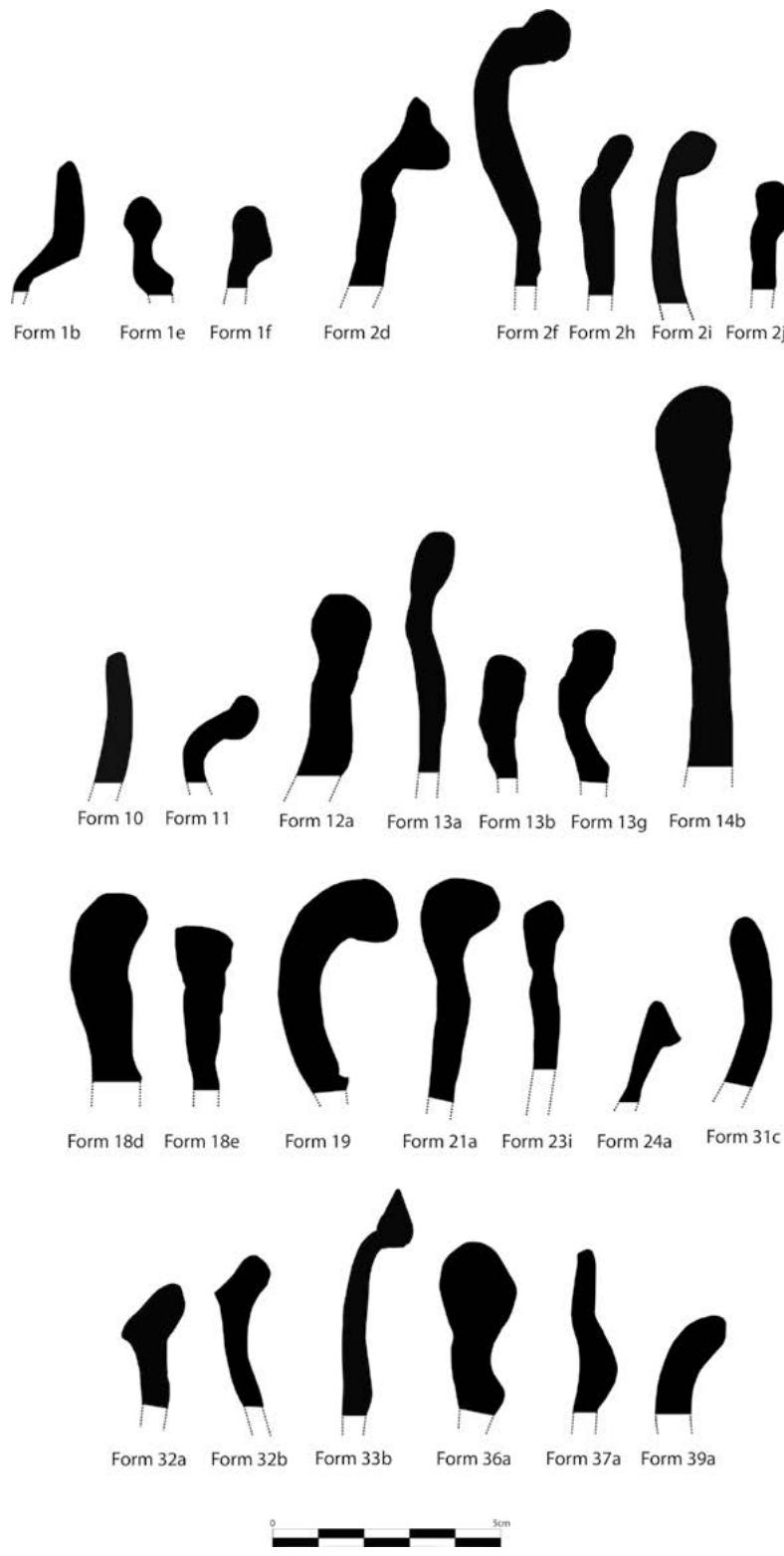


FIGURE 3: Rim sherd profiles of all special forms in Unit 315a-1 (Shwe Creek) © Saw Tun Lin

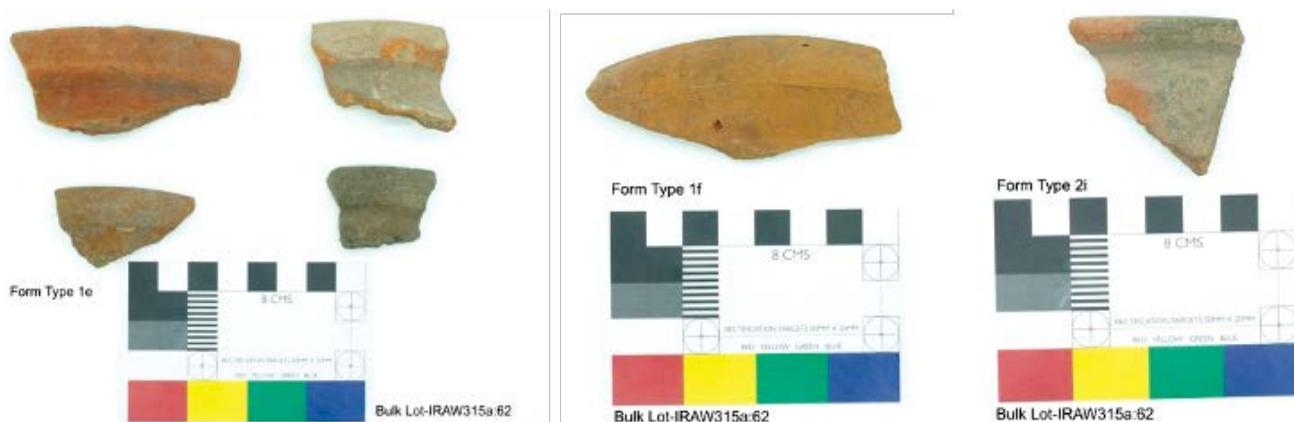


FIGURE 4: Special Forms 1e, 1f, and 2i found in Level 6b and 315a-1 F/8 © Gyles Iannone

special form series. Out of the successive occupation levels that were excavated in the 2019 field season, Level 5 has been dated to 1254–1295 cal (calibrated) CE and Level 6 to 1045–1216 cal CE. With reference to C14 dates, the other corresponding levels in Unit 315a-1 can also be assigned to a relative date at Shwe Creek. Moreover, it is possible to determine a chronology for diagnosed sherds in respective occupation levels.

For example, Forms 1e, 1f, and 2i only occur in Level 6b and 315a-1 F/8, pit fill associated with Level 6 [FIGURE 4]. These three forms appear to be completely absent after the Level 6 occupation. It would seem reasonable to date these three types to between the early 11th century and early 13th century CE.

Furthermore, there are other significant forms that can be assigned to common use between 1045 CE and 1295 CE. They are as follows: 2d, 2f, 13b, 13g, 18d, 31c, 33b, and 37a, which are found in Level 5 and Level 6 of the Unit 315a-1. Based on the associated C14 dates, it is determined that these forms were widely used throughout the Bagan period (11th to 13th centuries).

Other distinctive forms such as 1b, 2h, 2j, 10, 12a, 13a, 14b, 18e, 19, 21a, 24a, 32a, 32b, 36a, and 39a, were unearthed between Level 2 and Level 5. These forms seem highly likely to be in use from the mid-13th century onward. It should be noted for Forms 14b and 2h that there is a small gap between their first occurrence in Level 5b and second occurrence in Level 3, which is a sub-plow zone and thus a mixed deposit.

Form 23i, which is unique for its occurrence after the mid-13th century, was found in Level 4b and Level 3 (sub-plow). This form seems to be used only after the Bagan period [FIGURE 5].

Common Forms

Common forms are types which mostly occur from the lowest level to the topmost level of the excavation unit. Nonetheless, there are significant gaps in some common form distributions. These forms are chronologically important as they might have been used from the early 11th century to the post-Bagan period. There are 22 common forms classified according to their occurrence within the

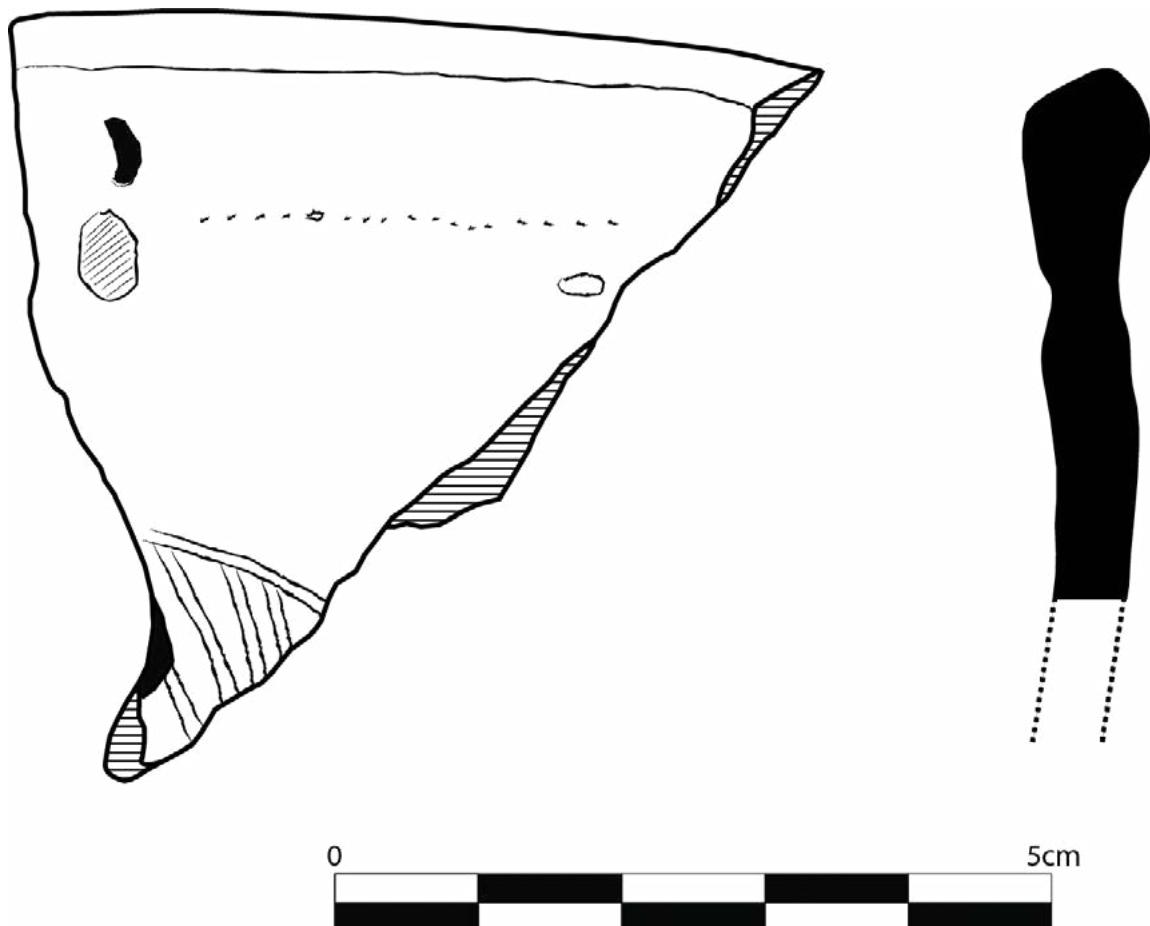


FIGURE 5: Drawing and profile of Form 23i, probably post-Bagan period © Saw Tun Lin

assemblage [FIGURE 6]. TABLE 3 presents the occurrence of each common form in the excavated levels in Unit 315a-1. A disparity exists in occurrence of each Form between layers. It is found that Forms 1a, 2a, 2b, 2c, 5, 6a, 12c, 13d, 18a, 18b, 18h, 23a, 23c, 33a, and 34b are consistently found in each occupation level. For this reason, we can assume these forms were continuously used and were probably the most popular ones from the early Bagan period to post-Bagan period. Forms 1c, 2l, 13e, 18i, and 39b do not occur in all levels, but they do appear in the lowest occupation level.

Moreover, there are significant intervals of occurrence within the stratigraphic levels. It is possible, therefore, that we can observe these forms becoming increasingly common in the early 11th century and perhaps there was a short interval of decrease in usage or absence before they were more widespread again.

Isolated Forms

Isolated form means a particular type which is present only in the single stratigraphic layer. In other words, the forms of all sherds in this type do

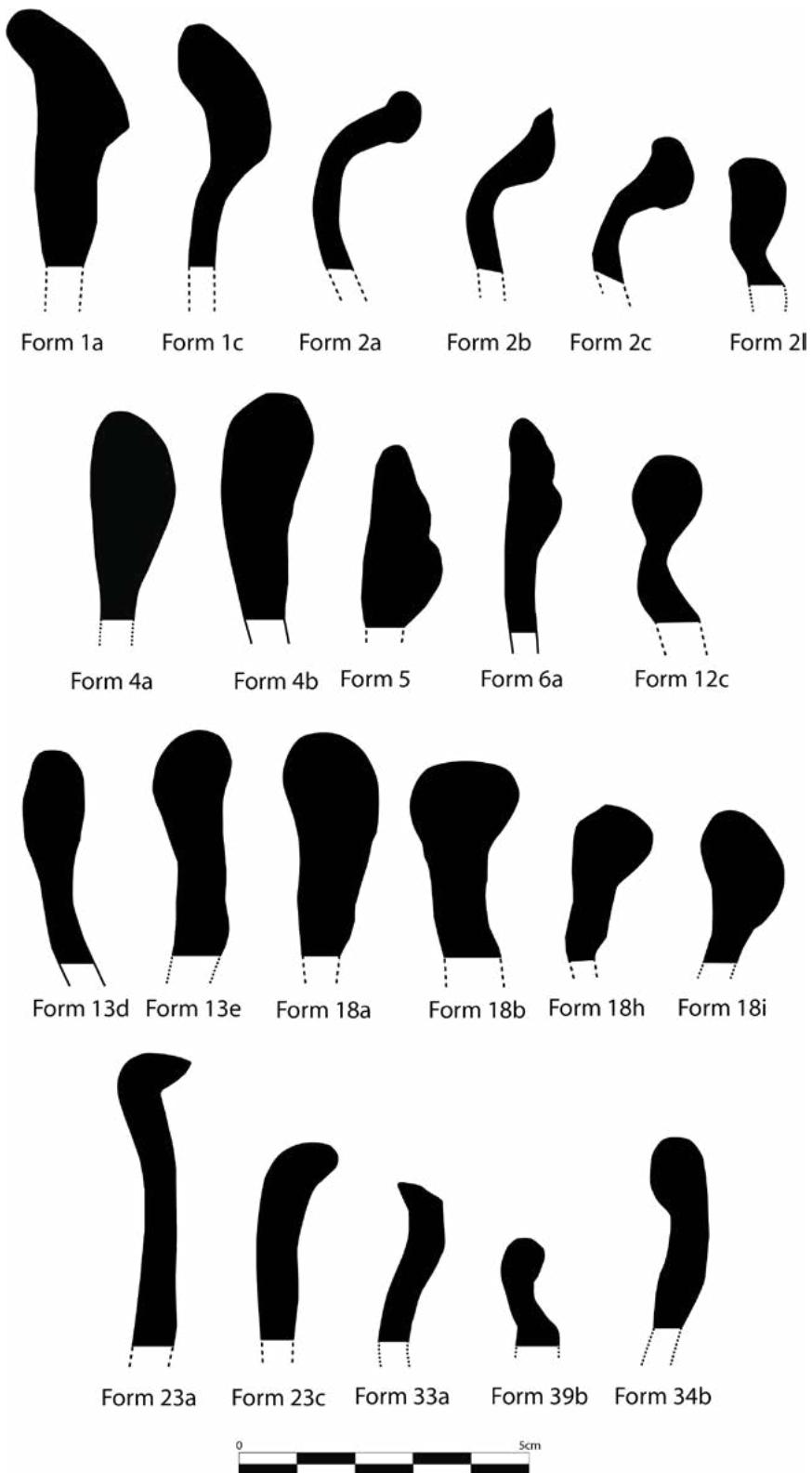


FIGURE 6: Rim sherd profiles of all common forms in Unit 315a-1 (Shwe Creek) © Saw Tun Lin

TABLE 3: Occurrence of common forms in Unit 315a-1

Form	Level 2	Level 3	Level 4a	Level 4b	Level 5a	Level 5b	Level 6a	Level 6b	315a-1 F/8
1a									
1c									
2a									
2b									
2c									
2l									
4a									
4b									
5									
6a									
12c									
13d									
13e									
18a									
18b									
18h									
18i									
23a									
23c									
33a									
34b									
39b									

not match with the other recognized forms. A total of 101 isolated forms were identified in Unit 315a-1 [FIGURE 7]. Whether these represent limited production of certain vessels during a limited period or whether they were produced idiosyncratic forms that were never reproduced, cannot be ascertained given the available data from the single test excavation unit. It is tentatively suggested that these forms were not as popular as the special and common forms in the assemblage.

Standardization

Standardization in ceramic production offers a lens through which to examine the organization of craftsmanship, economic systems, and cultural practices in ancient societies (Costin 1991: 144–148; Rice 1991; Orton & Hughes 2013). The analysis of earthenware sherds from Shwe Creek provides insights into the degree of standardization in pottery production and its implications for understanding the socio-economic and cultural dynamics of the Bagan period. By categorizing sherds into special, common, and isolated forms, the study reflects varying levels of standardization within the assemblage.

Special forms, identified as unique to specific chronological layers, suggest a degree of standardization in their production. These forms were likely crafted to meet specific functional or cultural requirements within a defined temporal framework. The consistent presence of these forms in specific stratigraphic levels indicates that potters followed standardized practices to maintain uniformity in shape and

design for particular uses. This standardization might reflect centralized control or specialized production workshops during the Bagan period.

Common forms, which are found consistently across multiple stratigraphic levels, demonstrate a higher degree of standardization. Their widespread and prolonged use suggests they fulfilled daily utilitarian functions, requiring repetitive and uniform production processes. This consistency implies that pottery workshops produced these forms in large quantities, adhering to standardized templates that facilitated their replication over centuries.

Isolated forms, by contrast, exhibit a lack of standardization. Their presence in only single stratigraphic layers or their idiosyncratic designs might reflect experimental production, individual creativity, or limited production for specific, short-term purposes. The absence of repetition for these forms suggests a divergence from standardized practices, highlighting the coexistence of both standardized and non-standardized ceramic production within Bagan society.

Attached and Independent Modes of Production

In Bagan, craft production reflected both attached and independent modes [TABLE 4], as defined by Costin (1991). Cathy Costin defines attached production as the creation of goods by artisans under elite control for high-status, religious, or ceremonial purposes. In Bagan, the terracotta Jātaka plaques adorning stupa and temple terraces

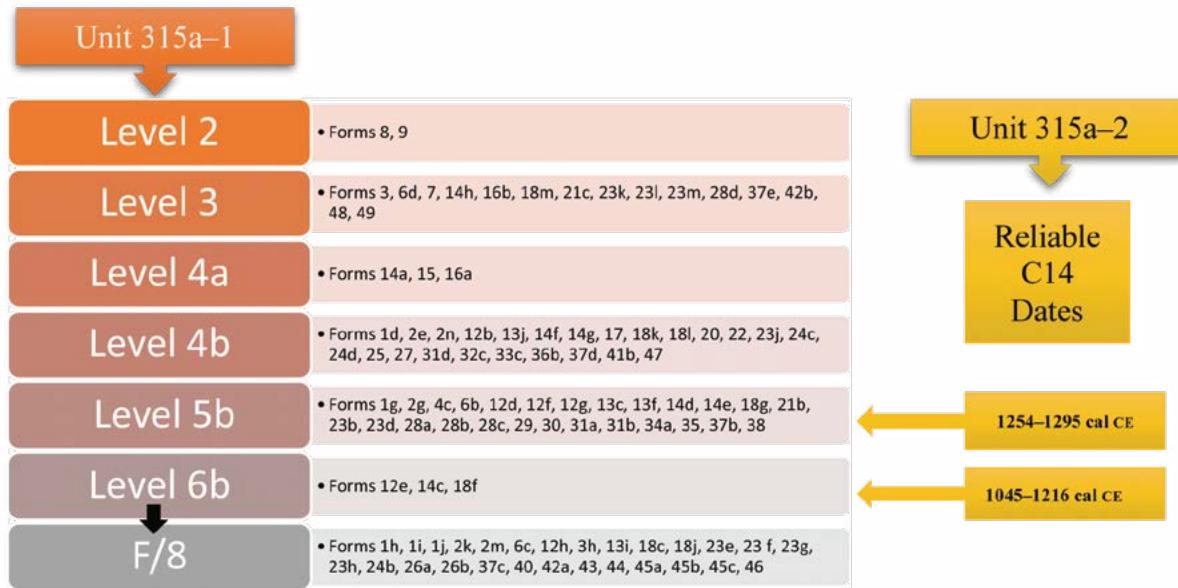


FIGURE 7: Occurrence of isolated forms in stratigraphic levels of Unit 315a-1 with reliable C14 dates from corresponding levels of Unit 315a-2 © Saw Tun Lin

exemplify this system. Likely commissioned by royalty or religious leaders, these plaques reflected elite wealth, piety, and status, reinforcing Bagan social and religious fabric. This tradition of elite patronage extended beyond Bagan, as evidenced by 19th century historical records indicating that artisans were commissioned to replicate the Jātaka plaques from the Ananda temple in Bagan (Stadtner 2001). These replicas were used to create similar glazed Jātaka plaques, which were installed at the Mingun stupa in Sagaing under the patronage of King Bodawphaya (ဘုရားတော်ဘုရား; r. 1782–1819).

The artistic skill and specialization evident in the plaques suggest that artisans were attached to royal or religious institutions. This aligns with Bruce Trigger's (1990) argument that attached specialists often produce symbols of power and status in hierarchical societies. We can thus conclude that the plaques were products of

centralized elite-controlled craft specialization, serving both religious and political purposes.

In contrast, earthenware sherds found at the IRAW excavation sites and elite locations such as the Bagan palace most likely reflect independent production, characterized by artisans working autonomously to meet community needs. These utilitarian wares, such as cooking pots and storage vessels, were crafted for daily use across all social strata. The decentralized nature of independent production is evident in the variety and functionality of these ceramics, which were essential for everyday life. Their widespread use, even in elite households, highlights the versatility and significance of independent production in Bagan society.

The coexistence of attached and independent production modes in Bagan underscores the interconnectedness of its socio-economic structure. While attached production focused on high-

TABLE 4: Comparison of attached and independent production at Bagan

Aspect	Attached Production (Terracotta Plaques)	Independent Production (Earthenware)
Control	Controlled by elites (e.g., royalty, religious institutions)	Produced by local artisans for both commoners and elites
Purpose	Religious/ceremonial or for elite status and prestige	Utilitarian, made for daily use across social strata
Scale of Production	Likely large-scale, highly organized, and possibly centralized	Small-scale, localized, and decentralized
Artisans	Specialized artisans with high skill, attached to elite groups	General craftsmen, working independently or in small groups
Distribution	Possibly limited to religious sites or elite households	Widely distributed for commoners and elites
Example in Bagan	Terracotta Jātaka plaques	Earthenware from commoner sites at IRAW excavation and elite contexts like the Bagan palace

status goods such as the Jātaka plaques, independent production fulfilled essential daily needs across social classes. The presence of utilitarian wares at elite sites reflects the reliance of all societal levels on large-scale decentralized production. As Costin (1991) notes, these systems demonstrate varying degrees of integration, with independent production playing a vital role in daily life at Bagan.

Discussion and Conclusion

The ceramic assemblages from Shwe Creek and Otein Taung offer valuable insights into the multifaceted roles of ceramics in Bagan society. Beyond their functional utility, ceramics held cultural,

economic, and ritual significance that shaped both local practices and regional interactions. The prevalence of utilitarian wares such as water vessels, kitchen utensils, construction materials like roof tiles and bricks and ceramic stamps (Cheong 2019: 69–70; Rivera & Cheong 2019: 162, 285; Tamura & Cheong 2019: 124, 127, 232–233), illustrates their integral role in daily life. These materials point to independent specialization, where artisans produced goods to meet the daily needs of a broad societal base. These items were not exclusive to elites or institutions, but were integral to the lives of commoners as well. This reflects a more generalized form of specialization, where potters balanced the production

of utilitarian ceramics, addressing the overlapping cultural and practical needs of Bagan society. Such flexibility aligns with the concept of functional diversity in specialization, emphasizing the ability of artisans to cater to a wide range of societal demands.

The libation jar (*kendi*) illustrates how specialization extended beyond utilitarian functions to address spiritual and cultural needs. These libation jars, integral to Buddhist merit-making practices, required artisans with specific skills to produce standardized forms suited for ritual smashing and other ceremonial acts, as evidenced by inscriptions (Taw Sein Ko & Forchammer 1899: 96, 160) and the archeological recovery of fragments. This reflects a form of attached specialization, where potters catered to the religious demands of Buddhist practices. The production of *kendi* jars also underscores the link between technical proficiency in ceramic production and its socio-cultural significance, demonstrating how specialized crafts contributed to the religious fabric of Bagan.

Diagnostic sherds from Shwe Creek (Unit 315a-1) reveal 151 distinct forms, categorized into special, common, and isolated types. Special forms, with chronological significance, were found across six levels, while common forms persisted from the early 11th century to post-Bagan periods. Isolated forms, unique to single layers, suggest limited production or specific use. Radiocarbon dating contextualized the special forms within a chronological framework, but cataloging errors and methodological limitations highlight the need for a more structured classification approach,

incorporating multiple attributes to enhance accuracy and insights. Despite limited data, the preliminary analysis reveals significant characteristics of Bagan's earthenware, useful for establishing a regional ceramic chronology. These findings on ceramic forms and their chronological contexts provide a foundation for understanding the interplay between production organization and socio-cultural dynamics during the Bagan period.

The presence of production tools such as ceramic anvils and kiln bricks further attests to Shwe Creek's role as a ceramic production hub. This aligns with evidence from Otein Taung, which also functioned as a multipurpose site with residential, industrial, and ritual activities. Furthermore, an inscription referencing the Queen of Bagan commissioning ceramic vessels from Twante in lower Myanmar (Luce 1969: 20, n. 61) illustrates the internal trade and craft production networks within the kingdom. Twante, recognized for its ceramic production, was capable of meeting the demands of the Bagan court, reflecting a high degree of specialization and organization of craft industries in the region. This historical account not only emphasizes the role of ceramics in Bagan's material culture but also demonstrates the integration of local and regional production systems in supporting the socio-political and economic structures of the Bagan period.

While local production catered to daily and ceremonial needs, imported ceramics demonstrate Bagan's participation in regional trade networks and highlights the intersection of local and global craft industries. The presence

of Chinese porcelains and celadons imported from lower Myanmar in Bagan, as documented by Kong F. Cheong (2019: 69–70) and Goh Geok Yian (2018: 179–97), provides compelling evidence of regional and interregional trade networks during this period. These imported ceramics, known for their high-quality craftsmanship and aesthetic appeal, highlight active participation in broader commercial exchange systems, underscoring the economic and cultural connections with neighboring regions and beyond. Notably, the limited quantity of high-value porcelains and celadons at Bagan may reflect differing economic or social statuses between the elites and commoners. This may also indicate how specialized goods could reinforce social stratification, with imported ceramics symbolizing wealth and prestige.

The analysis of earthenware sherds from Shwe Creek thus highlights both standardized and non-standardized aspects of pottery production during the Bagan period. While the presence of special and common forms indicates organized production and long-term standardization, the isolated forms and irregular diagnostics suggest variability and exceptions in the system. However,

limitations such as fragmentation, insufficient data on material properties, and cataloging errors underscore the need for more comprehensive and meticulous data collection in future studies. These results provide a foundation for further exploration of the socio-economic and cultural dynamics of ceramic production in the Bagan period.

Moreover, the dual presence of attached and independent production systems in Bagan reflects the interconnected and layered nature of its socio-economic structure. Attached production exemplified by the terracotta Jātaka plaques was elite-driven, symbolizing power, religious devotion, and status, while independent production, as seen in utilitarian earthenware, fulfilled the practical needs of daily life across all social strata. The coexistence of these systems highlights a dynamic interplay between centralized elite-controlled craft specialization and decentralized artisanal networks. This integration underscores the reliance of even the upper echelons on locally produced functional goods, illustrating the complementary roles of both production modes in shaping cultural and economic landscape at Bagan.

ACKNOWLEDGMENTS

We express our gratitude to the Ministry of Religious Affairs and Culture and the Department of Archaeology and National Museum for permitting our fieldwork in Bagan. Special thanks go to Director General U Kyaw Oo Lwin, Director Daw Mie Mie Khaing, and the Bagan Archaeology Branch team, including U Aung

Aung Kyaw, U Min Swe, U Myint Thein, U Soe Soe Lin, U Ko Ko Aung, U Phyoe Pyae Ko Ko, and U Ye Lwin, for their invaluable support. We deeply appreciate the participation of staff from the Department of Archaeology and the Department of Historical Research, as well as the generosity of U Nandara, Abbot of Kheminka Thein Kyaung Monastery, for providing accommoda-

tions, meals, and workspace. The Bagan Museum is also thanked for storage assistance. Our heartfelt appreciation goes to U Aung Htoo and Hnin Hnin Hlaing for their exceptional field meals, and to U Han Thaung, and our driver Thet Khaing for their unwavering support. We are grateful to landowners Aung Hlaing and Myint Oo for allowing research on their properties, and to Tun

Tun for building excavation shelters. We also acknowledge the insights of the late experts Michael Aung Thwin, Elizabeth Moore, Janice Stargardt, as well as Bob Hudson, Nyein Lwin, and Charlotte Galloway. Finally, we extend our sincere thanks to Trent University and the Social Sciences and Humanities Research Council of Canada (SSHRC) for funding our 2019 season.

REFERENCES

- Aung Kyaing. 1999. Ancient Ceramic and Glazed Kilns at Bagan. Paper Presented at the conference *Glazed Ceramics of Southeast Asia: Their History, Technology, and Traditions*, National Museum of Bagan, 20–22 September.
- Aung Thaw. 1968. *Report on Excavation at Beikthano*. Rangoon: Ministry of Union Culture.
- Bayard, Don. 1977. Phu Wiang Pottery and the Prehistory of Northeastern Thailand. *Modern Quaternary Research in Southeast Asia* 3: 57–102.
- Brown, Roxanna M. 1977. *Ceramics of South-East Asia: Their Dating and Identification*. Kuala Lumpur: Oxford University Press.
- Cheong, Kong F. 2019. Surface Collection and Elevation Mapping Strategies at Shwe Creek and Otein Taung. In *Integrated Socio-Ecological History of Residential Patterning, Agricultural Practices, and Water Management at the “Classical” Burmese (Bama) Capital of Bagan, Myanmar (11th to 14th Century CE): Report on the 2019 IRAW@Bagan Field Season*, ed. by Gyles Iannone et al., 63–82. Peterborough: Trent University Press.
- Costin, Cathy L. 1991. Craft Specialization: Issues in Defining, Documenting, and Explaining the Organization of Production. *Archaeology Method and Theory* 3: 1–56.
- Department of Archaeology (ရွှေးဟောင်းသုတေသနီးစီးဌာန). 2003a. ပုဂံအနောက်မင်းနန်းတော်ရာ သုတေသနပြု တူးဖော်မှု အစီရင်ခံစာ [Report on the Excavation of Anawrahta Palace Site in Bagan]. Bagan: Department of Archaeology.
- . 2003b. ပုဂံနန်းတော်ရာကုန်း တူးဖော်မှု လုပ်ငန်း တင်ပြ အစီရင်ခံစာ [Report on the Excavation of Bagan Palace Site]. Bagan: Department of Archaeology.
- Fraser-Lu, S. 1994. *Burmese Crafts Past and Present*. Kuala Lumpur: Oxford University Press.
- Guy, John. 1989. *Ceramic Traditions of South-East Asia*. Singapore: Oxford University Press.
- Hein, Don & Ramsay, W. Ross H. 2014. The Kilns of Myinkaba—for Pottery or Glass? Paper Presented at the *Myanmar Ceramics Symposium*, University of Yangon, 3–4 March.
- Higham, Charles F.W. 2001. Commentary on Archaeology in Myanmar: Past, Present, and Future. *Asian Perspectives* 40(1): 127–138.
- Hudson, Bob. 2004. *The Origins of Bagan; the Archaeological Landscape of Upper Burma to AD 1300*. PhD Dissertation. University of Sydney.

- Hudson, Bob et al. 2001. The Origin of Bagan: New Dates and Old Inhabitants. *Asian Perspectives* 40(1): 48–74.
- . 2002. Digging for Myths: Archaeological Excavations and Surveys among the Legendary Nineteen Founding Villages of Pagan. In *Burma: Art and Archaeology*, ed. by Alexandra Green & T. Richard Blurton, 9–22. London: British Museum Press.
- Iannone, Gyles et al., eds. 2019. *Integrated Socio-Ecological History of Residential Patterning, Agricultural Practices, and Water Management at the “Classical” Burmese (Bama) Capital of Bagan, Myanmar (11th to 14th Century CE): Report on the 2019 IRAW@Bagan Field Season*. Peterborough: Trent University Press.
- Luce, Gordon H. 1969. *Old Burma-Early Pagan (Volume 1)*. New York City: J.J. Augustin.
- McIntosh, Roderick J. 1991. Early Urban Clusters in China and Africa: The Arbitration of Social Ambiguity. *Journal of Field Archaeology* 18(2): 199–212.
- Myo Nyunt Aung. 2018. Archaeological Conservation of Bagan Ancient Monuments in Myanmar. နာဂုံ/NAJUA 33: 23–42.
- Orton, Clive & Hughes, Mike. 2013. *Pottery in Archaeology*. Cambridge, UK: Cambridge University Press [2nd Ed.].
- Plog, Stephen. 1978. Social Interaction and Stylistic Similarity: A Reanalysis. *Advances in Archaeological Method and Theory* 1: 143–182.
- . 1983. Analysis of Style in Artifacts. *Annual Review of Anthropology* 12: 125–142.
- Rice, P.M. 1991. Specialization, Standardization and Diversity: A Retrospective. In *The Ceramic Legacy of Anna O. Shepard*, ed. by R.L. Bishop & F.W. Lange, 257–279. Niwot: University Press of Colorado.
- Rivera, Raiza S. & Cheong, Kong F. 2019. Operation 315a, Unit 315a-2: Archaeological Investigation of the Occupation Site at Shwe Creek, Bagan, Myanmar. In *Integrated Socio-Ecological History of Residential Patterning, Agricultural Practices, and Water Management at the “Classical” Burmese (Bama) Capital of Bagan, Myanmar (11th to 14th Century CE): Report on the 2019 IRAW@Bagan Field Season*, ed. by Gyles Iannone et al., 143–168. Peterborough: Trent University Press.
- Sawang Lertrit. 2003. On Chronology-Building for Central Thailand through an Attribute-Based Ceramic Seriation. *Asian Perspectives* 42(1): 41–71.
- Stadtner, Donald M. 2001. The Questions and Answers of Maungdaung Sayadaw and the Confluence of the Ananda Temple, Pagan and the Mingun Pagoda. Paper Presented at the conference *Texts and Contexts in Southeast Asia*, Yangon, 12–14 December.
- . 2011. *Sacred Sites of Burma: Myth and Folklore in an Evolving Spiritual Realm*. Bangkok: River Books.
- . 2013. *Ancient Pagan: Buddhist Plain of Merit*. Bangkok: River Books [2nd Ed.; 1st Edition 2005].
- Strologo, Sergio Della & Kyaw Nyein. 1963. *Report on Pagan Trip for Analysis of Old Glazing Kiln. A Chapter of Improved Ceramic Production in Burma*. Unpublished USAID Project Report.
- Tamura, Ellie & Cheong, Kong F. 2019. Operation 315a, Unit 315a-1: Archaeological Investigation of the Occupation Site at Shwe Creek, Bagan, Myanmar. In *Integrated Socio-Ecological History of Residential Patterning, Agricultural Practices, and Water Management at the “Classical” Burmese (Bama) Capital of Bagan, Myanmar (11th to 14th Century CE)*,

ed. by Gyles Iannone et al., 93–134. Peterborough: Trent University Press.

- Taw Sein Ko & Forchhammer, Emmanuel. 1899. *Inscriptions of Pagan, Pinya and Ava*. Rangoon: Superintendent of Burma, Government Printing.
- Than Tun. 2005. *Myanma Design*. Yangon: Plastic Rainbow.
- Trigger, Bruce G. 1990. Monumental Architecture: A Thermodynamic Explanation of Symbolic Behaviour. *World Archaeology* 22(2): 119–132.
- Yian, Goh Geok. 2018. Positioning Bagan in the Buddhist Ecumene: Myanmar's Trans-Polity Connections. In *Bagan and the World: Early Myanmar and Its Global Connections*, ed. by Goh Geok Yian et al., 179–197. Singapore: ISEAS–Yusof Ishak Institute.
- Yian, Goh Geok & Miksic, John N. 2019. *Southeast Asian Archaeological Site Reports: Myanmar–Singapore Archaeology Training Project (MSATP)*. Singapore: NUS Press.