
Report on the IRAW@Bagan Project 2017 Field Research

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CHAPTER 1
An Introduction to the IRAW@Bagan Project

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The IRAW@Bagan project is a long-term archaeological research program aimed at generating an 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). This research endeavor gains its importance from the fact that our current understanding of Bagan society is biased towards its upper echelons, being based almost entirely on elite-focused texts, art, and architecture. A settlement archaeology study within the peri-urban (mixed urban-rural) zone immediately surrounding Bagan’s walled and moated, regal-ritual epicenter (Figures 1.1 and 1.2) will: 1) provide much needed balance to our conception of Bagan as a dynamic capital city; 2) generate insights useful to elucidating the unique aspects of urban development in the tropics; and, 3) inform considerations of resilience and vulnerability in contemporary tropical metropolises.

Figure 1.1. Location of Bagan and some of the other Classic Southeast Asian kingdoms.
Figure 1.2. Map of Bagan’s epicenter and surrounding peri-urban settlement zone (modified from Kan Hla 1977, Fig 1; and Aung-Thwin 1985, Map 4).
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Bagan (aka Pagan), like most of the historic Buddhist capitals of Myanmar, was located in the central “dry zone” (Aung-Thwin 1987:88, 1990:1; Aung-Thwin and Aung-Thwin 2012:38; Cooler 1997:19-20; Hudson 2008:553; Strachan 1989:8), on the eastern bank of the strategic and economically important Ayeyarwady River (Higham 2001:134; Hudson 2004:221, 265). Recent archaeological and scientific assessments support a mid-9th century CE date for the establishment of the Bagan community (Hudson 2004:220, 265-266; Moore et al. 2016:285; Nyunt Nyunt Shwe 2011:26), with the 11th to 14th centuries being the period when Bagan was the capital of a polity that controlled much of what is now the country of Myanmar (Daw Thin Kyi 1966:187; Galloway 2006:35; Higham 2001:134; Hudson 2004:183, 266, 2008:553, 555; Kan Hla 1977:17; Moore et al. 2016:285; Stadtner 2011:214-215, 2013:14, 18). Bagan’s florescence was followed by an era of socio-political “collapse” and reorganization, after which time it saw continued usage as a provincial capital and pilgrimage center (Hudson 2004:234-245, 266, Table 15, 2008:555; Hudson et al. 2001:53; Stadtner 2011:215-216, 2013:14, 18). These periods of growth and decline coincide with, and may have been influenced by, two significant climate changes: The Medieval Climate Anomaly (MCA; 900-1300 CE), marked by warmer conditions with increased rainfall, longer monsoon seasons, shorter dry season droughts, and rains more evenly distributed throughout the year – which were ideal conditions for agriculture – and the subsequent Little Ice Age (LIA; 1300-1570 CE), a cooling period that brought negative changes in both rainfall and temperature, and hence deteriorating agricultural conditions (Buckley et al. 2010, 2014; Cook et al. 2010; Lieberman 2003:103, 2009:330, 792, 2011:939; Lieberman and Buckley 2012:1052; Wohlfarth et al. 2016; Wündsch et al. 2014; Yamoah et al. 2017).

The Bagan epicenter, as is true for other historic Myanmar capitals, was an “exemplary” center that was imbued with cosmological and regal-ritual significance, at the same time that it was home to royals, nobles, military leaders, guards, servants, and elite craft workers (Aung-Thwin 1985:50-51, 1987:88, 94-98; Aung-Thwin and Aung-Thwin 2012:81, 100-101; Daw Thin Kyi 1966:187; Hudson 2004:221; Kan Hla 1977:21). Such epicenters were normally characterized by a walled and moated regal-ritual space with 12 gates that housed royal temples (with interior space), stupas (solid cores with offerings), ordination halls, libraries, monasteries, “preaching halls,” and a palace (Aung-Thwin 1985:50-52, 1987:89-91; Aung-Thwin and Aung-Thwin 2012:81; Daw Thin Kyi 1966:179; Hudson 2004:220; Stadtner 2011:219-220). Historically, Myanmar epicenters were roughly 2.5 km² in size (Aung-Thwin 1987:90; c.f., Daw Thin Kyi 1966:179). Bagan’s epicenter is slightly smaller, at 1.5 km² (Aung-Thwin and Aung-Thwin 2012:78), although it is impossible to determine its original dimensions because its western wall washed into the Ayeyarwady River sometime in antiquity (Daw Thin Kyi 1966:179; Hudson 2004:221; Luce 1969:7, 106; Stadtner 2013:125).

When considered today, Bagan’s epicenter clearly: “represents an elite core, not an urban boundary,” given that a dense amalgamation of brick temple complexes, stupas, and monasteries extends out and away from the walled enclosure in all directions, thereby forming an extensive peri-urban settlement zone (Hudson 2004:221; see also Aung-Thwin and Aung-Thwin 2012:101; Kan Hla 1977:21; Luce 1969:229). Most of these features were constructed during Bagan’s florescence (Hudson 2004:236), and the spatial extent of the peri-urban zone itself appears to have been established by the end of the 11th century (Kan Hla 1977:18). This peri-urban zone is estimated to have covered around 80 km² (Grave and Barbetti 2001:75; Hudson 2004:237;
Hudson et al. 2001:48; Moore et al. 2016:294; c.f., Aung-Thwin and Aung-Thwin 2012:91), and it encompassed at least 2200 brick temples (Hudson 2004:236; Kan Hla 1977:15), and possibly as many as four thousand (Aung-Thwin 1985:169; Kan Hla 1977:15; Prichard 1992-2003). The emphasis on channeling resources into monumental architecture during Bagan’s early development suggests that these edifices were considered strategic mechanisms for broader societal integration (Hudson 2004:243; Hudson et al. 2001:51; see also Trigger 1990). Crucial to this integration was the Buddhist notion of “merit,” which was fundamental to the Bagan belief system, and indeed to the daily life of all members of the kingdom (Aung-Thwin 1987:89; Aung-Thwin and Aung-Thwin 2012:83-84). It was good deeds, and more significantly donations of capital and both human and natural resources to the Buddhist church (the Sangha), that allowed all citizens – but mostly those with access to such resources – to secure “social recognition and spiritual benefits,” along with a higher quality rebirth (Aung-Thwin 1985:26, 43-44, 169-171; Aung-Thwin and Aung-Thwin 2012:94; see also Luce 1969:89-90, 107, 109, 112, 115; Stadtner 2013:18).

Hudson et al. (2001:70) posit that: “By the twelfth century A.D., [Bagan’s peri-urban zone was] characterized by a low-density, monument-rich complex that could expand without the constraint of a predefined outer boundary,” such as a perimeter wall or any other type of defensive feature (Daw Thin Kyi 1966:187; Kan Hla 1977:19). The inscriptions inform us that although the majority of temples and stupas were made of brick, some monasteries, and the many palaces, commoner residences, and schools scattered throughout the peri-urban zone were crafted from wood and built on “stilts” (Aung-Thwin and Aung-Thwin 2012:91; Kan Hla 1977:20; Luce 1969:229; Strachan 1989:7). As a result, other than the clay roof tiles used in elite structures, these buildings have all perished (Aung-Thwin and Aung-Thwin 2012:91). According to John Miksic (2001:100): “Subjective impressions of Pagan obtained by walking over the ground suggests that many areas in fact may have been densely inhabited, to judge from the dense scatters of ceramic sherds littering the ground” (see also Aung-Thwin and Aung-Thwin 2012:79-80; Daw Thin Kyi 1966:187; Stadtner 2013:15, 50). Hudson et al. (2001:70) concur, positing that: “Spatio-temporal evidence from Bagan’s key multi-attribute artifacts, its buildings, indicates that there may have been a number of long-term settlements spread throughout the urban complex” (see also Strachan 1989:7). Indications are that these settlement “clusters” were normally surrounded by greenery and located adjacent to agricultural plots of various size (Kan Hla 1977:21; Moore et al. 2016:294). Recent analysis also indicates that the peri-urban zone contains remnants of a complex and extensive, yet comparatively “small-scale” water management system (Cooler 1997:22-23; Moore et al. 2016:285, 294-300, 302; Win Kyaing 2016).

What then do we know about the population that inhabited Bagan’s peri-urban city-scape? It is here where Bagan’s inscriptions and retrospective chronicles provide us with some important information. We are told that a small portion of Bagan’s society was made up of officials of upper and lower rank, and an even smaller number of nobles, including those comprising the royal court (Aung-Thwin 1985:71, 96; Aung-Thwin and Aung-Thwin 2012:97; Stadtner 2013:25). The apex of the commoner class included village heads, artisans, and crown service troops (Aung-Thwin 1985:72-73). By far the largest segment of Bagan’s support population was made up primary producers, most of which were involved in some form of agricultural production (Aung-Thwin 1985:71-73, 95; Aung-Thwin and Aung-Thwin 2012:49). Besides farmers, Bagan was also home to myriad craft specialists (Aung-Thwin and Aung-Thwin 2012:49, 90-91; Higham 2001:134; Hudson 2004:212; Kan Hla 1977:21; Luce 1969:108, 112,
Regardless of their occupation, most commoners were formally “bonded” to either the Crown, the Sangha (Buddhist church), or less frequently to wealthy nobles, in a complex web of patron-client relationships that were codified into law (Aung-Thwin 1985:71, 74, 78, 87, 1987:88; Aung-Thwin and Aung-Thwin 2012:97). Indications are that Bagan’s support population was multi-ethnic (Aung-Thwin 1985:71; Aung-Thwin and Aung-Thwin 2012:88, 96-97), and although Theravada Buddhism was the state religion, other Buddhist schools (i.e., Mahayana), traditional animistic practices, and even Hindu beliefs were apparently tolerated (Luce 1969:72-73; Nyunt Nyunt Shwe 2011:26). The historic texts also imply that this societal heterogeneity conditioned Bagan’s residential patterning, giving it both a clustered and cellular character, wherein a combination of one’s “socio-spiritual” status, clientage, occupation, and ethnicity determined where and with whom one lived (Aung-Thwin 1985:74, 91-96; Hudson 2004:212).

Regardless of the apparent details provided by the historic records, it is accurate to state that there is little attention paid to the general lifeways of Bagan’s peri-urban population (Luce 1969:116; Miksic 2001:91). We must also remain cognizant of the fact that such elite-focused representations are, by their very nature, one-sided, and they should therefore not only be reviewed with a critical eye, but also actively challenged using alternative datasets. This is likely to result in contrasting, multivocal, and undoubtedly more realistic renditions of Bagan society (see Feinman 1997; Overholtzer 2013). The elite-biased perspective that governs our current understanding of Bagan’s peri-urban population stimulates a series of research questions that will help guide the long-term IRAW@Bagan research program 1) How accurate is our current understanding of the commoner population that inhabited Bagan’s peri-urban settlement zone, given the elite-centric focus of our current text-based data sets? 2) Can the posited heterogeneity and cellularity of Bagan’s peri-urban population be materially confirmed, given the diversity in status, ethnicity, occupation, and bondage suggested by the historic records? 3) If such diversity can be recognized archaeologically, what might this tell us about commoner agency, and shifting levels of adherence or resistance to the dominant, merit-based, Buddhist ideology, and the system of bondage that supported it? and, 4) Did different segments of Bagan’s peri-urban population exhibit varying degrees of resilience to ecological, climatic, economic, socio-political, and religious changes, and if so, why?

Another area that requires further investigation is the character of Bagan’s peri-urban ground plan. The inscriptions and retrospective chronicles relating to Bagan have led some to imply that its peri-urban settlement zone was formally planned on an orthogonal, grid and block system, with distinct “wards” housing individuals sharing the same occupation (Aung-Thwin 1987:92; Aung-Thwin and Aung-Thwin 2012:91; Kan Hla 1977:21), not unlike what is found in the Chinese tradition of “compact urbanism” (Wheatley 1971). Others have underscored that Bagan’s peri-urban zone does not appear to have been either gridded or orthogonal in plan, although the placement of prominent structures was surely intentional (Kan Hla 1977:21-23; Moore et al. 2016:302). The latter characterization has also been advocated by those advancing a cross-cultural, comparative perspective, wherein Bagan’s city-scape is considered an example of a quasi-orthogonal, “low-density” (Fletcher 2009, 2012; Hudson et al. (2001:70), or dispersed urban center (Iannone 2015). As such, it is posited to equate with a unique urban tradition that persisted for a considerable length of time in the world’s tropical zones (Fletcher 2009, 2012; Haviland 1969:431-432, 1970; Iannone 2015; Isendahl and Smith 2013; Miksic 2001:102, 2012:179; Stark et al. 2015:1442; Wheatley 1971). Given these alternative perspectives, four additional questions will help frame the IRAW@Bagan research program: 1) How were
individual Bagan houses, house-lots, and villages configured, what kinds of activities took place in these residential spaces, and did the nature of these spaces change over time? 2) Does the residential patterning in Bagan’s peri-urban zone reflect the orthogonal/compact tradition of China, or the quasi-orthogonal/dispersed traditions of the tropics? 3) Did Bagan’s city-scape transition from being more dispersed and haphazard to more compact and grid-like over time? and, 4) How extensive and interconnected were Bagan’s peri-urban water management and agricultural systems, how did they develop, and in what ways did different stakeholders engage with them?

METHODS

The IRAW@Bagan project will employ theoretical and methodological tools from Iannone and Macrae’s previous settlement archaeology project in the Maya subarea (e.g., Iannone 1996, 2003, 2004, 2005; Iannone and Connell 2003; Iannone et al. 2008; Longstaffe and Iannone 2011; Macrae and Iannone 2011, 2016; McCane et al. 2010), and their six years of comparative research (2010-2016) into socio-ecological resilience in South and Southeast Asia (Iannone 2014a, 2014b, 2015, 2016; Iannone et al. 2015). Three interconnected sub-projects will frame the research program.

The Residential Patterning Sub-Project

This sub-project will explore diversity in settlement unit location, size, composition, ground plan, orientation, and activities, with the goal of evaluating the tight integration, residential clustering/cellularity, and orthogonal/grid-block ground plan suggested by the historic records (Aung-Thwin 1985:74, 91-96; Aung-Thwin and Aung-Thwin 2012:91; Kan Hla 1977:21). The principal challenge for the residential patterning sub-project is that: “Excavations in Mainland Southeast Asia have yet to reveal a single complete house plan” (Higham 2017:369; emphasis mine). Indeed, the settlement patterns and residential architecture of the classical period polities of Southeast Asia have rarely received archaeological attention (Miksic and Goh 2017:26, 358), with the exception of Angkor, Cambodia (Bâty 2005; Stark et al. 2015), and Trowulan, East Java (Miksic 2001:100, 2012), where recent excavations have been specifically aimed at exposing house remains. As such, the fundamental goal of Phase I of the IRAW@Bagan residential patterning sub-project is to find ancient living surfaces and reveal the city’s first complete house plans. As is common practice in such “exploratory” situations, our initial investigations will employ non-probabilistic (purposive/judgmental) sampling methods to enhance the potential for finding buried residential features (Banning 2002:28-29; French 2015:21). This sampling strategy has been informed by prior archaeological observations concerning the possible locations of settlement clusters at Bagan (Hudson 2004:208-220, 234--266; Hudson et al. 2001:53-62). Based on such knowledge, preliminary surface reconnaissance by the IRAW@Bagan research team (May 2017) resulted in the discovery of four potential residential loci, given the presence of exceptionally dense ceramic scatters: 1) Shwe Creek, 2) Otein Taung, 3) South Wall, and 4) Kiln #4. Our Phase I excavations will focus on these four possible residential sites, and any other possible sites encountered during GPS-guided pedestrian survey of three 250 m wide transects (see the field work plan [below] for more details). These “purposively” situated transects will be used to locate extensive scatters of ceramic detritus
(Banning 2002:90), a plausible proxy for residential occupation (Banning 2002:15, 75, 206). This reconnaissance will be aided by scheduling our fieldwork in April-May, coinciding with the end of the dry season and the time when ground cover is most limited. A series of 1 x 4 m test trenches and larger 4 x 4 m horizontal exposures will subsequently be used to search for and uncover buried residential features, such as postholes (please see the fieldwork schedule [below] for more details). Context information will be recorded in notebooks and on level/feature forms and entered into a Microsoft Access database. A hand-held digital SLR camera and georeferenced ground control points (using a total station) will be used to record all excavation contexts, on-floor artifact distributions, features, and both plans and sections. Processing of these data using “Structure from Motion” (SfM) photogrammetric software (Agisoft LLC 2017a, 2017b) will allow for the production of high resolution orthophotos (sub-millimeter), digital elevation models (DEM), accurate 3D and 2D maps, precise post-excision measurements (e.g., lengths, heights, and volumetrics), and geospatial analysis in ArcGIS ([ESRI 2016]; Benavides Lopez et al. 2016; Green et al. 2014; Koenig et al. 2017; Quatermaine et al. 2014). Samples for radiometric (bone or charcoal) and/or luminescence (ceramics) dating will be collected to aid in chronology building. Artifacts will be processed and analyzed using standard procedures (e.g., Rice 1987), including the use of both identification guides (e.g., Brown 2000) and reference collections in the Bagan Museum.

The Agricultural Practices Sub-Project

The Bagan polity was supported by an agrarian economy, but the city itself was not well suited to wet-rice cultivation (Aung-Thwin 1990:8; Cooler 1997:22-23). This sub-project will therefore explore the agricultural potential of the peri-urban settlement zone in terms of “dry weather crops” – such as sesame, millet, sorghum, legumes, palm trees, dry rice, onions, and root crops (Aung-Thwin 1990:5-6; Cooler 1997:23; Kan Hla 1977:15; Moore et al. 2016:302-303; see also Spate 1945:524-526) – in addition to assessing the distribution of fields, gardens, and granaries. This research will build on earlier assessments of Bagan’s agricultural capacity (Aung-Thwin 1990), taking into consideration that the agricultural potential of Bagan’s peri-urban zone would have varied across the MCA and LIA climate regimes. The agricultural practices sub-project will involve total-station mapping and excavation of possible remnant field “walls” and adjacent field surfaces (1 x 2 m trenches) encountered during the transect surveys (please see the fieldwork schedule [below] for details). Excavation areas will be selected based on their connection with identified hydrological features and proximity to known settlement units (see Macrae 2017:123). Soil samples collected from each stratigraphic profile will be subjected to pedological tests, including: soil taxonomy, textural classes, organic matter, exchangeable micro- and macro-nutrients, and trace element concentration, as well as chemical constituents such as pH, electrical conductivity, and estimated cation-exchange capacity (French 2015). Subsequent analysis will focus on interdependent soil characteristics such as soil fertility, soil moisture retention capability, and vulnerability to soil erosion (Macrae 2017:155-168). The soil samples will also be subjected to macro- and micro-botanical analysis (phytolith, starch, and pollen). Results of these tests will be examined in terms of expected crop production and intensity. A developmental model for sections of the ancient Bagan agricultural field system will then be generated using excavation data, proximity to datable hydrological or settlement features, and correspondences between fields and temple/monastery spatial orientations, as determined through remote sensing (e.g., Hawken 2013). Finally, a global information system (GIS) model
for crop suitability and productivity potential will be produced through an analysis of crop suitability based on precipitation (as extrapolated from regional climate signatures), soil quality (from the archaeopedological analysis), topographic conditions (from available DEMs and hydrological mapping), and the biophysical requirements of the crops identified by macro- and micro-botanical analysis (Macrae 2017:226-253). Production potential will be modeled by examining the manipulation of crop suitability through farm management practices, technological advances, and cropping systems, assigning each management condition a unique value that influences potential levels of production (Elsheikh et al. 2013:98). Production potential will then be evaluated for a series of crop groups (cereal, fiber crops, oil crops, roots and tubers, stimulants, fruit trees, and vegetables) under different management practices.

The Water Management Sub-Project

Access to water was an endemic issue at Bagan (Cooler 1997; Luce 1969:7), and most kings attempted to augment the city’s water supply through the construction of brick wells, dams, canals, and brick or stone-lined holding tanks (Kan Hla 1977:22; Luce 1969:76, 84, 256; Pe Muang Tin and Luce 1923:65, 131; Stargardt 1968:360-361). This sub-project will attempt to reconstruct the broader water management system associated with Bagan’s peri-urban settlement zone. It will build on prior examinations of Bagan’s water management system, (Moore et al. 2016:283; see also Win Kyaing 2016; c.f., Cooler 1997:32), including preliminary examinations of known water management features in the peri-urban zone carried out by the IRAW@Bagan research team in May 2017. This sub-project will involve a GIS-based hydrological study of Bagan’s peri-urban settlement zone. The analysis will be based on hydrological modeling programs (Arc Hydro [see Maidment 2002]) within a geographical information system (ArcGIS [ESRI 2016]). The foundation of this analysis will be a high-resolution DEM derived from existing remote sensing datasets (i.e., recent aerial photographs and prior mapping initiatives) and traditional total station and GPS survey data collection. The Hydrological analysis will include the direction of flow, flow accumulation, and watershed delineation (see Macrae 2017:214-225; Macrae and Iannone 2016:374-388). The identification of these hydrological characteristics across the landscape will provide information on both naturally occurring features – such as slope, streams, and seasonal ponds – as well as cultural features, such as reservoirs, canals, weirs, and moats. Identifying potential areas of strategic water management and zones of high flow accumulation will provide the basis for traditional total station survey of both natural and anthropogenic water flow. Sub-meter accurate GPS devices will be used to ground-truth and map these features in real time. The results will be used to both identify and differentiate between natural and cultural features, and these observations will be used in conjunction with data derived from remote sensing to facilitate the analysis of changing hydrological processes. This analysis will include assessments of localized weather patterns indicative of annual wet and dry periods (see Aung-Thwin 1990:6), providing the necessary comparative data for identifying changing water levels across the anthropogenic system. This analysis will also facilitate investigation of the potential ramifications that the MCA and LIA climatic regimes had on both domestic water security and agricultural production during Bagan’s rise and fall as a political center. Targeted excavations of water management features will focus on cross-sectioning canals and weirs (1 x 2 m trenches) that functioned to distribute water between the agricultural fields and larger reservoirs (please see the fieldwork schedule [below] for details). The location of these excavations will be based on considerations of the
hydrological flow and accumulation maps, and insights generated through the systematic transect surveys. Excavations will address both the chronological sequence and techniques of construction. Soil samples will be collected and soil organic matter (SOM) will be radiocarbon dated to substantiate the results of ceramic date attributions, and to facilitate direct temporal correlation with adjacent agricultural fields and settlement units.

**IRAW@Bagan Fieldwork Schedule**

- **May 2017**: Initial settlement reconnaissance was conducted at the four traditional palace sites and the Shwe Creek, Otein Taung, South Wall, and Kiln #4 occupation sites, collection of epigraphic and iconographic data related to domestic life and settlement patterns was carried out, and preliminary investigation of Nat Yekan sacred water tank on the Tuyin was initiated.

- **December 2017**: Ethnoarchaeological study of settlement patterning and agricultural practices in ten traditional villages in and around Bagan’s peri-urban settlement zone was completed, further reconnaissance at the Shwe Creek and Otein Taung occupation sites was carried out, and 3-D mapping of Nat Yekan Tank and hydrologically focused reconnaissance of the Tuyin-Thetsoe range and Mya Kan Reservior were conducted.

- **May 2018**: Excavation of a proposed dam feature and associated spillway in the northeast corner of the Nat Yekan Tank and GIS-based mapping and hydrological analysis of the Tuyin-Thetsoe range and Mya Kan Reservior; Ethnoarchaeology of socio-religious practices associated with water.

- **November 2018**: The PI (Iannone) will spend time reviewing the artifact collections at the Bagan museum to aid in subsequent analysis, and to facilitate the crafting of data recording forms and the formulation of the Microsoft Access database.

- **May 2019**: Quadrant-based surface collection (diagnostic sherds and special finds) and sub-surface testing of the Shwe Creek and Otein Taung occupation sites, including excavation of a 1 x 4 m trench in the center of each ceramic scatter (N-S orientation), and a 1 x 4 m trench 10 m to the east or west of the central units (E-W orientation); Reconnaissance and mapping of a 250-m wide x 1.75-km long NE-SW transect between Shwe Creek and Otein Taung occupation sites.

- **May 2020**: Surface collection and sub-surface testing of the South Wall and Kiln #4 occupation sites, including excavation of a 1 x 4 m trench in the center of each ceramic scatter (N-S orientation), and a 1 x 4 m trench 10 m to the east or west of the central units (E-W orientation); Reconnaissance and mapping of a 250-m wide x 2.15-km long NW-SE transect between Otein Taung occupation site and Minnanthu Village.

- **May 2021**: Surface collection and sub-surface testing of two occupation sites discovered during the Years 1 and 2 transect surveys, including excavation of a 1 x 4 m trench in the center of each ceramic scatter (N-S orientation), and a 1 x 4 m trench 10 m to the east or west of the central units (E-W orientation); Reconnaissance and mapping of a 250-m wide x 2.75-km long SE-NW transect between Otein Taung occupation site and the South Wall occupation site.

- **May 2022**: Horizontal excavation of the previously tested occupation site with the clearest signs of residential occupation. This will involve 3-4 contiguous 4 x 4 m excavation units strategically positioned based on the results of prior test excavations;
Sectioning of field walls and adjacent field surfaces (1 x 2 m trenches), soil sample collection and flotation analysis (macro-and micro-palaeobotanical recovery), ground-truthing of GIS-based hydrological analysis, and test excavation (1 x 2 m trenches) of canals and weirs along the three survey transects; Artifact analysis for socio-cultural reconstructions and chronology building.

- **May 2023:** Horizontal excavation of a second previously tested occupation site with clear signs of residential occupation. Once again, this will involve 3-4 contiguous 4 x 4 m excavation units strategically positioned based on the results of prior test excavations; Sectioning of field walls and adjacent field surfaces (1 x 2 m trenches), soil sample collection and flotation analysis (macro-and micro-palaeobotanical recovery), ground-truthing of GIS-based hydrological analysis, and test excavation (1 x 2 m trenches) of canals and weirs along the three survey transects; Artifact analysis for socio-cultural reconstructions and chronology building.

**List of References**

Agisoft LLC  

Aung-Thwin, Michael  

Aung-Thwin, Michael, and Maitrii Aung-Thwin  

Banning, E. B.  

Bâty, P.  


Brown, Rozanna M.

Buckley, Brendan M., Kevin J. Anchukaitis, Daniel Penny, Roland Fletcher, Edward R. Cook, Masaki Sano, Le Canh Nam, Aroonrut Wichienkeeo, Ton That Minh, and Truong Mai Hong

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Cooler, Richard M.

Daw Thin Kyi

Elsheikh, Ranya, Shariff, Mohamed Abdul Rashid B., Fazel Amiri, Noordin B. Ahmad, Siva K. Balasundram, and Mohd A. M. Soom

ESRI
2016 *ArcGIS Desktop: Release 10.5* [Computer Software]. Environmental Systems Research Institute, Redlands, California.

Feinman, Gary M.

Fletcher, Roland

French, Charles

Galloway, Charlotte Kendrick

Grave, Peter, and Mike Barbetti

Green, Susie, Andrew Bevan, and Michael Shapland

Haviland, William A.

Hawken, Scott

Higham, Charles F.W.

Hudson, Bob

Hudson, Bob, Lwin Nyein, and Win Maung (Tanpawady)

Iannone, Gyles


2005 The Rise and Fall of an Ancient Maya Petty Royal Court. Latin American Antiquity 16:26-44.

2014a Framing a Comparative Analysis of Tropical Civilizations: An Introduction to the Socio-Ecological Entanglement in Tropical Societies (Sets) Project. In Framing a Comparative Analysis of Tropical Civilizations: SETS Project – Phase I (Volume 1), edited by Gyles Iannone, pp. 1-23. Occasional Papers in Anthropology No. 17, Department of Anthropology, Trent University, Peterborough.

2015 Key Insights from the Phase I Study. In Framing a Comparative Analysis of Tropical Civilizations: SETS Project – Phase I (Volume 2), edited by Gyles Iannone, pp. 245-284. Occasional Papers in Anthropology No. 18, Department of Anthropology, Trent University, Peterborough.


Iannone, Gyles (editor)
2014b Framing a Comparative Analysis of Tropical Civilizations: SETS Project – Phase I (Volume 1). Occasional Papers in Anthropology No. 17, Department of Anthropology, Trent University, Peterborough.

Iannone, Gyles, and Samuel V. Connell (editors)

Iannone, Gyles, Kendall B. Hills, and Scott Macrae (editors)
2015 Framing a Comparative Analysis of Tropical Civilizations: SETS Project – Phase I (Volume 2). Occasional Papers in Anthropology No. 18, Department of Anthropology, Trent University, Peterborough.

Iannone, Gyles, Carmen McCormick, and James Conolly
2008 Community Archaeology at Minanha: Some Preliminary Insights from the Phase II Settlement Study. Research Reports in Belizean Archaeology 5:149-158.

Isendahl, Christian, and Michael E. Smith

Kan Hla, U  

Koenig, Charles W., Mark D. Willis, and Stephen L. Black  

Lieberman, Victor B.  

Lieberman, Victor, and Brendan Buckley  

Longstaffe, Matthew, and Iannone, Gyles  

Luce, Gordon H.  

Macrae, Scott  

Macrae, Scott, and Gyles Iannone  

Maidment, David R.  
McCane, Carmen A., Scott A. Macrae, Gyles Iannone 2010 A Consideration of the Spatial Arrangement of Settlement Groups and Terraces in Contreras, Minanha, Belize. Research Reports in Belizean Archaeology 7:141-152.


Quatermaine, Jamie, Brandon R. Olson, and Anne E. Killebrew 2014 Image-Based Modeling Approaches to 2D and 3D Digital Drafting in Archaeology at Tel Akko and Qasrin: Two Case Studies. Journal of eastern Mediterranean Archaeology and Heritage Studies 2(2):110-127.


Stargardt, Janice

Stark, Miriam T., Damian Evans, Chhay Rachna, Heng Piphä, and Alison Carter

Strachan, Paul

Trigger, Bruce G.

Wheatley, Paul

Win Kyaing (U)

Wohlfarth, Barbara, Charles Higham, Kweku Afrifa Yamoah, Akkanæewut Chabangborn, Sakonvan Chawchai, and Rienk H Smittenberg

Wündsch Michael, Siria Biagioni, Hermann Behling, Bastian Reinwarth, Sarah Franz, Peggy Bierbaß, Gerhard Daut, Roland Mäusbacher, and Torsten Haberzetl
2014 ENSO and Monsoon Variability During the Past 1.5 kyr as Reflected in Sediments from Lake Kalimpaa, Central Sulawesi (Indonesia). *The Holocene* 24(12):1743-1756.

Yamoah, Kweku Afrifa, Charles F. W. Higham, Barbara Wohlfarth, Akkanæewut Chabangborn, Sakonvan Chawchai, Frederik Schenk, and Rienk H Smittenberg
“History tends to be dominated by stories of kings and kingdoms even when it is reconstructed from archaeology rather than texts. This is partly because high elites are simply more visible, but it also reflects a tendency to see these people and their stories as more important” (Middleton 2017:214).

It is in the consideration of the lifeways and social relationships of the non-elite inhabitants of Bagan’s peri-urban city-scape, along with the examination of the development and structure of its urban ground plan, that archaeologists can most effectively augment the elite-focused, text-based and/or art historical understandings of Bagan society (Miksic 2001:102-103; see also Feinman 1997:371; Overholzer 2013). The IRAW@Bagan project’s efforts to achieve this research goal fall under the category of an “archaeology of community” (Yaeger and Canuto 2000), wherein “…a community is defined not just by spaces, people, and their synchronized interaction, but also by its historical context” (Yaeger and Canuto 2000:6). Communities are “ephemeral and ever-emergent,” and for this reason an archaeology of community must strive to isolate “dynamic patterns in community organization and identity” (Yaeger and Canuto 2000:8). In order to achieve such an understanding for Bagan, our investigations are specifically aimed at developing a multifaceted, temporally sensitive data set for the city’s broader peri-urban “community.” In doing so, we will strive to remain sensitive to the dualistic concepts of the natural community – the material aspects of a community, including its buildings, ritual deposits, material culture, and the distribution of these across the landscape – and the constituted community – the community as an “idea” based on the production and reproduction of social identities, roles, and statuses resulting from the practices of knowledgeable agents (Canuto and Fash 2004:55-59).

We believe that an archaeology of Bagan peri-urban “community” can be most effectively advanced through the application of a “settlement archaeology” approach. Settlements draw our attention as archaeologists because they tend to leave “substantial tangible remains on landscapes” (David and Kramer 2001:225). Stephen Kowalewski (2008:226) defines settlement patterns: “as the regularities formed by the distribution of multiple places where people lived or carried out activities, including regularities in the relations of these places and activities to each other and to other features of the environment.” Settlement archaeology therefore becomes “the study of societal relationships using archaeological data” (Trigger 1967:149). Such studies
emphasize both the synchronic and diachronic aspects of multi-faceted communities (Fletcher 1986; Trigger 1967:151), and thus seek to acquire data from all time periods represented in a study area (Kowalewski 2008:246). In spatial terms, settlement archaeology extends its focus from the single building – whether it be a house, temple, or granary – to the surrounding community, and ultimately to the broader region within which myriad communities of different size and complexity interact (Fletcher 1986; Trigger 1967:151-152). The importance of utilizing a settlement archaeology approach at Bagan, and in urban contexts in general, has been succinctly summarized by Stephen Kowalewski (2008:237): “Settlement pattern archaeology has broadened understanding of urbanism beyond historical cases and supplied much-needed regional developmental contexts. Recent studies are providing a much better idea of the impressive demographic scale of ancient urban societies as well as a new appreciation of variations in the processes that shaped urban systems” (see also Marcus and Sabloff 2008; Smith 2011; Storey 2006; c.f., Christie et al. 2016).

Classical Settlement Patterns in Southeast Asia

Given their potential for enhancing our understanding of past societies, it is surprising that the settlement patterns and residential architecture associated with the Classical period polities of Southeast Asia have rarely received any focused attention (Miksic and Goh 2017:26, 358). Indeed, Charles Higham (2017:369) opens his recent chapter on The Prehistoric House: A Missing Factor in Southeast Asia, by lamenting the fact that: “Excavations in Mainland Southeast Asia have yet to reveal a single complete house plan, yet the potential of residential archaeology to illuminate social change…is emphasized by recent research in other parts of the world.” That said, settlement archaeology has been conducted at Angkor, Cambodia, and Trowulan, East Java on a limited scale. In both instances, some intriguing glimpses into non-elite settlement patterning have begun to emerge.

Settlement Archaeology at Angkor, Cambodia

At Angkor the recognition of a patterned association between ponds, earthen platforms, mounds with surface ceramics, and small temples has been interpreted as evidence for particularly common settlement type (Fletcher and Evans 2012:52; Gaucher 2003; Pottier 2012:18-20). Recent LiDAR studies at Angkor have also provided some tantalizing images of a series of formally structured (i.e., on an orthogonal grid) “blocks” of residential mounds with adjacent ponds within, and extending outside of, the Angkor Wat religious complex (Stark et al. 2015; Pottier 2012:20). Subsequent exposure of postholes and potential living surfaces with similar non-elite, on-floor materials support the idea of “light residential patterning” (Stark et al. 2015:1446, 1452). Given their location inside the walled and moated Angkor Wat complex – one of the world’s largest religious monuments – such residences were likely of the special function variety, possibly being the permanent or semi-permanent domiciles of non-elites, including guards, attendants, cooks, and other service specialists who helped maintain the temple (Stark et al. 2015:1440, 1450-1452). Analogous residential patterning also appears to exist within the vast Angkor Thom urban complex (Gaucher 2003; Pottier 2012:20). Although these two complexes differ in terms of their size and overall characteristics (one being more religious in emphasis, the other serving as a more multifaceted urban-administrative center), the residentially patterning they exhibit should not be equated with the types of settlement units inhabited by the vast
majority of Angkor’s agrarian-based, peri-urban and/or rural support population. In fact, as recently as 2015, Miriam Stark and her colleagues (2015:1440) were still able to conclude that regardless of the vast amount of research carried out within the greater Angkor city-scape, no research program at Angkor had as yet “studied households as an analytical unit.” That said, recent excavations by Pierre Bâty (2005), conducted as part of the Siem Reap airport expansion, have focused on, and uncovered evidence for (i.e., post-holes and ceramics), a number of ancient Khmer residential units.

**Settlement Archaeology at Trowulan, East Java**

Although remote sensing has clearly been useful at places such as Angkor, settlement surveys using random sampling procedures have hardly ever been conducted in association with the urban zones of Southeast Asian Classical period polities, and when they have, they have rarely been broad in their scope (Miksic 2001:101). One of the only places in Southeast Asia that has been subject to detailed settlement archaeology is Trowulan, the capital of the east Javanese polity of Majapahit (Miksic 2001:100, 2009:140-144, 2012). At this locus a three-year settlement survey project was undertaken in order to determine boundaries for, and characteristics of, the urban settlement zone (Miksic 2001:101, 2012:168). The project employed pedestrian survey along randomly selected transects, the surface collection of artifacts, and consideration of finds location in conjunction with contemporary land-use strategies as a means to assess contemporary impacts on material culture distributions (Miksic 2001:101). The findings of this study indicated that Trowulan (Miksic 2001:101): 1) was a densely settled urban capital; 2) its inhabitants exhibited a wide range of craft specializations; 3) its residents had access to a significant level of non-local goods; 4) it was not highly defensive in character; and, 5) it exhibited a complex water management system that was both utilitarian and symbolic. The Trowulan settlement survey also coincided with the large-scale horizontal exposure of a number of what have been characterized as “discontinuous” settlement clusters. These excavations provided insights into house-styles, floor plans, and activity areas (Miksic 2012:169-172). It has been suggested that a similar program of settlement archaeology, including detailed settlement survey, would be highly insightful if it was carried out in association with Myanmar’s various early urban centers (Miksic 2001:102-103).

**The IRAW@Bagan Approach to Settlement Archaeology**

Regardless of the useful insights that have resulted from the aforementioned research programs, it is accurate to state that much more work needs to be done if we are to truly get a sense of what life was like for the vast majority of people that inhabited the Classical polities of Southeast Asia. The principal datasets that have been successfully used to craft integrated socio-ecological histories in our earlier *Socio-ecological Entanglement in Tropical Societies* (SETS) project (Iannone 2014a, 2014b, 2015, 2016; Iannone et al. 2015) are once again serving as the primary focus of the three sub-projects at the base of the IRAW@Bagan settlement archaeology study: *residential patterning, agricultural practices, and water management*. These sub-projects are employing a range of tools and approaches to achieve their goals, including systematic ground reconnaissance and surface exposure assessments, remote sensing (i.e., drone imagery), geospatial and landscape analysis (GIS), horizontal and vertical excavations, collection and analysis of palaeoenvironmental ecofacts, detailed analysis of architecture, art historical imagery,
and artifacts, ethnoarchaeological observation and analogy building (e.g., David and Kramer 2001; Lyons and Casey 2016; McNiven 2016; Politis 2016; Stanislawski 1973), ethnographic and ethnohistoric information (e.g., Aung-Thwin 1990; Freestone 1974; Leach 1977; Spate 1945), considerations of epigraphic materials, and extensive literature reviews.

**The Residential Patterning Sub-Project**

It is generally assumed that Bagan’s peri-urban zone was home to a diverse support population (Daw Thin Kyi 1966:187; Hudson et al. 2001:70; Miksic 2001:100; Strachan 1989:7), but we know very little about the settlement patterning associated within this urban matrix. Through survey, horizontal and vertical excavations, and detailed artifact analysis, this sub-project is examining the temporal and spatial aspects of Bagan’s peri-urban settlement zone to assess how its residents and their varied activities were distributed across the landscape over both time and space. These investigations are building upon an initial hinterland settlement survey and collateral excavations conducted by Bob Hudson (2004:245) and his colleagues (Hudson et al. 2001), although the IRAW@Bagan study has a more restricted spatial focus (i.e., the peri-urban zone, rather than the broader hinterlands), and a broader temporal emphasis (i.e., the entire settlement sequence, as opposed to the earliest villages).

The previous hinterland settlement study did come to the important conclusion that the village-level communities at Bagan may have been established as early as the 9th century CE (Hudson 2004:248). In addition, this preliminary settlement survey suggested that certain concentrations of small monument dating to the 11th to 13th centuries may be indicative of the presence of peri-urban settlement clusters (Hudson 2004:212, 245-266, 247; Hudson et al. 2001:62, Figure 9). Indeed, this settlement clustering is argued to have been instrumental to the development of Bagan’s urban footprint (Hudson 2004:219-220). Such findings are consistent with what has been referred to elsewhere in the tropics as “urban clustering” (Isendahl 2010:545; Isendahl and Smith 2013:133; McIntosh 1991, 2005; McIntosh and McIntosh 2003; Smith 2011:51, 54), a residential settlement pattern often associated with dispersed (Iannone 2015:251-252; Wheatley 1971, 1983) or “low-density” urbanism (Barthel and Isendahl 2013:227; Chase et al. 2011; Fletcher 2009, 2012; Isendahl 2010; Isendahl and Smith 2013; Lucero et al. 2015; Scarborough et al. 2012; Scarborough and Lucero 2010; Sinclair 2010:24; Smith 2010a:234, 2010b:145, 2012:16; Waldheim 2010:4-5). Importantly for the IRAW@Bagan settlement archaeology study, the initial settlement survey also made some suggestions as to the possible locations of residential occupation sites (Hudson 2004:208-220, 234-248, 260, 266; Hudson et al. 2001:53-62, Figure 9). These include the areas:

1) Immediately north of Minnanthu;
2) Immediately southeast of Myinkaba;
3) Just to the north of Thiripyitsaya and the Loka-nanda;
4) Adjacent to the Shwe-zigon;
5) Immediately to the south of the city walls (although Luce [1969:49] suggests this area comprised the “royal quarter”);
6) Southwest of West Pwa Saw (Anauk-pwa-saw);
7) Around the Otein Taung mounds.
At this time there are only two instances where physical evidence for such residential “clustering” has been recognized in and around the capital (Hudson 2004:266). These include excavations at the Yonhlut habitation site (Yon Hlut Kyon) – a possible “palace” located in a rural area ca. 10 km southeast of the Bagan epicenter (Hudson 2004:195, 220) – where high phosphate levels and an extensive (150 x 70 m) scatter of earthenware (unglazed) sherds (i.e., ‘habitation debris”) were found in association with a large mound, and the Otein Taung mounds, situated in the eastern portion of Bagan’s peri-urban zone (Hudson 2004:208-219). Although the former locus remains poorly dated, the latter may have been occupied as early as the 9th century CE (Hudson 2004:211, 266). Otein Tuang appears to represent a long-standing community possibly specialized in earthenware production that was eventually able to establish its own small temples by the 13th century, and which persisted as an occupied settlement into the 14th century (Hudson 2004:211-212, 234-245, 248, 250, 260; Hudson et al. 2001:53-62; see also Higham 2001:134).

**Agricultural Practices Sub-Project**

This sub-project is building upon earlier assessments of Bagan’s agricultural capacity (Aung-Thwin 1990). Given the palimpsest quality of agricultural field systems, it will be necessary to use remote sensing data, geospatial analysis, sub-surface testing and sediment analysis, historic, art historical, ethnographic data (Aung-Thwin 1990), and ethnoarchaeological observations to build an understanding of Bagan’s relic field system. Such assessments will be augmented by sediment and palynological analyses, ethnobotanical studies, GIS, and remote sensing techniques. Of interest is the fact that risk husks incorporated into clay bricks have been used to assess the types of rice grown in Bagan’s major cultivation zones, with over 95.8% of the samples recovered representing the round (Japonica) variety (Aung-Thwin 1990:8). Also of methodological relevance is recent GIS research in Cambodia, where the geometric differences in bunded rice paddy orientations, and their spatial relationships (i.e., orientation) to datable Angkorian temples, canals, ponds, water tanks (barays), or roads, have been used to develop a temporally sensitive model for localized land-use strategies at the former Khmer capital (Bâty 2005; Hawken 2013; Pottier 2000:111-112, 2012:19-20). A similar analysis will be attempted at Bagan. Finally, any study of agricultural practices at Bagan must also consider the impacts of the precipitation regimes associated with the Medieval Climate Anomaly (MCA, 900-1300 CE) and the subsequent shift into the Little Ice Age (LIA; 1300-1570 CE), as these would have dramatically altered the agricultural potential of Myanmar’s Dry Zone (e.g., Lieberman 2003:103-112, 2009:330, 792, 2011:939; Lieberman and Buckley 2012:1052).

**The Water Management Sub-Project**

This sub-project is not only exploring individual water management features, but also attempting to reconstruct the broader water management system associated with Bagan’s peri-urban settlement zone using remote sensing, hydrological modeling (Win Kyaing 2016), geospatial analysis, ethnoarchaeological observations, and ethnographic data (Spate 1945:524, 531-532). The research team is taking into consideration the potential hydrological fluctuations that coincided with the major climate change regimes discussed above. The water management sub-project is designed to build upon a recent examination of the “micro-exploitation of scarce water resources at Bagan” carried by Elizabeth Moore and colleagues (Moore et al. 2016:283).
This study concluded that although it was situated in a relatively flat plain, Bagan’s engineers utilized its proximity to the Ayeyarwady River, and a series of perennial lakes and streams, to initiate subtle landscape transformations aimed at both redistributing and storing precious water, in addition to managing periodic flooding (Moore et al. 2016:283). This comparatively “small-scale” water management system was comprised of seasonal ponds, streams, canals, deliberately positioned and planned temple complexes (e.g., the Sulamani), and the moat surrounding the epicenter (Moore et al. 2016:285, 294-300, 302). The water draining from the Tuyin Range, 12.9 km southeast of the epicenter, was particularly important to this distribution system, which ultimately drained into the Ayeyarwady (Luce 1969:76 345; Moore et al. 2016:285). A number of artificial tanks/reservoirs (some with intricately carved interiors) located atop the Tuyin- Thetsoe Range were likely crucial components of the water management system, especially during the December to May dry season (Moore et al. 2016:295). A water management system such as this would have been necessary for daily consumption, cooking, and bathing, and would have also been useful for cultivating garden crops such as onions and root crops, but it was not suitable for wet-rice cultivation (Moore et al. 2016:302-303; Stargardt 1968).

Settlement Archaeology: Middle Range, Epigraphic, and Art Historical Insights

As indicated above, all three sub-projects are relying, to varying degrees, on supplemental data provided by ethnographic, ethnoarchaeological, epigraphic (inscriptions and retrospective chronicles), and art historical studies to help “flesh out” our understandings of past lifeways. A brief discussion of some of the key data sets and insights provided by this combined “Middle Range” (Binford 1981, 1982, 1983), textual, and iconographic approach is therefore warranted.

Settlement Archaeology and Ethnography

Residential Patterning. The archaeological search for, and examination of, residential house remains can be greatly informed by ethnographic studies. For example, Spate (1945:524) confirms that even in the mid-20th century, Myanmar continued to be “a country of villages, with nucleation, often strongly marked, the rule.” In terms of their ground plans, such villages tended to consist of a rather loosely organized agglomeration of treed house-lots with hedged or fenced perimeters, all separated by “a maze of little lanes” (Spate 1945:531; see also Freestone 1974:44). These “village clusters” appear to have a long-standing prevalence in Myanmar (Freestone 1974:9, 44; Leach 1977:68). The house alignments within these village clusters are generally “haphazard” (Freestone 1974:44; Leach 1977:68, 111). Such communities are regularly found around lakes, ponds, or water tanks, or along streams or rivers, or they might be strung out in linear fashion along roadways, or along a significant topographic change, such as where the uplands meet the plains (Freestone 1974:6-7, 9; Spate 1945:532). Such villages generally do not exhibit public buildings or central “squares” (Freestone 1974:44). Ethnographic studies from the mid-20th century also indicate that most Myanmar villages contain at least one small, white-washed temple and an adjacent monastic complex with residences built of wood and raised above the ground on piles (Spate 1945:532). Less central to the village were small shrines dedicated to local nats (animistic spirits), often found in association with large banyan trees (Spate 1945:532). Elsewhere, we are told that fenced gardens are situated adjacent to house-lots in some villages (Leach 1977:111), and granaries might also be present (Freestone 1974:44).
Ethnographic studies also indicate that most traditional housing in Myanmar—regardless of ethnicity (i.e., Bama, Mon, Shan, Kachin, or Inn—that—is constructed from locally available, “ready to use”, and comparatively “cheap” materials (Cho Oo et al. 2003:161). Wood is often used for house frames, flooring, and walls, with other locally available materials being employed for walls, roofs, or as binding materials, including bamboo, palm or grass thatch, and cane (Cho Oo et al. 2003:161; Leach 1977:110; Spate 1945:530). In the large sample of houses examined by Cho Oo et al. (2003:162), mixed wood-bamboo houses (54%) and bamboo-thatch houses (26%) were particularly common, as were wooden houses (15%). Fletcher and Evans (2012:50-52) discuss the resilience aspects of such perishable houses, noting that they are not only easily repaired, replaced, and moved, but when compared to stone or brick constructions, they do not anchor people and/or institutions to a particular node on the landscape, nor do they necessarily inhibit innovation because they are relative impermanent. That said, traditional houses in Myanmar can be used for 30 years or more, although not all houses last this long (Cho Oo et al. 2003, Figure 7). Clearly, such vernacular architecture is well suited to the “extreme weather conditions” and economic circumstances of most Myanmar villagers (Cho Oo et al. 2003:161, 168;), the only major drawback being that such houses are highly flammable (Spate 1945:530).

Ethnographic studies also inform us that, like most indigenous housing in the world’s tropical zones, traditional houses in Myanmar have a single story, a large veranda, a compact floor plan, and tend to be built on stilts (piles) in order to keep the houses cool in the dry season and dry during the subsequent rainy season (Cho Oo et al. 2003:164; Leach 1977:108; Spate 1945:530). The height that the house floor is raised above the ground varies from as little as 0.5 to more than 1.5 m, and this not only reflects the local propensity for seasonal flooding, but also conditions the degree to which the space beneath the house can be used as a livestock stable, storage area for tools, kids play area, boathouse, or workshop (Cho Oo et al. 2003:164, Figures 3-6; Spate 1945:530). Areas adjacent to the house are also used to store agricultural produce, often in large bamboo containers or clay jars (Spate 1945:530).

**Agricultural Practices.** Bagan’s peri-urban zone is to this day still divided up into small cultivation plots and areas used for animal husbandry. Ethnographic research indicates that, without irrigation, the dry zone is only marginally adequate for “dry weather crops” such as sesame, millet, legumes, palm trees, and dry rice (Aung-Thwin 1990:5-6; Kan Hla 1977:15; see also Daw Thin Kyi 1966:180; Spate 524-526). Ethnographic studies also confirm the importance of small-scale garden production in Myanmar’s dry zone (Spate 1945:530), and we are also informed that village house-lots often contain shade trees that yield useful food stuffs, such as mangoes and tamarind, or building materials, such as bamboo (Spate 1945:531). Ethnographic research indicates that agricultural fields often contain field huts of more temporary construction that are used seasonally (Spate 1945:532).

**Water Management.** Ethnographic studies also provide information concerning the relationship between villages and water sources. Spate (1945:524) underscores that in the dry zone settlements tend to cluster around or along water sources, such as small streams descending from the uplands (Spate 1945:532). He also indicates that, given the constraints of water availability in the dry zone, villages often constructed stone-lined tanks, some of which were used for bathing and the others for drinking, and all for socializing (Spate 1945:531-532). Spate does note, however, that because the dry zone witnesses significant evaporation, such artificial water sources can often go dry, leaving villages with a serious shortage of a highly critical resource.
Ethnographic studies provide information for use in archaeological interpretation, but because ethnographers do not always focus on material culture to the extent that archaeologists do, ethnographies can lack the kinds of insights useful for archaeological interpretation; this is where ethnoarchaeology comes into play (David and Kramer 2001:1-2). Ethnoarchaeology can be defined as: “the ethnographic study of living cultures from an archaeological perspective” (David and Kramer 2001:2). Ethnoarchaeology has long been considered to be an important component of settlement archaeology (Stanislawkski 1973), although it has yet to be utilized in the few settlement archaeology studies that have been carried out in association with the Classical polities of Southeast Asia, at least not explicitly. Our visitations to two traditional villages in the area of Bagan in 2013 – as part of the SETS Project – suggested that many of same ground plans, building materials, and activity areas discussed in the earlier ethnographies (e.g., Cho Oo et al. 2003:161; Spate 1945:530) are still evident in today’s villages, houses-lots, and house structures. Acknowledging that significant environmental, economic, social, and political changes have occurred at Bagan over the past eight centuries, the goal of such ethnoarchaeological research is to provide some insights into the types of material correlates, or “behavioral residues,” that might be encountered during our archaeological investigations. Such “middle range” insights are invaluable when it comes to crafting more sophisticated interpretations of the past, especially in situations where little to no information exists concerning the “complex living situations” that are under examination (Stanislawski 1973:375), as is the case at Bagan.

Indeed, ethnoarchaeological research provides a variety of useful insights for researchers interested in the physical attributes of settlement patterns (David and Kramer 2001:270-278, 284), and in doing so, it helps provide answers to the following questions:

1. Where are settlements located and why are they situated where they are?
2. How large are settlements?
3. How are settlements configured and what kinds of ground plans prevail?
4. How do residents and visitors move through and around settlements?
5. What kinds of “off-site” features exist around settlements?
6. How large are house compounds, how are they spaced vis-à-vis each other, and how are their perimeters delimited?
7. What kinds of buildings and features are found in house-lots, how are they organized in spatial terms, and what kinds of activities take place in association with them?
8. How are houses built, what kinds of materials are used, and where are these materials obtained?
9. How are house interiors and exteriors organized, and how do these spaces structure activities?
10. What kinds of activities are carried out within, beneath, and immediately surrounding houses?
11. What types of water management facilities are used, how is water stored on the scale of the settlement (e.g., village), house-lot, and house-hold, and what kinds of ritual practices are associated with water?
12. What kinds of plants are grown, what forms of cultivation are utilized, what kinds of farming tools are employed and where are they made, repaired, and stored, and where
and how are surplus produce and/or seeds stored?

13. Does individual or collective memory indicate that any of these cultural practices changed over time, and if so, what is believed to have stimulated these changes (e.g., how have villages and households reacted to climate change)?

In social terms, the ethnoarchaeological study of communities can inform us about intra- and inter-village social variability (Hayden and Cannon 1984:1-2), especially regarding:

1. The demographic character of villages and households;
2. The economic, social, political, ethnic, and socio-religious organization of communities and households;
3. The roles, statuses, and multi-faceted socio-spiritual and ethnic identities of individual community members.

Settlement Archaeology, Epigraphy, and Art History

Any archaeological insights into settlement patterning at Bagan must be considered alongside the historical framework that has been crafted using the inscriptions and chronicles (Miksic 2012:179; Pyiet Phyo Kyaw 2017). “Without the overriding chronological and historical framework (and in certain cases, specific detail) that these chronicles provide, we would not have had a clue where to look, what to look for, or what it all means” (Aung-Thanwin and Stark 2001:3). Archaeologists must simply learn to employ inscriptions and artistic depictions more judiciously, rather than “picking and choosing whatever seems to bolster and illustrate their archaeological interpretations” (Feinman 1997:372).

Residential Patterning. The epigraphic inscriptions, retrospective chronicles, and artistic images relating to Bagan all contain information that has a direct bearing on our understanding of residential patterning and domestic life (Pyiet Phyo Kyaw 2017). The written records indicate that, other than a small number of monastic domiciles, residences at Bagan – whether they be elite palaces or the homes of commoners – were constructed predominantly of perishable materials (Kan Hla 1977:29; Koller 2017:93; Luce 1969:65, 77-78, 229). As is true today, locally available materials were preferred – including wood, bamboo, and palm thatch – resulting in houses that were easy and cheap to repair, reconstruct, and move if necessary (Kan Hla 1977:20). Palaces and commoner residences are also said to have been elevated on posts and accessed via stairs (Luce 1969:66). There was a type of “cult” associated with house posts (Luce 1969:72). No mere wooden support, house posts had symbolic significance, and they were erected in conjunction with consecration ceremonies, and sometimes had dedicatory offerings placed at their base (e.g., fresh milk, boiled rice, gem stones), and at their four sides (e.g., precious metals and gemstones; Luce 1969:66-71).

Clearly, not all houses were the same. U Kan Hla (1977:20-21) speculates that there were some more permanent residences, referred to as “country-houses” or monastery housing – with similarities to village homes found around contemporary Bagan – as well as some less permanent, more readily movable “workers” housing that was used near construction sites. Unfortunately, although artistic renditions provide us with a glimpse of the vast wooden palace complexes that existed at Bagan, we can only guess what commoner residences may have looked like (Kan Hla 1977:20). Not surprisingly – given the dry climate, emphasis on using wood for fuel, and perishable materials used in construction –fires were apparently a frequent occurrence...
at Pagan (Luce 1969:65). This might also be taken as evidence that residential houses were located in close proximity to each other (i.e., the epicentral and peri-urban zones may have contained densely packed residential clusters). It also explains why many temple and monastery complexes, and the epicenter for that matter, were surrounded by brick walls (Luce 1969:233).

The inscriptions and retrospective chronicles also inform us that occupation and ethnicity were intricately intertwined at Bagan, and that status was symbolically displayed in tattoos, insignia, dress, and other forms of material culture (Aung-Thwin 1985:90). We are also told that the Crown actively worked to foster administrative control over the location and composition of communities (Aung-Thwin 1985:91). As a result, Bagan’s residential patterning developed a cellular character, with a combination of one’s “socio-spiritual” status, clientage, occupation, and ethnicity serving to determine both where and with whom one lived (Aung-Thwin 1985:74, 91-96; Hudson 2004:212). We can therefore infer that greater Bagan was home to a myriad of villages that were distinctly Kywan-twa (Crown clients), Hypaya-Kyun (Sangha/Buddhist Church clients), Kwan (private clients), and Athi (unbonded) in composition, and which tended to exhibit an occupational, or “guildlike” character (Aung-Thwin 1985:91, 1987:92; Aung-Thwin and Aung-Thwin 2012:91; Kan Hla 1977:21). Cellularity at Bagan therefore did not lead to settlement redundancy, but rather specialized village clustering, at least according to the inscriptions and chronicles. Villages such as these were presumably Bagan’s basic administrative units (Aung-Thwin 1985:106).

Agricultural Practices and Water Management. Although it does not figure as prominently in the epigraphic and art historical records, these data sets do inform us about some aspects of agricultural practice at Bagan (e.g., Nyunt Nyunt Shwe 2011:30). For example, some of the plows that appear in murals look virtually identical to those used today (see Figure 2.12). The written texts also indicate that Burmese kings regularly dressed up as the god Sakka (i.e., Indra) to conduct the laythwan mańgalā, “the auspicious ploughing ritual to insure the arrival of the monsoons” (Aung-Thwin 1985:49). Water sources also figure prominently in many of Bagan’s murals and Jataka plaques. According to the inscriptions and chronicles, Bagan’s rulers were required to construct significant water management features to emphasize their legitimacy and demonstrate their largesse (Aung-Thwin 1985:63). More detailed analysis of these epigraphic and art historical data sets promise to contribute to our understanding of the commoner lifeways that characterized Classical Bagan’s peri-urban settlement zone (e.g., Pyiet Phyo Kyaw 2017).

Having outlined some of the principle methods and collateral data sets that are being employed by the IRAW@Bagan project in our “archaeology of community” study at Bagan, we will now summarize the fieldwork that was conducted in 2017.

May 2017 IRAW@Bagan Research Activities

The May 2017 field season ran from May 6th to 21st and involved a number of preliminary research activities (see Table 2.1):

1. Prior to departure for Myanmar, project members engaged in the review of relevant literature, including archaeological, epigraphic, historical, ethnographic, and ethnohistoric sources;
2. While in Bagan, the team examined temple/monastery murals and reliefs for imagery relevant to the residential patterning sub-project (see Chapter 3);
3. The team assessed the potential extent of the peri-urban zone, and established the perimeter of the study area, which generally coincides with the existing boundaries of the Bagan Archaeological Zone (Figure 2.1);

4. At the request of the Department of Archaeology, the IRAW@Bagan team conducted surface reconnaissance at the four traditional palace sites (Figure 2.2), including:
   a. *Yonhlu*t (Hudson 2003, 2004:193-196), the earliest place site;
   c. *Ywasaik* (6th century CE; Hudson 2004:191), the third palace site;
   d. *Pyinbya* (11th to 14th centuries), the fourth “palace” site (Hudson 2003, 2004:22, 27, 220);

5. Previous suggestions concerning the possible location of residential sites made by Bob Hudson (2004:208-220, 234-248, 260, 266; Hudson et al. 2001:53-62, Figure 9), and surface reconnaissance (i.e., field walking), were used to isolate areas with significant surface exposures of artifactual material. Four such areas were subsequently designated for more detailed survey and excavations in our efforts to uncover residential remains in Bagan’s peri-urban zone (Figure 2.3):
   a. *Shwe Creek Site*;
   b. *Otien Taung Site*;
   c. *Southwall Site*;
   d. *Kiln #4 Site*;

6. The research team also visited a number of the major water sources in Bagan’s peri-urban settlement zone – principally the large, often seasonally dry reservoirs referred to as “lakes” or Kan (see Figure 2.4) – including:
   a. *A Lan Pya Kan*
   b. *Ka Zun O*
   c. *Kan Daw Thit*
   d. *Ma Yoe Kan*
   e. *Min Nan Thu*
   f. *Nyun Lat Ta Phet*
   g. *O Photoe Kan*
   h. *Po Thu Daw*
   i. *Phwar Soe Kan*
   j. *Se Kan*
   k. *Tha Ktay Kan*
   l. *Thant Sin Kyae*
   m. *Za Yar Thwt Kan*

7. We carried out initial reconnaissance of the Nat Yekan sacred water tank (Ni Tut 2013; Nyan Hlaing Lynn 2017), located on the Thetsoe Taung peak of the Tuyin Range (Figure 2.5). This visitation allowed for:
   a. The collection of photographic images of the tank, its various stairways, and its myriad iconographic images (Figure 2.6);
   b. Assessment of the cultural modifications made to the tank location, with particular emphasis on what appears to be a dammed-up spillway that would have previously channeled water into the area of the Mya Kan Reservior, located at the base of the Tuyin Range (Figure 2.7);
8. The team also collected some drone imagery for the Nat Yekan tank and the possible Shwe Creek residential site (Figures 2.8);
9. Visitations were made to eight of the known kiln sites involved in glass bead production (Figure 2.9);
10. The team attended meetings with relevant Department of Archaeology officials, including the Director General for Archaeology, U Kyaw Oo Lwin, and Daw Mie Mie Khaing, Director of International Relations (at the Department of Archaeology Office in Yangon), and U Aung Aung Kyaw, Director of the Bagan Archaeology Branch (at the Department of Archaeology in Bagan).

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Table 2.1. Activity schedule for the May 2017 fieldwork.
Figure 2.2. Surface reconnaissance at Thiripyitsaya, palace site #2.

Figure 2.3. Locations of the four possible residential sites discovered in 2017.
Figure 2.4. Location of the various large-scale water management features visited in 2017.

Figure 2.5. Locations of the Tyuin-Thetsoe Taung “Range”, Mya Kan Reservoir, and Nat Yekan tank.
Figure 2.6. Iconography and stairway inside Nat Yekan tank (west side).

Figure 2.7. Possible dammed-up spillway and associated iconography at Nat Yekan (northwest corner).
Figure 2.8. Drone image of Nat Yekan tank, facing southeast (note the stair in the bottom right corner).

Figure 2.9. Kiln Site #4.
December 2017 IRAW@Bagan Research Activities

The December 2017 field season ran from December 7th to 23rd and focused mainly on gathering ethnoarchaeological data relevant to our understanding of residential patterning and agricultural practices. These activities, along with some of the other fieldwork carried out at this time, are outlined below (see also Table 2.2).

1. The IRAW@Bagan team conducted ethnoarchaeological studies in ten traditional villages located in the vicinity of Old Bagan, some of which lay inside of what was once the ancient city’s peri-urban settlement zone, others located in more rural settings (see Figures 2.10 and 2.11). The general goal of the ethnoarchaeology study was to explore the material correlates of domestic lifeways specific to Myanmar’s “dry-zone”. This information will enhance our ability to both recognize and interpret the archaeological residues of ancient settlement patterning in Bagan’s peri-urban zone. The project included site visitations, written and photographic record taking, and strategic questioning of residents concerning any relevant temporal changes in residential patterning, agricultural practices, and water management strategies (see Chapters 4, 5 and 6). The specific goals of the ethnoarchaeology project were to: Assess the ground plans of villages, house-lots, and individual dwellings and out-buildings; Determine the types of activities carried out in these nested spaces, with particular attention to their material residues; Examine construction methods and materials; Explore the economic, engineering, and socio-spiritual relationships between village residents and their domestic water sources (this study has not yet been completed; see Chapter 7); Investigate traditional agricultural practices, including activities relating to both cultivation and surplus storage. Ethics Board approval for these interviews was obtained through Trent University. The villages visited as part of this study included:

   a. Minnanthu;
   b. East Pwa Saw;
   c. West Pwa Saw;
   d. Thuhtaykan;
   e. Kon-Tan-Gyi;
   f. Kon-Sin-Kye;
   g. Hypauk-Seik-Pin;
   h. Zee O;
   i. Shwe Hlaing;
   j. Thae Pyin Taw.

2. The IRAW@Bagan team also continued to visit temples and monasteries to get a better sense of Bagan’s peri-urban city-scape, as well as to search for representations in murals and reliefs relevant to our understanding of domestic life in the old capital (Figure 2.12);

3. Visitations to the Shwe Creek and Otient Taung occupation sites were carried out to engage in further planning for our proposed 2019 excavations at these two locales;

4. A day was spent exploring the summit, base, and flanks of the Tuyin-Thetsoe range, with particular emphasis on building on our preliminary understanding of the water management system associated with the Nat Yekan water tank (Figure 2.13). This research was aimed at advancing our knowledge in preparation for excavations, mapping,
and hydrological modeling of Nat Yekan and its surrounding area in May 2018. The December 2017 research activities included:

a. Additional photography of the iconography and architectural features (i.e., stairways) found inside of Nat Yekan tank (Figure 2.14);


c. Traversing the drainage channel leading out of northwest corner of the Nat Yekan tank to an area where a waterfall descends down to the area of the Mya Kan reservoir, and following another drainage channel upwards from the Mya Kan reservoir to the same waterfall (Figure 2.17);

d. Discovery of a number of additional water management features on top of the Thetsoe Taung ridge that are relevant to the Nat Yekan water management system, including two small ponds that may have ritual significance, a series of rock-cut and stone-walled feeder channels, and a possible second tank on the opposite side of the ridge to Nat Yekan that may be of equal size, and which may have been partially surrounded by a roofed area, given what appears to be a regular arrangement of post-holes (Figures 2.18 and 2.19).

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Table 2.2. Activity schedule for the December 2017 fieldwork.
Figure 2.10. Interviewing informants at Kon-Sin-Kye Village.

Figure 2.11. Measuring a dilapidated house at Kon-Tan-Gyi Village.
Figure 2.12. Mural showing traditional farming practices, from the Shwe Hlaing Village Monastery.

Figure 2.13. Walking a rock-cut and stone-lined feeder channel running from the south into the northern side of Nat Yekan tank.
Figure 2.14. Artificially walled up section of the Nat Yekan tank (east side).

Figure 2.15. Nye Lynn Seck (3xivr Virtual Reality Productions) and Paing Thet Phyo conducting high resolution, 3D scanning of the interior of Nat Yekan tank.
Figure 2.16. 3D image of the interior of Nat Yekan tank (courtesy of Nye Lynn Seck, 3xvivr Virtual Reality Productions).

Figure 2.17. Waterfall area northwest of Nat Yekan tank, with Mya Kan reservoir in the background.
Figure 2.18. Location of some of the water management features and associated religious edifices in and around Nat Yekan tank.

Figure 2.19. Exposed interior wall associated with a possible 2nd water tank located on the east side of the Thetsoe-Taung Ridge.
Conclusions

The 2017 fieldwork conducted by members of the IRAW@Bagan settlement archaeology project, although preliminary in nature, provided information that will be useful as we move towards the more significant survey and excavation components of our research program. We were able to develop a better sense of the size and composition of Bagan’s peri-urban settlement zone by travelling through the city-scape and visiting its various monuments, and in doing so, we were able to establish the parameters of our study zone. Consideration of relevant inscriptions, chronicle passages, and artistic representations also allowed us to build a basic understanding of the possible lifeways of the people that lived at Classical Bagan, and to generate some ideas as to what its urban ground-plan may have been like. Ethnographic readings and our own ethnoarchaeological fieldwork provided different, yet equally relevant insights into residential patterning, agricultural practices, and water management in Myanmar’s “dry-zone.” Indeed, these data sources will likely prove to be highly useful in our efforts to find, excavate, and interpret any archaeological contexts associated with past domestic occupation. Finally, our brief but none-the-less fruitful investigations on Tuyin-Thetsoe Taung have set the stage for a more detailed understanding of the role that this upland area may have played in both the secular and sacred aspects of water management during the Bagan era.

References Cited

Aung-Thwin, Michael

Aung-Thwin, Michael, and Maitrii Aung-Thwin

Michael A. Aung-Thwin, and Miriam T. Stark

Barthel, Stephan, and Christian Isendahl

Bâty, Pierre
Binford, Lewis R.


Cho Oo, Saburo Murakawa, Kyesuke Sakaue, Daisaku Nishina, Yasuo Koshikawa, and Atsushi Yakushijin

Christie, Jessica Joyce, Jelena Bogdanović, and Eulogio Guzmá (editors)

David, Nicholas, and Carol Kramer

Daw Thin Kyi

Feinman, Gary M.

Fletcher, Roland

Fletcher, Roland, and Damian Evans
Freestone, Colin S.

Gaucher, Jacques

Hawken, Scott

Hayden, Brian, and Aubrey Cannon

Higham, Charles F.W.

Hudson, Bob

Hudson, Bob, Lwin Nyein, and Win Maung (Tanpawady)

Iannone, Gyles
2014b Framing a Comparative Analysis of Tropical Civilizations. Paper presented at the Trent @ 50 Archaeology Symposium, Peterborough.
2015 Key Insights from the Phase I Study. In *Framing a Comparative Analysis of Tropical Civilizations: SETS Project – Phase I (Volume 2)*, edited by Gyles Iannone, pp. 245-284. Occasional Papers in Anthropology No. 18, Department of Anthropology, Trent University, Peterborough.


Iannone, Gyles, Kendall B. Hills, and Scott Macrae (editors)
2015 *Framing a Comparative Analysis of Tropical Civilizations: SETS Project – Phase I (Volume 2)*. Occasional Papers in Anthropology No. 18, Department of Anthropology, Trent University, Peterborough.

Isendahl, Christian

Isendahl, Christian, and Michael E. Smith

Kan Hla, U

Koller, Alexander

Kowalewski, Stephen A.

Leach, Edmund R.

Lieberman, Victor B.
Lieberman, Victor, and Brendan Buckley

Luce, Gordon H.

Lucero Lisa. J., Fletcher Roland., and Coningham Robin

Lyons, Diane, and Joanna Casey

Marcus, Joyce, and Jeremy Sabloff (editors)

McNiven, Ian J.

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McIntosh, Roderick J, and Susan Keech McIntosh

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Miksic, John N., and Geok Yian Goh

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Pyiet Phyo Kyaw

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Scarborough Vernon L., and Lisa J. Lucero
Sinclair, Paul J.J.  

Smith, Michael E.  

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Stanislawski, Michael B.  

Stargardt, Janice  

Stark, Miriam T., Damian Evans, Chhay Rachna, Heng Piphal, and Alison Carter  

Strachan, Paul  

Storey, Glenn R. (editor)  

Trigger, Bruce G.  

Waldheim, Charles  
2010 Notes Toward a History of Agrarian Urbanism: Design Observer.  

Wheatley, Paul  
Win Kyaing (U)

Yaeger, Jason
CHAPTER 4
Settlement Patterning at Classical Bagan:
Insights from The Inscriptions, Chronicles, Murals, and Plaques

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This chapter is focused on analyzing the entanglements between the Crown, the Sangha (Buddhist monkhood), and the commoner population and determining how these relationships shaped the settlement patterns of the greater empire. The Buddhist notion of “merit-making” and its role in donations and indentured labour is a central tenet as it tightly bundled together these three agents and transformed religious monuments into epicenter-like settlements. By using epigraphic and iconographic data, this research seeks to gain more insight into the composition and layout of the city, the village and the homes that occupied Bagan. By reconstructing these settlements, it is possible to interpret the types of entanglements that the commoner people formed with the Crown and/or Sangha with whom they were inevitably bonded too. The information gathered from these historical datasets alongside the data gathered from the fieldwork conducted in the summer of 2017 will provide the foundations for the excavations occurring in the summer of 2018.

RESEARCH GOALS

Although Bagan is currently home to approximately 2,200 surviving brick temples, stupas and monasteries (Aung-Thwin 1985:169, Hudson 2004:236, Hla 1977:15), few studies have been done analyzing the settlements that emerged as a response to this explosion of monument construction. Therefore, the primary goal of this research is to determine the types of political, religious, and economic entanglements that formed between the Crown, the Sangha, and the commoner population through the act of merit-making. In addition to this, this research is also interested in determining what aspects of these bundles were most entangled with Bagan’s commoner population, as well as the overall nature of the city, the village, and the commoner.

BACKGROUND

Merit-Making

Merit (kutho) was a Buddhist belief that dominated the religion in Bagan and was integrated into the daily life of both the laity and elite alike (Aung-Thwin 1985:164, Aung-Thwin 1987:89, Aung-Thwin and Aung-Thwin 2012:83-84). Merit was associated with all aspects of life and was linked to birth, status, wealth, legitimacy, and the entirety of a person. It was the biggest motivating force of a person’s behaviour. Regardless of an individual’s social status, merit making was the primary directive for the people of Bagan as its accumulation meant a better life upon reincarnation (Aung-Thwin 1985:171). While the ultimate goal of merit accumulation was the achievement of nibbana (salvation through enlightenment), it also had the more attainable benefit of allowing an individual to increase their social status either within their current lifetime or upon their rebirth (Aung-Thwin 1985:170-171).
Merit was attained through pious acts, such as performing good deeds or by making endowments to the Sangha. For those of lesser status, donations could take the form of occasionally feeding monks, providing a few basic amenities, or even temporarily entering their service as a labourer. However donating large amounts of wealth to the Sangha was the fastest means of accumulating merit as the value of the donation equated to the amount of merit gained (Aung-Thwin 1985:174). For those of wealthier means, merit accumulation equated to the donation of a variety of materials such as capital, wastelands, artificial water management features, livestock, building materials, palm trees, ritual objects, food, and most importantly tax-free agricultural lands and people to work them, build religious features, and overall maintain the Buddhist institution (Aung-Thwin 1985:26, 43-44, 169-171, Aung-Thwin and Aung-Thwin 2012:94, Duroiselle 1871, Frasch 2014, Stadtner 2013:18). Some donations could also be made in perpetuity (Aung-Thwin 1985:164). This belief system led to the amassment of an incredible amount of wealth by the Sangha and the construction of temples, monasteries and stupas within a short time period and on a tremendous scale.

**Settlement Patterns and Epicenters**

Amongst the many north-south oriented rivers throughout Myanmar, none have been as influential in shaping settlement patterns as that of the Irrawaddy River. Running down the country’s centre, the Irrawaddy was and continues to be the most agriculturally productive region, yielding highly diverse crops (Aung-Thwin and Aung-Thwin 2012:37). It is no surprise then that this major river attracted various peoples to its fertile lands becoming the heartland for many Burmese empires, including Bagan (Aung-Thwin and Aung-Thwin 2012:38). Although the Irrawaddy was highly fertile, only two regions were capable of producing rice, Kyaukse and Minbu (Aung-Thwin 1985:162, Gutman and Hudson 2004:170, Moore et al. 2006:302). This meant that the Crown needed to acts as a redistributive mechanism in order to provision the rest of Bagan’s settlements with their staple crop.

The walled city of Bagan, and the primary epicenter, was roughly 1.5km² (Aung-Thwin and Aung-Thwin 2012:78). The city was imbued with spiritual significance as it represented a microcosmic reflection of the macrocosmic heavenly realms (Stuart-Fox and Reeve 2011). This spiritual potency was achieved through city planning and by incorporating ritualistic images into the temple and palace. The layout of the city and its ornamentation invoked ideas of the sacred and mythical Mount Meru (Stuart-Fox and Reeve 2011:109). From this city-centre was where the rest of the empire radiated outwards. Practicing a galactic-like form of administrative control where the city was the centre of economic, religious, and political power its administrative and cultural influence lessened with increasing distance (Tambiah 1977). Therefore polities along the outermost peripheries of the empire were least entangled and least dependent on the city-centre.

Bagan’s administrative control extended far beyond the city’s walls and covered an area of approximately 80 km² (Grave and Barbetti 2001:75). This “peri-urban” zone housed the majority of the empire’s monumental architecture and its inhabitants with the commoner peoples making up approximately eighty percent of Bagan’s total population (Ponting 2007:65). Like many other tropical societies, Bagan’s peri-urban settlements practiced a form of low-density agrarian-based urbanism (Fletcher 2009, 2012). Due to the abundance and accessibility of resources, populations were not inclined to concentrate themselves in specific areas (Miksic 2000:107). Therefore, polities along the outermost peripheries of the empire were least entangled and least connected to the city-centre. It was therefore important for the Crown that populations living
along the edges of the empire be brought closer to the core and culturally assimilated. A Goal achieved through monument building. The construction of monumental features and the religious ceremonies that were associated with them would have coerced various groups of peoples into gathering in the surrounding area. The act of merit building and monument construction were therefore integral in establishing settlements throughout Bagan. These monuments transformed the landscape by becoming lesser epicenters and acted as a cultural extension of Bagan.

**Patron-Client Relationships**

All individuals of Bagan participated in some form of patron-client relationship that was ultimately connected to either the king or the Buddhist monkhood. Being a client of the Crown primarily involved the payment of taxes, whereas acting as a client to the *Sangha* involved donations. Bonding oneself did not necessarily mean a transaction of goods but rather could involve individuals voluntarily offering their indentured service for a specified period. This system of patron-client bondage was mutually beneficial as individuals who had bonded themselves to a particular house or institution would provide their time and labour in exchange for being released from fiscal responsibilities or in the case of the *Sangha* received spiritual gratification in return.

One type of patron-client relationship that developed with the Crown were those involving the elites of Bagan. The kings of Bagan would reward loyal patrons with lands, titles, and wealth and in exchange they would act as administrative agents within their own polities (Aung-Thwin and Aung-Thwin 2011:113, Lieberman and Buckley 2012:1070). This ruler-supporter relationship was how kings were able to maintain their stability and control in otherwise far distant settlements (Wisseman 1995:271). Some of the patron-client relationships that developed with the Crown were less voluntary as individuals captured during conquests of expansion or individuals owning a debt to the treasury were forcibly bonded to this institution (Wolter 1999:164-165). Freemen could also develop dependent relationships with wealthy elite patrons. Once again, these individuals were released from financial duties and given a home, protection, and access to women (Tambiah 1977:89-90). In return – apart from labour – they could serve in their master’s private armies allowing these houses to gain more political leverage when needed (Lieberman 2003, Tambiah 1977:90). People that bonded themselves to the *Sangha* rather than the Crown experienced the similar benefit of being freed from fiscal responsibilities as they had the opportunity to work on tax-exempt lands and additionally could accumulate merit through their service (Lieberman and Buckley 2012:1071, Wolters 1999:165).

Similar to individuals bonding themselves to various patrons, the Crown and the *Sangha* could also bond themselves to each other. Throughout Burmese history, these institutions both played the role of patron and client at various times. During the ascension of a new king, the Crown needed the legitimacy that could only be granted by the *Sangha*. The *Sangha* also served a number of other functions for the Crown such as acting as education and economic centres as well as helped to mobilize the population facilitating processes of redistribution and administrative control (Lieberman 2003). In exchange, while partly due to religious obligations, the Crown provided resources and people to the *Sangha* thereby also creating new patron-client relationships between the common peoples and the monkhood. These resources became necessary for the *Sangha* to support itself and its monument building agenda.

The *Sangha* became especially dependent on the Crown for its maintenance and survival, during periods of Buddhist re formations. Periodically, the *Sangha* would become so engorged
with wealth that kings enacted sasana reforms, purification of the monkhood, and all donated material possessions were returned back to the Crown (Aung-Thwin 1985:165). During this period, the newly reformed Sangha was forced to play the role of client in order to coerce the Crown and elites to return to fulfilling their duties of gifting donations. This patron-client system created a multitude of entanglements between the Crown, the Sangha, and the commoner population. Although these relationships could sometimes be symbiotic ones they were not always equally beneficial nor were they always sustainable. Nonetheless, the bonding of individuals or institutions to one another resulted in the movement and concentration of populations overall influencing the settlement patterns of Bagan.

**THEORY, METHODS AND DATA**

**Entanglement Theory**

This research utilizes Entanglement theory proposed by Ian Hodder (2011a, 2011b, 2012) in order to assess the nature of the relationship between the Crown, Sangha, and the laity. In essence, entanglement theory argues that all humans live within a series of interconnecting dependent relationships occurring between other humans or things. These relationships not only help with our day-to-day activities but they also define us. As much as humans are dependent beings so too are “things” dependent entities. Just as humans depend on temples to satisfy spiritual needs, so too do temples rely on the bricks for their construction which in turn results in bricks depending on humans for their formation. These recursive relationships of dependency are what forms the basis of Entanglement theory. While a number of these entanglements may emerge from a variety of things, these entanglements are not necessarily equally dependent nor symbiotic as one thing may limit or constrain the future functionality of another thing depending on levels of dependency (Hodder 2012:51).

**Epigraphic and Iconographic Datasets**

The epigraphies, especially those related to merit-making, can provide insight into the entanglements that were present between the Crown and the Sangha. These inscriptions can be used to determine the types of resources that the Sangha was dependent on the Crown for its maintenance. In reverse, this information also helps to determine what resources were being taken away from the Crown and the consequences or benefits that emerged as a result. These large donations by the Crown led to the construction of numerous temples, monasteries and stupas that in turn attracted and concentrated large amounts of the population thereby forming new settlements around these religious monuments.

The effects of these construction projects can be interpreted through the examination of the temple mural paintings and terracotta plaques. Although these iconographies primarily reflect Buddhist themes, their backgrounds contain secular elements. These illustrations contain detailed visual representations regarding the spatial context of settlements, the presence and architecture of various features and the types of activities and occupations that inhabited these spaces. The chronicles, histories written by ancient Burmese kings, also provide a vivid reconstruction of ancient Burmese settlements. Many of these histories involve kings coming from humble beginnings and thus interacting with elements from village-life. These chronicles also include
Buddhist ideas of heavenly spaces which can provide more insight into the layout of settlements as ancient Burmese kings constantly attempted to imbue sacredness into their spaces.

Data Collection

Data collection for this project took place during the 2017 summer field season in Bagan and was focused on surveying water management features, religious landmarks, and agricultural fields. Given that religious landmarks acted as a type of epicenter where populations gravitated towards (Evans et al. 2007, Fletcher 2009) the distribution of ceramics near monumental features offers insight into the usage of space by these past populations. In addition to conducting surveys, photographs were also taken of a variety of temple mural paintings and terracotta plaques. The most comprehensive collection of Bagan’s iconographies can be found in Pichard’s *Inventory of Monuments at Pagan, Volumes 1-8* (1992-2002), however all the images are in greyscale or contain only a written description regarding the contents of the mural. Furthermore, other publications regarding the iconographies of Bagan tend to primarily focus on the religious elements being depicted. Therefore the photos taken during this field season were unique in that they documented the more secular components of ancient Burmese art.

Secondary methods of data collection included museum visits, which provided an assortment of material evidence for past domestic architecture as well as visual reconstructions of village life and palatial structures. General observations of rural houses and traditional farming practices were also conducted which formulated ideas about the layout and construction of ancient Burmese homes and the activities they participated in.

FINDINGS

The City

The walled-city of Bagan was home to only the king, some members of the elite, and a handful of common peoples who served as attendants, entertainers and cooks (Daw Thin Kyi 1966:179). The city contained ordination halls, libraries, monasteries, preaching halls, temples, monasteries, and the royal palace (Aung-Thwin 1985:50-52, 1987:89-91, Aung-Thwin and Aung-Thwin 2012:81, Hudson 2004:220). Although the royal palaces did not survive in the archaeological record, they were visually represented on temple mural paintings. From these paintings, it can be noted that these were highly elaborate non-stilted wooden buildings (Figure 3.1). Although the majority of the structure was constructed from what appears to be wood, they also depict the use of more durable materials. Staircases leading to the entranceways of these buildings are made of masonry and some roofs are depicted as being made of terracotta tiles. It is however also possible that the roofs were made of teak wood that were nailed on to battens, such as those seen in contemporary Myanmar (Dumarçay 1987:24), but surface finds also showed evidence of the use of rectangular ceramic tiles. These roofs were elaborate, multi-tiered and highly ornamented. Apart from the palaces, the murals also depicted houses belonging to the elite (Figure 3.2). These homes were also made of wood that used tiles (the materials of these tiles cannot be determined). Both the roofs of the elites and kings’ residences were depicted with having turquoise tiles. Amongst the few tiles that were found during the field survey, none were coated with a coloured glaze. Unlike the palaces, these homes were stilted and were built with a wooden staircase and wooden balcony.
When recounting the history of the ancient Pyu city of Sriksetra, the chronicles describes the city as having the “things needful for a city” which included features such as gates, moats, and towers (Tin and Luce 1923:14). Surrounding the walled enclosure are the remnants of a moat that was observed during the field survey (Figure 3.3). The chronicles often stressed the cosmological importance of surrounding a significant site with a permanent body of water which may have led to the construction of many artificial water management systems alongside temples and stupas (Hudson and Lustig 2008:291). Whilst the Irrawaddy acted as an important trade route and resource for fisherman it therefore also satisfied this cosmological requirement of being in proximity to water. The moat surrounding the wall may have also been constructed for symbolic purposes as it represents the great river that surrounded Mount Meru (Herbert 2002:85).

Also found were the locations of the three entrance gates that led into the city. These gates were oriented in the cardinal directions (North, East, and South) which was symbolically important as they represented the four lesser peaks also surrounding Mount Meru (Stuart-Fox and Reeve 2011:116). This may explain the function of the northern gate since, unlike the other two gates, was not connected to a major road. These gates, as depicted in the iconographies were made of brick and may have even held a wooden structure on top from where individuals could look out from (Figure 3.2).

The city was a bustling metropolis where trading occurred. Along the bottom of a mural from the Ananda monastery (Ananda ok-kyauung) are individuals in the process of exchanging goods. One woman in particular is performing a transaction whilst sitting in a stilted wooden shelter (Figure 3.4). This shelter is evocative of the markets of contemporary Bagan (Figure 3.5). While some people sold their goods on a tarp placed on the ground, the majority of vendors conducted their business within stilted teak structures and at the end of the day would simply empty their stall of goods.

Just outside of the walled city were buildings of varying degrees of elaboration. The mural from the Ananda monastery also depicts a three-sided walled wooden stilted structure representing a rest house (Figure 3.2 and Figure 3.6). The structure is simple in design and its walls are made of plant fibres. Also depicted at the Ananda monastery is a painting that is set outside the city walls. The presence of an animal pen in the background and stone pavilions with wooden roofs on top in the foreground can be spotted (Figure 3.7). This type of pavilion is also found in other ancient Burmese murals, such as on Sāma jataka from the Shwe Kyaung U temple (Figure 3.8), however rather than placed in a city context this pavilion supposedly belongs to hermits living in the forest (Duroiselle and Taw Sein Ko 1961: 29-32). As the space within the city became increasingly limited, and more people became attracted to this metropolis, Bagan was forced to expand outwards in all directions.
Figure 3.1. Kukkura jataka, Ananda monastery. Depiction of a walled city. The wall (noticeable in the black box) surrounds a highly ornamented royal palace made of wood with stone staircases (modified from Green 2002: Figure 7.7).

Figure 3.2. Mural painting from the Ananda monastery. Depiction of an elite residence surrounded by the city wall, the gated entrance, market activities, and a resthouse in the upper left corner.
Figure 3.3. Remnants of the moat’s embankments that surrounded the city wall. A slight depression is visible along the surface.

Figure 3.4 Close inspection of a mural painting from the Ananda monastery. The individual holding scales sitting in the wooden structure is in the process of exchanging goods.

Figure 3.5. Vendors selling goods in stilted structures in the markets of Bagan.
Figure 3.6. Contemporary Burmese resthouse.

Figure 3.7. Mural depicting life outside the city walls. The black box marks the presence of an animal pen (modified from Green 2002: Figure 7.7).

Figure 3.8. Sāma jataka, Shwe Kyaung U temple. Depiction of a stone pavilion with a wooden structures built on top (taken from Green 2002: Figure 7).
The Village

Many inscriptions specified how much land was being donated with some kings donating tremendous quantities. One inscription recounts king Anawrahta donating 2055 pay (approximately 3,596 acres) to the Yan-aung-myint and Lak-saññ-rhaññ temple (Frasch 2014:21). The donations of these lands by the Crown to the Sangha were large and frequent which brings to question the location of these donated lands and their relationship to their bonded religious complex. I argue that these donations did not necessarily occur within the same vicinity as their bonded religious complex. A handful of inscriptions dedicate the gifting of paddy fields to a variety of religious monuments such as the Shwezigon pagoda (Duroiselle 1871:118), the Myauk Guni temple (Duroiselle 1871:39), and the Letputkan pagoda (Duroiselle 1871:48). Even though none of these monuments were nowhere near the productive rice fields of the Kyaukse or Minbu basins, paddy fields were nonetheless donated to them. Therefore, donors could bond distant lands to temples and monasteries. Settlements that emerged as a response to working on these lands could therefore have had much further connecting bonds to temples than previously believed. Whether these settlements actually displayed any physical connections with these monastic complexes is yet to be determined and will require more archaeological evidence.

Although not enclosed in a brick wall, apart from the presence of a royal palace, the villages of Bagan contained similar structures to those that were found in the city. Some donations specified the types of buildings that were to be built providing some insight into the composition of the monastic settlements. Apart from the temple and monasteries, donations could be made for the construction of ordination halls, libraries, preaching halls, rest houses, almshouses, and storehouses (Duroiselle 1871, Frasch 2014).

In addition to these buildings villages, like the city, relied upon water management systems in order to sustain their crops. “[King] Narapatisithu, on his visit to the Taywin hill, saw a shining spot of ground and he built thereon the Sulamani pagoda and a monastery and dedicated lands and slaves” - Inscription No. 113 (Duroiselle 1871:17). Although some ritualistic beliefs may have dictated the placement of monumental features, they were also guided by the accessibility of water. The Sulamani temple, whose construction and maintenance would have required a stable supply of water feature is also coincidentally located within close proximity of two large natural water reserves (Figure 3.9). Both artificial and natural water features can also be spotted on terracotta plaques and temple mural paintings. These two water reserves can be differentiated by their overall shape, as artificial water tanks were more geometric (Figure 3.10 and Figure 3.11).
Figure 3.9. Location of water reserves, marked in the red box, in close proximity to the Sulamani temple (modified from Google Earth 2018).

Figure 3.10 Paduma jataka, East Hpet Leik temple. A rectangular shaped artificial pond with walled embankments (taken from Rao 2001: Plate 181).

Figure 3.11 Sāma jataka, Shwe Kyaung U temple. The son of two blind ascetics goes to retrieve water for from a pond (Duroiselle and Ko 1961:29-32) (taken from Green 2002: Figure 7.5)
According to the epigraphic and iconographic evidence, the villages could be craft and even people specific. One mural from the Ananda monastery (Jataka No. 4), shows a multitude of ceramic pots stacked on top of one another in the background (Figure 3.12). The two figures on the right can also be seen holding these ceramics and in the process of selling them. This mural was likely depicting a pottery producing village whose presence in Bagan was verified in the archaeological and ethnographic record during the field survey (Figure 3.13 and Figure 3.14). The high frequency and variety of different ceramic types that was found along the surface of the Otein Taung mounds, located directly south of the Sulamani temple, indicates that this site was the primary supplier of all ceramic needs (water and cooking vessels, draining, building materials, etc.) for a number of other settlements in Bagan.

The inscriptions also allude to the presence of status-based and ethnic specific villages in Bagan. An inscription from the Myazedi pillar discusses the gifting and ownership of “slave villages” (Duroiselle and Taw Sein Ko 1919: 25-26, 51-52, 56-57, 63-64). According to the inscription, these peoples were originally bonded to the son of King Sri Tribhuwanadityadhammaraj’s wife but were then re-gifted and bonded to the Sangha (Duroiselle and Taw Sein Ko 1919: 25). This inscription provides insight into the longevity of these villages and the treatment of its inhabitants. “Let this deed of mine be the cause of my obtaining Omniscience! After me, whether my son, or grandson, or relative, or any other person, if he oppresses the slaves I have offered to this Buddha, may he not behold the Buddha Arimittiya!” (Duroiselle and Taw Sein Ko 1919:26).

Families occupying these bonded villages could be of bonded status for a multitude of generations. Some inscriptions use the term sapok in order to identify individuals who were born of bonded parents (Tun 1958:43). Eventually entire bonded villages emerged and were called kyon rwālum (Tun 1958:43). These villages had some administrative independence as they had their own headman (suśli) who oversaw the village, officers (kumtham) who supervised the cultivation, as well as group of village elders (sankrī) (Tun 1958:47). The dedication or rededication of entire villages was not was practiced by kings during the early Bagan period (Duroiselle 1871:7, 9, 17), however during the later periods the inscriptions no longer describes the donating of entire villages.

Indian villages or Indian districts may have also emerged in response to merit-making and the bondage system. The inscriptions compiled by Duroiselle (1871) show that donations were made in order for the construction of a number of kalakyaungs, Indian monasteries. Furthermore the inscriptions by Frasch (2014) also show that a number of Indian people were bonded to a variety of temple complexes. One inscription regarding the construction of the Dhammayazika stupa states that 1,000 slaves were donated by King Narapatasingh of whom 500 were of Indian origin (Frasch 2014:51-52). A sizable population of Indians were therefore residing in Bagan during this period of which many were bound to specific monasteries that may have eventually developed into Indian specific settlements.

The occupations that were present in these villages can be divided into four general categories. Most commonly were the agriculturalists who practiced farming and herding (Figure 3.15). Food suppliers were also present and included cooks, hunters (Figure 3.16), and fishermen (Figure 3.17). Specialized craftsmen and artisans are frequently mentioned in the inscriptions as masons, blacksmiths, brick makers, painters, and carpenters were necessary for constructing temple complexes. Lastly, musicians and entertainers are often found in iconographies as flutists, horn players, drummers, and dancers.
Although these occupations were practiced by the commoner population, there was considerably variability in their value and status. For example, an individual who specialized in painting Buddhist images was worth 20 ticals of silver - approximately 16 grams (Luce and Shin 1969:237) whereas a painter whose job was to simply paint temple walls was only worth 2 ticals of silver (Tun 1959:78). This disparity in wealth amongst the laity can also be seen amongst agriculturalists. For example, the cart shown in the Takkala Jataka (Figure 3.18) is fairly simple in construction, showing a wooden block fitted on an axle with wheels. In contrast the Nandivisala Jataka (Figure 3.19) from the West Hpet Leik temple is fairly decorated with the front end curving upwards. The degree of ornamentation is also highly variable amongst the houses of the common peoples.

Figure 3.12. Jataka (No. 4) from the Ananda monastery. Illustration of a pottery producing site (taken from Falconer 1998:159).

Figure 3.13. High frequency of ceramics found along the surface of the Otein Taung mound.
Figure 3.14. A farming settlement in contemporary Bagan. The stacking of ceramics evocative of the mural painting from the Ananda monastery.

Figure 3.15. Contemporary farming practices of Bagan. A farmer ploughing his fields and planting crops in preparation for the onset of the rainy season.

Figure 3.16. Jataka from the Anauk Petleik pagoda. Depiction of a hunter using a bow.
Figure 3.17. Mural painting from a temple (No. 1026). Illustration of fishing activities.

Figure 3.18. \textit{Takkala jataka} from the East Hpet Leik temple. Figure on the left is riding a simply built ox cart (taken from Rao 2011: Plate 251).

Figure 3.19. \textit{Nandivisāla jataka} from the Dhammayazika temple. The depiction of a relatively more elaborate ox-driven cart (taken from Rao 2011: Plate 139).
The House

The homes of traditional Burmese houses (Figure 3.20) are typical made of teak, bamboo, timber, or palm leaves with thatched roofs (Hla 1977:20, Oo et al. 2003).

Figure 3.20. Traditional Burmese home in Bagan.

Houses tended to be represented in mural paintings and terracotta plaques as simply ornamented, single-roomed buildings with varying roof styles (flat or peaked) and could be either stilted or non-stilted. Some houses displayed evidence of greater wealth compared to others. One example is a jataka from the Shwezigon pagoda (Figure 3.21). The house is made up of two parts with two distinct roofs. A smaller and flat roofed structure makes up the entrance of the building, and this leads into a larger room with high ceilings and a peaked roof. This house is significantly larger with a more complex layout compared to the single-roomed flat roofed structures more commonly associated with the laity, however still pales in comparison to the multi-tiered houses of the elite.

Figure 3.21. Jataka from the Shwezigon pagoda (taken from Rao 2001: Plate 322).
Most families have small garden patches located in proximity to their homes (Brant 1954:5). The presence of small gardens can sometimes be found in mural paintings (Figure 3.22). They can be identified by a small enclosed space with vegetation growing inside. The lack of wide and large open fields and the presence of housing structures nearby differentiates these gardens from agricultural lands.

Figure 3.22. Jataka (No.4) from the Ananda monastery. Illustration of a house garden (taken from Falconer 1998:159).

Whilst conducting field surveys, observations were also made regarding the traditional houses of Bagan. Houses belonging to agriculturalists were sometimes noted to be surrounded by dense vegetation and built near either creeks or water tanks (Figure 3.23). This characteristic is evocative of the story of cucumber farmer in the Glass Palace Chronicle (1923:58) whose garden was isolated in the forest. These contemporary homes required constant maintenance as the thatched roofing and wooden walls that suffered from weathering needed to be replaced.

Constructing these homes first involved organizing the different structural parts of house on the ground that were then trimmed to size. Next holes were dug for where the stilts were to be inserted (Dumarçay 1987:15-16). Once the beamwork had been completed, prior to the layering of the walls and roof, a ceremonial offering was tied to one of the stilts (Figure 3.24). Once the house was completed, other ceremonies were to be observed prior to the owner first entering their new home (Dumarçay 1987:16).

Figure 3.23. Home of an agriculturalist surrounded by dense vegetation
Figure 3.24. Traditional Burmese house in the process of being built. The stilt on the left has an offering tied to it.

COMMENTS REGARDING THE ENTANGLEMENTS OF BAGAN

Through the act of merit-making and the patron-client system of Bagan, the Crown, Sangha, and common peoples became highly entwined with one another ultimately shaping settlement patterning. The temples, monasteries, and royal palaces of the walled-city was where economic, religious, and political ideologies were all bundled together, attracting groups of peoples to this epicenter. As a result, this city eventually developed into a bustling metropolis where trading and important ceremonies were held. Over time, the city prospered concentrating and generating wealth ultimately leading to goals of expansion. As the Crown expanded, it became increasingly entangled with the Sangha as it needed their help in order to maintain the support of the people as well as govern them. The Crown, as part of religious and political obligations, began making large contributions to the Sangha. This led to the rapid construction of thousands of religious monuments scattered throughout the landscape.

An outcome of this building frenzy, coupled with the donation of labourers by the Crown to the Sangha, was that entire populations became concentrated around the building and maintenance of these monuments. This led to the emergence of various villages, thereby bonding its occupants to the Sangha. While the villages bonded to these monastic complexes were entangled with the Sangha they were also tightly entangled with the Crown. As the Crown relied on the payment of taxes by the commoner population in order to continue giving endowments to the Sangha, the laity also depended on the Crown to act as an effective redistributive mechanism to supply them with rice which was only produced in two nearby regions.

Although the entanglements that formed between these three groups were tightly interwoven with one another, over time they became increasingly unequal. By the end of the thirteenth century, the Sangha was able to acquire between one and two-thirds of Upper Myanmar’s cultivable land through donations (Lieberman 2003:113). The commoner population became evermore enticed by these tax-exempt lands and were increasingly bonding themselves to the monkhood, thereby weakening their bonds with the Crown. The loss of a large taxable population
effectively destabilized the Crown eventually resulting in the fragmentation and collapse of this once powerful empire

CONCLUSIONS

This report presents a discussion regarding the nature of Bagan’s settlements that was interpreted from epigraphic and iconographic data. In addition, the observations documented from this field season helped create a comparison between the historical record and contemporary Bagan’s settlements. This also helped to fill in certain missing gaps in the literature and historical data. The religious monuments that emerged as a result of the massive donations made by the Crown were powerful integrative mechanisms that concentrated an otherwise dispersed population. Perhaps the early peoples of Bagan lived in fairly isolated communities that periodically gathered to construct a religious monument. However as the construction demands and employment opportunities increased, these temporary congregation sites eventually developed into more permanent villages.

The findings from this field season is relevant in that it compiles all the information currently available to archaeologists studying Bagan and is amongst the few settlement studies in the region. This research also opens the possibility for future contributions as it will be interesting to compare the results of this research with the data produced from the 2018 excavations. By doing so, we will gain a better understanding to the extent of information that these historical sources can provide.

REFERENCES CITED

Aung-Thwin, Michael


Brant, Charles S.

Daw Thin Kyi

Dumarçay, Jacques

Duroiselle, Charles

Duroiselle, Charles and Taw Sein Ko (editors)  

Fletcher, Roland  

Frasch, Tilman  

Grave, Peter and Mike Barbetti  

Gutman, Pamela and Bob Hudson  

Herbert, Patricia  

Hla, U Kan  

Hodder, Ian  

Hudson, Bob

Hudson, Bob and Terry Lustig

Lieberman, Victor

Lieberman, Victor, and Brendan Buckley

Miksic, John

Moore, Elizabeth, U San Win and Pyiet Phyo Kyaw

Oo, Cho, Saburo Murakawa, Kyosuke Sakaue, Daisaku Nishina, Yasuo Koshikawa, and Atushi Yakushijin.

Pichard, Pierre

Ponting, Clive

Stadtner, Donald M.

Stuart-Fox, Martin and Paul Reeves

Tambiah, Stanley J.
Tin, Pe Maung, and G.H Luce (translators)

Tun, Than

Wissemann Christie, Jan

Wolters, Oliver W.
1999 *History, Culture, and Region in Southeast Asian Perspectives (revised edition)*. Southeast Asia Program, Cornell University, Ithaca.
CHAPTER 4
Ethnoarchaeology in the Traditional Villages of Bagan

by
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As a part of Integrated Socio-Ecological History for Residential Patterning, Agricultural Practices, and Water Management at the Medieval Burmese Capital of Bagan, Myanmar (IRAW @ Bagan), the goal of this project is to use ethnoarchaeology to understand how a traditional village, house compound, and house are composed in the Bagan plain. I also aim to isolate elements that will or will not be useful to archaeologists excavating 9th-13th century village sites at the core of old Bagan. My research can be broken down into two main questions: 1) How are contemporary Bagan villages composed? 2) What part of that composition will be useful for archaeologists? To answer these questions, I travelled to Myanmar and visited a number of villages in the area around the ancient core of Bagan. At each of these villages, observations were made at the village, house compound, and house levels. At the village level, my goal is to determine if there are regularities in components and their placement (i.e., pagodas, water tanks, and monasteries), as well as the dimensions of the villages and their overall organization (i.e., are streets planned or organic?). For house compounds, the goal will be to draw out any regularities in the dimensions of the lots, as well as the placement of particular outbuildings (i.e., outhouses, cowsheds, granaries). There will also be the placement of specific activity areas – including dung, ash, cooking, washing, and storage – that may not be associated with a building. Using post diameters, I will consider whether there is a way for an archaeologist to differentiate between outbuildings of different functions, as well as the house. The goals, at the house level, will be to see if there is regularity between the sizes of the houses and post organization, as well as the placement of particular rooms. Initial interpretations suggest that there are some regularities in spatial organization and material correlates that will preserve and aid in future interpretations of excavated Bagan villages.

Background

Little of the archaeological work completed at Bagan can elucidate the settlement of the general population (Miksic 2001:99). The most common village organization in Myanmar is the nucleated village (Figure 4.1). This organization style is typified by houses that are closely packed together, divided by organic meandering streets, with farm plots surrounding the boundaries of the settlement (Freestone 1971:44; Spate 1945:532). This type of village does not tend to grow into a city, even with an increase in population. Instead, this village most often produces entirely separate nucleated villages once the population passes a threshold (Christie 1991:24). These thresholds are smaller in the dry zone than areas that receive a lot of rainfall (Freestone 1971:44). This means that, in the Bagan plain, villages are commonly associated with formal water tanks (Spate 1945:532). Spate describes all villages in the plains: houses are built within their own compounds among organic streetways; there is a pagoda in all of the more affluent villages; there are usually tamarind and mango trees within the compound, and Banyan
trees outside the village boundary, where tiny shrines are held with offerings (Figure 4.2). Of all the houses, almost none are made of brick (1945:530-531). This is corroborated in more recent work which found that the majority of houses are still built with traditional materials: bamboo for walls and roof frameworks, leaves and grasses for the roofing, and acacia, in, and teak used for posts and larger frames (Oo et al. 2001:166,168). There is a tendency for villagers to upgrade parts of their homes as a first act when a surplus is obtained. Today, this means updating from palm leaf roofs to tin, or from posts to brick foundations (Than 1987:57). This gradual change goes to show that time for research on these building styles is not unlimited (though overall, the change has been slow).

Historical research on traditional villages is almost entirely non-existent, making it very difficult to obtain an understanding of the general population at Bagan. Kan Hla suggests that wealthy artisans and craftsmen lived within the city walls, while commoners lived beyond them, covered by vegetation and almost unnoticeable between the temples that are still present today. He also believes that there were two modes of settlement: movable villages based around construction sites, as well as formal sedentary villages (Hla 1977:21). It is not clear what he bases this information on as he states, “No evidence of ordinary housing in ancient Pagan survives. We can only speculate on what houses looked like and where they were located,” (Hla 1977:20). Aung-Thwin does not make such bold claims, but does suggest that the location of Bagan’s houses is likely well away from the core of ancient Bagan, as it was an exemplary center with its foundations deeply entrenched in ceremony and the replication of perfection (Aung-Thwin 1985:101).

Figure 4.1 Nucleated Village (Modified from Google Earth Pro).
Approach

This project will use an ethnoarchaeological approach to understand how the villages, house compounds, and houses are composed, as well as how they may appear in the archaeological record. Ethnoarchaeology is not a theoretical approach as much as it is a useful tool for archaeologists to create a body of knowledge that can help interpretations of the past. In this case, I will be building a body of knowledge about traditional housing that will help future interpretations. The term ethnoarchaeology was originally used in 1900 by anthropologist Jesse Walter Fewkes to describe an archaeologist that has a deep knowledge of the present which can be applied to their work (David and Kramer 2007:6; Hodder 2012:28). Since that time, ethnoarchaeology has come to mean somewhat more. Ethnoarchaeology implies that the archaeologist is using ethnographic techniques, with a focus on material culture, that would otherwise be ignored by ethnographers (Hodder 2012:38). It now lies under the umbrella of actualistic studies, which mainly serves to provide more materials for analogy (David and Kramer 2007:13). It is different from experimental archaeology in that the researcher is not creating an artificial subject or environment. There is no trying again, only questions and observation (Hodder 2012: 29).

This project does assume some level of cultural continuity between the peoples of the present and those of the past. To address this, the formal analogy is a strengthened by the villages’ proximity to Bagan and their traditional mode of construction (Hodder 2012:18). The ethnoarchaeological information should allow me to make relevant suggestions as to what an archaeologist may find, should they come across a traditional house in their excavations. By
understanding what the formations of posts are in a particular building, and the intended function of those buildings, it may be possible to find correlations between building type and post spacing or diameters. Further, activity areas may be found to have a spatial association with buildings which may provide suitable areas for scientific testing (i.e., dung piles, ash piles, etc.). Without ethnoarchaeological work, interpretations of buildings and refuse pits would be weaker.

My Sample

For the purpose of this project, the sample I will be working with is ten villages selected for their close proximity – the furthest being 20 kilometers – to the ancient core of Bagan. These ten villages visited in order were Thè Pyin Taw, Thè Shwe Halaing, Zee Oo, Kon Sin Gyi, Kon Tan Gyi, Minnanthu, Hpauck Sein Pin, Thah Tay Kan East Pwa Saw, and West Pwa Saw (Figure 4.3). At each village, one house compound was selected by willingness to take part in the survey, as well as relevance to the study. In three cases – Kon Sin Gyi, Kon Tan Gyi, and Thah Tay Kan – the initial lot did not contain all of the components of interest for this study, so a second lot was visited. Within each compound, I focused on recording buildings and activity areas.

Figure 4.3. The villages visited in relation to the ancient core of Bagan (Modified from Google Earth Pro)

Field Work and Methods

In December of 2017, I travelled to Bagan with the members of the IRAW @ Bagan project. We arrived at Thè Pyin Taw on the 10th of December and completed my survey after visiting
West Pwa Saw on the 17th of December. I was aided by members of the project from Yangon University in translating and taking measurements as I took notes and asked questions. On certain days, I was able to complete two house compound surveys per day. Though there was some variation in the process, each house compound followed the same general procedure. We first met with a community leader, a monk from the local monastery or village headman. In most cases, this community member would organize the house compound that I would be able to survey. Upon arriving at a house compound, I would record a GPS coordinate on my recording form so I could refer back to the location if necessary, using GIS software. Our team would then begin to measure the length of the boundary fence of the compound, a selection of its fence post diameters, and the distance between each of the posts. Once the perimeter of the compound was established in my drawings, we moved onto the outbuildings and activity, measuring their locations relative to each other, as well as post diameters and distance between posts. Finally, the house was surveyed, taking into account activity areas, post diameters and distances between posts. Throughout this process, photographs were taken of activity areas, buildings, and materials. Once the survey was completed, an interview was carried out with someone associated with the home. This interview was based around finding the intended use of areas and what processes – those which were not immediately apparent – affected the material correlates that were present. Apart from the quantitative data from the survey, I also recorded qualitative data in my recording form: the responses to my interview questions, materials, and activity areas.

**Initial Findings**

**Village**

Consistent with descriptions from Spate (1945) and Freestone (1971), the villages shared several qualities. Most of the villages were nucleated settlements, while only Shwe Hlaing was organized as a linear settlement, based around the main road which ran through the town (Figure 4.4; Freestone 1971:39). All of the villages had organically laid out street plans that did not conform with a grid. The roads were dirt and ranged from four to seven meters in width and, in many cases, doubled as drainage during the wet season. Settlements are primarily formed by closely kept house compounds, but they all contain, at the very least, two other components. Each of the ten villages had a monastery and formal water tank or pond. Most villages also had an accompanying stupa. These three elements are always found to be in close proximity to one another: the distance between a monastery and pond or tank was between 70 and 190 meters. The only exception to this rule exists at Kon Tan Gyi, where it appears that the closest pond is 1.1 km away, on the opposite side of the village from the monastery. I believe that the field immediately to the north of – 80 meters away – the monastery may have served as this village’s water source, as it shows some signs of repeated flooding. Furthermore, the monastery, pond or tank, and stupa are always located on the very edge of the settlement (Figure 4.5). In most cases, these three features form a distinctive conglomerate on the perimeter of the main mass of houses that compose the village. The only exception is at Thè Pyin Taw, where the monastery,
water tank, and stupa are to be found in the middle of the village, with houses to the north and south of this location. The eastern wall of the monastery compound backs onto the outer edge of the village. Garbage disposal seems to have taken place mainly on the outer edge of each village. Today, much of the garbage is collected and burned in large steel hoppers due to the buildup of inorganic waste. However, it is plausible that, before the prevalence of inorganic garbage, waste would be allowed to deteriorate naturally in situ.

Figure 4.4. Linear Settlement (Modified from Google Earth Pro).

Figure 4.5. Monastery, Pond, and Stupa Organization (Modified from Google Earth Pro).
House Compound

The house compounds are normally surrounded by a fence weaved of bamboo, toddy palm, or stick (Figure 4.6). The posts are generally spaced 1.2 meters away from one another, except for small gaps for gates. These posts were dug 0.51 meters into the ground. Along the fence line, there were stones and broken pottery, which were described as barriers for pests. Within the compounds, there was often a barn for cows with an area in the rafters to store the fodder (Figure 4.7). Toilets were kept away from most other buildings, in a small enclosure of their own. They were often elevated slightly from the ground with either a basket or a pipe leading away from the enclosure (Figure 4.8). Most of the posts for the buildings were constructed from acacia wood, while frames for second-floor storage were built of teak or inn wood, as they are stronger materials. Generally speaking, the larger the construction for the outbuildings, the larger the diameter of post. There were also different activity areas not enclosed inside buildings present in the compounds. Separate washing stations for men and women were evident from large flat stones where the bather could sit (Figure 4.9). Most compounds had a number of cultivated plants for food such as lemon, papaya, and tamarind trees (Figure 4.10) and building materials like bamboo (Figure 4.11). Storage also occurs throughout the compound using large ceramic pots (Figure 4.12) for more liquid substances and large weaved baskets for various seeds (Figure 4.13).

Figure 4.6. Toddy Palm (L) and Bamboo Fence (R).
Figure 4.7 Typical Cow Shed.
Figure 4.8. Outhouse.

Figure 4.9. Bathing Area.
The houses varied in size significantly, depending on the economic standing of a family and the number of people living in the household. The number of posts ranged from 28 in larger houses to nine in some smaller houses, with diameters between 10 and 17 centimeters. House posts were generally dug 0.61 meters into the ground. The second post from the back corner of the house is the “Uru Post.” This post is where the construction of the house begins and from where all other measurements are made. Before this post is placed, offerings in the form of coins and food are made to ensure a prosperous house. The houses were generally of a rectangular configuration with posts placed at regular intervals from 1.8-2.1 meters (Figure 4.14). Around the perimeter of some of the houses, a slight drainage ditch was created either naturally or by the home owner to channel run-off away from the house (Figure 4.15). Most houses were organized into two distinctive sections. The first area is an open space with seating, tables, and some
storage on top of a dirt floor, which is generally a third of the total area of the house (Figure 4.16). The second area is the family’s private living quarters, which makes up the remaining two-thirds of the house, and is commonly elevated 0.61 meters from the ground (Figure 4.17). This area is often divided by an enclosure, serving as the women’s area for changing their clothes (Figure 4.18). A Buddhist altar is located opposite the enclosed space, and is always placed in the rafters as sacred space (Errington 1989:66) (Figure 4.19). An occasional third section is the kitchen, but in some cases, this is in an entirely detached building. Inside most kitchens, which had not updated to electric hot plates, were small fireplaces lined with brick or other materials to protect the flammable bamboo walls from catching fire (Figure 4.20). Some fire pits had broken toddy pots used as stands for cooking surfaces (Figure 4.21). The back two-thirds of the house were often elevated. Underneath, homeowners stored various materials and the household transportation. The floors and walls of the house were all made of weaved bamboo. The bamboo walls were often made into intricate designs. The roofs of the houses were usually toddy palm if they had not been updated to tin roofs. The main structure of the house was built with hard woods like acacia, inn, or teak.

Figure 4.14. Newly Renovated House.
Figure 4.15. Rainwater Drainage.

Figure 4.16. Open Entertaining Area.

Figure 4.17. Elevated Private Area.
Figure 4.18. Women's Area

Figure 4.19. Household. Buddhist Shrine.

Figure 4.20. Kitchen & Cooking Area.  
Figure 4.21. Toddy Pot Used for Cooking Surface.

Weaknesses of the Data Set

The greatest weakness of this data set is the number of villages and subsequent houses and house compounds that I was able to survey. Doing an exhaustive survey of all of the villages around Bagan would have strengthened the research. I will need to approach my conclusions with care as to their definitive nature. However, in the time available for this study, the results of the survey have provided a large number of interesting patterns and avenues for further study.

A second weakness is the unrelenting advance of globalization and people’s desire to modernize their houses (Than 1987:57). This means that many of the elements relevant to this study are being replaced with modern goods. Though change to the materials of houses has been slow, it is still changing in greater numbers than ever before. The use of modern materials was more prevalent the closer that our team approached the core of Bagan. This trend towards more global materials is making the use of ethnoarchaeology as a source for strong interpretations
more difficult as time goes on. Many of the roofs had been replaced with tin roofs where toddy palm was once used. Houses are now being built with cement foundations or having them added on (Figure 4.22). Others have been transformed entirely: cement foundations with tile floor, milled posts from a lumber yard, and wood walls where there had once been bamboo (Figure 4.23). The lots were changing as well. Many of the house compounds located closer to Bagan had abandoned livestock and were making their livelihoods from craft sales in the city and from their homes. This limited the number of cow sheds and granaries located within those compounds. In some cases, where our team encountered a house or element of the house compound that was now missing, we were able to appropriate the missing element form an adjacent lot. However, in doing, so we lose the spatial relationship that the element may have had within the compound. This project was suitably timed, and although there were some issues with finding traditional constructions of the compound and house, there were examples remaining.

Figure 4.23. House with Milled Beams and Brick & Cement Floor.
The lack of available writing on traditional villages in Myanmar, much less Bagan, made our fieldwork in December of 2017 imperative. It allowed me to obtain an abundance of quantitative data that – to my knowledge – is not documented for this region anywhere. At the same time, I was able to obtain answers about function and meanings from interviewees that quantitative data alone would have rendered invisible. Yet, there are some ethnographic works – focused on Myanmar and other parts of Southeast Asia – that will be useful to increase the strength of my ten-village sample. These sources do not, however, have the focus on spatial relationships that this project requires. The shortage of historic sources highlights the need for ethnoarchaeological work to narrow down the possibilities of how historic traditional villages, compounds, and houses may have been composed.

It appears that villages are regularly nucleated organic settlements which frequently occur with a nearby source of water, flanked by a monastery and stupa. The house compounds are of varying shape outlined by fences with regular intervals. The components of the compounds are largely ubiquitous and all constructions are built with an eye for symmetry. The houses are rectangular structures, symmetrically designed with areas for women and religious stations. Every house has a veranda with places to sit in the front of the house while the remaining two-thirds is enclosed.

Though much of the construction of traditional houses is made with perishable materials, the post holes, stones, ceramics, hard patted earth from frequent activity, water drainage, monasteries, and water reservoirs will all take much longer to become invisible in the
archaeological record. It is from these clues and armed with our analogies of how these process function today that we aim to piece together the traditional villages of Imperial Bagan.

References Cited

Aung-Thwin, Michael.

Christie, Jan Wisseman.

David, Nicholas and Carol Kramer.

Errington, Shelly.

Freestone, Colin S.

Hla, U Kan.

Hodder, Ian.

Miksic, John N.

Oo, Cho., Saburo Murakawa, Kyosuke Sakaue, Daisaku Nishina, Yasuo Koshikawa, and Atsushi Yakushijin.

Spate, O.H.K.

Than, Mya.
CHAPTER 5
Traditional Myanmar Housing: beyond Bagan

by
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The IRAW@Bagan settlement study began with ethnoarchaeological research of traditional household across the peri-urban settlement zone. While researchers visited and studied households in ten traditional villages, there was a need to expand the scope of analysis. Thus, the project has endeavored to address variability in traditional houses across Myanmar as well as explore traditional belief systems in relation to households. This chapter address this expansion of the IRAW@Bagna settlement study.

Traditional House System of Tanintharyi Township

This preliminary survey is designed to record information about the housing system of Tanintharyi people and to describe how the Tanintharyi Division Housing systems shows variability between each house. The Tanintharyi township is located along the Andaman Sea in southern Myanmar on the Kra Isthmus. Tanintharyi became a junction of governing Thai and Myanmar for many years as it became an important trading center. Due to this complicated history the area holds evidence of a shared culture.

Types of Tanintharyi Houses

According to the collected photo record, there are respective types of houses relating to the ethnicity of the people dwelling within it. These ethnic groups include, Mawkin, Mon, Dawei, Kayin, and Tanintharyi. The spacing and organization of the settlement area is the defining characteristics of the different types of housing system, a factor strongly dictated by geography. This revealed significant differences amongst the ethnic groups and will be the premise of further study. This study of housing patterns is based on four houses from the Thaninthayi township and focused on photography (Appendix A) to interpret their structural patterns, styles, and what material would persist in the archaeological record. Ancient Thaninthayi became the second site in Tanintharyi Region to be included on the national list of forty-seven Notified Zones of Cultural Heritage Regions and Buildings maintained by the Ministry of Culture, Department of Archaeology.

The style and plan of the houses all included, a kitchen, barn, and additional outbuildings. Each of these house features illustrates aspects of the social, economic and religious daily life in the villages of Lower Myanmar. The building materials used are hardwoods, ironwood, bamboo, palm slats, Dani phat, ‘sweet wood’ or thit cho (sideroxylon tomentosum). Each building material had a different purpose within the house such as pillars, beams, floorboards, roof, and walls. The
house style placed an emphasis on space for the cooking, storage, public activities, and animals. According to the type of house, kitchens were placed either on the upper or lower sections of the houses within the boundary area. Most of the fence used to enclose the household compound are constructed from bamboo. Some of the broken glass, pots, and others household refuse are placed in the back corner of the house. The majority of the households planted vegetables and flowers around their residential areas.

Figure 5.1. Left, drawing of a Dawei house (Mg Ni Win, 1979). Right, picture taken of Tanintharyi house

Figure 5.2. Right, Drawings of Tanintharyi traditional house. Left, Photo of Mawking house.
Human survival and existence in the world depends on several factors. Firstly, they must meet basic needs such as food, clothing, and shelter. In addressing shelter, the Buddha said in the Aggana Sutta, “And those beings who in those days indulged in sex were not allowed into a village or town for one or two months. Accordingly, those who indulged for an exceedingly long period in such immoral practices began to build themselves dwellings so as to indulge under cover” (Walshe 1987:412). The ancient Burmese social system based on a rural social system. A system that develops unity, harmony, altruism, filial piety, and more. When children of a family are matured enough to get married, they do not live separately. They live with parents-in-law even in a shed so that husband and wife are trained for their manners and behaviors in matrimony. When the shed gets old, it needs to be rebuilt. Parents and parents-in-law are reported about renovation of the house. Men in the village come to those who would like to build a new house to help with money. Only then do parents, relatives and friends help. The following is description of the ritual procession that occurs when collecting the wood for building a house;

When a house falls into disrepair a man cuts down trees or buys woods and bamboos from a place where they are plentiful. Using these materials, the house is built. Whether house is carried after tumbling, woods are brought, or trees are cut down, people in the village welcomes it. Such act is known as Thit-kyo, meaning welcome the wood.

Welcoming the couple, the villagers rejoice that a new house will increase the village and they feel empathy that our friend and villager is going to build a new house. Carts of drawn by oxen carrying woods and bamboos are tied with Eugenia twigs, representing the omen of victory. The first cart has a gong that’s struck. When villagers hear the gong, they rejoice as they know it is the sound from the wood carrying carts and that it symbolizes an endeavor for marriage and thriftily living.

Those who wait for Thit-kyo welcome the wood cart in front of the house. The housewife waits in front of the village and sprinkles oxen with water soaked
in the fragrance of Eugenia twigs. Only then does she splash the driver and wets every log on the cart. Villagers share fried pancakes, jiggery, sweetmeat balls and cheroots with the drivers. They ask, “What have you taken?” And the drivers reply, “Gold, silver, and gems.”

Selecting Wood for the House

When a man wants to build a house, he invites his friends go into the forest to select the correct lumber. There are several factors they consider in this selection process. They refrain from cutting down trees that exhibit features such as hollowed wood, knotted wood, wood perched by a vulture, wood having three twigs that from a fork (Thi-gya-htaing), hanging wood, and wood rubbing other trees. Further, the they do not cut down certain species of trees including Banyan, Cinchona, Trumpet flower (Dolichandrone atrovirens), Chaulmoogra, Plum, Eugenia, Red silk cotton, Bahera (Bellaric myrobalan), and Gooseberry.

Choice of Direction of Head of Dragon

When the work of building a house is begun, an auspicious day known as Bayin-yet is chosen. Such days of auspicious (yet-ra-ja), inauspicious (pya-tha-da), and the direction of the dragon head (naga-hle) are found in the calendar. In ancient time, Tagu-thakyaw, htun-paw-Kason, Nayon-nyunt-sa, … were memorized. Auspicious days are counted as follows;

• Friday and Monday in Tagu (March-April)
• Saturday and Thursday in Kason (April-May)
• Only Tuesday in Nayon (May-June)
• Sunday and Wednesday in Waso (June-July)
• Friday and Wednesday in Wagaung (July-August)
• Thursday and Saturday in Tawthalin (August-September)
• Tuesday in Thidingyut (September-October)
• Thursday and Late Thursday (Rahu) in Tazaungmon (October-November)
• Monday and Saturday in Nattaw (November-December)
• Thursday and Saturday in Pyatho (December-January)
• Thursday and Tuesday in Tabodwe (January-February)
• Sunday and Wednesday in Tabaung (February-March)

Concerning the direction of the dragon head, the dragon turns its head towards the west in the first three months, to the north in the second three months, as well as the east in the third months and the south in the last months. Therefore, on any journey, a traveler cannot go against the head of the dragon. If he does, inevitably, he must manage to pass through the belly of the dragon. Then, it defines trespassing the tail of the dragon and then going to its head so that the scales of the dragon are peeled.

Choosing a Good and Bad Day for Driving the Stake
Suitable months to build house are Tagu, Kason, Wagaung, Nattaw, Pyatho and Tabaung. However, there are good and bad days for which to begin building on. The start of construction is symbolized by diving the first foundation peg in the ground and raising the posts.

Good days to drive the foundation peg includes the 4th and 14th waxing moon and 9th waning moon, under tiger constellation, which will help the household accumulate wealth. The 2nd and 12th of waxing moon and 7th waning moon, under elephant constellation, will assist peace to prevail in the household. The 1st and 11th waxing moon and 6th waning moon, the mouse constellation, will help gain success within the household. Peace will prevail on 7th waxing moon and 2nd and 12th waning moon under the Keit constellation.

On the other hand, bad days to choose include the 3rd and 13th of waxing moon and 8th waning moon, under the lion constellation, invites disease. The 9th waxing moon and 4th and 14th waning moon, under dragon constellation, suggests that poverty will prevail. The 8th waxing moon and 3rd and 13th waning moon, under the tuskless elephant constellation, invites confinement and arrest. Litigations will involve on 6th waxing moon and 1st and 11th waning moon, under Varameittu an unlucky day on the Burmese calendar, on which the number representing the day of the week, and the date add up to thirteen.

Ceremony of Driving Stakes

After choosing good or bad day for construction the Pannet-Tin ceremony is held. There are different names for pannet-tin-ta-myin-kyo-khin (laying ruling line), pannet-rite (stakes are driven), pannet-cha (stakes are laid) (see Aung-Thein 1990:106).

The Im Mahosadha Jataka tale, describes the process of preparing the land for construction (see Awbhasa 2012:324-5).

The architect assured, “Well”, after taking one thousand coins, after clearing thorns, spikes and impediments in the plot of land and leveling the ground, he laid the ruling line strangely and elegantly through his mastery. But, Mahosadha disliked him and … “Take the ruling line and I’ll lay the line,” said Mahosadha and did so. Such laying seemed to be that of Visakyon god mysteriously and elegantly

- For the house owned by Sunday-borns, Thursday-born and Friday-born hold the ruling line and Saturday-born drives the stakes. If so, prosperity will bring about. If those who are born on Tuesday and Wednesday must not hold the line and Monday-born does not strike the stakes, disease will affect, economy and sons and daughters and home will be doomed.
- When Monday-borns build the house, Friday-born and Saturday-born must hold the line while Sunday-born must drive stakes. In other words, Wednesday-born and Thursday-born hold the line and Tuesday-born strikes the stakes, destruction will be inevitable.
- For Tuesday-borns’ house, those who were born on Saturday and Sunday hold the line while anyone who was born on Monday drives the pegs. Then, they will be wealthy enough. Contrarily, If Thursday-born and Friday-born hold the line and Wednesday-born pegs, they will destroy.
- For the house of Wednesday-borns, Sunday-born and Monday-born hold the line and Tuesday-born strikes, affluence will occur. But, Friday-born and Saturday-born hold and Thursday-born strikes, doom will bring about.
• For the house of Thursday-borns, Monday-born and Tuesday-born must hold the line and Wednesday-born strikes the pegs. It will be rich. But, when the line is held by Saturday-born and Sunday-born and pegs are driven by Friday-born, doom will be inevitable.
• Tuesday-born and Wednesday-born hold the line and Thursday-born strikes the pegs for the house of Friday-borns. It will be prosperous. If not, Sunday-born holds the line and Saturday-born strikes, destruction will face.
• For the house of Saturday-borns, Wednesday-born and Thursday-born holds the line and Friday-born hits the stakes. If so, much gain and prosperity will acquire. But, when Monday-born and Tuesday-born holds the line and Sunday-born pegs, doom will accrue.

Erecting Posts

There are eleven woods suitable for erecting in the ground. These woods include teak, iron wood, Dumala (Shorea oblongifolia), sal tree, sunder (Heritiera fomes), Rock dammar tree, Indian kino, catechu, ah-son, kya-son and lacquer tree (Nan Aung Hlaing 2017:110). After choosing auspicious day to erect posts of the house, the posts are equally cut in a process known as Taing-theik-thi.

During the Taing-theik-thi Monks are invited and they recite Paritta (Protective) discourses on the posts and read Kammavaca (Pali passages). The posts are then covered so that dogs cannot climb on them. The recitation of the Paritta, describes the Kyansittha Palace Inscription in Bagan period during which officers in ceremonial dress led by Zaya Thabin, Khin Kha Thu, Raza Thu, and Kalan Chief and all the pandits took their seats at the place where golden wreath and tray holding stands for oil lamps, observed Sila while five precepts requested monks to recite Paritta discourses. Shin Araham facing the east from the west gave the Sila discourse. Then, 4108 monks chanted Paritta discourses. After recitation, it was night time (Than Tun 2007:235-236).

The direction of the dragon head plays an important role in digging post holes. If post hole is dug on the head of the dragon, the house owner will die. If it is done on the tail, wife and children will die. When the hole is dug on the back of the dragon, husband will be die. So, to be prosperous and plentiful of foods and water, it is traditional to dig at the abdomen of the dragon. In Tagu and Kason, when holes are dug, it is noteworthy, “Abdomen on the north, back on the south, tail on the east, head on the west.”

Then, which post is dug first? There are six posts. They include; Uru on the southeast, Kya-ngan on the northeast, Nyaung-yan on the southwest, Tha-by on the northeast, Ra-way on the south, and Kob-bhi on the north. Uru post is first to be erected, only then are Nyaung-yan, Kya-ngan, Tha-by, Ra-way and finally Kob-bhi set up.

Nowadays, it is found that carpenters and architects build a house, “Uru post” is given priority to erect after a bowl of offertory is offered (Aung Thein 1990:126). Care is needed not to touch other posts during erection. Wednesday-born holds the base of the post, Thursday-born middle and Sunday-born tip and they set up post straight. Then posts are sprinkled with incense water from below to the top of the posts as auspiciousness and blessing (Aung Thein 1990:130).

Flights of Stair

After erecting posts, there are some rules to be followed; tabus- hti-ma-saung, sha-ma-htwet, kyee-ma-na. Hti-ma-saung means that the width of the tie beam or purlin that attaches on the
post is bigger than the post. *Sha-ma-htwit* is that curtains are used to screened in rooms of the house and those curtains are not to be longer than tie beam, if so, it is *sha-htwit, kyee-ma-na* implies that before house-warming or the house owner lives, others are not allow sexual intercourse there.

Ladder lead to success and loss in social and economic contexts. When a house is built, only after a ladder is set up, is it believed to be complete. So, when a ladder is made, good quality wood especially teak is chosen. If the height of the house is six feet, the ladder must be nine feet. The number of flights of stairs must be in odd numbers. According to the numbers of flights, advantages and disadvantages are described (Nan Aung Hlaing 2017:120).

1. Having three flights leads to good economy.
2. Having five flights leads to much gain.
3. Having seven flights leads to good health and overcome all danger.
4. Having nine flights leads to rid of harm and have amicable friends.
5. Having eleven flights leads to prosperity.
6. Having thirteen flights leads to have many retinues.
7. Having fifteen flights leads to economic development and wish-fulfil.
8. Having eighteen flights leads to overcome all dangers and widespread fame.
9. Having nineteen flights leads to develop wealth and shine glory.

To erect the ladder several offerings are made. These include a offertory bowl with bananas, coconuts, and Eugenia twigs is offered to the house guardian spirit. The stair is also sprinkled with incense water. In setting up the stair, there are some regulations to follow (see Nan Aung Hlaing 2017:122-124);

- If the house owner is Sunday-born, Tuesday-born, Wednesday-born and Saturday-born are to carry the ladder from the base while Monday-born, Thursday-born and Friday-born are to carry from the top.
- If the owner is Monday-born, those who are born on Sunday, Wednesday and Thursday are to lift from the base while those who are born on Tuesday, Friday and Saturday are to do from the top.
- If the owner is Tuesday-born, Thursday and Friday-borns are to carry from the base while those who are Sunday, Wednesday and Saturday are from the top.
- If the owner is Wednesday-born, Saturday-borns are to carry from the base while Sunday, Monday and Thursday-borns are from the top.
- When the owner is Thursday-born, those who are Sunday, Wednesday and Saturday-borns are from the base while Monday, Tuesday and Friday-borns from the top.
- When the owner is Friday-born, those of Sunday, Monday and Thursday are from the base while those of Tuesday, Wednesday and Saturday from the top.
- When the owner is born on Saturday, those of Monday, Tuesday and Friday are from the base and those of Sunday, Wednesday and Thursday from the top.

While setting up the ladder, good words are spoken while disputes, fights and kidding are prohibited. Water soaked in gold, silver and nine precious stones (ruby, pearl, coral, emerald, topaz, diamond, sapphire, garnet and cat’s eye) is sprinkled on the ladder and prayer is made. The ritual sprinkling of water has several connotations;
Sprinkling with ruby water leads to fame.
Sprinkling with emerald leads to peace.
Sprinkling with diamond water leads to prestige.
Sprinkling with cat’s eye leads to praise.
Sprinkling with sapphire leads to affection.
Sprinkling with garnet water leads to strength.
Sprinkling with topaz water leads to health.
Sprinkling with coral water leads to chief.
Sprinkling with pearl water leads to grace.

After that, bowls of offertories are prepared for the Triple Gem (the Buddha, Dhamma, and Sangha) are venerated. Through powers, compassion, and loving-kindness of all Enlightened Buddhas, Dhamma and Sangha, all gods and Brahmans protect and to be widespread with blessing, three verses of Bhavatu sabba mangala are recited.

After the ladder has been set up, the first person who climbs the flights of stair is the architect or carpenter. Then follows a dignified couple carrying the Buddha image, family members of the house owner holding bowl of offertories for the Buddha, jars and meals for the Buddha, together with those having respective birthdays, relatives and friends. The house owners entertain guests with meals and delicacies and pay respects to the dignified couple, give presents for the architect and carpenter (Nan Aung Hlaing 2017:133-135).

House-Warming Ceremony

The architect and carpenter implore the owners of the house for a house-warming ceremony. They select a certain auspicious day for the ceremony. During which special materials are kept in the house to increase blessing:

- Brimful pot on the northeast
- Basketful rice on the east
- Umbrella and Bow and arrow on the southeast
- Grinding stone for Thanakha bark and stone blade on the south
- Carpet on the southwest
- Damsel on the west
- Rice and curries on the northwest
- Conch-shell and milk pot on the north
- Gems and money in the middle

On the dawn of the ceremony day, the Buddha in the shrine is offered a bowl of offertory, rice, curries, flowers, water, and incense sticks. Then, the couple disseminates loving-kindness and shares merit accrued to all beings in the house and the world. Pathana text and Paritta discourses are played over speakers to bring blessing and grace before monks come. Then, libation jar and donations are ready for monks. Then, a senior monk gives sermon about the house-warming ceremony. All monks recite Paritta discourses and receive offerings from the couple. As a token of victory at the end of the ceremony, the monks share merits, while popcorons and money are showered by the house owners. Guests are served with meals and talk of
gratitude. This is a gesture of respect to Burmese culture. It is noted that auspicious songs are played to bring blessing and glory in the house. On the following days house-warming ceremony should not celebrated:

- 5th waxing and waning moon of Tagu
- 6th waxing and waning moon of Kason
- 6th waxing and waning moon of Nayon
- 1st waxing and waning moon of Waso
- 1st waxing and waning moon of Wagaung
- 2nd waxing and waning moon of Tawthalin
- 2nd waxing and waning moon of Thadingyut
- 3rd waxing and waning moon of Tazaungmon
- 3rd waxing and waning moon of Nattaw
- 7th waxing and waning moon of Pyatho
- 4th waxing and waning moon of Tabodwe
- 5th waxing and waning moon of Tabaung

Conclusions

Although the functional activities of houses are different, their beliefs and customs are similar. When considering the archaeological remains left by the households, the upper parts of the house will be gone. However, most of the posts in the ground will facilitate a link between the housing plan and the past. The ashes from the cook fires will tell us where the kitchen was and what materials were used. Correlations between contemporary materials identified in the ethnoarchaeology project and archaeological materials excavated will help identify the role and functions of the household spaces in the archaeological record.

References Cited

Awbhasa, Minbu

Aung Thein, Sinphyugyun

Nan Aung Hlaing, (Hlaing)

Than Tun, Dr

Thein Aung, U
2014 *Burmese Traditional Auspicious Miscellany*, Ywet Sein Press, Rangoon.

Walshe, Maurice

**Appendix A: Photo Library of Tanintharyi Houses**
CHAPTER 6
Exploring Bagan’s Peri-Urban Agricultural Strategy: An Ethnoarchaeological Approach

by
Scott Macrae
(Trent University)

The agricultural subproject conducted within the Bagan peri-urban is based on the larger research questions proposed by the long-term IRAW@Bagan project. As such, it strives to understand how the support population which surrounded the Classical Bagan epicenter worked to supply the food demands and surplus requirements. The initial stages of this sub-project began with the ethnoarchaeological study of ten traditional villages located within the Bagan peri-urban settlement zone. To gain a more nuanced understanding of agricultural production and to identify potential analogies to the ancient farming strategies within Myanmar’s arid zone, a series of semi-structured interviews were conducted with local farmers.

Ethnoarchaeology is defined as the “ethnographic study of living cultures from archaeological perspectives… with the goal of… understanding the relationships of material culture to culture as a whole both in the living context and as it enters the archaeological record, and to exploiting such understandings in order to inform archaeological concepts and to improve interpretation” (David and Kramer 2001:2). Generally, the aim of this research program is to collect information from the present that can be used to assist in interpreting and explaining the archaeological record and prehistoric human behavior (Stiles 1977:90). Data that can be used to understand patterns in the relationships between human behavior and the physical world which is imprinted on the landscape and material remains. In our research agenda, this involves collecting data that can function both as analogy to the archaeological record as well as to inform hypotheses and models of the past. These two goals, when combined, form the basis for the research program of ethnoarchaeology (see Stiles 1977:95-97). This chapter will present the results of this ethnoarchaeological study as well as address how this fit within the Bagan peri-urban agricultural subproject.

Methods

During the December 2017 field season, a collaborative team of IRAW@Bagan research associates visited a series of traditional villages that are located throughout the Bagan peri-urban settlement zone. These villages were not only chosen for study based on location, but also the adherence to traditional lifeways. These qualifying characteristics validate the selected villages as the most informative loci for conducting ethnoarchaeological analyses. This research included a series of semi-structured, IRB approved (TRENT# 25067) interviews with local farmers that lived within the selected villages.

Interviews were begun by explaining our study and research objectives to a local monk at a central monastery or a village headsman. These individuals would initiate the interview by inviting a local farmer who was willing to participate to join us. Interviews were semi-structured as a list of prepared questions and talking points provided direction to these discussions. These
questions were broken into broad topics. However, to facilitate a higher level of engagement with the interviewees conversations were not dictated by the question list. Rather, participants were encouraged to digress from the posed question and into other aspects of the topic that they were more interested in. This was facilitated by intentionally leaving many of the questions asked open-ended to encourage conversation and discussion. Being able to engage in discussion with the interviewees helped to indirectly answer many of the initial listed questions. Also, just as important, this process more often than not lead to revelations in what affected or concerned farmers beyond what was anticipated prior to the study. While there was no required interview time, they often lasted no more than 3 hours as they found a natural conclusion.

Results

The data collected during the interviews can be divided into three topics, within which are numerous sub-divisions. The broad topics discussed included; Agricultural Strategy, Household Production, and Broader Concerns. Dividing results into topics provides a streamlined process for managing data. However, as with any complex dataset, each topic and sub-topic has a great deal of intricacy. The goal in presenting this data is to not only highlight the trends uncovered during the interviews, but also to delve in to the intricacies that bring to light the decision-making processes of the farmers. Given the learning curve that was experienced during the interview process and in attempts to put the interviewee at ease there are occasional questions that lacked clear answers. In these cases, the data has been left blank.

Agricultural Strategy

The topic of agricultural strategy addresses the strategies, activities, and resources that traditional farmers engage with. This has been subdivided into field systems, crops, production strategy, labor, seeds, yield, storage, and crop damage.

Field Systems. Field systems were addressed by asking a series of questions concerning the size, distribution, distance, and topography of the plots of lands each farmer owned (Table 6.1). The size of fields that each farmer owned were small in comparison to the industrial farming practices of today. There is also a fair amount of variance in the farm sizes, as they ranged from 3.25 – 17 hectares. Further, 8 of these farms were separated into small fields dispersed across a range of 0.25 – 4 miles from their household compound. These fields varied in size from 0.5 – 2 hectares. When asked if they would prefer to have fields all together or separated every famer cited that it was better to have the fields separated due to the local variability in rainfall. The remaining 2 farmers, with their fields together countered this argument by enjoying the mobility benefits of having fields amalgamated. Discussing the topography of the field systems only one farmer stated that they had some lands that were not flat, exhibiting a small degree of slope.

<table>
<thead>
<tr>
<th>Field size</th>
<th>Thae Pyin Taw</th>
<th>Shwe Halaing</th>
<th>Zee O</th>
<th>Kon-Sin-Kye</th>
<th>Kon-Tan-Gyi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15 ha</td>
<td>9 ha</td>
<td>7.25 ha</td>
<td>15 ha</td>
<td>12.15 ha</td>
</tr>
<tr>
<td>Distribution</td>
<td>Separated</td>
<td>Separated</td>
<td>Separated</td>
<td>Separated</td>
<td>Separated</td>
</tr>
<tr>
<td>Distance furthest</td>
<td>N/A</td>
<td>1.5 miles</td>
<td>N/A</td>
<td>2 miles</td>
<td>3 miles</td>
</tr>
</tbody>
</table>
Table 6.1. Characteristics of the traditional farmers’ field systems.

**Crops.** A discussion about the crops grown revealed both similarities and dissimilarities amongst the farmers. There were a group of five primary crops that nearly all the farmers grow; ground nut, pigeon pea, sesame, mung bean, and millet (see Table 6.2). One farmer had recently stopped growing sesame and millet citing that they could no longer afford the necessary labor. There were several types of ground nuts grown that were based on their time it took to maturation; 3-months, 4-months, and 6-months. Each farmer typically grew a selection of two, each destined for a different use. This is similar for the sesame where farmers described growing either short-term or long-term sesame. While all the farmers grew millet, it was the least desirable crop as it was only used for animal fodder. This is opposed to the more desirable ground nut that produced the peanut for sale as well as stalks and leaves for fodder.

Beyond the five primary crops there were six others that were grown but with little consistency between the farmers. All the farmers were asked about the use of arboriculture. While there was a great deal of variance amongst the answers every farm did participate in either the active cultivation of trees or the management of naturally growing trees. This is not a surprising result given that all the fields are demarked with a row of trees. The boundaries play an important role in land ownership and taxation. When asked if these boundaries changed, everyone replied that they would add an additional boundary line if they had to split their lands for inheritance. However, none of the interviewees had ever added or removed a boundary.
Table 6.2. Lists of the crops and arboriculture trees that traditional farmers grow.

Production Strategies. The discussion of production strategy addressed the management practices that farmers used in terms of both their field systems as well as crop production (Table 6.3). Polyculture is the practice of planting more than one crop within the same field. This counters monoculture which involves planting a single crop in a field. Globally, polyculture is a common practice amongst traditional farmers and no different in the peri-urban zone of Bagan. All the farmers interviewed practiced polyculture with their 5 primary crops and described a variety of methods that involve planting intersecting or alternating rows of crops. In addition to polyculture, four of the farmers also set aside portions of their field for the monoculture production of millet, pigeon pea, or sesame. Nearly all of these monocultured crops were strategically rotated annually. This often involved rotating shorter rooted plants (i.e. millet and sesame) with longer rooted plants (i.e. pigeon pea) to exploit varying levels of nutrients in the soil. In one case, monoculture was used to farm less hospitable field systems by using more robust plants. Crop rotation also played an important role in polyculture as farmers changed and
rotated the combination of plants grown based on decline yields. The practice of fallow, leaving fields unused for a period of time, was not common amongst the farmers. Three of the four farmers left field unsown, but this was not out of a desire to increase soil fertility, but rather out of necessity of being unable to afford the necessary labor to farm the land. In all these cases there was no systematic process, but rather they targeted the least productive fields for fallow until they were able to afford to be farmed again.

The use of fertilizer was very common amongst the farmers. Typically, fertilizer was applied to the fields every two years prior to planting. Every farmer interviewed strove to use natural fertilizer such as cow or goat dung, which they collected and kept in their household compound over the year (Figure 6.1). Six farmers that used modern fertilizer, only did so if the natural fertilizer was not sufficient. The rationale behind the preference for natural fertilizer was its productive qualities, affordability, and general distrust of modern fertilizers.

<table>
<thead>
<tr>
<th>Thae Pyin Taw</th>
<th>Shwe Halaing</th>
<th>Zee O</th>
<th>Kon-Sin-Kye</th>
<th>Kon-Tan-Gyi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyculture</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Monocropping</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Crop rotation</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Fallow</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes*</td>
</tr>
<tr>
<td>Field maintenance</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**FERTILIZER**

| Natural dung | Yes | Yes | Yes | Yes | Yes |
| Natural silt | N/A | Yes | Yes | No  | No  |
| Modern       | N/A | Yes** | Yes** | No  | No  |

<table>
<thead>
<tr>
<th>Minnanthu</th>
<th>Hypauk-Seik-Pin</th>
<th>Thuhtaykan</th>
<th>East Pwa Saw</th>
<th>West Pwa Saw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyculture</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Monocropping</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Crop rotation</td>
<td>Yes</td>
<td>Yes</td>
<td>Rarely</td>
<td>Yes</td>
</tr>
<tr>
<td>Fallow</td>
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<td>Yes*</td>
<td>Yes*</td>
<td>No</td>
</tr>
<tr>
<td>Field maintenance</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**FERTILIZER**

| Natural dung | Yes | Yes | Yes | Yes | Yes |
| Natural silt | No | No | No | No | No |
| Modern | Yes** | No | Yes** | Yes** | Yes** |

*Due to labor scarcity; **Always stipulated that only used when natural fertilizer is insufficient

Table 6.3. The production strategy and fertilizer use amongst the traditional farmers.
Labor. As traditional farmers the family unit plays a central role in the labor necessary to farm the land. However, all the farmers reported a need to hire labor during critical points in the production cycle; planting, weeding, harvesting (Table 6.4). In all the interviews a concern about a scarcity or increasing cost of labor was discussed. Specifically, with a concern of both a younger generation being drawn to the cities for other jobs and a general desire not to follow in the farming tradition. In several of the cases these labor concerns have manifested themselves in an inability to put all the available lands to use. While there have been efforts in the last five years to incorporate mechanized farming into their practices both the farmers that hire machines and those that do not, stated that it reduces their profit significantly or simply is unaffordable.

<table>
<thead>
<tr>
<th></th>
<th>Thae Pyin Taw</th>
<th>Shwe Halaing</th>
<th>Zee O</th>
<th>Kon-Sin-Kye</th>
<th>Kon-Tan-Gyi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hire for planting</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hire for weeding</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Hire for harvest</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Machine</td>
<td>N/A</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Minnathu</th>
<th>Hypauk-Seik-Pin</th>
<th>Thuhtaykan</th>
<th>East Pwa Saw</th>
<th>West Pwa Saw</th>
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<tr>
<td>Family</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hire for planting</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hire for weeding</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hire for harvest</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Machine</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 6.4. Breakdown of various periods in the production cycle that labor needs to be hired.
Seeds. Every farmer interviewed was asked about the seeds they planted with. Specifically, they were asked if they collected seeds from the previous harvest (self-sufficient), bought seeds, sold seeds, or traded seeds (Table 6.5). In all the cases the vast majority of the seeds used for planting were collected from the previous harvest and stored in the household compound (Figure 6.2). Five of the farmers said that they occasionally bought seeds from their neighbors or a local trader. These seeds were bought if they had a poor harvest the prior year and/or had to sell all of their harvest. Alternatively, seeds were occasionally bought or traded for from their neighbors if they had a particularity good harvest. Four of the farmers sold their seeds to family and friends who had previously experienced a bad harvest or had underestimated the required seeds. One farmer described how he would sell his seeds to the farmers that worked on the flood plain, for these farmers would sell all their harvest every year in order to avoid the difficulty of storing seeds.

<table>
<thead>
<tr>
<th></th>
<th>Thae Pyin Taw</th>
<th>Shwe Halaing</th>
<th>Zee O</th>
<th>Kon-Sin-Kye</th>
<th>Kon-Tan-Gyi</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-sufficient</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Buys</strong></td>
<td>N/A</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Sells</strong></td>
<td>N/A</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Trade</strong></td>
<td>N/A</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 6.5. The amount that traditional farmers collect, buy, sell, and trade seeds.

Figure 6.2. Bamboo baskets filled with ground nut from the harvest and crocus bag full of seeds for next year.
Yield. Discussions concerning the yields of crops and farmlands were particularly difficult during the interview process. However, over the course of the interviews a simplified equation that focused on the harvest per seed planted was used to standardize the data (Table 6.6). Results indicated that on an average year farmers would approximately harvest 3 times the number of seeds planted, while on a good year it could increase to 5 times. Obviously, on a bad year the harvest could dip as low as zero.

<table>
<thead>
<tr>
<th></th>
<th>Thae Pyin Taw</th>
<th>Shwe Halaing</th>
<th>Zee O</th>
<th>Kon-Sin-Kye</th>
<th>Kon-Tan-Gyi</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Best</strong></td>
<td>N/A</td>
<td>5x</td>
<td>3x</td>
<td>4x</td>
<td>5x</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>N/A</td>
<td>N/A</td>
<td>2.5x</td>
<td>3.5x</td>
<td>3x</td>
</tr>
<tr>
<td><strong>Bad</strong></td>
<td>N/A</td>
<td>N/A</td>
<td>0x</td>
<td>0x</td>
<td>0x</td>
</tr>
</tbody>
</table>

*Harvest equal #x the seeds planted

Table 6.6. Description of the annual yields.

Storage. Several questions were posed to the interviewees that addressed the storage of harvested crops, seeds, and animal fodder (Table 6.7). Straightforward results indicated that farmers stored the harvest inside large bamboo baskets, often in the rafters of the household or outbuilding (see Figure 6.2). Occasionally, it was discussed that baskets could be lined with dung in order to keep pests out. The seeds selected for the next harvest were stored in large crocus bags alongside the harvest. The final aspect related to storage was the housing of animal fodder, often millet, which was kept in a separate outbuilding referred to as a granary (Figure 6.3).

<table>
<thead>
<tr>
<th></th>
<th>Thae Pyin Taw</th>
<th>Shwe Halaing</th>
<th>Zee O</th>
<th>Kon-Sin-Kye</th>
<th>Kon-Tan-Gyi</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basket</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td><strong>Crocus bag</strong></td>
<td>No</td>
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<tr>
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<td>N/A</td>
<td>N/A</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

*Seeds for planting; **Fodder for animals

Table 6.7. The different forms of storage described within the household compound.
Figure 6.3. Granary in household compound waiting to be filled with fodder.

**Crop Damage.** All the farmers were asked about crop damage in the form of insects/pests and plant disease. Throughout the interviews, these concerns were referred to as a minor problem. While many farmers discussed issues with insects or leaf rot early in the season, these concerns were always abated with the oncoming rains which resolved the issues (Table 6.8). Six of the farmers reported using insecticide occasionally if crop damage became too much of a problem.

<table>
<thead>
<tr>
<th>Insects/Pests</th>
<th>Thae Pyin Taw</th>
<th>Shwe Halaing</th>
<th>Zee O</th>
<th>Kon-Sin-Kye</th>
<th>Kon-Tan-Gyi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Insecticide</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Insects/Pests</th>
<th>Minnanthu</th>
<th>Hypauk-Seik-Pin</th>
<th>Thuhtaykan</th>
<th>East Pwa Saw</th>
<th>West Pwa Saw</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

| Insecticide | No | No   | Yes  | Yes  | Yes |

Table 6.8. Various forms of crop damage experienced by traditional farmers.

**Household Production**

Discussions of household production were designed to address what crops, if any, were grown within household gardens, what were the uses of these crops, and if the farmers participated in any animal husbandry. It has been argued that these practices could constitute as much as half of the household’s consumption, with surplus to be traded and sold (Davivongs
2003:2; Dove 1990). It has also been argued that this represents an early form of tropical cultivation which has often been overshadowed by an emphasis on the study of both wet and dry land cultivation (Dove 1990:150; Hutterer 1983:187). To address these questions two sub-topics were created; Household Crops and Animal Husbandry.

**Household Crops.** Through the discussion of household gardens, it quickly became apparent that there was a great diversity not only in the extent of crop production, but also in the types of plants grown (Table 6.9). Responses ranged from growing nothing to up to nine different crops for household consumption, with an average of four amongst all the interviewees. None of these crops were destined for sale in the local market as it was indicated that all the produce found in the market is typically from the farmers who exploit the riverbeds and river banks. However, despite these numbers there appeared to be only minimal areas of the household dedicated to production (Figure 6.4). The one farmer interviewed who did not own a household garden explained that it was because all the children had moved out and they simply didn’t have the time to maintain a garden. Besides the crops for household consumption there were also flowers grown in many of the households. These flowers were grown for several reasons including decoration, donations, and sale. Seven of the farmers interviewed grew these flowers.

<table>
<thead>
<tr>
<th>CONSUMPTION</th>
<th>Thae Pyin Taw</th>
<th>Shwe Halaing</th>
<th>Zee O</th>
<th>Kon-Sin-Kye</th>
<th>Kon-Tan-Gyi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guard</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<td>No</td>
</tr>
<tr>
<td>Cucumber</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pumpkin</td>
<td>Yes</td>
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<td>No</td>
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</tr>
<tr>
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<td>No</td>
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<td>Yes</td>
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<td>No</td>
</tr>
<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Cluster beans</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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</tr>
<tr>
<td>Tulasi</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Long bean</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Okra</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Pomegranate</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
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<tr>
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<td>Drum stick</td>
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<td>Yes</td>
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<td>No</td>
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<td>West Pwa Saw</td>
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<td>No</td>
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<td><strong>DECORATIVE</strong></td>
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<td>No</td>
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<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Used for shade

Table 6.9. Various household crops describing those for consumption and decoration.
Animal Husbandry. The discussion of the different animals that each farmer owned was fairly straightforward (Table 6.10; Figure 6.5). Every farmer interviewed had at least one ox which was necessary for plowing the fields. None of the farmers were actively engaged with breeding of cattle for sale. Four of the farmers indicated that they also kept goats, pigs, or chickens which were primarily used for personal consumption.

<table>
<thead>
<tr>
<th>ANIMALS</th>
<th>Thae Pyin Taw</th>
<th>Shwe Halaing</th>
<th>Zee O</th>
<th>Kon-Sin-Kye</th>
<th>Kon-Tan-Gyi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Goat</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Pig</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
<tr>
<td>Chicken</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 6.10. List of the different animals kept in the household compounds.
The topic of broader concerns was created to address several aspects of farming that were beyond the control of the traditional farmers. This topic was initially designed to address water, weather, and climate concerns. However, as the interviews progressed this topic further expanded to ask each traditional farmer what they found hardest and what they liked best about traditional farming.  

**Water Concerns.** Each of the farmers interviewed were asked about their relationship with rain and crop irrigation (Table 6.11). This discussion addressed whether they experienced periods of too much or too little water, unpredictable rain, and if they used any preventative measures. Results, indicated that there was significantly more concern about too little water than too much water, not surprisingly given that Bagan is located in the dry zone. However, results also indicated an even higher level of concern over the unpredictability of rainfall, with all the farmers emphasizing this concern over the general lack of water. During discussion about this issue it became apparent that this had been a growing concern over several decades, especially amongst the more elderly farmers. It was reported that over the last 50 years rainfall has been
increasingly less predictable, with significant changes beginning 40 years ago and then again 25 years ago.

<table>
<thead>
<tr>
<th>WATER CONCERNS</th>
<th>Thae Pyin Taw</th>
<th>Shwe Halaing</th>
<th>Zee O</th>
<th>Kon-Sin-Kye</th>
<th>Kon-Tan-Gyi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too much water</td>
<td>Rare</td>
<td>No</td>
<td>No</td>
<td>Occasionally</td>
<td>No</td>
</tr>
<tr>
<td>Too little water</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Unpredictable rain</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Preventative measures</td>
<td>No</td>
<td>No</td>
<td>Terraces</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Too much water</td>
<td>Minnanthu</td>
<td>Hypauk-Seik-Pin</td>
<td>Thuhtaykan</td>
<td>East Pwa Saw</td>
<td>West Pwa Saw</td>
</tr>
<tr>
<td>To little water</td>
<td>Occasionally</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Unpredictable rain</td>
<td>Yes</td>
<td>Yes</td>
<td>Occasionally</td>
<td>Yes</td>
<td>Occasionally</td>
</tr>
<tr>
<td>Preventative measures</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tr>
</tbody>
</table>

Table 6.11. Various concerns about water and weather expressed by traditional farmers.

*The Hardest Thing About Farming.* During the interview process each farmer was asked what the hardest part or biggest concern was of being a traditional farmer. Answers to this question were very similar amongst all the farmers. Six of the farmers stated irregular or unpredictable rains, two of these farmers expressed additional concerns about droughts. The second most expressed difficulty was an increase in labor scarcity and cost, which was expressed by four of the farmers.

*The Best Thing About Farming.* To conclude our interviews, each farmer was asked what they liked best about being a traditional farmer. Seven of the farmers stated that good harvests were their favorite part. Four of these seven expanded on this, describing they enjoyed a good harvest so that they could provide greater donations to their local monastery. Three farmers also expressed that one of the best thing about farming was when it rained. Finally, two farmers stated that growing ground nut was what they enjoyed most about farming.

**Discussion**

The IRAW@Bagan project is conducting the first settlement and agricultural study in the peri-urban zone. As such, there is little comparative materials. Following the statement by David and Kramer (2001:1) “Archaeological interpretation is founded and ultimately depends upon analogy” the ethnoarchaeology sub-project strove to develop a strong dataset of traditional farming practices. As the project moves forward this dataset will be drawn upon for comparative analogies to the archaeological record as well as to direct and test hypotheses and models. The combination of both these approaches create an integrated whole that forms the research program of ethnoarchaeology (Stiles 1977:97).

**Analogy**

One of the primary directives of conducting the ethnoarchaeological studies of traditional farmers surrounding Bagan is to develop a dataset for direct historical analogies (see Acher
1961:324; Stiles 1977:96). Particularly important to this process is examining what physical remains of the farming practices may persist in the archaeological record. Two examples of the relic remains of farming practices that were identified by our interviews included; first, the use of animal dung fertilizer. This will raise the phosphorus levels within field systems. Second, all the farmers interviewed discussed the use of boundary trees grown along the edges of their fields creating an upraised bund. These types of bunds will be archaeologically identifiable. Further, similar studies of field organization at the Khmer capital of Angkor has suggested a continuance of relic and contemporary field organization (Bâty 2005) and a larger organization of field systems indicative of social organization and ownership (Hawkings 2013; Pottier 2000). The identification of either higher phosphorus levels or bunds during excavation can be used to draw analogy to the persistent activity of the contemporary farmers that leave similar traces on the landscape.

Hypotheses Development and Model Testing

The second objective for conducting the ethnoarchaeological studies of traditional farmers is to develop a dataset to assist in hypotheses development and model testing of the agricultural strategy of the Classic Bagan peri-urban zone. The discussions held with the traditional farmers in regards to their production strategy provides invaluable information for the techniques and production capacity of this particularly dry zone. Further, the discussions about broader concerns brought forward the consistent worry over both irregularity in weather patterns and labor scarcity. These same discussions have highlighted that the climate is consistently in a state of change, particularly trending towards a dryer climate with great irregularity in rain patterns. These insights provide important data for modeling both how the Myanmar dry zone is farmed, but also how the farmers adapt to change. When considering this from an archaeological perspective this dataset works as a source of inspiration for developing hypotheses and models and also a source of analogies to test for in the archaeological record (Stiles 1977:95-97).

Conclusions

The Bagan peri-urban agricultural subproject strove to understand how the support population surrounding the Classical Bagan epicenter worked to satisfy the food demands and surplus required by this capital. During this early stage, researchers successfully conducted an ethnoarchaeological study of ten traditional villages distributed across the Bagan peri-urban settlement zone. The results of this study have produced a robust dataset that includes topics such as agricultural strategies, household production, and broad concerns. Through the various interviews conducted with traditional farmers the IRAW@Bagan project has developed a more nuanced understanding of agricultural production within Myanmar’s arid zone that will assist in hypotheses and model development and identify several potential analogies to the ancient farming strategies. This research will continue to prove invaluable as it provides a large dataset that can be consulted when researchers progress with their excavations and resultant interpretations.
REFERENCES CITED


David, Nicholas and Carol Kramer 2001 *Ethnoarchaeology in Action*. Cambridge University Press, Cambridge, United Kingdom


CHAPTER 7
Ritualization of Water and Water Management at Bagan

by
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Water has long been identified as an important theme linking the study of Southeast Asia (Rigg 1992:1-6). This is partly due to the accessibility that the sea and rivers create in bridging distant communities. Furthermore, water has been the essential component in the cultivation of wet rice, Southeast Asia’s main subsistence crop (Rigg 1992:1). Within Southeast Asia, a great importance was attached to the development of management strategies that ensured excess water would be properly stored to allow for the irrigation of crops during the dry season (Moore et al. 2016 283-285; 301; Moore 2007:33-34; Gupta 2001:923-925). Due to the location of Bagan within the dry region of central Myanmar (Aung-Thwin 1990:1), the construction of water management systems fed by perennial streams and rivers enabled the cultivation of rice paddies, the crop which allowed Bagan to grow and develop from a fort into a kingdom (Aung-Thwin 1985:101, 114-115). In addition to sustaining life, water management systems have had a spiritual role for the Burmese population over many centuries (Moore et al. 2016:302). The religious significance of water has been reflected in the material culture of Southeast Asia in numerous ways (Rigg 1992:1-6). Some examples which reflect the spiritual role that the elite in Bagan attached to water and water management can be found in the performance of several water rituals conducted by the king during coronation and cleansing ceremonies, the display of water motifs in the architecture and iconography of mural temples, and the presence of water symbols carved inside water reservoirs.

In my research, I will examine the way in which the appropriation of water ritualization by the elite in ancient Bagan influenced the creation, continuation, and dissemination of water rituals. The principal questions that I seek to answer are: What was the spiritual role and symbolic significance that water and water management had for the elite in ancient Bagan? In which ways were water and water management ritualization utilized and disseminated by the ruling elites?

The purpose of this chapter is to introduce the research objectives, approach, and methodology that will be guiding my data collection during the field season of May 2018. A literature review aimed at providing insights into the spiritual role that water and water management had in Bagan will also be presented. The last section of this chapter will outline the main activities that will be carried out during the 2018 field season.

The Role of Water Ritualization in The Development of Bagan

The spiritual role of water has been associated with the animistic worship of nats. Nats are believed to be spirits that reside everywhere (the air, the water, the house), and have been referred to as the souls of people who suffered a violent death (Aung-Thwin 1985:52-56; Vossion 1891:107-110; Nash 1966). The creation of shrines and the placement of offerings with images of nats near ponds and lakes (Aung-Thwin 1990:16; Burlings 1965:91) were intended to
appease the spirits that inhabited these water reservoirs. Nat worship is believed to have prehistoric origins (Vossion 1891:107). In addition to being associated with animistic practices, the spiritual role of water management has also been connected to the Buddhist practice of “merit”. This practice encouraged kings to construct waterworks to prove that they cared for their subjects. By means of waterwork construction, rulers would gain merit and ensure a better rebirth in the afterlife (Pe Maung Tin & Luce 1923:65). Irrigation systems were thus perceived as the means through which the authority of the ruler was linked to the power of agricultural renewal (Stargardt 1968:360). Animistic beliefs that encouraged the worship of nats were part of the “informal world of Burmese supernaturalism”. Hindu and Buddhist practices were part of the “formal world of Burmese cosmology” (Aung-Thwin 1985:30). As stated by Aung-Thwin (1985:31) “In some cases, the formal (Buddhism and Hinduism) and informal (animism) worlds were inextricably intertwined, whereas in others they were patently contradictory”.

An understanding of the perceptions and attitudes attached to the ritualization of water that occurred in ancient Bagan will inform the nature of the coexistence and syncretism that prevailed between the religious beliefs of Buddhism, Hinduism, and animistic nat worship practices of prehistoric origin (Vossion 1891:107), and how these practices spread and changed over time. It has also been stated that the differences between the nats who guarded the natural landscape, the nats who protected villages, and nats who represented the ancestors of political figures remain unclear (Aung-Thwin 1985:32-33; Vossion 1891:108-111). An examination of water ritualization will provide insights into the nature of nat spirits that were believed to inhabit water reservoirs, and how their worship may have differed from the worship of other types of nats in ancient Bagan.

It has been stated that Hindu-Buddhist conceptions about kingship, the state, and the way in which the universe functions were adopted during the process of state formation in many regions of Southeast Asia (Aung-Thwin 1985:6; Coedes 1968:22-25; Winzeler 1976:624). However, researchers continue to debate through which processes and to what extent were concepts of kingship, the state, and cosmology altered by indigenous beliefs (Winzeler 1976; Mabbett 1977; O’Connor 1983:1-6). The impact that particular behaviors encouraged by religious and spiritual beliefs had in the development of institutions and the formation of ancient Southeast Asian states has often been defined in vague and general terms. It is often mentioned that “certain” revolutionary ideas emerging from Hindu traditions were responsible for the emergence of these states. Similarly, their decline was caused by “certain” Theravada Buddhist ideas (Aung-Thwin 1985:7). Understanding the way in which religious beliefs impacted institutions and events is an arduous task. However, interpreting the way in which religious conceptions may have inspired behaviors that impacted the development of social institutions will allow researchers to better understand how particular religious practices influenced the formation and decline of Southeast Asian states.

The spiritual role associated with water and water management shaped the development of numerous social institutions in ancient Bagan including politics, agriculture, religion, economics, and community relationships (Aung-Thwin 1990:7). Understanding the way in which particular perceptions and attitudes associated with water ritualization encouraged behaviours that in turn impacted the development of numerous social institutions will provide insights into the role that not only Hindu-Buddhist conceptions, but also indigenous animistic beliefs had in the growth and decline of ancient Bagan.
Background

Few studies have concentrated on describing the rituals of which water was an important component in pre-colonial central Myanmar (Aung-Thwin 1987:95-96; Aung-Thwin 1990; Stargardt 1992; Dumarcay 1991:17-20), and greater Southeast Asia (Geertz 1980:75-82; Errington 1989:44-48; Wolters 1999:80-85). Research about the importance of water in Myanmar has focused on describing water management strategies (Aung-Thwin 1990, Stargardt 1990), the role of water management in government centralization (Stargardt 1968; 1992), and the connection of water management strategies with the construction of religious buildings (Cooler 1997; Moore et al. 2016). However, there has not been a comprehensive research program that examines the ritual significance that water and water management had for the elite in Bagan, as well as the and the implications that these beliefs had for the development of other institutions within society.

Water Rituals in Pre-colonial Burma

Due to the scarcity of archaeological evidence with regards to the ritualization of water in the dry region of central Myanmar (Stargardt 1990; Stargardt 1992; Moore et al. 2016), most of the information about the nature of pre-colonial Burmese rituals that involved the use of water has been gathered through the use of inscriptions and chronicles (Aung-Thwin 1987; Aung-Thwin 1990), and documents that described court life during the eighteenth century (Dumarcay 1991:5). Due to their role in religion, the ruling elite, in particular, had an intimate connection with water and water management ritualization (Christie 1992:22). Chronicles and inscriptions have described three important elite rituals and offerings that involved the use of water. One of these rituals is the “abhiseka” or bath of purification. This ritual was performed for a variety of reasons including the beginning of a new war, the coronation of a new king, or to increase the wealth of the realm (Dumarcay 1991:19). The “Abhiseka” involved the use of vessels made of gold, silver, copper, and earthenware to collect water from the banks of five different rivers. After permission was requested from the water “guardians”, symbolically represented by a group of men, offerings were made to the water spirits. Water was brought back to the temple and was used to purify the king’s palace. The body of the king was bathed while reciting a prayer (Dumarcay 1991:20). According to Aung-Thwin (1987:95), during the coronation of a new king in ancient Bagan, the purified water used as part of the “Abhiseka” was considered to be the essence that turned the human recipient into the embodiment of Sakka, a deity considered to be king of the gods. Only after the use of purified water could the king take formal possession of the city by circumambulating its moat.

Another important festivity that involved the use of water was the “Thingyan” or water festival held after the winter harvest of rice (Aung-Thwin 1990:11). This festival was a time during which royal coronations took place, and farmers were able to become involved in social activities before planting the main crop on June. Similarly, the festivities associated with the “Ploughing Ceremony” and the “Swinging Ceremony” conducted in Burma and Thailand before the beginning of rice cultivation, were aimed to provide an augury of the planted harvest and ensure that rain would occur at the right moment, in order to increase crop cultivation. These ceremonies involved dancing around a copper bowl full of water into which buffalo horns were submerged, and setting a swing in motion during the day that Siva comes down to earth. The
participants would then sprinkle each other with water while spectators attempted to gather drops of water that symbolized abundant rain (Aung-Thwin 1990:11; Dumarcay 1991:38).

**Ethnohistoric and Contemporary Water Rituals in Southeast Asia**

A greater number of ethnohistoric and contemporary studies have been conducted about the symbolic significance and ritual use of water in other regions of Southeast Asia. Wolters (1999:80), through an analysis of inscriptions from Angkorian Cambodia, has been able to associate the construction of a lake with the king’s desire to create an outlet for his “royal glory” which has been depicted as a lotus stalk. According to Wolters (1999:81), Indian mythology sees the lotus as the life symbol that has risen from the water. In the Cambodian mythos, the lotus stalk has been associated with Vac, the goddess of the waters and wife of the creator Siva. Vac, the goddess of the waters, has also been associated with nagas, mythical creatures that take the form of a snake. Indigenous Khmer beliefs recorded by a Mongol envoy indicate that the Khmers believed that the king slept with a serpent princess (Nagi) every night. The mutually beneficial relationship that the king has with a Nagi was believed to allow for the prosperity of the country (Wolters 1999:85).

Due to the fact that the creative energy and divine authority of the king were believed to be derived from the creator, Siva (Wolters 1999:82), it can be argued that indigenous Khmer beliefs sought to replicate the relationship that existed between the creator (Siva) and the goddess of the waters (Vac) on the terrestrial realm through the creation of a relationship between the king and the Nagi serpent princess. According to an inscription, as a result of the relationship between the king and the nagi princess, “royal glory was released in the direction of the underworld” which resulted in fertilizing forces being released below the surface of the soil, guaranteeing the productivity of the land (Wolters 1999:83). Due to the association of the nagi princess with Vac, the goddess of the waters, a clear connection described as mutually beneficial between the king and the sacredness of water can be distinguished. Furthermore, the royal glory believed to be released in the direction of the underworld reflects the physical properties of water, its ability to travel directionally, which made it the proper vehicle to connect the terrestrial realm with the underworld. This vehicle was able to transport royal glory that would, similar to the effects that water would have on the agricultural land, result in increased fertility of the soil that would increase the prosperity of the kingdom.

According to Moore (1992:43), iconography depicting nagas in association with elephants is a popular theme throughout the iconography of Northeast Thailand. Elephants were thought to have once inhabited the skies. On earth, they were believed to be able to attract the clouds, which were considered their celestial relatives, and produce rain. Images associating elephants and nagas reinforce the role that nagas, the mythical snakes, had in controlling water in different regions of Southeast Asia.

The notion of water as a vehicle that can transport different powers and properties can be further examined through the work of Errington (1989:44-48) who studied the ritual use of water to cure the sick. In her research, Errington examined the way in which a healer infused water with powers during the ceremonies performed for the sick in Luwu, Indonesia. The softly whispered spells recited by the curer were intended to infuse the water with properties that would heal the sick after drinking it. The use of water to heal the sick can be explained through the concept of potency. In this community, potency was the sacred cosmic energy that permeated the universe and was responsible for the wealth, status, and influence of the members of the
community. This sacred energy could not be seen because according to Luwu beliefs, something that is inherently powerful is invisible. Similarly, water’s physical properties of being transparent and tasteless made it an appropriate way to transport potency. Additionally, Luwu’s inhabitants believe that water allows people to communicate with the spirits due to its ability to travel directionally and downwards, from the terrestrial plane to the underworld.

Ethnographic evidence from Central Kalimantan, Indonesia (Jay 1992:73-78), indicates that water was also seen by the Ngaju Dayak people as a vehicle that transports the magical properties stored within the Tree of Life, a shaft that connects the Upperworld and the Underworld. In Central Kalimantan, water is considered to be a life-giving essence that has the ability to bring life to the human soul, even after death. According to Jay (1992:77-78) aristocrats had acquired a considerable amount of their power as a result of possessing objects that had become embedded with supernatural properties that had been introduced into these heirlooms through the powers that the “Water of Life” possessed. Jay’s study supports the argument that the association between the symbolic importance of water has been responsible for allowing the elite to achieve and maintain their position within the social hierarchy. As stated by Jay (1992:78), Ngaju Dayak rulers gained their perceived right to rule and lead as a direct result of the connection that they established with the life-giving essence associated with water.

Another example that reflects the perception of water as a vehicle can be examined through the presence of carved lingas on the riverbed at the site of Kbal Spean in Siem Reap, Cambodia. These lingas, carved between the 11th and 12th century, were believed to purify or “bless” the water contained in these reservoirs. Through their powers of fertility, water was believed to be infused and transported to the agricultural fields with the goal of increasing productivity (Tawa 2009).

Similarly, practices that reflect the desire to infuse fertility powers and “blessings” into water in order to increase agricultural production have been recorded from nineteenth-century Bali. Through the use of ethnohistorical sources, Geertz (1980:75-82) examined the ritual use of water as part of Bali’s institution of water management. Each of the three levels of hierarchical organization (terrace, intra-subak, and the subak) that formed the water management institution in this region performed individual ceremonies aimed at increasing agricultural productivity and preventing floods. At the lower terrace level, offerings consisted of flowers and food placed at the corners of the fields. At the intra-subak level, the rituals consisted of similar offerings near major water dividers placed on stone altars known as bedugul. At the highest level of the subak, was found the “head of the rice fields temple” or Pura Ulun Carik. This was a major temple into which gods descended during the start of the agricultural cycle. The rituals that took place within this temple were conducted by priests during “Water-Opening Day”. On this day, the first stage of rice cultivation began (Geertz 1980:80). The ceremonies of each level of the hierarchical organization were linked to the first large ceremony called the “Opening of Openings”. This ceremony took place at the major temple of the region, the Batu Kau. After this ceremony was conducted, all other ceremonies at the individual temples were set in motion (Geertz 1980:80-81). The replication of these ceremonies intended to imitate the “Water-Opening” day activities of the central microcosm. Appropriately timed replication of the rituals conducted at the “exemplary center” had the intention of replicating higher cosmic order (Geertz 1980:82).

**Ritualization of Water Management in Pre-colonial Central Myanmar**
Even though my research will not focus on examining the utilitarian aspects of water and water management, the utilitarian and the ritual components of water and water management do not form distinct categories and tend to overlap (Geertz 1980:68-80; Errington 1989:44-48, Rigg 1992:6). Understanding the ritual properties of water thus requires the understanding of its utilitarian components, particularly the components related to water storage and distribution.

Common irrigation works that existed in the dry region of central Myanmar include canals, dams, and weirs used to gather water from the rivers (Moore et al. 2016:285; Aung-Thwin 1990; Stargardt 1968). Seasonal ponds and encircling moats were also ways to manage water resources which intended to maximize water conservation used for cultivation (Moore et al. 2016:284). Due to the existence of “constricted river channels”, channels of low elevation that allowed large volumes of water to accumulate, water remained in these channels long after the rains had ceased (Aung-Thwin 1990:5). The retained water contributed to the proliferation of bacteria that provided fertility to the land. This allowed the population to maintain a stable reliance on agricultural land that accomplished its optimum potential (Aung-Thwin 1990:6), particularly in the three major agricultural areas of Bagan: Kyaukse, Minbu, and the Mu valley (Aung-Thwin 1985:101).

Some of the earliest work on the subject of water management that contains ritual components took place during the 1980’s when Stargardt (1990; 2012) discovered ancient irrigation works located in central Myanmar. These waterworks proved to be vital for the development of urban settlements of the Pyu people who inhabited central Myanmar before the flourish of Bagan. Her discovery indicated that canals surrounded major burial terraces before entering the city (Stargardt 1992:67-70). She mentions that “The Pyu practice of leading the drinking and irrigation water of the living through the burial grounds of the ancestors contrasts strongly with the normal Indian practice of avoiding physical contact with the death” (Stargardt 1992:69). This practice goes against Hindu and Buddhist beliefs which consider death and the dead as sources that emanate pollution. This could indicate that the practice of purifying the dead through water rituals, although convergent with some Hindu and Buddhist practices, may have developed as an independent animistic practice (Stargardt 1990:111).

Michael Aung-Thwin has also conducted extensive research on water management in Central Myanmar. H analysis of chronicles has indicated that after the construction of a weir, a pagoda and a nat shrine were built to create a place where offerings to the spirits (nats) could be placed (Aung-Thwin 1990:16). This practice still exists in contemporary Myanmar where shrines and offerings placed near ponds and lakes are believed to appease the spirits (nats) that inhabitant these water reservoirs (Burlings 1965:91-92). Moore et al. (2016) have recently compared the water management strategies of the dry zone of central Myanmar against high-rainfall lower regions. In the central region, their study focused on analyzing water management strategies associated with the Turin Range, particularly on the largest reservoir located on the peak of Thetso Mountain, Nat Yekan (Spirit Lake) water tank (Moore et al. 2016:294-296). Their research indicates that water management strategies reflected a strong knowledge of the landscape. Lakes located on top of Mount Tuyin-Thetsoe were found to be connected to canals and numerous water reservoirs across the plain of Bagan. However, water management strategies in the dry zone of Bagan were not used for irrigation (Moore et al. 2016:295:301). Carvings of birds, a serpent, a crocodile, and fish were discovered in the interior walls of Nat Yekan lake may indicate that a spiritual component was attached to the strategies of water management within the dry region of central Myanmar. Although Moore et al. (2016:303) do not discuss this possibility, they acknowledge that water management was intimately connected to Buddhist
rituals and animistic customs likely reflected in the everyday life of Bagan. The excavation of the fill deposit that blocks the spillway of the Nat Yekan reservoir will form a major component of my research. Due to the fact that water management strategies in this region were not used for irrigation purposes (Moore et al 2016:301), the analysis of these carvings and the excavation findings of the fill deposit that blocks the spillway of this tank will provide insights into the spiritual role of water and water management in Bagan. Furthermore, the discovery of ancient shrines that may have been built near water tanks located on top of Mount Tuyin-Thetsoe would provide further evidence on the role that animistic nat worship practices had within water ritualization.

Discussion

Through these studies, it becomes clear that a scarce amount of research has been conducted about the ritual significance and symbolic meaning of water and water management in central Myanmar. The majority of these studies have focused on examining the utilitarian components of water and water management strategies. Studies about the ritual properties of water in other parts of Southeast Asia are also scarce and tend to appear only as minor components of studies in which water was not the primary research focus (Geertz 1980:75-82; Errington 1989:44-48; Wolters 1999:80-85). However, the information gathered from these studies does provide significant insights into the ritual nature of water and water management indicating that during rituals, water was perceived as a cleansing and purifying agent (Dumarcay 1991:20), a symbolic agent through which the abundance of rain could be manipulated (Dumarcay 1991:38-39), and a vehicle that transported potency (Errington 1989:45), the essence of deities (Aung-Thwin 1987:95), and powers of fertility (Tawa 2009; Wolters 1999:81-85).

Due to the extreme climatic variations of the region, and the preeminence of rice paddy cultivation, water was considered a valuable, life-giving resource that had to be carefully administered. It becomes evident that numerous water rituals attempted to emphasize the link that existed between the sacredness of the king and the great value associated with water. This is reflected in the performance of the “Abhiseka” through which water allowed the king to become the embodiment of Sakka during the coronation ceremony (Aung-Thwin 1987:85). Cambodian inscriptions from Angkor also reflect this association by suggesting a Nagi-King relationship that increased the fertility of the land and the prosperity of the country (Wolters 1999:85). Practices in Kalimantan, Indonesia which allow aristocrats to acquire power as a result of possessing objects embedded with the powers of the “Water of Life” (Jay 1992:78) also indicate that status was gained through the association with water. Furthermore, epigraphic accounts from ancient Bagan (Aung-Thwin 1990:43), indicate that all waterworks belonged to the king. The construction of bathing places and irrigation works by the king was seen as the continuation and improvement on the creation of the gods. Through the construction and arrangement of water distribution, the king demonstrated his concern to strive for an ideal order. The king’s concern with the creation and maintenance of order within his realm reflected the gods’ concern with the creation and maintenance of cosmic order. Thus through the construction of waterworks, the king earned the right to reside, like a god, on Mount Meru (Dumarcay 1991:7). A clear attempt was made to emphasize the connection that existed between the king and the sacred realm of the gods with regards to the water management.

The physical properties of water such as its ability to travel directionally from the Upperworld to the terrestrial plane, and to the Underworld, allowed water to be perceived as a
valuable vehicle. It can be argued that through the performance of water rituals, the elite promoted the association between the essential nature and great value attached to water as being similar to the status and nature of the king. Water rituals directed by the royalty would aim at strengthening the sacredness and social position of the ruler and the elite within the social hierarchy.

**Theoretical Considerations**

In my research, I will examine the way in which the appropriation of water ritualization by the elite in ancient Bagan influenced the creation, continuation, and dissemination of water rituals. I hope to argue that water rituals and ceremonies performed by the elite facilitated the naturalization, and legitimation of the ruler. The association of the sacredness of the king and the vital importance of water facilitated the position of the ruler within the social hierarchy to be strengthened.

Ritual has been traditionally understood as a way to inculcate a set of shared beliefs to increase the solidarity within a community and enable dominant groups to gain social control (Kertzer 1988:62). In my research, reflecting the view of Bell (2010:190-191), the performance of numerous water rituals and the act of water ritualization will not be understood as an instrument that imposed a set of beliefs and attitudes in an attempt to control the masses. It will be seen as an instrument that allowed different social factions to negotiate and establish a dialogue through which water rituals reflected different values and gains among different social groups (Brumfiel 1992:551; Bell 1992:186-196). Understanding the performance of rituals as a dialogue will allow me to examine the way in which a distinct social group, the elite, interpreted the symbolic meaning and significance of water differently and appropriated, through varying degrees of consent, water ritualization to achieve different ends.

**Research Objectives**

The principal questions that my research seeks to answer are: What was the spiritual role and symbolic significance that water and water management had for the elite in ancient Bagan? In which ways were water and water management ritualization utilized and disseminated by the ruling elite? The ways in which the elite appropriated water ritualization will be examined through two main hypotheses:

1. The appropriation of water ritualization by the elite is expected to be seen as a large number of royal symbols (the parasol or umbrella, the empty throne, and the lion) associated with depictions and symbols representing water (the lotus flower, the naga, and the water libation flask) in temple murals (Wolters 1999: 80-85; Bautze-Picron 2003). Royal symbols would also be expected to appear as carvings inside water reservoirs. Chronicles and inscriptions would be expected to emphasize the connection that existed between water ritualization and the privileged position of the king.

2. A greater number of water rituals to emphasize the sacredness of water and the king should occur at times when the social position and the power of the ruling elite was being threatened. This would be expected to happen during times of war, and social upheaval.

Subsidiary research questions include:
1) What was the impact that water and water management ritualization had on the development of institutions such as politics, economics, agriculture and community relationships in Bagan?

2) Within the performance of water ritualization practices, can we distinguish animistic from Hindu-Buddhist components?

3) If so, what can the animistic components tell us about the nature of nat worship of water spirits and how it differs from other types of nat worship?

My research will aim to focus exclusively on the ritual and symbolic meaning of water and water management in ancient Bagan. An exhaustive analysis of the perceptions and understanding of the spiritual role of water among contemporary communities in Bagan will not be part of this research. The analysis of contemporary ritualization of water and water management near the core of Bagan will only be used as part of the ethnoarchaeological component of this investigation, in order to construct models that aid in the interpretation of archaeological findings. Similarly, a comprehensive examination and description of the utilitarian functions of water management will not be included in this research.

**Research Methods**

To answer my principal research questions and test my hypotheses, I will gather qualitative data through ethnoarchaeological research, iconographic analyses, the study of inscriptions and chronicles, and archaeological excavations. Through observations and interviews conducted as part of my ethnoarchaeological research, I intend to construct models that aid in the interpretation of archaeological findings. Interviews will be conducted in ten villages located near the core of Bagan. These villages were selected because of their proximity to the core, their accessibility, and their ongoing implementation of traditional subsistence practices. The interview subjects will be selected by the Cultural Anthropologists that will be participating in our project. Participants will likely include village heads or their designate, many of which speak English. If the participant does not speak English, a translator will be asked to sign a confidentiality form to ensure that consent is provided. Some of the questions that will be asked during the interviews include: How do you obtain water when this reservoir is dry? Who has access to this reservoir? What is the purpose of the shrine and offering near this reservoir? When do you leave an offering at this shrine? Are there procedures or a particular behavior to follow before, during, or after one takes water from this reservoir? This ethnoarchaeological research has been approved by the Ethics Research Board at Trent University.

The observations that will take place at the villages during this ethnoarchaeological study will include an examination of water collection methods (the type and style of the containers used to collect water), the types of offerings provided at the nat shrines, and types of behavior displayed towards nat shrines and water reservoirs. An examination of the types of offerings placed at the nat shrines will help identify the perceptions that villagers have towards the water spirits. Similarly, an examination of the behavior displayed towards nat shrines will help assess the properties and effects that water is believed to have in contemporary Bagan.

Through an iconographic and iconological analysis of water depiction in temple murals, I attempt to identify the recurrent symbols and themes that reflect prevalent beliefs and the symbolic significance associated with water and water management among elite members of ancient Bagan. The murals will be selected based on their location within the Bagan area, as well
as their accessibility. Temple murals in the region are known to depict water within the context of Buddha Jataka tales which are stories and depictions that recount the previous lives of the Buddha (Cowell 1895). Guided by the content of these tales, I will identify the context in which the depiction of water occurs. The methodology of this analysis will be based on Panofsky’s methods of Iconological interpretation (Mazzola 2015:417-418). This method is formed by three stages:

1) **A Pre-iconographic Description**: The identification of pure forms such as figures or symbols of animals of objects recognized to represent a particular theme. Within the context of my research, this will include Buddhist symbols and animals known to be associated with water such as the lotus flower, the elephant, the naga, and the water libation flask. Additionally, this stage will involve the identification of expressional qualities such as gestures and poses in the mural.

2) **An Iconographic Analysis**: the connection of the motifs (symbols and objects) with the subjects and concepts present in the painting in order to create stories or allegories. Within the context of my research, this will involve distinguishing the connections that exist between mural depictions and particular Jataka tales.

3) **Iconological Interpretation**: through the iconographic analysis of the second stage, a synthesis will aim at interpreting the relationship that existed between mural depictions and the socio-political context of ancient Bagan. As stated by Mazzola (2015:418), this stage involves observing the intrinsic meaning or content of a work and interpreting it a symptom of the society.

Archaeological Excavations that will take place at the Net Yakan water tank will focus on excavating the fill deposit that blocks the spillway of the tank. The Net Yakan water tank was selected due to its location with respect to the Bagan plain. The tank appears to have been vital to the collection and redistribution of water through its association with a number of canals and water reservoirs. Additionally, this tank was selected due to the presence of iconographic features that have been associated with water such as a serpent, a crocodile, birds, a water maze, and depictions of the Buddha (Moore et al. 2016:295). The discovery of iconographic features under the spillway would support the idea that this tank had the purpose of sanctifying or “blessing” the water and increasing its properties to provide fertility to the land before leaving the reservoir and flowing down from the mountain onto the lowlands of Bagan. The screening and artifact analysis of the material that is recovered from this fill deposit is expected to provide additional information about the ritual purpose of this water reservoir. Within the context of my research, the presence of iconographic features associated with royalty would strengthen the argument that water management ritualization aimed to emphasize the association between water sacredness and the ruler. A search for ancient shrines that may have been built near water tanks located on top of Mount Tuyin-Thetsoe will be aimed at providing further evidence on the role that animistic nat worship practices had within water ritualization.

Lastly, the study of chronicles and inscriptions will be an important component of this research that will assist in the study of archaeological artifact analyses as well as the iconographic analysis of temple murals. Publications of translated chronicles and inscriptions (Maung Htin Aung 1970; Pe Maung Tin and Luce 1921; Pe Maung Tin and Luce 1923; Luce and Shin 1969) reflect the idea that water management systems belonged to the king and were a reflection of his righteousness and responsibility to care and protect his subjects (Aung-Thwin 1990:43). An examination chronicles and inscriptions will provide information about the specific
kings that were associated with the construction of different waterworks. Through the examination of epigraphic accounts, this study will also provide information about the role that people believed spirits had in guarding water reservoirs, and the behavior performed by members of the royalty towards water and the construction of water management systems.

Due to the fact that the ruling elite was in charge of the construction of large water management systems, the creation of temple murals, and writing of chronicles and inscriptions, the selected sample will be ideal for examining the way in which the elite ritualized water and water management. However, due to this same reason, it will not be possible to comprehensively analyze the perceptions held by the commoners in respect to water ritualization. However, if future research is conducted on the perceptions and significance that water ritualization had for commoners in Bagan, it would be appropriate to examine differences in the construction of nat shrines and water vessels. The ways in which the commoners may have appropriated, and modified water ritualization could be analyzed by examining the number of resources utilized for the construction of nat shrines, and the presence or absence of certain symbols in shrines or water vessels. The ruling elite was likely to invest more resources into the creation of elaborate and costly shrines than the commoners. Examining the existence of royal symbols could also indicate the ways in which commoners may have appropriated water ritualization practices to better fit their perceptions.

Timeframe and Fieldwork

The collection of qualitative data that will answer my principal research questions and test my hypotheses will take place during the fieldwork season of 2018. Arrival in Bagan is expected to occur Saturday, April 28th, departure from Bagan will take place on May 21st. The interviews and observations that are part of my ethnoarchaeological research, the iconographic analyses of temple murals, and the excavation of the Net Yakan water tank will take place during the 24-day duration of the 2018 field trip. The interviews and observations at Bagan’s villages that form part of the ethnoarchaeological component of this study will take place from April 29th to May 8th. The excavations of the fill deposit blocking the spillway of the tank, screening, and artifact analysis of the material recovered from this deposit will begin during the second week of the field trip. An examination of artifact collections housed at the Bagan Archaeological Museum will also take place during this trip. The examination is expected to further illustrate the perceptions and significance of water ritualization in Bagan.

Conclusions

Numerous rituals conducted in Bagan and greater Southeast Asia indicate that the symbolic significance associated with water was related to its property to act as a vehicle that transported valuable attributes such as the essence of the gods, and powers of fertility. Similarly, numerous water rituals attempted to highlight the link that existed between the sacredness of the king and the great value associated with water.

The data gathered as part of this research will indicate the symbolic significance and the role that the elite in ancient Bagan had in the creation, continuation, and dissemination of the water ritualization. The spiritual role associated with water and water management shaped the development of numerous social institutions in ancient Bagan including politics, agriculture,
religion, economics, and community relationships (Aung-Thwin 1990:7). An examination of the symbolic significance of water and water management will allow a better understanding of the way in which particular perceptions and attitudes associated with water ritualization encouraged behaviours that in turn impacted social institutions in ancient Bagan. Furthermore, this examination will indicate which Hindu-Buddhist, and in particular, which indigenous animistic components of water ritualization (Moore et al. 2016:302) influenced institutions that had a role in the growth and decline of the kingdom of Bagan.

References Cited

Aung-Thwin, Michael

Aung-Thwin, Michael

Aung-Thwin, Michael

Bautze-Picron, Claudine

Bell, Catherine

Brumfiel, E.

Burlings, Robbins

Christie, Jan

Coedés, George

Cooler, Richard
Cowell, E.

Dumarçay, Jacques

Errington, Shelly

Geertz, Clifford

Gupta, Ashim

Jay, Sian

Kertzer, David

Luce, Gordon H., and Bo-Hmu Ba Shin

Mabbett, I. W.

Maung Htin Aung

Mazzola, Renan B.

Moore, Elizabeth

Moore, Elizabeth

Moore, Elizabeth, U San Win, and Pyiet Phyo Kyaw

Nash, June

O’Connor, Richard A.

Pe Maung Tin & G.H. Luce

Rigg, Jonathan

Stargardt, Janice

Stargardt, Janice

Stargardt, Janice

Stargardt, Janice, G. Amable, and B. Devereux
Tawa, Michael  

Tin, Pe Maung, and Gordon H. Luce (translators)  

Vossion, Louis  

Winzeler, Robert  