APPENDIX A

Methodology

ARCHAEOLOGICAL METHODS

The bulk of data considered in this book is archaeological, since for the majority of the period covered this is the primary source of information about food. Archaeological data are derived from excavations in the Banda region that have been ongoing since 1989. Domestic structures, kitchen contexts, midden deposits, and craft-working areas were extensively sampled at four sites (Banda 13, Ngre Kataa, Kuulo Kataa, and Makala Kataa) spanning the period from 1000 to the 1920s, with limited test excavations at many more sites as part of a regional testing program (BRP 2002; Smith 2008; Stahl 2007). Botanical, faunal, ceramic, and metal samples were systematically collected from all deposits.

All methods used in excavation of archaeological sites and processing of material culture have been previously summarized by Stahl (1999b, 2007). Middens were usually sampled by isolated 1x2m or 2x2m units (Stahl 1999b, 11), which was appropriate given the large quantity of materials that resulted. For domestic and craft-working contexts, adjacent, mostly 2x2m units, were excavated to achieve broader areal exposure of deposits. Excavation units were identified by the coordinates of their northeastern corner on an arbitrary site grid. Excavation commenced in arbitrary 10 cm levels unless there were natural or cultural boundaries present; in the case of multiple deposits or features in a single level, individual deposits were removed separately and designated differently (Area A, Zone A, etc.). Identifiable features such as pits or floors were excavated separately. All soil was sieved through a 5 mm (1/4 inch) screen (Stahl 1999b, 11–12). Pottery, bone, slag, and small finds (beads, metal, etc.) were collected and recorded separately.

MACROBOTANICAL ANALYSIS

The charred seeds, nut shells, and other materials recovered from flotation are referred to collectively by archaeologists as macroremains or macrobotanical

remains. Paleoethnobotanical collection and analysis methods followed published protocols (Pearsall 2015; Piperno 2006), with modifications made for field conditions. The Banda sites are among the most intensively sampled for plant remains in the African continent. Scatter samples of 5 or 10 liters were collected from almost every level, feature, and depositional unit over the two decades of Banda Research Project excavations (1989–2009); point samples, usually of smaller volume, were collected from features of interest (e.g., burnt areas) (Stahl 1999b, 12). Interior contents of pottery vessels were also routinely collected and floated. Generally, 10 liter samples were collected in earlier phases of the project (Makala Kataa: BRP 1989, 1990), but sample sizes were reduced due to practical considerations in the mid-1990s (Makala Kataa: BRP 1994; Kuulo Kataa: BRP 1995, 2000; Banda 13, Ngre Kataa, and Bui Kataa: BRP 2008, 2009). Samples of 5 or 10 liters were the maximum feasible size given that at the end of an excavation day samples must be head-loaded to vehicles and manual flotation was the only method possible without running water (or electricity until 2007) in Banda; all flotation water was drawn from boreholes and head-loaded by women. Given these constraints, the number and size of samples collected is exceptional in West Africa. Samples were floated manually, with sediment placed in clean water in a headpan, and floating remains skimmed off using a tea strainer (approx. 0.5 mm mesh) and deposited onto finely woven cloth for drying.

Sampling of light fractions was necessary as excavations resulted in over 1,600 floated soil samples. Judgmental sampling was chosen over random sampling given the hit-and-miss nature of macrobotanical preservation (i.e., requiring fire); the diversity of excavated contexts (e.g., domestic, ritual, ironworking); and their appropriateness for answering the research questions. All samples were selected based on a detailed reading of the contexts available in field notes from each site. An attempt was made to complete a similar number of samples from each site and time period, but samples at some sites (Banda 13 and Kuulo Kataa) were remarkably homogeneous, leading to diminishing returns. Once diversity had leveled off at these sites (i.e., further samples resulted in data redundancy), I opted to sample sites with better preservation, better contexts, and more diverse assemblages. At all sites, both midden and domestic contexts were targeted. Middens were selected since they are typically richer and more diverse and allow for chronological reconstruction. Domestic contexts, though considerably more sparse, were selected in order to reconstruct daily practice over space. A limited number of samples were completed from craft and ritual areas to compare with household sites. To date, 326 flotation samples from twenty-three contexts at nine sites have been analyzed, a portion of which, from the Ngre to Late Makala phases, is reported in appendix B (see Logan 2012 for results from earlier periods). Contexts dating to the Late Ngre, Kuulo, and Early Makala phases were targeted in order to track the impact of American crops.

All light fractions were weighed, separated through nested sieves (2 mm, 1 mm, 500 μm, 250 μm), and examined under 7–40x magnification. All components

(charcoal, seeds, other) were separated and recorded for the 2 mm and above fraction; the remaining size fractions were scanned for seeds only. Samples weighing more than 25 g were split using a riffle splitter; weights reported in the data tables (appendix B) are of the material analyzed only (i.e., they do not include unanalyzed portions). Heavy fractions were also collected and sorted. I made identifications by reference to collections at the University of Michigan Ethnobotany Laboratory as well as the African Archaeobotany unit at Goethe Universität in Frankfurt.

Two categories used in this study need explication. "Unidentified nonseed charred plant remains" refers to material that is clearly not wood charcoal, and may include materials of interest that could be further identified in the future (e.g., parenchyma). "Unidentifiable seed fragments" refers to seeds and seed fragments that are unlikely to be identified in the future due to extreme distortion and/or fragmentation.

Based on the generally low seed counts as well as unevenness in the data (e.g., several thousand grains in MK 6 samples versus a few dozen in NK Mound 7), I opted not to use statistical techniques for quantifying my results. Instead, I use simple presence/absence and count data. The idea was that phytolith and starch analysis would help confirm the spatial distribution of important crop and wild plants, though, as I now describe, this confirmation is still a few years off.

PHYTOLITH AND STARCH GRAIN SAMPLING AND PROCESSING

Sampling for both phytoliths and starch grains differed at various stages of the project. There are no soil samples available for the earliest excavations (in 1989 and 1990), though some grinding stones were archived unwashed—at this point in time, phytolith studies were only just emerging. Soil samples were taken more regularly in 1994 and 1995 at Makala Kataa Station 6 and Kuulo Kataa, often in the form of column samples from select walls. Soil and unwashed grinding stones were also collected from Makala Kataa Station 6 in 1994. After I joined the project in 2008, more extensive sampling for microbotanical remains was undertaken (i.e., at Bui Kataa, Ngre Kataa, and Banda 13). A small soil sample was collected from each 5 liter flotation sample in an attempt to get a scatter sample of each excavation unit. This was supplemented by point samples of interesting features (e.g., floors, hearths). Further details about the methods used to process soil samples, as well as the limitations and challenges of analyzing soils from archaeological sites in Africa can be found in Logan (2012).

The phytolith data I discuss in this book derive from artifact surfaces, with the goal of obtaining a basic understanding of food processing. Although only a fraction are reported here, 64 artifacts were sampled for phytoliths and starch using the methods outlined in Pearsall, Chandler-Ezell, and Zeidler (2004), with modifications made for field conditions. These included the creation of a clean zone in the laboratory, use of new disposable materials for each artifact (toothbrushes,

plastic bags, etc.), and use of bottled water for sampling (distilled water was not available). Sampling involved collection of three sediments from unwashed artifacts (dry brush, wet brush, and sonicated fraction). All artifacts sampled were photographed. This kind of intensive sampling was undertaken for the sites of Ngre Kataa, Bui Kataa, and Banda 13. Due to differential sampling, I focused analysis on the two excavation areas with the most comparable samples: Makala Kataa Station 6 and Ngre Kataa Mound 7.

Phytolith extraction and scanning methods follow those used in the University of Missouri Paleoethnobotany Laboratory (Pearsall 2015), modified for extraction of calcium compounds, such as faunal spherulites, which are found in animal dung and are composed of calcium carbonate (Coil et al. 2003; see Logan 2006, 30–38 for procedure detail). Phytolith samples were examined at 400x magnification using a Leica DME microscope.

Unfortunately, given the infancy of phytolith analysis in Africa (especially West Africa), we do not yet have strong diagnostic indicators that would distinguish sorghum, pearl millet, maize, and other likely crops (with the exception of banana). I describe the progress that has been made in my dissertation (Logan 2012) and a recent article (Ball et al. 2016), but my general approach here is to use indicator methods. Indicators may or may not be diagnostics, since phytolith production in the local flora is not well-enough defined to evaluate possible redundancies. Instead, I assign the identification a weak, moderate, or strong probability that it represents the particular species. These descriptors indicate the strength or likelihood of the identification. *Strong* identification means that the phytolith shape has also been found to be unique across other world floras or that within any given sample, there are multiple and recurrent indicators of that taxa (especially for the grasses). Identifications labeled *moderate* have a good probability that they represent the species of interest, assessed based on their diagnostic level in at least one other tropical flora, apparent uniqueness of the form based on global phytolith literature and/or the Banda flora studied, or common presence in a given sample. *Weak* probability identifications mean that forms observed in a taxon of interest are also observed in the archaeological sample, but similar forms may be observed in closely related taxa, or closely related taxa have not been studied and may produce similar forms. Large variant 1 crosses that are diagnostic of maize leaf in the Americas offer a good example: while concentrations of these might weakly or even moderately suggest the presence of maize leaf in a sample, isolated occurrences could represent maize, or a number of other African wild grasses that produce this form.

Although phytolith production patterns in maize are well documented, only a handful of studies have documented phytolith production patterns in sorghum (Logan 2012; Radomski and Neumann 2011; Madella, Lancelotti, and García-Granero 2016) and pearl millet (Logan 2012; Madella, Lancelotti, and García-Granero 2016). What is clear is that it is possible to separate the domesticated grasses from each other; millet produces small bilobates and crosses, while

maize and sorghum do not. Sorghum produces several complex short cells which are generally taller and not elongate, including the potentially diagnostic saddle-like rondel. Maize produces more elongate and squat rondels than sorghum, in addition to three forms which may be diagnostic.

The real challenge is distinguishing these taxa from wild grasses in the archaeological record. My approach here is to use a series of ratios to quantify strong, moderate, and weak probability identifications of sorghum, maize, and millet. The method should be considered tentative until independent means are used to test their accuracy. The best check I have at present is whether or not charred grains of the same taxon occur in similar contexts, but since the objective in using phytoliths is to find processing activities that did not involve fire or whole grains, this is problematic. The identification potential is highest for sorghum, followed by maize; millet remains a challenge. However, it does allow me to tentatively evaluate whether sorghum and maize are more ubiquitous than the macrobotanical record suggests.

ETHNOARCHAEOLOGICAL AND ETHNOGRAPHIC METHODS

Ethnoarchaeological methods were built around my central research questions regarding continuity and change in food practices. This involved documenting the variability in specific foods, materials, and techniques over space and between generations. I attempted, so far as possible, to avoid asking questions that would introduce assumptions of timelessness into the data. In other words, the objective of this research was not to collect baseline quantitative data for quantities such as crop yields, because such measures are not comparable or obtainable from the archaeological record, and they do not take into account the impact of changing governmental and economic inputs into agriculture (such as fertilizer), not to mention shifts in labor and gender dynamics. This is not to belittle the many excellent case studies of this type that have already been accomplished; but this is not one of them. Although I have spent a total of about eleven months in Banda, this comprised several nonconsecutive visits between 2008 and 2014, some of which were spent engaged in archaeological research. My time was concentrated in the wet season (April through October) and early dry season (October and November). Ideally, I would have stayed over the dry season, where I would have seen fields prepared for planting, and eaten the leaves and vegetables dried in the wet season for later use. However, I feel that I have an adequate idea of these activities from interviews and from previous fieldwork during the dry season (January through March) in neighboring Togo and more distant Senegal. Further, I observed and have interview data about the two primary food seasons.

My ethnoarchaeological research design was shaped by David and Kramer (2001), and was based on my experience in Sudan with Catherine D'Andrea in 2005. Prior to fieldwork, my methodology and sample questionnaires were

approved by the University of Michigan's IRB, which issued an exemption, because the information to be collected was deemed not sensitive. As part of the interview process, name, age, and area of origin information were collected to aid in possible future longitudinal studies, but information was coded and/or all identifiers were removed for reporting purposes out of an abundance of caution. Names are revealed in the text where information is not sensitive, and changed in cases where the information is potentially sensitive.

My initial ethnoarchaeological study focused on food change, and took place from July to November 2009 in the period as the wet season transitioned to the dry one and food shifted from TZ to yam *fufu*. I conducted 120 interviews primarily with women spread across six villages in the Banda region, including one on the west side of the hills (Dorbour) also studied by Cruz (2003). Interviews on food change were semi-structured, initially using a questionnaire to guide the interview, but were tailored to highlight the knowledge of each interviewee. All interviews were conducted by me and translated by Enoch Mensah, a long-time Banda Research Project assistant who is fluent in the local language, Nafaanra, as well as Twi and English and is well known in the community. Generally, interviews focused on one person at a time, but some group interviews were also conducted. Men were often interviewed in groups, as they wished to give me the "official" story. Middle-aged and elderly women (forty years and older) were the focus group for most interviews, but in each village a small number of men and younger women were also interviewed. Informants were generally interviewed at their home, and selected mostly at random or on occasion based on recommendations from other informants. Interviews generally lasted around one hour. All photographs were taken with consent.

The six villages were selected based primarily on their proximity to archaeological sites, not so that a direct analogy could be constructed per se, but because residents of these towns were already familiar with the work of the Banda Research Project. Villages interviewed included Bui (near Bui Kataa), Dumpofie/Kuulo (near Kuulo Kataa), Ngre/Nyiire (near Ngre Kataa), Makala (near Makala Kataa), Banda-Ahenkro (where recent middens and a house were sampled for plant remains), and Dorbour, the latter so I could compare ethnoarchaeological observations of food to Cruz's (2003) mid-1990s examination of pottery. The good relations that the principal investigator Ann Stahl has established in the region over the last thirty years, and in these villages in particular, made it possible for me to visit several villages and quickly obtain blessings and cooperation. As is custom in this part of Ghana, before any research began, the paramount chief and elders in Banda-Ahenkro proper were consulted. Their permission secured, I then met with the chief and elders of the individual villages in which I worked to obtain appropriate permissions as well as advice on who best to talk to. Only after this did I visit individual informants and begin interviews. At all steps in this process, the good working relationships and long-term relationship that Stahl had with these

communities aided my acceptance. In return, I discussed with my interlocutors how the BRP archaeological work connects to the present and is relevant to the many individuals with whom I spoke.

Interviews generally began with an introduction as to why we were there and what information we were seeking. If the informant consented (which they almost unanimously did), we began the interviews with a simple question: How have foodways changed in your lifetime or since that of your parents? The initial responses usually followed one of several patterns: (1) that no change had occurred, everything was the same, but there were different foods for different seasons; (2) that there were several dishes that were no longer made and crops no longer grown; or (3) that there were a lot of wild leaves that had formerly been used (which often were still used). Generally I continued my questions based on this first response, and let the mood and interest of the subject guide my next questions. Every interview ended with two queries: What was the biggest change (besides those already talked about) that you have seen in your lifetime or since that of your parents?; and did the interviewee have any questions for me? These open-ended questions often involved the subject asking more about the research and its value to the community, adding information they thought relevant but we had not covered, or describing changes that had had big impacts on their lives. The "biggest changes" question helped me to understand the broader social and economic changes people had seen in their lifetimes; food intersects with most of them in interesting ways.

Intensive participant observation focused primarily on three households, one in Banda, one in Bui, and one in Ngre, each representing a different socioeconomic stratum. Repeated visits were made to each household for several hours in duration to observe food preparation practices from start to finish. In addition, observation occurred during afternoon interviews, when women were busy processing various products (calabashes, kapok fibers, shea butter, etc.) and preparing food. Shorter observations occurred at random as we were passed by someone cooking or processing plants, which often led to interviews. Because interviews and observation occurred primarily during the wet season, several dry-season plant processing activities, such as sorghum processing, were not observed directly; however, several informants from different villages were questioned regarding these in an attempt to capture the variability present.

Ethnobotanical plant collection was also a focus of my 2009 ethnoarchaeological season. I focused on collecting useful wild and domesticated plants. Whenever possible I collected duplicates of the entire plant (leaves, inflorescence, seed, and roots) in order to facilitate identification and ensure appropriate material for building a phytolith comparative collection. Plant collection took place with help of community experts on wild plants; men generally knew of fruits and women of wild leaves. Both were knowledgeable about plants with other uses (for ash, soap, etc.). All plants were pressed when possible, though in practice drying presented

some difficulties as it was the wet season. Consequently there was more loss than I had anticipated. I donated a duplicate set of voucher specimens to the Ghana Herbarium, Department of Botany, University of Ghana, where Dr. Patrick Ekpe kindly identified them.

I also attempted to the best of my abilities to record words for plants, tools, and dishes in Nafaanra and Kuulo/Dumpo. Transcription was phonetic, where possible, based on the spellings used by the Nafaanra Literacy Project and the knowledge of my research assistant, Enoch Mensah. These spellings are imperfect, but where possible I have cross-referenced them with the Nafaanra dictionary available online as well as with linguistic work by Blench among the Dumpo/Kuulo (Blench 2007).

ARCHIVAL METHODS

Archival work was essential for augmenting understanding of the colonial period. Building on the detailed archival work of both Stahl (2001) and Cruz (2003; Stahl and Cruz 1998), I conducted research in the Ghana National Archives in Accra, Kumasi, and Sunyani, which provided insight into colonial perceptions of Banda in the first half of the twentieth century, and also anchored many of my informants' memories in calendar years. Though archival information is sparse, it provides tantalizing glimpses of Banda life as viewed through the eyes of others.

In 2009 I visited the Brong-Ahafo Regional Archives in Sunyani which houses information from approximately the late colonial to independence eras (around 1925 to 1970s), as well as the Kumasi branch, which focuses on the period when Banda was considered part of the Ashanti region (1900–1920s). The Sunyani archives were examined in 2009 with the help of Enoch Mensah; all Banda regional material was examined, as well as documents on agricultural policy affecting Brong-Ahafo.

In 2011 I returned for a more intensive look at the Accra and Kumasi archives. The Accra archive contained a mix of material from all periods. There I examined material relating to food and agriculture in the colonial era, excepting that of cocoa and oil palm, which was the majority. I also reexamined archival sources cited in Stahl (2001) and Cruz (2003), which led me to several lists of foods, trade, and taxations, as well as colonial descriptions of Banda. Another important source of data were trade records from Wenchi and Kintampo, where Banda inhabitants traveled to ply their wares. In the Kumasi archives, all material relating to the Banda region was examined. Additional archival material from the colonial era is available at the National Archives (UK), which have been surveyed previously by Stahl (2001), and were not consulted further for this study.