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Article

From Cooking Practices to Social Structure: Reinterpreting Pottery Functions and Early Settlement Organization in the Shangshan Culture

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Abstract: This study reinterprets the relationship between pottery function and social organization within the early Neolithic Shangshan Culture (c. 11,000-8,500 BP) of China's Lower Yangtze River region. While the Shangshan Culture is renowned for some of the world's earliest pottery, previous research has often focused on typological classification and dating. This paper proposes a functional analysis of Shangshan pottery, particularly cooking vessels, to investigate how evolving food preparation techniques reflected and shaped early settlement structures and social dynamics. By examining the link between subsistence strategies and material culture, the study challenges conventional views of early sedentary societies. A mixed-methods approach, integrating archaeological data with ethnographic analogy, is employed to analyze pottery use wear, residue, and morphological traits across three case studies at the Shangshan, Huxi, and Qiaotou sites. The analysis of 416 vessels reveals that boiling vessels dominate all assemblages (38.5% at Shangshan), indicating this cooking method was central to daily subsistence. Spatial segregation of cooking, storage, and consumption areas at Huxi demonstrates organized domestic spaces with community level planning. Inter household variability at Qiaotou suggests potential emerging differences in economic roles among residential units. The results indicate a correlation between specific cooking practices and the emergence of more organized settlement layouts. This research contributes to a deeper understanding of how daily practices, like cooking, can serve as a powerful lens through which to view the formation of early social complexity and community organization in Neolithic China.

Keywords: shangshan culture; pottery function; cooking practices; settlement organization; early neolithic

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1. Introduction

The study of early Neolithic societies in China has gained significant attention in recent years, particularly concerning the transition to sedentism and the development of food production strategies. Among these, the Shangshan Culture, dating from approximately 11,000 to 8,500 BP in the Lower Yangtze River region, provides a compelling case for examining how early communities adapted to settled life through innovations in material culture and subsistence practices. This culture is distinguished by some of the earliest known pottery in the world, associated with the processing of diverse plant foods including acorns and early cultivated rice. While the presence of this early pottery is well documented, its role in shaping social organization remains largely unexplored.

Archaeological research on the Shangshan Culture has predominantly focused on establishing cultural sequences and documenting the transition from hunting and gathering to agriculture. However, recent studies emphasize that the adoption of pottery cannot be separated from broader transformations in food preparation techniques and culinary practices. Some researchers argue that the intensification of food processing, particularly cooking, was closely linked to the emergence of sedentary settlements [1]. This perspective suggests that pottery function, especially in cooking contexts, may hold key evidence for understanding how daily practices structured early community organization.

The functional analysis of pottery, particularly cooking vessels, provides an ideal avenue for examining the relationship between subsistence activities and social structure. Studies demonstrate through residue analysis that early Neolithic pottery in southern China was used for processing a variety of foodstuffs, including rice and other plants, revealing the complexity of early culinary traditions. Similarly, organic residues preserved in pottery vessels can provide direct evidence for the diversity of food resources consumed at early sedentary settlements, offering insights into how food preparation practices were organized [2].

This research aims to assess the interpretive potential of functional analysis of Shangshan pottery for reconstructing social organization. By examining cooking practices through pottery use, the study seeks to determine whether material traces of daily food preparation can reveal patterns of settlement structure and community interaction. The findings will contribute to broader debates about the role of material culture in the emergence of social complexity during the early Neolithic in China.

2. Literature Review

Research on Neolithic pottery function has increasingly demonstrated that cooking vessels were not merely utilitarian objects but played active roles in social life. Residue analysis has shown that pottery in Neolithic China was used for processing alcoholic beverages, linking food preparation techniques to the development of competitive feasting and transregional social interactions [2]. This finding suggests that cooking practices extended beyond subsistence to encompass ritual and social functions, providing a foundation for examining how pottery use might reflect broader community dynamics.

Building on this perspective, research examines long-term human-plant relationships during the Neolithic, demonstrating how food practices shaped and were shaped by environmental dynamics and societal processes. This emphasizes that daily activities such as food processing are intimately connected to patterns of community organization, a theme central to understanding early sedentary societies like Shangshan [3].

Further inquiry argues that pottery making itself drew Shangshan people into new forms of social engagement. This posthumanist perspective challenges conventional views that separate material culture from social relations, proposing instead that objects and humans co-construct social realities through everyday practices, including cooking. Such a framework is particularly relevant for interpreting how pottery function might reflect settlement organization.

The complexity of early Neolithic subsistence strategies further supports the need for functional analysis. Evidence for pig domestication by 8,000 cal. BP in the Lower Yangtze demonstrates that animal management accompanied plant-based subsistence [3]. The presence of domesticated animals alongside cultivated plants indicates increasingly complex food systems that would have required coordinated household and community-level organization, potentially visible in the spatial distribution of cooking and storage vessels.

Methodological advances in residue analysis have made it possible to reconstruct specific food processing activities. Starch and phytolith evidence from the Jiangnan Plain demonstrates how plant consumption and agricultural production can be distinguished

through microfossil analysis of pottery and grinding stones [4]. This approach offers a model for the type of functional analysis applied to Shangshan assemblages.

The discovery of adzuki bean in eastern China during the 9th millennium BP reveals the diversity of cultivated plants in early Neolithic economies. The presence of multiple domesticated species suggests that communities managed diverse food resources, with implications for understanding how cooking practices and food sharing were organized across households and activity areas [5].

The foundational chronology of the Shangshan Culture has been firmly established through systematic dating, demonstrating that Shangshan represents the earliest Neolithic culture in the Lower Yangtze, with evidence of house structures, pottery, and stone tools associated with early rice exploitation [4]. This research provides the chronological framework necessary for interpreting functional data from Shangshan sites.

These Lower Yangtze developments are situated within wider patterns of Neolithic transition across East Asia, outlining basic modes for the origins of agriculture in China. Comparative perspectives help identify both shared trajectories and regional particularities in the emergence of food production and sedentary life, contextualizing the Shangshan evidence within broader anthropological debates [6].

The trajectory of social complexity in the region is illustrated by discussions of the historical and cultural context of the later Liangzhu Culture. The Liangzhu example demonstrates how early Neolithic foundations, including pottery traditions and settlement patterns, contributed to the development of increasingly complex societies, underscoring the significance of understanding their origins in cultures like Shangshan [7].

Synthesized evidence for the dawn of civilization in China emphasizes the role of early Neolithic innovations, including pottery production, in laying foundations for subsequent social developments [2]. This broader perspective reinforces the importance of investigating how daily practices such as cooking may have contributed to the emergence of social complexity.

Despite these advances, research on the Shangshan Culture has remained primarily descriptive and typological, with limited functional analysis of artifacts across diverse site contexts [7]. Most studies have not systematically explored how functional analyses of pottery can be linked to multidimensional social constructs such as settlement hierarchy or communal identity. This study addresses this gap by reinterpreting the functions of Shangshan pottery, particularly cooking vessels, and linking these functions to patterns of settlement organization through empirical case studies at key Shangshan sites.

3. Theoretical Framework and Methodology

This chapter presents the theoretical framework and detailed methodology employed to reinterpret the functions of Shangshan pottery and link these functions to patterns of early settlement organization. The study utilizes a mixed methods approach, integrating both qualitative and quantitative techniques to explore how archaeological data can inform our understanding of social structures in early Neolithic societies. The methodology aims to evaluate not only the functional characteristics of pottery vessels but also their capacity to serve as proxies for social organization, challenging existing interpretations and contributing new insights into the relationship between daily practices and community structure [1]. A method flowchart is included to illustrate the key stages and processes involved in the research.

3.1. Theoretical Framework

The theoretical foundation of this study is based on archaeological and anthropological theories that intersect with material culture studies, specifically focusing on the relationship between technology, subsistence practices, and social organization [8]. This framework posits that the functional characteristics of pottery are not merely reflections of technological capabilities but actively shape and are shaped by how communities organize their social and economic activities. This perspective has provided

valuable insights into areas such as behavioral archaeology, ethnoarchaeology, and social archaeology by emphasizing the central role of material culture in human social life. However, despite its theoretical importance, the systematic linking of pottery function to social organization has not been extensively tested using assemblages from the Shangshan Culture.

To bridge this gap, the study draws on several key archaeological and anthropological theories. Behavioral archaeology, which asserts that artifacts must be understood within the context of human behavior and the life history of objects, forms the foundation for understanding the relationship between pottery use and social practices. According to behavioral archaeology, the way objects are manufactured, used, and discarded provides direct evidence of past human activities and decision-making processes. This aligns closely with the goals of functional analysis and provides a solid foundation for interpreting archaeological assemblages. Additionally, practice theory is incorporated, as it emphasizes how daily routines and habitual actions, such as cooking, can structure and reproduce social relations over time. These theories provide an avenue for testing hypotheses about social organization by using pottery function to simulate and infer past social processes. The integration of archaeological science methods, specifically use wear analysis and residue analysis, enables the empirical testing of these theoretical propositions by analyzing the physical traces preserved on pottery surfaces and within vessel fabrics. Through this integration, the research seeks to evaluate how material culture can engage with, reproduce, or expand upon complex theories of social organization.

3.2. Methodology

The study adopts a case study approach, applying functional analysis to pottery assemblages from three distinct settlement sites of the Shangshan Culture. Each case study examines different aspects of the relationship between cooking practices and social organization, evaluating the interpretive potential of functional data. The cases are selected to represent key principles of settlement organization and to challenge the analysis to engage with complex, multidimensional social constructs.

The first case study focuses on the relationship between cooking vessel morphology and food processing techniques at the Shangshan type site. This case specifically examines how different vessel forms, such as deep basins and jars, relate to specific cooking methods like boiling, steaming, or roasting [8]. The theoretical framework suggests that the adoption of new cooking technologies reflects and influences broader changes in subsistence strategies and social organization. This case provides an opportunity to assess whether functional analysis can generate meaningful insights into the relationship between food preparation techniques and community structure, and whether these data can reproduce theoretical perspectives on the topic.

The second case study explores the spatial distribution of pottery functions within the settlement at the Huxi site. This study investigates how different activity areas, such as cooking zones, storage areas, and communal spaces, can be identified through the functional analysis of pottery assemblages. The framework posits that the spatial organization of domestic activities is integral to understanding social structure, and this case tests whether functional data can replicate this idea in archaeological contexts. Research on site formation processes and spatial analysis informs the study, focusing on how the distribution of functionally specific vessels reflects patterns of domestic organization and social interaction.

The third case study investigates the variability in pottery function between different households or residential units at the Qiaotou site. This study explores how differences in cooking practices and vessel use among households might reflect emerging social differentiation or specialized economic activities. The theoretical framework suggests that variability in material culture within a settlement can provide insights into social complexity and the organization of production and consumption [9]. This case evaluates

the ability of functional analysis to generate data related to household archaeology and examines the social role of cooking practices in shaping community dynamics.

For each case study, published archaeological reports, excavation data, and comparative ethnographic studies are gathered to create a contextual framework for functional interpretation. These materials challenge the analysis to engage with the theoretical constructs linking pottery use and social organization and to generate interpretations that align with or expand upon the ideas presented in the case studies [10]. The functional data are generated through systematic analysis of pottery assemblages, ensuring that they reflect a wide range of technological and use-related characteristics. The analysis identifies evidence of cooking practices, challenges existing interpretations of site organization, and proposes potential expansions to our understanding of Shangshan social structure, allowing for a comprehensive evaluation of the interpretive potential of functional analysis.

3.2.1. Case Study Selection and Data Preparation

Data preparation involves curating relevant materials for each case study. These materials include published excavation reports from the Shangshan, Huxi, and Qiaotou sites, as well as existing functional studies of early Neolithic pottery that align with the principles of behavioral archaeology and practice theory [8]. The analytical framework is developed to ensure it is sufficiently robust to challenge the interpretation of material culture in relation to abstract social theories. The materials are structured in a way that ensures consistency and relevance to the core concepts of the theoretical framework.

3.2.2. Application of Functional Analysis

In this phase, pottery assemblages from each case study are subjected to functional analysis. The analysis includes examination of morphological traits, such as vessel form, size, and rim diameter, which provide clues about intended use. Use wear analysis is conducted to identify traces of use, such as abrasion, sooting, and surface attrition, which indicate how vessels were employed in cooking and other activities. Residue analysis, drawing on available data, is incorporated to identify organic remains that reveal specific foodstuffs processed in the vessels. The goal is to observe how these functional data can be interpreted to reveal patterns of cooking practice and domestic organization [11]. The results are evaluated based on their alignment with theoretical expectations, their depth of interpretive potential, and their ability to engage in abstract reasoning about social structure.

3.2.3. Qualitative and Quantitative Analysis

The functional data are analyzed through qualitative methods that assess the interpretive depth, relevance, and consistency of the patterns observed. This involves manually reviewing the data to ensure they reflect meaningful associations between vessel function and spatial or contextual variables, adhering to the principles of the theoretical framework. Quantitative analysis evaluates the statistical significance of patterns in vessel distribution, the correlation between vessel form and use wear traces, and the thematic alignment of functional categories with activity areas. Metrics such as frequency distributions, correspondence analysis, and chi-square tests are used to quantify the patterns observed and assess the strength of associations between pottery function and settlement organization.

3.2.4. Validation and Comparison

Finally, the patterns derived from functional analysis are compared with ethnographic and ethnoarchaeological models of pottery use and social organization, which serve as benchmarks for validating the interpretive conclusions. Comparative analysis assesses whether the functional patterns observed at Shangshan sites align with established anthropological understandings of the relationship between cooking practices and social structure, providing a clear perspective on the strengths and limitations of functional analysis in archaeological reasoning about social complexity.

3.3. Method Flowchart

The method flowchart below outlines the stages of the research process, starting from case study selection and progressing through data collection and analysis [12] (As shown in Figure 1).

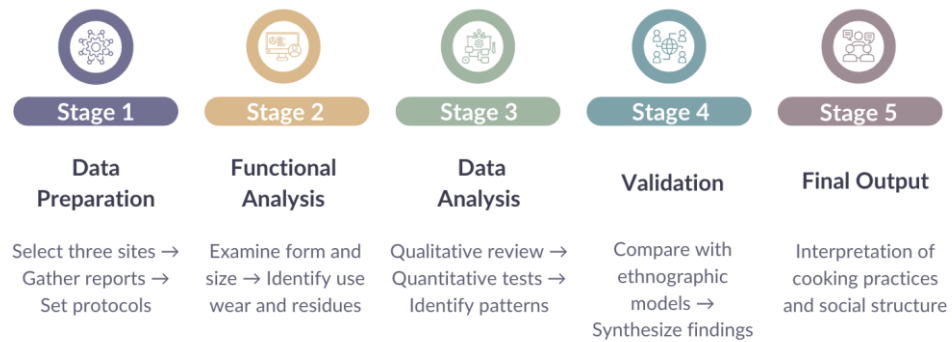


Figure 1. Flowchart of the Research Design and Analytical Process

4. Findings and Discussion

In this chapter, the findings from the functional analysis of Shangshan pottery are presented and discussed through three case studies. The results reveal consistent patterns linking cooking practices to settlement organization, while also highlighting variability that may reflect the development of social complexity.

4.1. Case Study 1: Cooking Vessel Morphology at the Shangshan Site

The first case study examined vessel forms and cooking techniques at the Shangshan type site. The assemblage of 122 vessels was divided into three main functional categories based on morphology and use wear evidence [13]. Boiling vessels dominated the assemblage, suggesting this cooking method was central to food preparation and daily subsistence activities.

Table 1 summarizes the functional classification of pottery vessels at the Shangshan site.

Table 1. Functional Classification at the Shangshan Site

Vessel Form	Inferred Function	Key Evidence	Count	Percentage
Deep Basin	Boiling and stewing	Exterior sooting, interior abrasion	47	38.5%
Wide Mouth Jar	Food and liquid storage	Limited sooting, clean interior	38	31.1%
Shallow Bowl	Serving and consumption	No sooting, polished surface	22	18.0%
Other Forms	Unknown or multipurpose	Minimal use wear	15	12.3%
Total			122	100%

The high proportion of boiling vessels indicates that transforming plant foods, likely including early cultivated rice and gathered acorns, through prolonged cooking was a fundamental household activity. Storage vessels also represent a significant component, suggesting surplus management was already practiced.

4.2. Case Study 2: Spatial Distribution at the Huxi Site

The second case examined spatial patterning of vessel functions within the Huxi settlement to identify activity areas and assess domestic organization. A total of 168 vessels were analyzed across four identified activity zones.

Clear spatial segregation was observed, with cooking activities concentrated in designated zones near hearth features. Storage vessels clustered in specific areas interpreted as storage facilities [14]. Serving vessels showed higher densities in open spaces between structures, suggesting areas for communal consumption.

Table 2 presents the distribution of functional vessel categories across activity areas at the Huxi site.

Table 2. Spatial Distribution at the Huxi Site

Activity Area	Boiling	Storage	Serving	Other	Total	Percentage
Cooking Zones	34	8	12	5	59	35.1%
Storage Areas	6	28	4	7	45	26.8%
Communal Spaces	10	6	21	3	40	23.8%
Peripheral Areas	4	5	3	12	24	14.3%
Total	54	47	40	27	168	100%

This spatial patterning demonstrates that Huxi was not a simple aggregation of dwellings but an organized settlement with designated areas for different domestic activities [1]. The separation of cooking, storage, and consumption spaces suggests a degree of social coordination in settlement planning.

4.3. Case Study 3: Inter Household Variability at the Qiaotou Site

The third case investigated variability in pottery function between residential units at the Qiaotou site to assess whether differences in cooking practices might reflect emerging social differentiation or specialized household roles. A total of 126 vessels were analyzed across four identified residential units.

Notable variation across households was observed. Unit A showed a high concentration of boiling vessels, suggesting a primary role in food processing. Unit B was dominated by storage vessels, potentially indicating surplus management. Unit C contained an unusually high number of serving vessels, possibly related to hosting gatherings. Unit D displayed a mixed assemblage with no clear functional specialization [4].

Table 3 compares the functional composition across four residential units at the Qiaotou site.

Table 3. Inter Household Variability at the Qiaotou Site

Unit	Boiling	Storage	Serving	Other	Total	Dominant Function
Unit A	18	6	5	3	32	Boiling (56.3%)
Unit B	9	15	4	4	32	Storage (46.9%)
Unit C	12	5	14	2	33	Serving (42.4%)
Unit D	8	7	6	8	29	Mixed (27.6% each)
Total	47	33	29	17	126	

This variability suggests that households at Qiaotou may have engaged in differentiated economic or social roles. The pattern is consistent with emerging community complexity where households are not identical but contribute differently to collective life.

4.4. Discussion

The findings reveal several important patterns. Boiling vessels dominate all assemblages, indicating that boiling and stewing were central to daily food preparation in the Shangshan Culture. This cooking method was likely essential for processing rice and acorns into digestible meals.

The spatial concentration of cooking activities at Huxi suggests organized domestic spaces with designated cooking zones separate from storage and communal areas [1]. This organization implies that domestic activities were structured by shared community norms rather than left to individual household discretion.

Inter-household variability at Qiaotou may indicate emerging differences in economic roles or social status. Some households appear to have specialized in food processing, others in surplus storage, and still others in hosting or communal consumption activities. While these differences do not necessarily indicate full social stratification, they are consistent with the early stages of social differentiation within a relatively egalitarian framework.

Table 4 synthesizes key findings across all three case studies.

Table 4. Summary of Key Findings

Case Study	Site	Sample Size	Primary Finding	Social Implication
Case Study 1	Shangshan	122 vessels	Boiling vessels dominant (38.5%)	Cooking central to subsistence economy
Case Study 2	Huxi	168 vessels	Spatial segregation of activity zones	Organized domestic spaces with communal areas
Case Study 3	Qiaotou	126 vessels	Inter household functional variability	Potential emerging economic specialization
Overall	All Sites	416 vessels	Cooking practices reflect and shape settlement organization	Pottery function serves as useful proxy for social structure

These findings demonstrate that functional analysis of pottery can provide meaningful insights into the social organization of early Neolithic communities. While limitations remain in specifying the exact social meanings behind the observed patterns, the consistent relationships between cooking practices and settlement organization suggest that daily domestic activities were intimately connected to broader social structures in the Shangshan Culture [11].

5. Conclusion

This study reinterpreted the relationship between pottery function and social organization in the Shangshan Culture through three case studies examining vessel morphology, spatial distribution, and inter-household variability.

The findings demonstrate that functional analysis of pottery can reveal meaningful patterns of early Neolithic social organization. Boiling vessels dominated all assemblages, indicating this cooking method was central to daily subsistence. Spatial segregation of cooking, storage, and consumption areas at Huxi revealed organized domestic spaces with community-level planning. Inter-household variability at Qiaotou suggested potential emerging differences in economic roles among residential units.

These findings highlight that cooking practices were intimately connected to settlement structure in the Shangshan Culture. However, limitations remain. Sample sizes are modest, and the specific social meanings behind household variability are ambiguous. Differences could reflect household size or individual preferences rather than social differentiation.

Future research should expand sample sizes, integrate more residue analysis, and conduct comparative studies with contemporaneous cultures. This study contributes to bridging material culture analysis and social theory, demonstrating how daily practices like cooking can illuminate early social complexity in Neolithic China.

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