Where It Goes? Social Complexity and Political Economy in the Middle Bronze Age, Central-western Korea

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The processes and mechanisms of change in prehistoric social organizations are explored in archaeology. At the heart of the exploration are studies on the emergence of a regional-level complex social organization and political economy. The transition from the Early to Middle Bronze Age in central-western Korea witnessed social complexity and the utilization of intensive rice-agricultural technology known as wet-rice farming. These two socioeconomic phenomena seem to have led to the first formation of a regional-scale political economy in Korean prehistory.

I reconstruct a Middle Bronze Age sociopolitical organization based on regional settlement pattern data and suggest and compare two regional polities, each of which had a three-tiered settlement hierarchy and a substantial concentration of population in their centers within the research area of central-western Korea. Although these two polities mark an organizational similarity and geographical proximity, they show dissimilarity in their patterns of production and distribution of wet-rice. This difference is attributable to differing politico-economic interests of the elite who resided at the centers of the polities. That is, the elite of each polity had different strategies (one for tribute collection, the other for the direct management of agricultural production), but the same goal (funding their newly arising sociopolitical institutions) for sustaining the systems of political economy.

Keywords: Middle Bronze Age, central-western Korea, political economy, social complexity, rice-agricultural intensification

I. Introduction

A social organization is defined as any institution in a society, which works to

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socialize its members, and common examples include education, governments, families, economic systems, religions, and any people or groups that they have social interactions with. It is a major sphere of social life organized to meet some human needs. It has been mainly studied by various social science disciplines, including archaeology, which is concerned with past human societies.

In archaeology, comparisons of temporal and spatial dimensions have been an important path to understanding how and sometimes why social organizations change and/or vary through the periods and regions. In this light, it is not surprising that the processes and mechanisms of change in social organizations have long been pursued in archaeological studies (Drennan 1996). The emergence of complex social organizations and their related political and economic changes are the most important part of the studies. A complex social organization implies the existence of an inherent social inequality and regional organization controlled by the sociopolitical elite, and a differentiation of local communities in function and size. Finding these phenomena in specific societies, we designate them complex societies.

Although social complexity in the real world can be a continuous process, it is a stepwise change as long as we can identify it in archaeological records. In order to explore any dynamic aspect in this stepwise change, archaeologists have usually chosen diachronic approaches and cross-cultural comparisons that focus on how the complex social organization was developed in relation to other social dimensions, for example, productive intensification, population growth, long-distance exchange, and military campaign.

Among the various social dimensions, agricultural intensification is the most frequently highlighted by archaeologists, because not only were most ancient complex societies agrarian, but also the agricultural product was one of the most important economic resources in pre-Industrial Revolution societies. Therefore, agricultural intensification accompanied with social complexity naturally led to the formation of a regional-scale political economy, which aimed to finance newly established sociopolitical institutions.

In the same theoretical and methodological strain, I explore the social complexity of the Middle Bronze Age (hereafter, MBA), in central-western Korea, that is, how the development of social complexity was related to some social dimension, especially agricultural intensification. The transition from the Early Bronze Age (hereafter, EBA) to the MBA in this area marks the initial emergence of a complex social organization and wet-rice production as an intensive form of rice farming. Therefore, the specific case of the MBA in

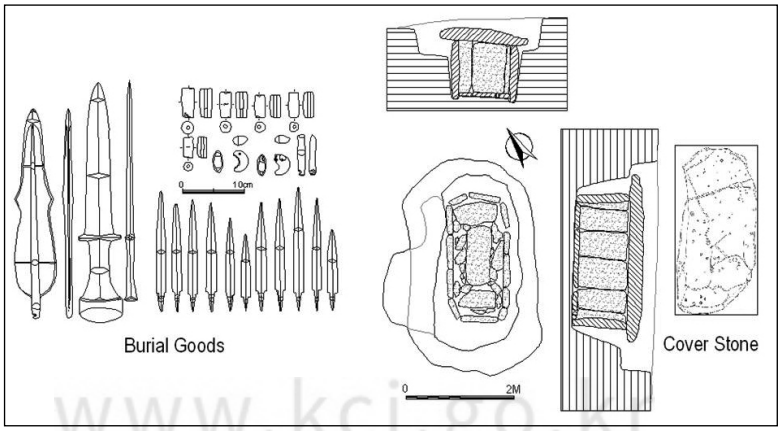
central-western Korea can provide a chance to explore the formation of a political economy in the context of an "emergent complexity" (Arnold 1996).

Relevant information has been generated by reconstructing a MBA regional settlement system based on surface survey and excavation data, analyzing the spatial correlation between regional settlement hierarchies and differences in the abundance of rice soils, the necessity of cooperative water management, and easy accessibility to the important junction of ancient transportation routes.

II. Archaeological Reconstruction of the MBA in Central-western Korea

The region of central-western Korea has been defined differently by researchers. However, when we discuss MBA socioeconomic patterns that are archaeologically reconstructed, many archaeologists place Chungnam Province in the center of it. One of the reasons that the region has been of more concern than any other region is because the southern part of Chungnam Province was thought to be the first region where Songgukri culture, equivalent to MBA material culture in the central and southern part of the Korean Peninsula, first emerged. In the region, archaeologists have recognized the MBA through identifying the emergence and spread of Songgukri-type assemblages. These assemblages are constituted of various kinds of archaeological indicators, such as Songgukri-type dwellings, Songgukri-type pottery, Songgukri-type tombs (stone slab tombs and urns), and some stone tools like triangular ripping knives, grooved stones, and arrowheads.

Figure 1 Tomb No. 1 of the Songgukri Site and its Burial Goods



Investigation of the assemblages was initiated by the accidental discovery of a stone slab tomb with a Liaoning-type bronze dagger (Figure 1) and a couple of seasons' succeeding excavations near the tomb at Songgukri, Buyeo, in the late 1970s. During the three ensuing decades, there were further discoveries of more sites with similar assemblages and continued analysis of individual artifacts aimed mostly at establishing chronology and spatial patterning of the sites at various scales. Most Korean archaeologists finally reached a substantial consensus that the Songgukri-type assemblage represented MBA culture from central-western Korea southwards. The assemblage, as a polythetic grouping, has been observed with considerable coherence in a vast area including Chungnam, Chungbuk, Jeonbuk, Jeonnam, and Gyoungnam provinces (Figure 2).

Moreover, large-scale excavations, as part of cultural resource management (CRM) projects, have exposed whole settlements sometimes enclosed by palisades, moats, and ditches, and with adjacent actual paddy fields. Technical advances in excavation and analytic methodology have identified considerable direct and indirect evidence of a developed system of wet-rice cultivation. This has led Korean archaeologists to pay close attention to the relationship between the emergence and spread of Songgukri-type assemblages and socioeconomic changes in the MBA, which resulted in the emergence of big settlements with defensive features. They have stressed the role of wet-rice cultivation in these sociocultural changes.

Much of the research initiated by this attention has concentrated on central-western Korea, attempting to explain the more or less remarkable dissimilarity between EBA and MBA material cultures, and the apparent separation of their regional settlement distributions (Figure 3). There is much disagreement among scholars, but they can be categorized largely into two groups. One group sees an influx of new culture accompanied by substantial immigration, emphasizing the dissimilarity and separateness between EBA and MBA material culture and settlement patterns. However, this group has not, so far, found the donor region or culture from which the Songgukri culture originated, nor have they suggested any push or pull factor for the sociocultural changes.

The other group of researchers suggests an indigenous evolution of the socioeconomic system and invention of material culture, finding some stylistic links between EBA and MBA assemblages in central-western Korea (Kim 2003). The scholars of this group make enthusiastic efforts to connect the sociocultural changes to the replacement of material culture along with the initiation and prevalence of wet-rice cultivation as an intensive form of rice

Figure 2 Distribution of Songgukri-type Sites in South Korea.

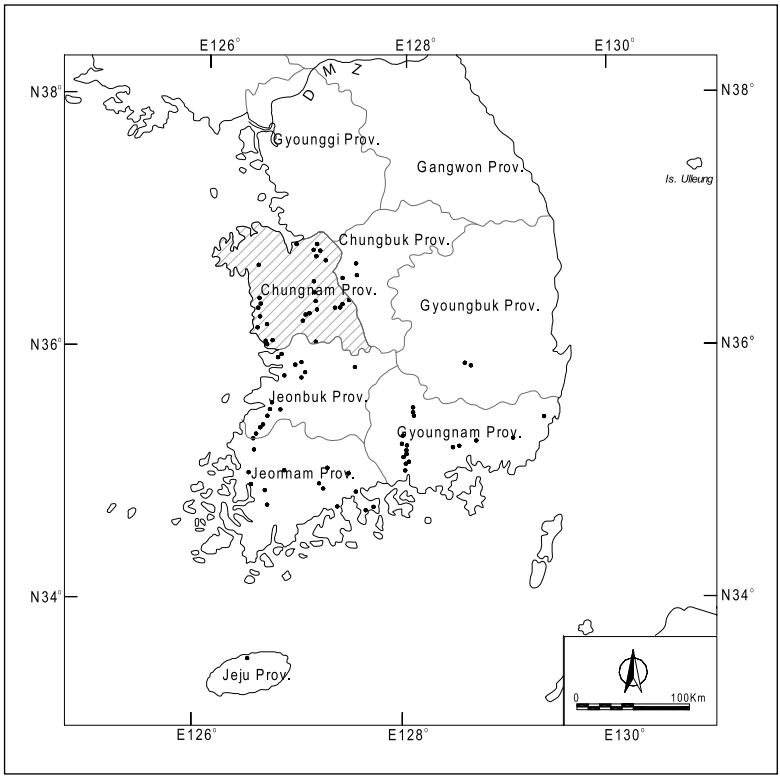
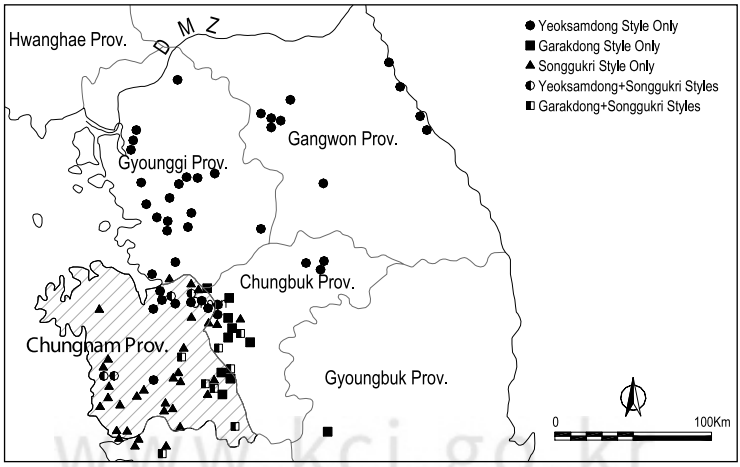


Figure 3 Distribution of EBA and MBA Sites in Central-western Korea.



production. These efforts include establishing an intermediate cultural stage or assemblage between the EBA and MBA, the so-called pre-Songgukri-type (An 1992), and suggesting that local population growth resulted in a food-population imbalance, overexploitation of soil productivity and deterioration of sustained yields, and local population movement into land suitable for wet-rice cultivation (Kim 2003). However, these attempts have had only limited success because they remain very hypothetical, not based on any substantial collection and analysis of data.

In spite of this clear disagreement about the process relevant to the formation of Songgukri culture, most researchers show substantial accordance in evaluating the nature and importance of the socioeconomic changes in the transition from the EBA to the MBA

III. Understanding the Political Economy and Social Complexity in Korean Prehistory: Theoretical Considerations

Early understanding of social complexity in Korean prehistory was based on the studies of dolmens. Dolmens, as megalithic burials, are prevalent in Korean Bronze Age landscapes, and in addition to metallurgy, have been pointed to as evidence of the emergence of social complexity (Barnes 1993; Choi 1984), based on the quite impressionistic and simple inference that metallurgy and building megalithic tombs might have needed esoteric knowledge and leadership for the organization of labor pooling (Choi 1984; Lee 1980). Dolmens were taken to be elite tombs, the largest of which would have required the expenditure of considerable amounts of energy (Choi 1984; Lee 1980). The association of monumental tombs, elite bronze artifacts, and rice cultivation is assumed from an adaptationalist, or functionalist, perspective to indicate managerial leadership (Brumfiel and Earle 1987) engaged in coordinating the pooling of labor for the construction and maintenance of paddy fields and irrigation systems (Choi 1984). Not all scholars, however, find this reconstruction adequately supported by the evidence.

Some critics argue against the notion that the dolmens were elite tombs whose monumentality required a level of energy expenditure adequate to indicate institutionalized inequality during the EBA despite the lack of differentiation in burial goods (Kang 1992; cf. Tainter 1977). This latter interpretation is also supported by the fact that such characteristics of emerging

complexity as the aggregation of the population and the differentiation within settlements are rarely seen (Kim 2001). Nevertheless, the monumentality of EBA sites cannot be entirely ignored in the discussion of sociopolitical development during the MBA because it might have been the initial foundation for labor pooling at the supra-village level or of the ideological materialization invested in by elites-to-be during the MBA (Earle 1991b; Nelson 1999).

Recently, a couple of studies suggest the possibility of social complexity emerging in the EBA, looking at some tombs with stone daggers, which might have imitated Liaoning-type bronze daggers and played a role as prestige goods in Korea (Bae 2007), unequal access to the enviable location, and differences in the dwelling size in EBA settlements (Lee 2009). Even in tribal societies in transition to an incipient complex society, we can find dynamics relevant to enhancing social complexity, but solid patterns are not observed at the regional-level or simultaneously in multiple social dimensions. In this light, these studies are likely to be just looking at the germinating processes to reach real social complexity. A more apparent sign of a regional-scale complex social organization can be recognized in the transition from the EBA to the MBA.

1. Overview of the Socioeconomic Changes in the Transition from the EBA to the MBA

As recent research reveals, the formation and spread of a new archaeological culture identifiable with Songgukri-type assemblages was accompanied by several kinds of socioeconomic changes, such as the drastic increase in the number and size of habitations and the emergence of large settlements functioning as central places; change in the internal structure of settlements (Kim 2006a; Kwon 1997); the emergence of an intracommunity wealth/status variability (Kim 2006a); development of defensive works enclosing residential areas of villages and the abandonment of houses with abrupt burning (Song 1995); intercommunity functional differentiation (Kim 2005); and mortuary differentiation within and between groups and the emergence of burials with elaborate and uncommon grave goods conceived to belong to the chiefs; structuration in burial placement (Kim 2004); and the emergence of communal storing facilities (J. S. Kim 2008).

In addition, the intensification of rice agriculture has been considered closely related to these phenomena (Kim 2006b, 2006c). In fact, a growing body of data indicates not only increasing nutritional dependency on rice at the transition

from the EBA to the MBA but also the beginning of wet-rice cultivation in central-western Korea during the MBA. Not only are carbonized rice, rice phytoliths, and rice pollen more frequently identified in MBA residential areas than EBA ones (An 1999), actual paddy field plots and related facilities, such as ditches and reservoir ponds, have been excavated as well.

Synthesizing the phenomena mentioned above, researchers are willing to conclude that MBA society in central-western Korea entered into a complex society which utilized intensive technology of rice production. However, just a few studies were concerned with how the development of a complex social organization and agricultural intensification were related to each other, whether the relational patterns were homogeneous or not in the entire region of central-western Korea, and how rice agricultural intensification contributed to generating variation, if there were differences in the relational patterns (Kim 2006b; Kim 2003).

2. Understanding the Politico-economic Aspect of Wet-Rice in the MBA, Central-western Korea

Since economy is defined as a series of activities and a social system of production, exchange, distribution, and consumption of goods and services to meet a human's needs, searching for and obtaining food resources could be the most important economic activity. Thus, an issue of subsistence patterns should be introduced into the studies of prehistoric economies. However, economy includes a much broader spectrum of more complex activities even in prehistory and some goods are related to two or more kinds of activities and changes through time.

Some food resources that met the basic nutritional needs of members in hunter-gatherer groups could have shifted into an important resource to finance sociopolitical institutions in a complex society. In Korean history, rice was that kind of resource. In pre-modern Korean societies, rice was not only the most important major crop, but also very important media for tribute and salary, although the first rice might not have been so. Bronze Age food resources seem to have been obscured through crop-cultivation, animal domestication, hunting, fishing, and gathering. However, we don't know enough about how contributable specific species were since there is a lack of raw data and reliable analytical methodology.

Nevertheless, it is clear that the only species produced by intensive technology

was rice. The definition of agricultural intensification that is broadly accepted is "increment of product per unit" (Morrison 1994). But it cannot be archaeologically identified without an archaeological indicator representing utilization of intensive technology: determination of large earth work type constructions such as irrigation ditches or field boundaries, the identification of plow marks, or the identification of manuring, to name just a few (Kelertas 1997).

Rice is by nature a swamp plant and continuously higher levels of productivity can be obtained from wet-rice cultivation, although some dry varieties can be grown on steep hillsides through shifting cultivation (An 1999; Bray 1986). Therefore, wet-rice cultivation can be an intensive form of rice production. In the context of the MBA in central-western Korea, initiation (or at least drastic spread) of wet-rice cultivation can be evidenced through reliable archaeological records. It is likely that rice agricultural intensification seems to have been the most salient economic change during the period of the Songgukri culture.

As discussed above, the economy seems to have been closely related to important sociopolitical changes. However, wet-rice cultivation of the period has been ironically explored from the viewpoint of a subsistence economy. I suggest that it is necessary to look at wet-rice cultivation from the viewpoint of political economy, for a full understanding on the dynamics in which rice agricultural intensification and other sociopolitical changes are closely related to each other.

Political economy can be distinguished from a subsistence economy in several ways (Johnson and Earle 1987). On the one hand, a subsistence economy aims to meet family members' or household members' basic nutritional needs, and therefore it is conservative and stable. That is, it is not pursuing an aggressive enhancement of productivity without any external impetus or change in the family or household size. On the other hand, a political economy attempts to produce a surplus. Where does the surplus go? It would be mobilized by the elite who are willing to finance his/her sociopolitical institutions, and is thus ceaselessly growth-oriented and unstable.

Agricultural intensification is one of the most appealing ways for the elite to enhance their political power because (1) it provides a reliable source of surplus, enabling leaders to fund new political institutions (Gilman 1981); (2) it creates a fixed and easily controlled capital-improvement of agricultural systems despite the requirement of a high initial investment (Gilman 1981); (3) it ties people to the land (Drennan 1988); and (4) the protection of these facilities against other groups promote social solidarity (Hastorf 1990).

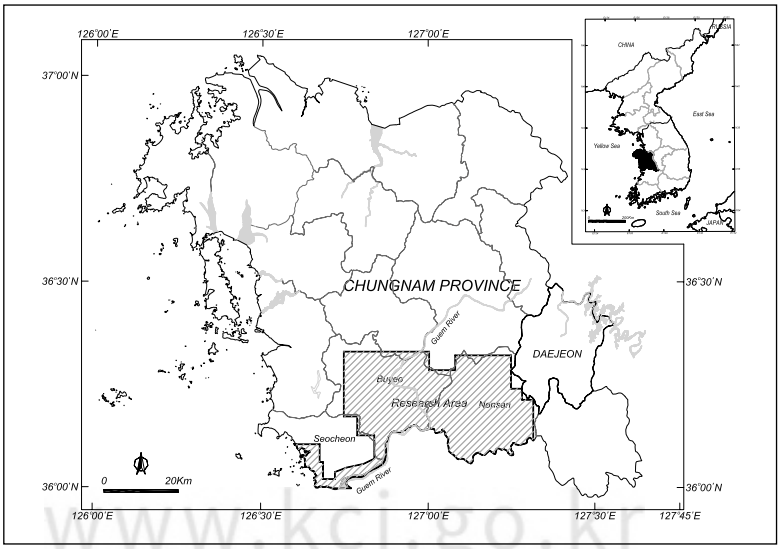
IV. Reconstructing a MBA Social Organization in Central-western Korea based on Regional Settlement Patterns

Where complex societies are concerned, archaeological reconstruction of a social organization has depended heavily on analyzing regional settlement patterns through a regional settlement system. We can understand its development through a regional approach in which all constituent social entities at different levels are vertically and horizontally related and thus some changes generated at any level can influence the others (Bermann 1994). This approach leads us to look, for example, in and outside regional-level social entities when regional-scale phenomena are at issue.

(1) Reconstructing a MBA Regional Settlement System

Using settlement data from the actual research area, which covers 1208 km^2 and is located in the heart of Songgukri culture, and includes Buyeo, Nonsan, and part of Seocheon, Chungnam Province (Figure 4), I reconstruct the regional settlement system. The system is constituted of fifty small-scale and locally-oriented communities—operationalized analytical units in this study—forty-four of which could be grouped into three polities (Polities A, B and C; Figure 5;

Figure 4 Location of the Actual Research Area



Kim 2005). Delineating the communities and polities based on the distributional patterns of seventy-nine spatially discrete locales representing MBA sites follows the approach suggested by Peterson and Drennan (2005), finding that their theoretical premise, analytical procedure, and examples of empirical data—especially Hongshan, China—which the method was applied to and/or generated from, are compatible with this study's data set (Kim 2005).

Comparing the three polities to each other with histograms of area and rank-size graphs also shows both similarities and dissimilarities. With reference to rank-size patterns, Polities B and C look essentially log-normal with quite low coefficient A values (Drennan and Peterson 2004). Both polities represent a three-tiered hierarchical settlement system. The first-tier communities in the histograms of area can be taken as primary centers for political and economic decision making within the higher-order communities. In the same vein, the second-tier group of communities can be designated as secondary centers, and the third-tier group of communities as rural villages (Figure 6). This kind of three-tiered hierarchical system has been broadly identified in societies at the incipient stage of social complexity.

On the other hand, the rank-size graph of Polity A, even after the partitioning, indicates a very convex pattern with a substantial statistical significance ($A = 0.503$, $p = 0.001$). The clearly dichotomized double-peak pattern shown in the histograms of area and spatial distribution of large

Figure 5 3 MBA Polities and 50 MBA Communities in the Actual Research Area

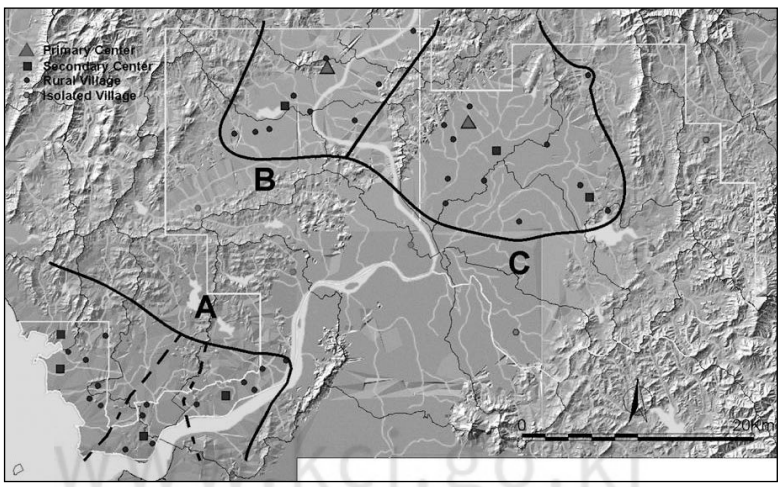
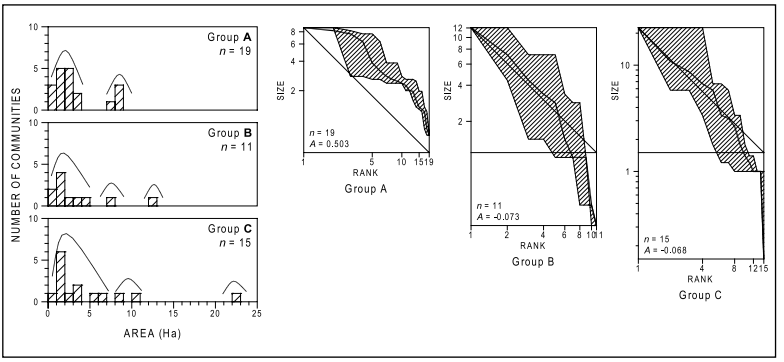


Figure 6 Histograms and Rank-size Graphs for the Three Polities



communities makes it clear that Polity A lacks centralization, unlike Polities B and C. Of course, some explanation could be possible for the dissimilarity between Polity A and the others. However, an explanation of this kind is beyond this paper's main concern. Thus, I will perform no further analysis or interpretation about Polity A's pattern.

V. Differing Relationship between Social Entities with Reference to Production and Distribution of Wet-Rice

I suggest that the similar structures of Polities B and C, each of which had a three-tiered settlement hierarchy and substantial concentration of population in a single primary center, can be identified: both are located on similar environmental settings and show a geographical proximity. However, from now on I will present how they are different in production and distribution of wet-rice, a byproduct of utilizing intensive technology, despite their similarity and proximity.

The differences are explored in terms of how the hierarchical aspects of settlement patterns and interpolity and/or intrapolity variation in production and distribution of wet-rice are related. The variation in production and distribution of wet-rice is reconstructed on the basis of analyzing interpolity and/or intrapolity soil-suitability for wet-rice cultivation, the necessity of cooperative water management, and the easy accessibility to surplus collection.

1. Settlement System with Reference to Soil-Suitability for Wet-Rice Cultivation

(1) Defining Analysis Area

The area to be analyzed around each community in regard to the distribution of soils suitable for wet-rice cultivation is a function of the distance which farmers are willing to travel to cultivate the land. It is designated here as the analysis area, and is largely compatible with the well-known concept of a site catchment area. That is, the area is defined by a specific radius from the individual settlements (or sites). However, the catchment area that matters here explicitly departs, in some respect, from Vita-Finzi and Higgs' seminal work (1970) and other works inspired by it. First, this study focuses on a specific crop, wet-rice, and suitable land for its production, rather than reconstructing the overall productivity potential within each MBA community's analysis area. Second, this study takes a much smaller analysis area than Vita-Finzi and Higgs did. In fact, reducing the radius of the catchment area has previously been urged in the context of highly sedentary agriculturalist complex societies (Steponaitis 1981). Since ethnographical research suggests "the costs of movement become sufficiently great to warrant" limiting intensive cultivation to a distance no more than one kilometer from dwellings without the assistance of modern technology of transportation (Chisholm 1968:131; Kim 2006b), this study defines a specific community's analysis area as the area within a one km radius from its constituent individual settlement(s). When the community at issue is a single settlement, a single circle, with its center at the community's center, is the analysis area without any modification. However, a multi-settlement community needs special treatment in order not to double count the areas of overlap of multiple circles drawn from the centers of individual settlements. The overlapped parts of analysis areas are performed in practice by creating buffer zones from the centers of individual sites and dividing overlapped areas by Thiessen polygon lines. Then individual communities' analysis areas are redelineated and recalculated.

(2) Intercommunity and Interpolity Variations in the Suitability for Wet-Rice Cultivation

The total amount and the proportion of soils suitable for wet-rice cultivation

within each analysis area can be easily measured and calculated using digitized soil maps at the scale of 1:25,000 and recommendations for land use that will produce the highest yields from the categories of soils, which were provided by Korea's National Institute of Agricultural Science and Technology.

The area of wet-rice soils assigned to individual communities varies and so does its proportion of analysis area. However, the variety, as a whole, seems not to be simply related to the hierarchical aspects of regional settlement patterns. The community area and area (or proportion) of wet-rice soils do not show any strong linear relationship.

However, the variations in wet-rice soil productivity at the level of the individual polity represent quite different patterns. For Polity B, no direct proportional relationship between the community size (Y) and the area of paddy soils (X) could be found (Figure 7; $r = 0.282$, $Y = 0.017X + 1.629$, $p = 0.400$). Sociopolitical centers are not systematically located in areas with higher productivity than rural villages. The primary center ranks below the average in both actual area and proportion of paddy soils. However, another look at the scatter plot reveals a direct proportional relationship between these measurements for rural villages. In fact, as indicated by regression analysis on the patterns of the rural villages, there is a strong and significant correlation between the two variables, community size and area of wet-rice soils ($r = 0.909$, $Y =$

Figure 7 Scatter-Plot of Community Area vs. Area of Wet-Rice Soils (Polity B). The best-fit lines: dotted line is for all communities, while the solid one with its 95% confidence region is for rural villages alone.

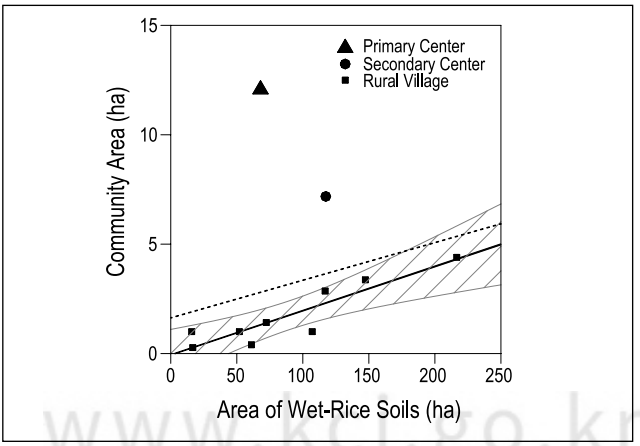
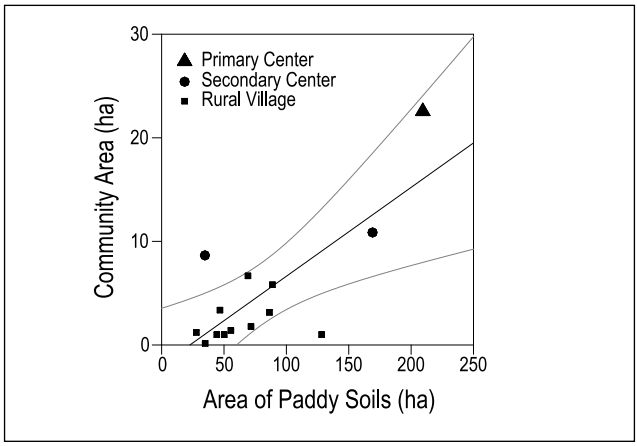


Figure 8 Scatter-Plot of Community Area vs. Area of Paddy Soils (Polity C). The best-fit line with its 95% confidence region.



0.02X—0.602, p = 0.001). Thus, for the Polity B rural villages, more populous villages were formed at locales with more cultivable lands. Neither the primary nor the secondary center follows this trend; both fall far from the best-fit lines.

For Polity C, there is, in statistical terms, a moderately strong and significant correlation between both variables (r = 0.768, Y = 0.086X—1.944, p = 0.001). Thus, we can have substantial statistical confidence that bigger communities centrally located within the polity—especially the primary centers—were located in pursuit of greater amounts of land suitable for wet-rice cultivation (Figure 8). On the other hand, for Polity C, the relationship between the two variables is less statistically significant when looked at just within the group of rural villages, especially since the primary center not only has the biggest analysis area, but also the largest amount of wet-rice land and the second highest proportion of wet-rice land.

2. Settlement Patterns with Reference to Water Management

Water management includes three categories of activities: drainage, flood control, and irrigation. For irrigation, whether supra-household level cooperation and centralized coordination of labor pooling is needed or not depends entirely on the size of the streams exploited by households or communities as a water resource. Drainage necessary for large-scale terracing to build paddy fields on a

flood plain and flood control in an area near big streams inherently require much bigger-scale cooperation and labor pooling (Bray 1986).

Although all three dimensions of water management are closely related to each other, the former two are tightly connected because both are strongly influenced by the same stream activity, flooding; thus the elevation of the flood plain directly reflects the area subject to inundation (Kwon 1986).

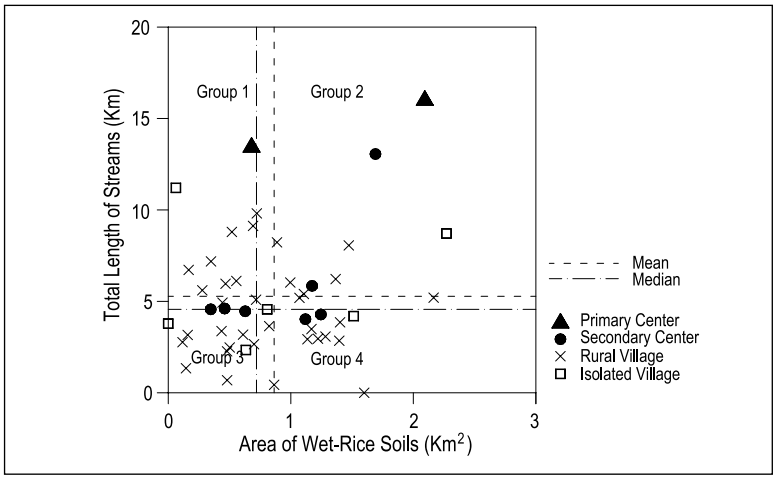
In this light, the necessity for cooperation beyond a household's capacity in the two dimensions of water management can be assessed by the same analysis, and are not required if the settlements and cultivated fields are high enough to avoid the risk of flooding. Geographical research in Buyeo suggests that the elevation of inundation is 5 m above sea level, on the basis of analysis of the elevation and distribution of flood plains recorded in maps made in 1925, which reflect the landscape prior to its massive transformation since the 1970s (Kwon 1986). Although there would be some variation through other parts of the research area, the elevation of inundation is not likely to exceed at most 10 m above sea level. The individual MBA settlements in the research area seem completely free from the risk of inundation. Even their analysis areas are rarely included within the zone below 10 m in elevation.

It can be largely concluded that MBA communities in the research area did not need supra-household level cooperation and centralized coordination of labor pooling for drainage and flood control. No primary or secondary center in any of the polities has any part of its analysis area below 10 m. Instead, it is only a few small rural villages' potential cultivation fields that might have been exposed to the risk of flooding. However, while the inundation level used here is almost certainly an overestimate, the Geum River shows less likelihood of inundation than any other major river, so even those small rural villages might really have faced very little risk of flooding.

The necessity for a supra-household level cooperation and centralized coordination of labor pooling for initiating and maintaining irrigation systems takes quite a different approach from evaluating cooperative water management. The necessity for cooperative irrigation is a function of how adequate lower-order streams drain and water wet-rice land within the analysis areas, because small-scale irrigation that depends on lower-order streams does not necessarily require labor pooling. The excavated paddy fields were usually irrigated with small streams originating in the upper parts of small gullies.

Small streams for purposes of this study are defined as first- and second-order ones marked on topographic maps at a scale of 1:25,000. With reference to

Figure 9 Relationships between Total Length of Small Streams and the Area of Wet-Rice Soils



the total length of small streams and their density, the fifty individual communities represent noticeable variety. However, there is no simple, direct, or reciprocal relation between either variable and area of community or analysis area. The complicated relations are unlikely to give simple support to the necessity of short-term massive input of labor. In fact, within some primary and secondary centers' analysis areas, small streams are well developed.

Considering irrigation for watering the potential paddy fields, further analysis on intra- and inter-community variation in the development of small streams in relation to soil suitability will make this clearer. A schematized explanation helps enhance the resolution of our understanding. The scatter plot area is divided into quadrants with lines representing the mean or median of each variable (Figure 9). The communities that belong to Groups 1, 2, and 4 do not need to exploit risky, big streams or engage in cooperative irrigation, but these practices are needed by the communities in Group 3. However, all central communities that fall under Group 3 belong to Polity A, which witnesses less regional-scale centralization than the other two polities do.

3. Settlement Patterns with Reference to Surplus Flow

If a specific community's locational preference depends on taking advantage of access to the flow of rice surplus, it should be located near the important

junctions of transportation routes. After georeferencing and rectifying the historical map, Daedongyeo jido, I reconstruct the ancient route system with real coordinates in the research area.

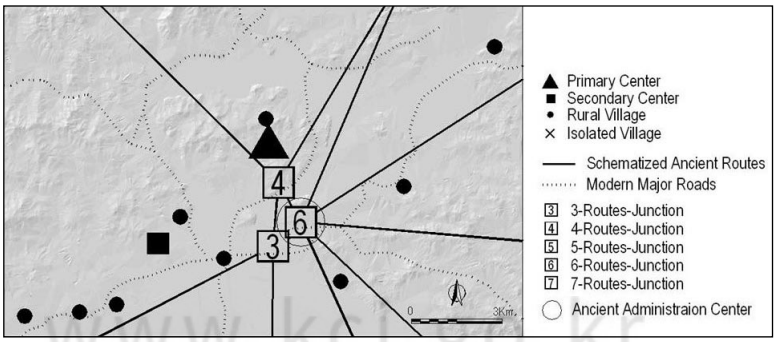
Surplus flow, or more specifically, tribute collection centering on wet-rice, the interest of this study, is basically an intra-polity affair. Thus this study analyzes the transportation networks within each of the polities, focusing on what the intra-polity route network patterns look like and where their centers are located.

Polity B's transportation network system is a radial shape, with major routes passing through all its constituent communities' vicinities and concentrating on a junction at which six routes join (Figure 10). That shape is frequently observed in imperial route systems so that all material and information can be efficiently delivered to capital cities. The primary center of Polity B is located quite near this major junction, a distance of 2.7 km, which can be covered in about thirty minutes of walking. Moreover, Polity B is located in a substantially mountainous zone, so there is not much possibility of alternative paths, and another look reveals that the main junction might have connected even more than six routes. These observations strengthen the argument for the importance of the junction of transportation networks in the center's location, and consequently for the importance of accessibility to tribute collection.

A noticeable similarity with patterns suggested by the tribute-flow model that was applied in the Formative of the Valley of Mexico (Steponaitis 1981:344; Figure 11) can give us a better understanding of the characteristics of Polity B's transportation networks with reference to surplus flow.

Compared to Polity B's transportation networks, Polity C's can be characterized by a well-developed junction system. Although the centers,

Figure 10 Reconstructed Transportation Networks of Polity B



including the primary center, are located in the vicinity of major junctions, there are other equivalents or even more important junctions in the overall transportation network that reach all constituent communities (Figure 12). Therefore, Polity C's centers do not dominate the transportation networks to the extent that Polity B's primary center does. Each polity represents a different

Figure 11 Comparison between Polity B and the Late Formative Periods, the Valley of Mexico

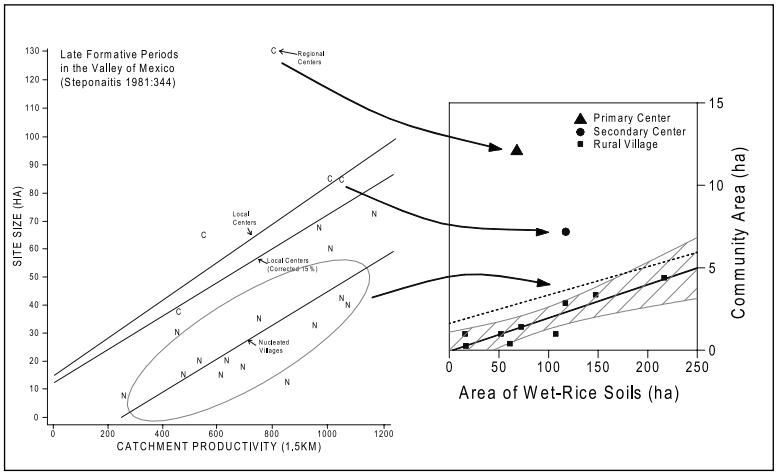
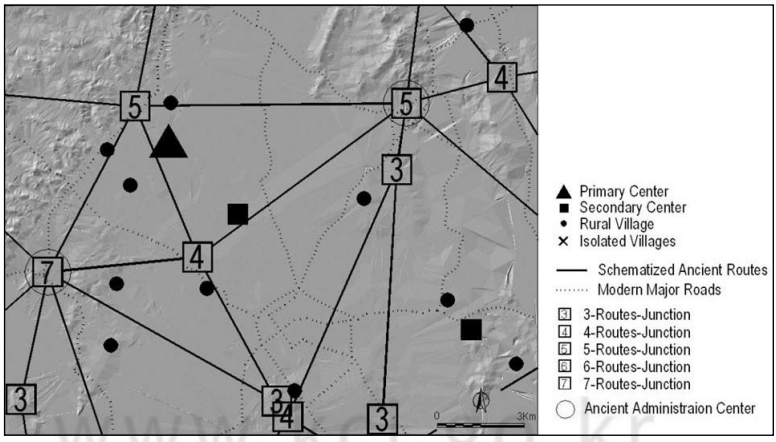


Figure 12 Reconstructed Transportation Networks of Polity C



transportation network and a pattern of the centers' accessibility to important junctions. This could reflect differences in the centers' locational and simultaneously socioeconomic preferences, at least, in regard to tribute collection. The primary center of Polity B might well have taken advantage of accessibility to tribute collection, and Polity C's centers show moderate advantages for such an activity.

VI. Discussion and Conclusion

Polities B and C show dissimilarity in patterns of production and distribution of wet-rice, although they have organizational similarity and geographical proximity. Polity B's primary center where the sociopolitical elite seems to have resided might have preferred a location remarkably advantageous for surplus collection rather than for direct production of surplus. On the other hand, while it is unlikely that Polity C's primary center even pursued surplus collection, its locational preference might have been agricultural productivity. This is likely to mean that the elite residing at Polity C's primary center more eagerly participated in the direct management of agricultural production.

Despite different strategies in which the elite had agricultural surplus generated, both polities' elite focused on collecting surplus. That is, they might have had different strategies (one for tribute collection, the other for direct management of agricultural production), but the same goal (funding their newly arising sociopolitical institutions) in sustaining the systems of political economy.

Here, one thing should be asked: why did Polity B's elite neglect direct management of agricultural production, or what could be an alternative for neglecting direct management of agricultural production? We have long been aware that complex societies at the incipient stage or chiefly organizations lack real coercion in comparison to statehood societies, and thus, a more reliable way for the elite to generate surplus might have been direct management of agricultural production.

A close look at the transportation route system could also provide a possible answer. The routes to the northeast are very important ones to reach Gyeonggi Province, and the ones to the southwest are the most efficient ones to reach the coastal zone. This is likely to indicate that Polity B's elite attempted to control other socioeconomic activities, such as long-distance exchange, rather than direct management of agricultural production.

In fact, although many scholars place elite control over basic economic resources in a position of relative importance (Earle 1997), empirical data from various parts of the globe show that emerging chiefs could have depended on various sources of power (Earle 1991a).

On the other hand, even in Polity C's primary center might have been more intensively cultivated than any other community in the research area (Kim 2006b), I cannot find any sign of cooperative water management. This pattern is not compatible with the original "hydraulic hypothesis" (Wittforgel 1957) and its revisions (Adams and Jones 1981): construction of landesque capital necessary for intensive production often requires short-term massive input of labor. In this light, for a better understanding of MBA sociopolitical development and rice agricultural intensification in central-western Korea, I'd like to propose the opportunistic leadership strategy model in which elites just provide incentives to primary producers to intensify existing technology or they themselves engage in restricted agricultural intensification specifically aimed at producing surplus to fund the political economy (Stanish 1994), rather than managing agricultural production on a broad scale (B. C. Kim 2008).

Regional-level political economy in Korea's prehistory seems to have formed in the transition from the EBA to the MBA. I suggest the formation of political economies was remarkably dependent on the surplus of wet-rice produced by an intensive technology of rice production. However, the strategies for maintenance of a political system varied, and politico-economic interests of the elite who resided at the primary centers of the polities were different.

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