

THE ARCHAEOLOGY OF EARLY AGRICULTURE IN THE KOREAN PENINSULA: AN UPDATE ON RECENT DEVELOPMENTS

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ABSTRACT

This paper discusses early agriculture in Korea and introduces data gathered in the 1990s to consider the origins and development of agriculture in the Korean Peninsula and Japanese Archipelago. Rice and other cultivars were used by 3000 BC during the Chulmun period (6000-1500/1000 BC), but the circumstances of this use remain unclear. Research into the transition to large-scale agriculture from the Chulmun to Mumun periods (1500/1000-300 BC) is just beginning, but rice and millet cultivation were important from the Early Mumun (1000-600 BC). Large and complex settlements with wet- and dry-fields have been discovered at four sites across South Korea. With the increased use of archaeobotanical analysis, the stage is set to gain a greater understanding of the origins and development of agriculture in Northeast Asia.

The archaeology of early agriculture in the Korean Peninsula is a relatively new part of East Asian archaeology. Since the 1950s, archaeologists in the north and south have discovered a number of habitation sites with evidence of plant remains and cultivation. However, partly because of their visibility on the landscape, archaeologists have concentrated on the excavation of Three Kingdoms period (c. AD 300-668) mounded tombs and Mumun¹ Pottery period (c. 1500/1000 - 300 BC) burials such as megaliths and stone cist tombs. Also, the recovery of plant remains has been unsystematic and not linked to problem-oriented research. Scholars have published some tentative work related to cultivation in Korea (Im 1992; Nelson 1992, 1993; Norton 1997; Pearson 1977; Sim 1990:209s), but until the 1990s the evidence of actual cultivation was sparse and indirect, usually in the form of carbonized grain remains associated with the Chulmun

Pottery period (c. 6000 - 1500/1000 BC) or the Mumun period (Hwang 1984; Nelson 1992, 1993).

The South Korean economy entered a period of expansion in the 1990s that has resulted in massive infrastructure developments and construction projects. This economic activity continues to expose many habitation and agricultural sites which are investigated by university museums and public institutions on a salvage archaeology basis. Archaeologists once assumed that the great density of settlement since 500 BC had destroyed many Chulmun and Mumun period settlement sites. However, increasing numbers of large-scale agricultural fields from the Early Mumun period (c. 1000-600 BC) have been found along with large settlements in the 1990s.

This review paper discusses some of the evidence for prehistoric cultivation in the Korean Peninsula, some recent excavations in South Korea, and some of the implications for the prehistory of the Korean Peninsula and the Japanese Archipelago. I specifically update our knowledge of early agriculture within the context of the excavations of two sites in southeastern Korea. It is hoped that this paper will contribute to a wider understanding of the cultural circumstances of the beginnings of agriculture in the Korean Peninsula Mumun period and of the Japanese Jomon-Yayoi transition in northern Kyushu (c. 500-100 BC). All of the sites mentioned with evidence of cultivation or grains are indicated in Figure 1 and Table 1.

SMALL-SCALE CULTIVATION AND THE CHULMUN PERIOD

The economy of the Chulmun period is roughly similar to that of the Early and Middle Jomon periods in Japan (5000-2000 BC). People lived in permanent settlements, made pottery and stone tools, and practiced hunting, gathering and fishing. It was previously thought that Chulmun settlements were only found along the coasts or near the

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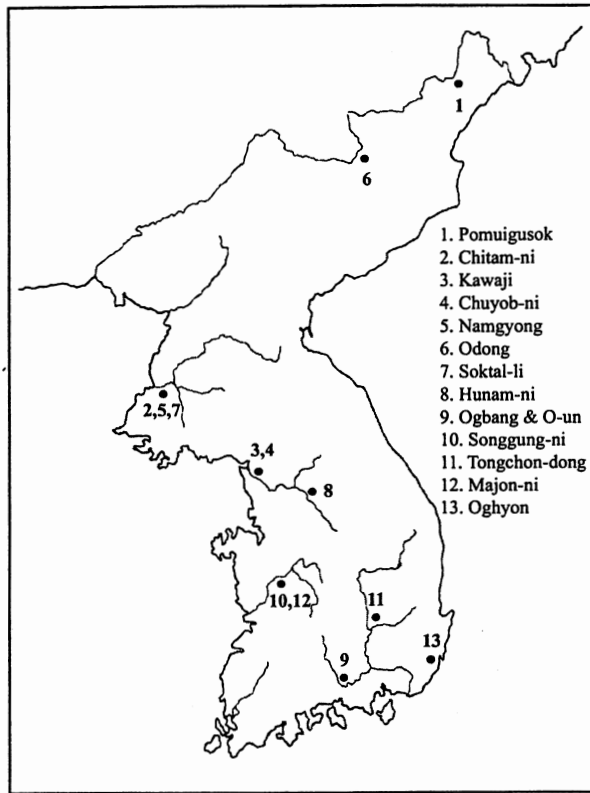


Figure 1: Locations of sites mentioned in the text.

mouths of major river deltas. However, settlements such as Sangch'on-ni Shinsoggi (Lee 1998), Ponggye-ri (DATP 1989) and Imbul-li (Ahn 1989) have increasingly been found in the southern interior of Korea along tributary rivers.

Some archaeologists think that small-scale cultivation or horticulture may have occurred during the Chulmun period (Crawford and Chen 1998:865; Nelson 1993:99). Most of the dating for the Chulmun period is accomplished by comparing pottery seriations with stratigraphy and a few radiocarbon dates. Non-Korean archaeologists sometimes do not have access to Korean data and are not able to use the Korean theory and methods literature in depth, and so the cross-dating methods remain somewhat mysterious in comparison to the practices in Japanese or Mesoamerican archaeology. Some of the dating for the Chulmun period sites seems less reliable than I would like to see, but for the time being we must consider the evidence as it is with common sense and a critical eye.

The earliest Chulmun sites associated with rice and other grains are close to the west coast of the Korean Peninsula, but it is unclear whether these finds represent domesticated cultivars or not. Crawford and Chen report that rice² phytoliths dated to 4400 BC were extracted from Chulmun pottery vessels recovered from the Chuyob-ni site on the lower Han River, Koyang City (Crawford and Chen 1998:862). They also relate that about 300 rice grains dated to 3000 BC were located in peat layers of the nearby Kawaji site (Crawford and Chen 1998:862).

Two sites near the west coast in the lower Taedong River area merit mentioning here. In the component of the Namgyong settlement site identified as Chulmun, several carbonized grains of an unknown cultivar were reported with stone querns from the rectangular Structure 31 (KPC 1984:22, 29). Both Hwang and Nelson indicate that a half litre of carbonized millet grains (*Panicum miliaceum*, *Setaria italica* ssp. *italica*, or wild *Echinochloa frumentacea*) was recovered from Chulmun vessels in Structure 2 of the Chitam-ni site on the Chaeryong River (Hwang 1984:95; Nelson 1993:99). This site is dated to about 3500 BC and also contained semi-lunar blades and querns.

At the Pomuigusok site in the far northeast, *Panicum miliaceum* (millet) and wild or domesticated sorghum grains were found in the rectangular

Table 1. Summary of sites mentioned in the text

SITE NAME	TIME PERIOD	CULTIVAR or FEATURE	SOURCE
1. Pomuigusok	Chulmun Period	millet, sorghum	Hwang 1984:95
2. Chitam-ni	c. 3500 B.C.	one or two kinds of millet	Hwang 1984:95; Nelson 1993:99
3. Kawaji	c. 3000 B.C.	rice grains	Crawford & Chen 1998:862
4. Chuyob-ni	c. 4400 B.C.	rice phytoliths	Crawford & Chen 1998:862
5. Namgyong	Chulmun Stratum	- unknown cultivar	KPC 1984:22,108
	Mumun Stratum	- rice, two kinds of millet, beans, sorghum	
6. Odong	Chulmun or Mumun?	two kinds of bean, millet	Hwang 1984:95
7. Soktal-li	c. 1000 B.C.	millet, beans	Hwang 1984:95
8. Hunam-ni	c. 1200 to 900 B.C.	rice, barley, millet, sorghum	Nelson 1992:182; 1993:115
9. Ogbang & O-un	c. 1000 to 600 B.C.	rice, millets, beans	Lee G.-A. 1999; Lee & Lee 1998
10. Songgung-ni	c. 800 to 600 B.C.	rice grains, rice impressions	KCP 1979:42-3,55; 1987:23
11. Tongchon-dong	Mumun Period	dry-field feature	YMMY 1999:107-9
12. Majon-ni	Middle Mumun Period	wet-field feature	Lee, K.-M. 1999
13. Oghyon	c. 700 to 600 B.C.	wet-field feature, rice grains	KNTP-MTP 1998; KNTP 1999

Structure 15 (Hwang 1984:65, 95). *Panicum miliaceum* grains, two kinds of beans including *Phaseolus angularis*, and hoe-shaped tools were recovered from the Odong settlement site (Hwang 1984:92,95). Hwang indicates that these sites range from 2500-2000 BC, which is considered to be the "Bronze Age" by some North Korean scholars (Hwang 1984:95).

These early dates for small-scale cultivation in the Korean Peninsula are not unreasonable when they are compared to estimates concerning the Middle Jomon period, although this issue remains a controversial topic in Jomon archaeology (Imamura 1996:101-09; Crawford and Chen 1998:863).

EARLY AGRICULTURE AND THE MUMUN PERIOD

The cultural and ecological reasons for the development of large-scale cultivation (or agriculture) are still unclear, but the following ideas have been presented. With the caveat that he is not making a case for environmental determinism, Pearson suggests that inland areas were used by early cultivators in Japan and Korea as a compromise between cultivated lowland resources and collected resources of forest slopes (Pearson 1977:1245). Norton hypothesizes that over-exploitation of marine resources in coastal areas by the small-scale cultivators of the Chulmun period may have caused them to move inland and find agriculturally-suitable areas (Norton 1997:301). Norton's (1997) hypothesis was proposed before the presence of interior Chulmun period settlements became well known, so the change in settlement patterns may have occurred in some areas before the Mumun period. Using an evolutionary framework, Nelson proposes that Mumun people began to gather in large cohesive groups because increases in agricultural production may have meant that production became unstable (Nelson 1992:179).

Whatever the possibilities, by 1000 BC settlements occur on hilltops, hillsides, terraces, and floodplains of secondary and tributary inland rivers. Mumun society seems to have been more culturally and technologically complex than Chulmun because of the unequal presence of prestige artefacts (jade, polished ground-stone knives and some bronze artefacts) in Mumun mortuary and settlement contexts, concentration of functions at large settlement sites, ditch-enclosed settlements (Bale 1999), and bronze artefact manufacture. Several well-reported examples of possible rice and grain agriculture are outlined below, but I do not describe all Mumun period sites with rice and other grains here.

In the lower Taedong River area, structures at the Namgyong site yielded semi-lunar blades, querns and digging tools. Carbonized rice, millet (*P. miliaceum* and *S. italica* ssp. *italica*), *Sorghum bicolor* and beans were found

in the fill just above the floor of the rectangular Structure 36, which is from the earliest Mumun period stratigraphic layer of the site (KPC 1984:108). Structure 36 was radiocarbon dated to 2889±70 BP, or 1294-898 BC (Han 1999:132). In the middle Mumun period layer of Namgyong, traces of millet grains were found on the floor of Structure 11 (KPC 1984:121). Structure 39 at the Soktal-li site (c. 1000 BC) yielded millet grains and *P. angularis* beans (Hwang 1984:95).

Rice, barley, *Setaria italica* ssp. *italica* and sorghum grains were recovered from the rectangular Structure 12 in the Hunam-ni site, where carbonized wood is radiocarbon dated to 2980±70 BP and 2920±70 BP, or 1365-1210 BC and 1260-1040 BC (Table 2) (Nelson 1992:182, 1993:115). Hunam-ni structures also yielded artefacts such as semi-lunar blades and stone digging tools, but cultivation at Hunam-ni must have been difficult because it is located on a steep hillside and the local area lacks flat land (Barnes 1993:161-2).

The Songgung-ni site is located in a hilly area near the Kum River and has 42 structures, ditches, palisades, pottery kilns, bronze weapons (from one stone cist burial), and stone moulds for bronze casting. A trench beside the round, Songgung-ni-style Structure 50-1 contained a pottery vessel with rice grain impressions (KCP 1979:42). Approximately 400 g of carbonized rice grains were recovered from the floor of the rectangular Structure 54-1 (KCP 1979:55) and carbonized wood from the structure was radiocarbon dated to 2665±60 BP and 2565±90 BP, or 870-785 BC and 820-585 BC (Table 2) (KCP 1979:148; Nelson 1993:115). Hundreds of rice grains were discovered in the fill just above the floor of the rectangular Structure 54-13 (KCP 1987:23). As with Hunam-ni, many Songgung-ni structures have semi-lunar blades, stone digging tools and querns.

Table 2: Radiocarbon dates mentioned in the text

Site	Material dated	BP date	Calibrated years BC
Hunam-ni:	carbonized wood	2980±70	1365-1210 (RIKEN)
	unknown	2920±70	1260-1040 (RIKEN)
Namgyong:	unknown	2889±70	1294-898
O-un:	carbonized rice	2850±60*	1260-890, 94.3% confidence level
	carbonized foxtail millet	2830±60*	1220-840, 94.3% confidence level
Songgung-ni:	carbonized wood	2665±60	870-785 (KAERI-186)
	carbonized wood	2565±90	820-585 (KAERI-187)

* Number not available, dated at Seoul National University AMS Laboratory

RECENT DISCOVERIES: MUMUN PERIOD FIELD FEATURES

As of 1999, few sites from the Mumun period show evidence of agriculture, but field features are known at four sites. This is in contrast to the hundreds of field sites that are known from Yayoi period Japan (400 BC-AD 300). The four Peninsular sites are located in west-central (South Ch'ungch'ong Province) and southeastern Korea (North and South Kyongsang Provinces). These sites are adjacent to or sometimes overlapping with settlement clusters and can be divided into two categories: wet-field rice sites (Majon-ni, Oghyon) and dry-field rice and millet sites (Tongch'on-dong, Ogbang - O-un localities).

Glover and Higham (1996:413) define wet-field rice agriculture as occurring in "lowland, normally permanent and intensively cultivated, flooded fields ... which are usually bunded to retain water". However, in the first detailed Korean case discussed in this paper (Oghyon - see below), wet-field cultivation occurred in a narrow depression between small hills in a hummocky ecotype. Glover and Higham (1996:413) also state that dry-field rice cultivation occurs in upland swidden fields which rely on rain, but in the second case I discuss (Ogbang - O-un localities - see below) dry-land cultivation occurred in an alluvial floodplain at 30-50 m asl.

Before turning to the detailed descriptions, I will briefly outline two other sites with field features. The first is the Majon-ni site, which is located on a small stream south of the Kum River, not far from Songgung-ni. Majon-ni consists of a Middle Mumun period settlement, cemetery and wet-field. The wet-field was well preserved because it was waterlogged, and irrigation canals associated with the feature were also found (Lee K.-M. 1999).

The second site is Tongch'on-dong, which is located in Greater Taegu along a small tributary of the Kumho River. It consists of an Early and Middle Mumun period (c. 600-450 BC) ditch-enclosed settlement with 57 structures and a poorly preserved dry-field feature that is roughly 200 m² in area (YMMY 1998:107). The dry-field feature is identified by ridges and furrows characteristic of cultivation and dates to the Mumun period, but excavators do not give a specific age for the feature (YMMY 1998:108).

WET-FIELD AGRICULTURE AND THE ULSAN MUGO-DONG OGHYON SITE

At the time of writing this paper, the final reports for the Oghyon and Ogbang - O-un locality sites were not yet published. However, in the following sections I use published and unpublished preliminary site reports (KNTP 1999; KNTP-MTP 1998; Lee and Lee 1998; STYP 1999) to discuss early full-scale agriculture at these two sites within

the context of the excavation results. I also use my own research on the Ogbang - O-un localities (Bale 1999) and fieldnotes from Oghyon.

The Oghyon site was investigated by the Kyongnam and Milyang University Museums in 1998 and 1999 because of the construction of an apartment complex in Greater Ulsan City. This site lies on a small knoll and in two adjacent depressions not far from a tributary stream of the Taehwa River, which flows into the Korea Strait. The site is almost enclosed by hills ranging between 300 and 600 m asl and the Taehwa River is accessible 1.5 km to the north by the stream adjacent to the east side of the site.

The small knoll has 73 rectangular and square pit-structures which date to between 850 and 600 BC (KNTP-MTP 1998:6). There is great size variation between the Mumun period structures, and some of the larger structures have more than one hearth, elaborate drainage features along the base of the walls in the interior of the houses, and interior postholes indicating the presence of raised platforms (KNTP-MTP 1998:6). One polished ground-stone discoidal tool and a few polished ground-stone daggers were recovered from two small square structures, but unequal presence of prestige artefacts was uncommon in structures (KNTP-MTP 1998:17).

A 150 m long ditch was found below the knoll in a narrow, slanting depression near the southwestern edge of the site. The ditch was 1-1.5 m deep, 2-2.5 m wide, and contained artefacts from the Early Mumun period (KNTP-MTP 1998:14). Other Early Mumun period settlement sites (some with ditches) on small hilltops are located nearby in the Taehwa River drainage area and include Panggi-ri, Komdal-li and Taun-dong.

The ditch slants along a natural incline towards the north part of the water-logged wet-field feature that is located in a swampy, long and narrow depression which is oriented east-west. Another 30 m long ditch was found along the east-west depression and may have connected with the stream that is east of the site. Several 2.8 m deep trenches were placed at right angles to the feature and revealed three wet-field layers in the stratigraphy that dated to the Early Mumun, Three Kingdoms and Choson (AD 1392-1910) periods.

The Mumun period wet-field was identified in the trench profiles by the presence of a native orange-brown soil matrix that was mixed with dark brown organic soil brought in from elsewhere, by the level character of the layer in profile compared to the undulations that were observed in naturally deposited upper layers, and by rim-perforated pottery type sherds from the Early Mumun (KNTP 1999:168-9). Directly below the Mumun wet-field layer a dark, ferrous-oxide and manganese soil layer with a clayey texture was found and is assumed to have been a base that was deliberately placed there to seal the above wet-field against water leakage.

Excavations of the Mumun layer revealed that the wet-field feature was approximately 80 m² in area and contained carbonized rice, red-burnished pottery, digging tools, and fishnet sinkers similar to ones found in the Mumun structures (KNTP-MTP 1998:15). Kyongnam University Museum researchers may have been unable to excavate the feature to its full extent because of a highway right-of-way immediately south of the site. Bunds that were between 16 and 52 cm in width divided the flat wet-field surface into rectangles that were between 2.2 m² and 4 m² in area. Various irrigation canals surrounded the wet-field area. The layout of the Oghyon wet-field appears similar to the wet-field at the Initial Yayoi Notame site in Fukuoka Prefecture, Japan, as shown in Imamura (1996:136). Kyongnam University Museum researchers estimate that the wet-field feature dates to between 700 and 600 BC (KNTP 1999:169).

DRY-FIELD AGRICULTURE AND THE OGBANG AND O-UN LOCALITIES

The Ogbang and O-un localities were investigated at various times in the 1970s and 1990s by more than ten archaeological institutions because of dam construction on the Nam River near Chinju City. The site lies on a low terrace of a small, backwards d-shaped alluvial floodplain (50 m asl) that was formed by stream meandering and alluvial re-deposition on the Nam River, a tributary of the Nakdong River. Ogbang is located in the south floodplain and O-un is in the north. The floodplain is circumscribed by high, steep hills and was historically subject to flooding. Occupations from the Chulmun to Choson periods have been found.

The site contained 64 rectangular and square pit-structures during the Early Mumun and 137 rectangular, square, and circular Songgung-ni-style structures during the Middle Mumun period. Two large settlement and burial clusters were spread along the river with smaller clusters in between and several extensive ditch enclosures in Ogbang. It seems that the localities are not different settlements because less than half a kilometre separates them (Bale 1999).

Structures and burials demonstrate incipient social inequality in the unequal presence of prestige artefacts such as jade ornaments, polished stone daggers, and one bronze object (Bale 1999:33; STYP 1999). In the Middle Mumun period, shallow but elaborate ditch-enclosures and palisades surrounded clusters of structures with prestige artefacts in Ogbang. A non-residential production area was found in the Middle Mumun period with jade workshops, raised platform structures (for grain storage?), a pottery kiln, and dry-field features (Bale 1999:36). Another large contemporary settlement existed just south of Ogbang, and other settlements (some with ditch-enclosures) were spaced at intervals of two km or less up and down the Nam, Tokch'on and Kyongho Rivers.

Six dry-field features are distributed along the Nam River and date from the Mumun to Choson periods. Approximately 9683 m² of Mumun period dry-fields were excavated in Ogbang and about 6208 m² were found in O-un. These fields are characterized by ridges and furrows and finds of carbonized cultivars, digging tools and other Mumun period artefacts. Lee Gyoung-Ah of the University of Toronto has conducted a systematic archaeobotanical project in Ogbang and O-un since 1997 in association with Kyongnam University Museum.

The largest single dry-field feature is at O-un (6000 m²) and was excavated by Kyongnam University Museum (Lee and Lee 1998). It sits 1-1.5 m below two "natural levees" (Lee and Lee 1998:183) where a cluster of 12 Early Mumun period structures and two outdoor hearths are located. The O-un Mumun period dry-field was identified 250 cm below the surface in the sixth layer of a trench that was established in the shallow depression. In profile the Mumun layer undulates like the ridges and furrows of a field, and the soil is characterized by a matrix of sandy brown alluvium with humus inclusions. Above the Mumun layer several historical dry-field layers were found. It is clear from observing the upper layers of sandy alluvium in profile that flooding events occurred several times before the present.

The dry-field is oriented north-south and its borders follow the topography of the depression, while the ridges and furrows are oriented east-west. One stone cist burial, nine piled stone features, and a variety of Mumun period artefacts were found in the field. In the 1997 field season 170 soil samples were systematically taken from the dry-field, piled stone features, structures, and outdoor hearths (Lee and Lee 1998:102). *Setaria italica* L. and several related wild species were identified in many samples from most of the previously mentioned locations, while *Oryza sativa* L., *P. miliaceum* and several related species (i.e., wild millet – *Echinochloa crusgalli* L.) were identified from the outdoor hearths (Lee and Lee 1998:102). Beans were also recovered from the field (Lee and Lee 1998:103).

It is thought that the O-un structures and pottery correspond to the Early Mumun period (Lee and Lee 1998). In 1999, carbonized samples of *O. sativa* L. and *S. italica* ssp. *italica* that were recovered from the floor of the rectangular Structure 99-103 at O-un were AMS radiocarbon dated to 2850±60 BP or 1260-890 BC (*O. sativa* L.) and 2830±60 BP or 1220-840 BC (*S. italica* ssp. *italica*) (G-A. Lee pers. comm. 1999) (Table 2).

DISCUSSION

A number of issues have been raised in this paper such as the circumstances and early dates for small-scale cultivation in the Chulmun period, and the cultural and environmental circumstances for the adoption of large-scale cultivation in

the Peninsula and Japan during the first millennium BC. While summarizing the evidence presented above, I will briefly discuss some of the implications of these issues.

Turning first to earliest Chulmun dates for cultivation, the date from Chuyob-ni (5500 uncal. BP or 4400 BC) is significant because it comes shortly after some of the first dates for rice in the Yangzi River in China (Crawford and Chen 1998:860). There are reasons to exercise caution in consideration of the antiquity of rice phytoliths extracted from vessels at Chuyob-ni. Without attempting to question the reporting of Crawford and Chen (1998) or the methods of the Korean investigators, more information about the circumstances of this find is required before I can be confident about Chuyob-ni. This evidence was presented by the Korean investigators in a conference paper in 1997, but questions remain as to the exact methods that were used in the extraction and preparation of the phytolith samples. Distinguishing rice from other unrelated weedy species in archaeological samples can be difficult, and sometimes depends on things such as the preparation of the phytolith samples and thin sections (G.-A. Lee pers. comm. 1999). Also, without the Chuyob-ni report at hand, further clarification of how the researchers did the dating seems prudent. Crawford and Chen (1998) are also cognizant of these issues because of the careful way they have reported on Chuyob-ni and other early rice finds in East Asia.

Even without considering the Chuyob-ni site, the evidence at Chitam-ni, Namgyong and Kawaji shows that Chulmun people near the west coast at sites along major rivers used rice, domesticated millets and wild millets by 3000 BC (Hwang 1984:95; KPC 1984:22, 29; Nelson 1993:99). Northeastern Chulmun people at Pomuigusok and Odong used millet, domesticated or wild sorghum and beans by 2000 BC (Hwang 1984:92,95). However, questions about the circumstances of these finds remain. Did Chulmun people harvest rice and millet or receive it through trade? Was the rice a domesticated species? The answers remain unclear, but weedy or wild rice (*O. rufipogon*, *O. nivara*) is known in Korea (Crawford and Chen 1998:863) and the Kawaji date (4300 uncal. BP or 3000 BC) is fairly old, so the rice grains could have been *O. rufipogon* or *O. nivara*. Evidence of trade during the Chulmun is sparse, and some rice or other cultivars must have been harvested.

Nevertheless, until more specific information from these sites is available, it is difficult to say conclusively that small-scale cultivation absolutely occurred there. However, ideas about Chulmun period economy may change because of the discovery of interior Chulmun settlements on tributary streams and the increasing use of systematic methods of archaeobotanical plant recovery in excavations.

A comprehensive model to explain the process of change from Chulmun to Mumun life-ways has not yet been

attempted, and explaining the process of how agriculture was adopted in the Korean Peninsula is difficult. The attempts made so far to account for some of these issues are a good starting point (Nelson 1992; Norton 1997; Pearson 1977; Sim 1990:209). There are other points and observations to be considered, but with some of the gaps in the cultural and ecological data, the following ideas are somewhat speculative.

Most of the Chulmun period sites with cultivars are close to the west coast. This area is a logical place for agricultural development because of its proximity to the Chinese Neolithic cultures that grew millet such as Late Dawenko (after 3500 BC) in the Shandong Peninsula and possibly others in the Liaodong Peninsula. Since fishing is an important part of the Chulmun subsistence repertoire, perhaps some early contact was made in the Yellow Sea between peoples of the Shandong, Liaodong and Korean Peninsulas around 3500 BC. There is no archaeological evidence to support this, but similar ideas have been proposed before (Imamura 1996:131). Dawenko and Chulmun sites differ because Dawenko sites can be situated along major rivers, and interior Chulmun sites are on tributary streams. However, in both settlement patterns, sites occupy the alluvial flatlands and river levees. Pearson suggests that early cultivators in Korea and Japan may have avoided settling along major rivers because they were difficult to manipulate with limited technology and small, localized groups (Pearson 1977:1245).

Until the 1990s archaeologists did not assign much cultural complexity to the Mumun period, but the results of excavations are challenging those assumptions (Bale 1999:2). For example, since field features are found at different places in southern Korea in the Early Mumun period, it is assumed that large-scale cultivation occurred by this time. Wet-field sites are found on tributary streams close to the east and west coasts of the Peninsula, and dry-fields are found on tributary streams in the interior of the Peninsula. Since several different kinds of cultivars were recovered from single structures (i.e.: O-un Structure 99-103, Namgyong Structure 36), the possibility that Mumun agriculturalists practiced multi-cropping and scheduling should be investigated further. Along with the technological skills required for wet-field rice cultivation, it seems other cultural developments in the Mumun period such as bronze-working, the presence of elites, ditch-enclosures (i.e., the threat of conflict) and concentration of functions at large settlement sites means that a reassessment of the Mumun period is in order.

If dry- and wet-field agriculture was introduced to Japan from the Peninsula during the Final Jomon (Sim 1990:209) (1000-300 BC), how and under what cultural circumstances did this occur? This question cannot be answered here, but perhaps the excavations of the Oghyon site, the Ogbang -

O-un Localities and other nearby sites can provide some clues. For example, the number of structures in the Nam River valley near Chinju more than doubled from the Early Mumun to Middle Mumun periods (Bale 1999:56). From the observation of settlement site locations during the Middle Mumun, it appears that settlements were tightly distributed in the Nam River valley near Chinju and in the Taehwa River watershed (UKS-CTP 1995). In particular, almost every area suitable for settlement or agriculture in the Nam River was occupied by about 500 BC, and the Taehwa River and its tributaries also appear to have been crowded (UKS-CTP 1995). Competition for space or overpopulation may be indicated by the increase in the number of structures and the observation that settlements with ditch-enclosures are spaced at two km intervals or less along the Nam River. Perhaps the above developments can be seen in the context of a spread of agricultural techniques and productivity that leads to increasing instability of production, and an emigration of the agriculturalists and their technology (Nelson 1992:179).

A migration of people from the Peninsula to Kyushu is a hypothesis that is sometimes used to explain the development of full-scale agriculture in the Japanese Yayoi period (Barnes 1993:170; Hudson 1999; Imamura 1996:131). Was the density of settlement distributions in parts of the Peninsula a factor that led a number of Mumun people to settle in northern Kyushu? Much more research is needed on the Korean side before this question can be answered, but other archaeological data supporting the migration hypothesis are present in northern Kyushu and the Nam River. These are the presence of ditch-enclosed settlements, Songgung-ni-style structures, bronze tool manufacture, similar red-burnished pottery, similar kinds of agricultural stone tools and wet-rice agricultural technology. As noted, the layout of the field and waterways at the Oghyon site appears to be quite similar to the Initial Yayoi site at Notame in Fukuoka as it appears in Imamura (1996:128). Furthermore, Imamura suggests that the Final Jomon wet-field site of Nabatake, which is "primitive" because of its location in a swampy area (similar to the conditions in Oghyon), may have been hastily set up by new immigrants from Korea to ensure a quick supply of food (Imamura 1996:136).

CONCLUSIONS

This paper highlights some of the evidence for prehistoric cultivation in the Korean Peninsula, excavation results of field sites in the 1990s, and some of the implications for the prehistory of the Peninsula and Japan. People used rice and other cultivars in the Chulmun period as early as 3000 BC, but the circumstances of this use are still unclear. Research into the development of full-scale cultivation and the

transition from Chulmun to Mumun life-ways is still in its infancy, but large-scale rice and millet cultivation was important by the Early Mumun period. Specifically, Mumun dry- and wet-field agriculture occurs in large settlements with evidence of cultural complexity.

Currently, much of the discussion of these issues relies on environmental determinism and evolutionary frameworks, but developments on a number of fronts in the 1990s such as new excavations and systematic archaeobotanical research has set the stage for a greater understanding of early agriculture in the Korean Peninsula. It is hoped that studies into the broader cultural and ecological contexts of these issues will help to explain the spread of agriculture in the Korean Peninsula and Japan.

NOTES

1. All Korean terms in the text are romanized according to the McCune-Reischauer system as adopted by the *Korea Journal*, with the exceptions of personal names and several site names in the titles of reports in the references cited section (Songguk-ri, Konam-ri). I do not use the term "Bronze Age" here because of the lack of bronze in different parts of the Korean Peninsula during the first millennium BC.
2. Latin terms for rice and other cultivars are not listed where Latin terms were not reported.

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REFERENCES

- Ahn, C.-B. 1989. On the Neolithic layer at Imbul-li, *Hanguk Kogo Hakbo* [Journal of Korean Archaeological Studies] 23:233-8.
- Bale, M.T. 1999. Prehistoric settlement and production in the Nam River Valley, South Korea. MA dissertation, University of British Columbia, Vancouver.
- Barnes, G.L. 1993. *China, Korea and Japan: the Rise of Civilization in East Asia*. London: Thames and Hudson.
- Crawford, G.W. and S. Chen. 1998. The origins of rice agriculture: recent progress in East Asia. *Antiquity* 72:858-66.
- DATP (Dong-A University Museum). 1989. *Somch'on Ponggye-ri yujok* [The Somch'on Ponggye-ri Site]. Pusan: Dong-A University Museum.
- Glover, I.C. and C.F.W. Higham. 1996. New evidence for early rice cultivation in South, Southeast and East Asia. In D.R. Harris (ed.), *The Origins and Spread of Agriculture and Pastoralism in Eurasia*, pp. 413-41. London: UCL Press.
- Han, C.-G. 1999. Recent trends on the study of the Bronze Age in North Korea, *Hanguk Sanggosa Hakbo* [Journal of the Korean Ancient Historical Society] 30:103-40.

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- Hudson, M.J. 1999. *Ruins of Identity: Ethnogenesis in the Japanese Islands*. Honolulu: University of Hawaii Press.
- Hwang, K.D. 1984. Choson-ui Chongdong-gi-shidae [The Bronze Age of Choson]. Pyongyang: Sahoe Kwahak Chulpansa.
- Imamura, K. 1996. *Prehistoric Japan*. Honolulu: University of Hawai'i Press.
- Im, H.-J. 1992. Prehistoric rice agriculture in Korea. In C.M. Aikens and Rhee, S.N. (eds), *Pacific Northeast Asia in Prehistory: Hunters, Fishers, Gatherers, Farmers, and Sociopolitical Elites*, pp. 157-60. Pullman: Washington State University Press.
- KCP (National Museum of Korea). 1979. *Songgung-ni I* [Songguk-ri I]. Seoul: National Museum of Korea, *Research Report XI* (in Korean with English abstract).
- KCP (National Museum of Korea). 1987. *Songgung-ni III* (Songguk-ri III). Seoul: National Museum of Korea, *Research Report XIX* (in Korean with English abstract).
- KNTP (Kyongnam University Museum). 1999. Excavation update 8 - the Ulsan Mugo-dong Oghyon paddy-field site excavation investigation. *Yongnam Kogohak* [Yongnam Archaeological Review] 24:168-74.
- KNTP-MTP (Kyongnam University Museum and Milyang University Museum). 1998. *Ulsan Mugo-dong Oghyon yujok* [The Ulsan Mugo-dong Oghyon site]. Masan: Kyongnam University Museum, Milyang University Museum.
- KPC (Science and Encyclopaedia Publishing House). 1984. *Namgyong yujok-ae kwanhan yonggu* [A study about the Namgyong site]. P'yongyang: P'yongyang General Printing Factory.
- Lee, D.-J. 1998. The Sangch'on-ni Neolithic Site. In Yongnam Archaeological Society (eds), *Namgangdaem sumoljigu-ui palgulsonggwa, jae 7 hoe Yongnam Kogohakhoe hagsul palbyohoe* [Nam River Dam Underwater Zone Excavation Results, Papers of the 7th Conference of the Yongnam Archaeological Society], pp. 1-12. Pusan: Saejongmunhwasa.
- Lee, K.-M. 1999. Nonsan paddy site excavations - Japan's farming roots confirmed. *Dijitul Choson Ilbo* [Digital Chosunilbo]. November 4th. <http://www.chosun.com/w21data/html/news/199911/199911040498.html>
- Lee, S.-K. and G.-A. Lee. 1998. The Taep'yong O-un 1 Zone Site and Botanical Remains. In Yongnam Archaeological Society (eds), *Namgangdaem sumoljigu-ui palgulsonggwa, jae 7 hoe Yongnam Kogohakhoe hagsul palbyohoe* [Nam River Dam Floodzone Excavation Results, Papers of the 7th Conference of the Yongnam Archaeological Society], pp. 99-110. Pusan: Saejongmunhwasa.
- Nelson, S.N. 1992. The question of agricultural impact on sociopolitical development in prehistoric Korea. In C.M. Aikens and Rhee, S.N. (eds), *Pacific Northeast Asia in Prehistory: Hunters, Fishers, Gatherers, Farmers, and Sociopolitical Elites*, pp. 179-83. Pullman: Washington State University Press.
- Nelson, S.N. 1993. *The Archaeology of Korea*. Cambridge: Cambridge University Press.
- Norton, C.J. 1997. Food storage, sedentism, and their implications for the advent of rice agriculture in Korea: Konam-ri. In Hanyang University Museum (eds), *Anmyon-do Konam-ni paech'ong palguljosabogoso 7* [Anmyon-do Konam-ri Shellmound Excavation Site Report 7], pp. 278-307. Ansan: Hanyang University Museum. (in English and Korean).
- Pearson, R. 1977. Paleoenvironment and human settlement in Japan and Korea, *Science* 197:1239-46.
- Sim, B.-K. 1990. *Hanguk Ch'ongdonggi Shidae munhwa-ui ihae* [Understanding Korean Bronze Age culture]. Pusan: Dong-A University Press.
- STYP (Sonmun University History Department Excavation Team). 1999. *Chinju Taep'yong-ni Ogbang 5 Chigu sonsayujok 3 ch'a palguljosa - hyonjang solmyonghoe charyo* [The 3rd excavations at the Chinju Taep'yong-ni Ogbang 5 Locality - site explanation meeting data]. Ch'ongju: Sonmun University, unpublished mss.
- UKS-CTP (Greater Ulsan - Ch'angwon National University Museum). 1995. *Ulsan-gun munhwa yujok wonbu (maejang munhwajae)* [Intensive site survey of Ulju-gu (buried cultural properties)]. Ulsan: Ch'angwon National University Museum, *Archaeological Research Report* vol. 8. Ch'ungjong General Printing Co.
- YMMY (Yongnam Buried Cultural Properties Research Institute). 1998. Excavation update 6 - the Taegu Tongch'on-dong settlement site excavation investigation. *Yongnam Kogohak* [Yongnam Archaeological Review] 23:107-9.