# The Subsistence Base of Middle Han Sites of the Chulmun Period

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FINDING sites with Chulmuntogi—"comb-pattern pottery"—on the coasts, islands, and major rivers of Korea, early archaeologists quite reasonably concluded that the associated subsistence base must have been aquatic resources. Figure 1 shows the location of the Chulmun sites, which clearly cluster in riverine and coastal groupings. Most of the coastal and island sites are shell mounds, and river sites contain numerous net sinkers, adding further weight to the locational inference. However, closer inspection of a group of related sites on the Han River in central Korea suggests a different pattern of subsistence activities in this location.

## THE SITES

An intensive survey was made of the Middle Han region, which is a distinctive section of the Han River extending from the confluence of the two major branches, the North Han and the South Han (Puk Han Gang and Sam Han Gang), to the tidal estuary at Seoul (Nelson 1973). The survey was intended to locate new sites and relocate ones that had been published. Figure 2 shows the area of intensive survey, and the previously mentioned sites, as published by Won-Yong Kim (1965). Of these, only Amsari, Misari, and Tongmak proved to be contemporaneous Chulmun period sites (Nelson 1973). It is data from these three sites which will be considered in this paper.

## ENVIRONMENT

Like most of the rest of Korea, the Middle Han region is an area of rugged hills, with the twisting river finding its way through uneven terrain to the sea. The hills are covered with scrub oak and pine forest, and the sandy river terraces support many varieties of herbs, grasses, and brush. Chulmun sites are found on river

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terraces with an elevation of about 10 m. Where there is room for the river to meander, the riverbed is wide. Sands, gravels, and large cobbles mark the maximum extent of the river at flood stage, and large islands occur at bends in the river indicating rapid shifts of the riverbed.

Thus there are essentially three microenvironments which were available to the Chulmun people for exploitation: the forested hills, the sandy river terraces, and the river itself. Although there are now small plains surrounding tributaries, these have been created by rice agriculture and cannot be considered as having been in the prehistoric environment.

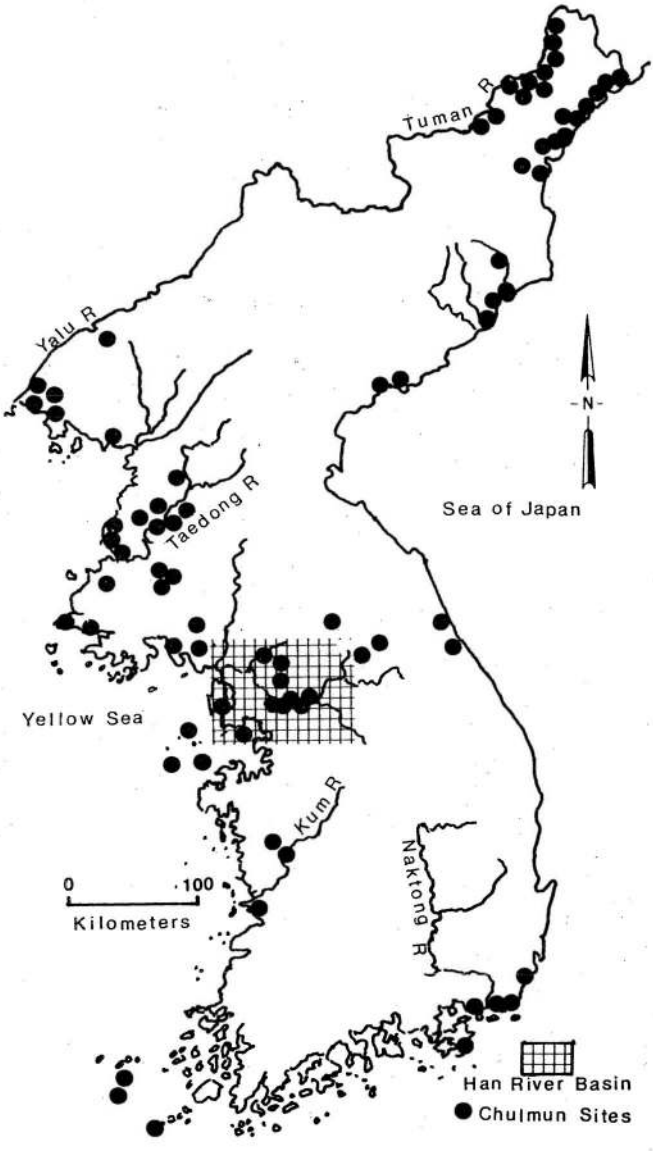


Fig. 1 Location of Chulmun sites in Korea.

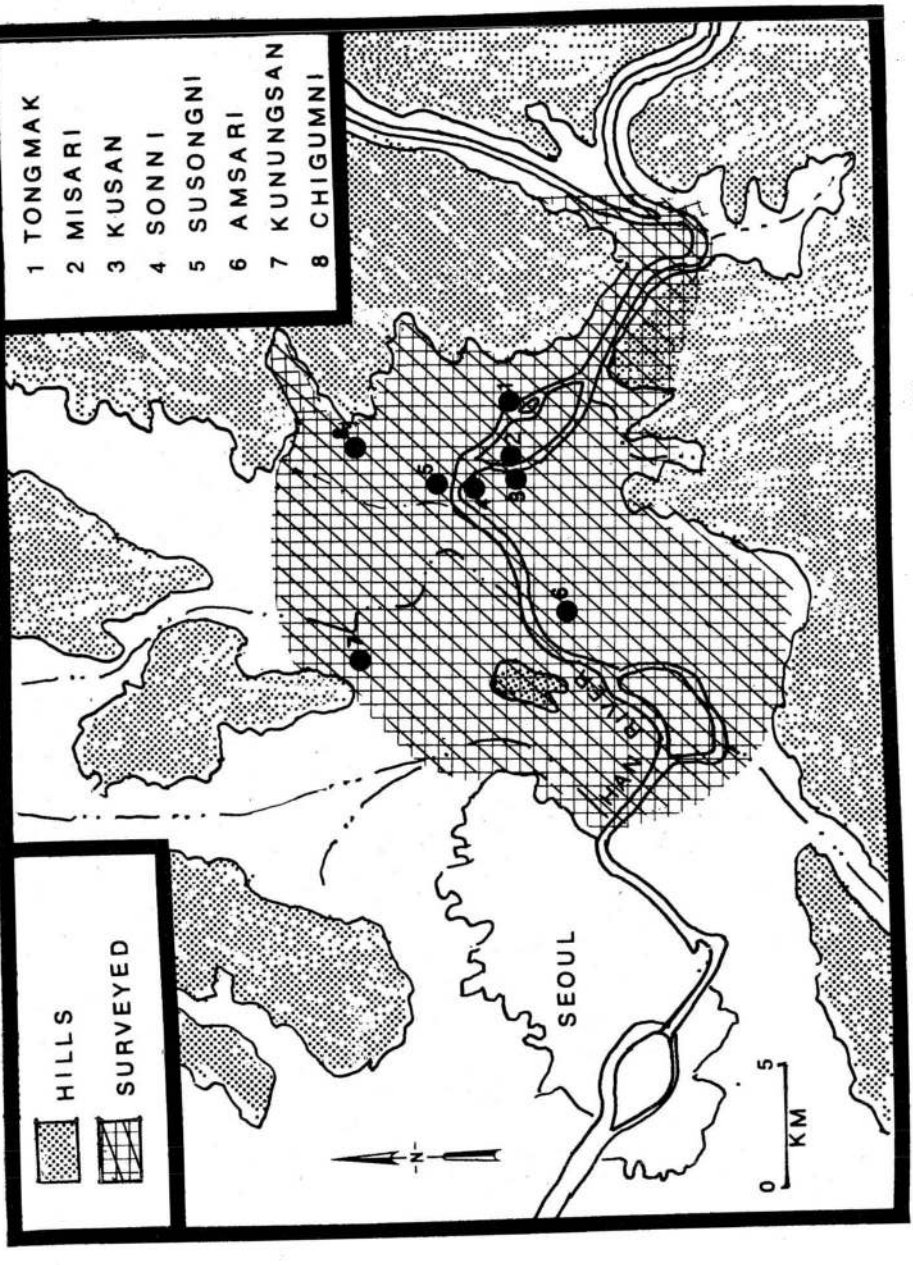


Fig. 2 Region of intensive survey on the Han River.

Although the prehistoric environment of Korea has not yet been studied in detail, there is some justification for accepting the present situation as representative of the microenvironments of 5000 years ago. The presence of deciduous forests is confirmed by the identification of charcoal from the site of Naepyung (near Chunchong) as *Ulmus* (elm), *Prunus* (plum or cherry), *Quercus* (white oak group), *Pinus* (pine), and *Picea* (spruce), according to identifications made by R. C. Koeppen, a botanist with the U.S. Forest Service. The only published pollen core from Korea, which comes from the vicinity of Pyong Taek, also provides evidence of deciduous forests at this period, with a predominance of arboreal pollen (Oh 1971).

## Forests

Although presently there are few wild animals in the scrub oak forests in the hills near Seoul, a few unidentifiable small mammal bones and an occasional small projectile point found in the Han River sites indicate that some hunting occurred in the Chulmun period. An indication of the potential deer population can be seen in the Demilitarized Zone, where deer have proliferated in the absence of local human population. Wild boar are still found in the less populated mountainous regions of Korea, and probably were once found throughout the peninsula.

In addition to deer, bear, and small forest animals, the aboriginal forests provided many kinds of fruits and nuts. Acorns have been found at Amsari (Byung-Tae Lim, personal communication) and Misari (Chase 1960), and some unidentified berries were found in the midden at Tongmak.

## The River

At the present time only a few small (2–3 cm) bivalve molluscs are found in the Han River. Although Fujita (1943) reported marine shells mixed with river shells at Amsari, the location of such specimens is not known. No river or marine shells have been reported from subsequent surface collections or excavations at any Han River site, with the exception of a small cache of tiny bivalve shells, not in a site and unassociated with identifiable artifacts, that was discovered by the author's survey team.

Net sinkers occur in large numbers, but fish bones have not been found, in spite of careful flotation of midden samples obtained from both Tongmak and Misari, as well as from a house floor at Amsari. Fragments of mammal bone were found in flotation samples from all three sites; therefore the lack of fish bones is notable.

The fish in the river near the site are quite small (6–7 cm long) and not numerous, and could not possibly support a population of any size in that region at present. The only exception to this is *Cyprinus carpio,* a carp which is found at the confluence of the North Han and South Han rivers, but which is exploited only for a few weeks in the spring.

The question arises whether larger and/or more numerous fish might have been present in the river in the Chulmun period. Two lines of evidence suggest that they were not. The first is the lack of fish bones in the sites. The second is that the character of the fish is related to the available niche. Deep pools are required to support large fish. In the Han River such pools are rare, occurring only where the

hills confine the river to a narrow bed, making a temporary deep spot even in winter when the river flow reaches its yearly low.

The pattern of river flow in Korea is derived from the combination of topography and climate. Korea's weather pattern is dependent on the polar front, which shifts from north of Korea in the summer to south of Korea in winter. The result is that the summer resembles that of monsoon Asia, with heavy rains concentrated in the summer months, while the winter is cold and dry. The relatively small amount of snow produces no appreciable snowmelt for spring flooding, and it is not until the rains begin in June or July that the rivers rise markedly. Not only is the river volume greatly increased at this time, but the velocity of the rivers is such that large cobbles are carried down the riverbed, and most of the silt is deposited in the Yellow Sea, rather than enriching the margins of the riverbeds (Bartz 1972). The alternation of seasonal high-velocity flows with very low winter river levels leaves few niches for large fish. Alternate sand and gravel layers underlying the site at Tongmak indicate that this pattern of river flow antedates the Chulmun sites, and therefore the type of fish in the river would not have been different at that time.

## RIVERBANKS

Along the riverbanks at present are intermittent fields, planted to a variety of dryfield crops. Rice is not generally planted on the banks of major rivers, but some rice padis have been created along the courses of small tributaries. Generally, however, the Han River valley is planted to truck garden crops, serving the city of Seoul. On the edges of these fields, and on the unplanted river terraces, many kinds of wild plants grow. Several of these have edible parts which are utilized by the local housewives. A plant collecting expedition under the guidance of a knowledgeable Korean-American (Mrs. Martha Sloan) produced 35 different kinds of utilized wild plants in the space of an hour (Table 1). The riverbanks, then, provided a natural open habitat in which a different type of flora could be collected, including presumably the ancestors of many native vegetables (e.g., the Chinese cabbage and the Korean turnip).

TABLE 1. WILD EDIBLE PLANTS COLLECTED NEAR THE HAN RIVER

| NO. | KOREAN NAME | FAMILY | GENUS AND SPECIES | PART EATEN |
|---|---|---|---|---|
| 1 | Jomdolbaenamu | Malaceae | *Pyrus faurieri* | Seeds |
| 2 | Ssuk | Carduceae | *Artemisia asiatica* | Leaves |
| 3 | Sumbakui | Chchoriaceae | *Ixeris dentata* | Root |
| 4 | Kosari | Pteridaceae | *Eteridium aquilinum* | Leaves |
| 5 | San Moorut | Liliaceae | *Lloydia serotina* | Leaves |
| 6 | Moorut | Liliaceae | *Scilla sinensis* | Root |
| 7 | Kirincho | Crassulaceae | *Sedum kamtaschaticum* | All |
| 8 | Minari | Apiaceae | *Oenanthe stolonifera* | All |
| 9 | Chamchui | Carduaceae | *Aster scaber* | Leaves |
| 10 | Sanchu | Rutaceae | *Fagara mandshurica* | Top |
| 11 | Jaebisook | Carduaceae | *Artemesia japonica* | Leaves |
| 12 | Mattari | Valerianaceae | *Patrinia scabiosaefolia* | Leaves |
| 13 | Kirum namul | Apiaceae | *Peucedanum terebinthaceum* | Leaves |

TABLE 1 *(continued)*

| NO. | KOREAN NAME | FAMILY | GENUS AND SPECIES | PART EATEN |
|---|---|---|---|---|
| 14 | Wari | Ranunculaceae | *Clematis mandshurica* | Top |
| 15 | Som namul | Carduaceae | *Leibnitzia anandria* | Top |
| 16 | Sanmanui | Alliceae | *Allium vixtorialis* | Root |
| 17 | Chot namul | Unidentified | Unidentified | Top |
| 18 | Chui namul | Carduceae | *Aster scaber* | Top |
| 19 | Myokchui | Carduaceae | *Solidago viraurea* | Top |
| 20 | Kyongepap | Juncaceae | *Luzula capitata* | Seeds |
| 21 | Wanchuri | Asphodelaceae | *Hemerocallis aurantiaca* | Top |
| 22 | Chik namul | Fabaceae | *Pueraria thunbergiana* | Root |
| 23 | Teljoong | Liliaceae | *Lilium amabile* | Top |
| 24 | Chille | Rosaceae | *Roas polyantha* | Leaves |
| 25 | Kaji | Solanaceae | Unidentified | Top |
| 26 | Hwangsenengi | Brassicaceae | *Cardamine flexuosa* | All |
| 27 | Kimchi ttok | Unidentified | Unidentified | Top |
| 28 | Chilkengi | Plantaginaceae | *Plantago asiatica* | Top |
| 29 | Kalttutegi | Poacceae | *Phragmites longivaluis* | All |
| 30 | Kunkkachi suyeum | Primulaceae | *Lysimachia clethroides* | All |
| 31 | Kottajo | Borraginaceae | *Trigonatis peduncaleris* | All |
| 32 | Nengi | Brassicaceae | *Capsella bursa-pastoris* | All |
| 33 | Mae | Convolvulaceae | *Calystegia japonica* | Root |
| 34 | Kkotaji | Brassicaceae | *Draba nemorosa* | Top |
| 35 | Myongaju | Chenopodiaceae | *Chenopodium album* | Top |
| 36 | Toraji | Campanulaceae | *Platycodon glaucum* | Root |
| 37 | Tot namul | Crassulaceae | *Sedum sarmentosum* | Leaves |

SOURCE: Identifications by Prof. Il-Koo Lee, Dept. of Biology, Kon Kuk University, Seoul.

Possibilities of subsistence bases, then, include hunting of deer and boar, fishing in the river, and collecting of nuts, fruits, and herbs from the forest and riverbanks. Direct evidence from the sites indicates that all three activities were present, but offers no clues as to the relative importance of these different types of food. The location of the sites allows easy access to all three microenvironments.

## SEASONALITY

Wild herbs are particularly edible in the spring and summer, and fruits and nuts tend to ripen in the fall. The shallow rivers freeze over in winter, making the fish nearly inaccessible with the technology of the Chulmun period. Even if freezing did not occur every winter, there would be years when fish could not be depended on. Forest animals might have been available throughout the year, but not in large herds. Clearly the period of food scarcity is in the winter when plant food is scarce. Therefore, if these were seasonal sites, the expectation would be that they would be abandoned in the winter. The dwellings, however, lead to the opposite conclusion. Semisubterranean houses, each with a central hearth, were surely built for winter occupancy (Kang-Su Kim 1970, Won-Yong Kim 1962). The combination of winter dwellings and spring-summer-fall availability of food suggests that the sites were occupied continuously throughout the year.

## FOOD STORAGE

With no secure winter food supply, but a permanent population, it is not surprising to find large numbers of storage jars in the Han River sites. Pottery is by far the most abundant artifact, and 99% of the sherds are from wide-mouthed conical pots, with the depth roughly equal to the diameter.

Although the wide mouth is more usually associated with cooking than with storage, these pots do not seem to have been cooking vessels. They were not used for cooking directly in a fire, for they are not fire-blackened on the outside. Stone boiling is a possibility; however, some of the pots clearly exceed an effective range of size for stone boiling. The inference that the large pots were used for storage is borne out by Lim's excavation at Amsari, which uncovered ten such pots in a group (Byung-Tae Lim, unpublished site plan).

Since the correlation coefficient for diameter/depth of whole and restored pots is 0.969, representing a very high correlation, the direct relationship of diameter to depth can be taken as a constant. Using this relationship, volume can be calculated from rim diameter alone with the formula for the volume of a cone ($1/3\ h\pi r^2$). This produces a reasonable estimate of volume for each diameter. A histogram of rim diameters from Amsari, Misari, and Tongmak (Figure 3) shows that the distribution is trimodal, with peaks at 25 cm, 40 cm, and 60 cm. These figures correspond to volume estimates of 4, 17, and 56 liters. While the smallest size could have been used for stone boiling, at least the larger two sizes must have been intended for storage.

## FOOD FOR STORAGE

Large storage jars indicate that the technology for storing food was available, and winter occupation indicates the need to store food. The question remains, What type of food was being stored to last this group of people through the winter? Many kinds of wild harvests were available—fish, deer, nuts, fruits, and herbs—but none of these would have been of a magnitude to provide sufficient surplus for winter storage. If broad-spectrum hunting-fishing-gathering was occurring, perhaps broad-spectrum storage also occurred, especially of fall-ripening tree crops. The three sizes of wide-mouthed pots may indicate two or three kinds of food being stored.

Nothing has been said so far, however, about Korea's most ubiquitous non-grain food crop, a root vegetable known as *mu*. The present form is *Raphanus sativus,* but it probably is an improved species of *Raphanus acanthiformis* Morel var. *spontaceus* Nakai, a native vegetable of Korea (Il-Koo Lee, personal communication). This is processed in a special way, unique to Korea, and is made into *kimchi,* an important part of the local diet which as a rule is consumed at every meal. Another ingredient of *kimchi* is the cabbage *Brassica pekensis,* but it is thought that the native plant *Capsella bursa-pastoris* was used before Chinese cabbage was imported.

In the fall each Korean household preserves enough *kimchi* to last through the winter, in large barrel-shaped jars with loose-fitting overlapping lids. While these jars are not the same shape as those of the Chulmun period, they are roughly the same range of sizes, and similar lids have been found along the Han River made of

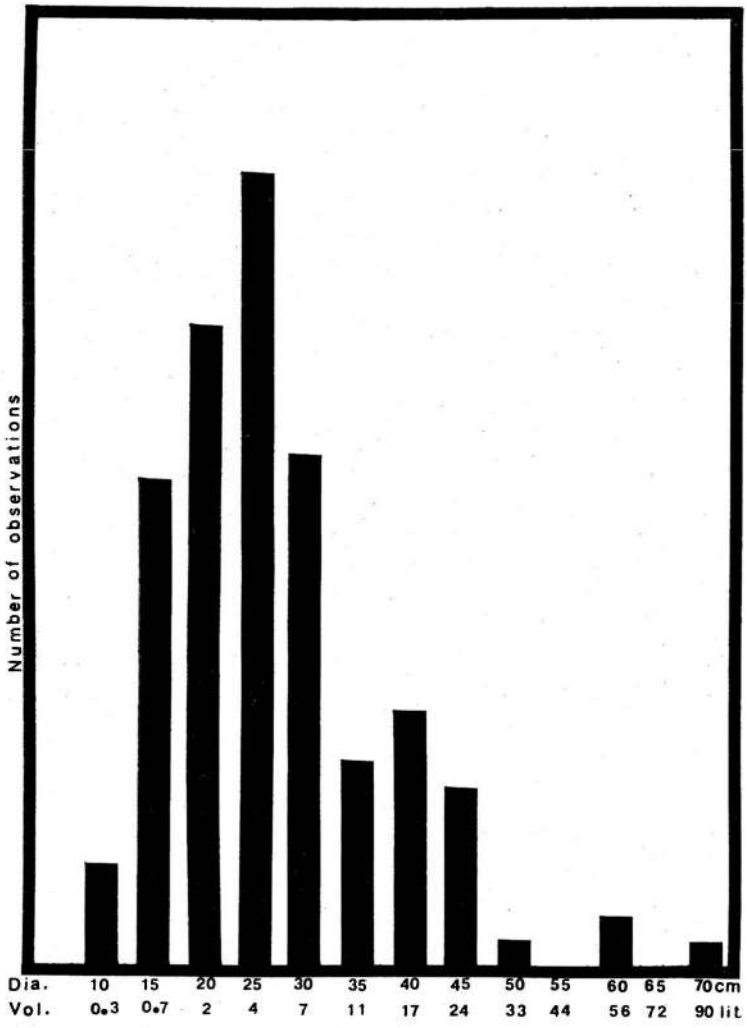


Fig. 3 Grouped data histogram of rim diameters and volume, Amsari.

Paekche grayware, dating to about A.D. 200. In rural districts present-day *kimchi* pots may be partly buried, as pointed-based pots presumably would also require.

The antiquity of *kimchi* can scarcely be denied, although its beginning in the Chulmun period remains unproved. The usefulness of root crops (Sauer 1952, Harris 1967), the presence in Korea of wild relatives of both vegetables used in *kimchi* (see Table 1), and the great usefulness of the root plant in terms of stored starch and vitamins make the storage and preservation of vegetables high on the list of possibilities for winter storage in the Chulmun period.

Grain that has been identified as millet has been found in a Chulmun pot of somewhat later date, at Chitamni in North Korea (Sohn et al. 1970). One unidentified grain impression in a sherd at Tongmak and several stalk impressions in Misari and Amsari pottery indicate that grains were being used to some extent.

Grinding stones at all three sites also indicate the use of grain, although whether wild or cultivated is still unknown.

## PLANT CULTIVATION

If vegetables and/or grain (foxtail millet?) were being stored, then either or both would probably have had to be cultivated in order to produce enough food to last through the winter. Independent evidence that there may have been cultivation includes the means for cultivation in the form of a stone tool, a location for planting—the open habitat on the riverbanks, and space for planting, with about 3–5 km between small villages (see Figure 2).

The stone tool, the so-called hoe-axe, is the most abundant type of implement found in the Han River sites. The mean dimensions of these tools are 10.8 × 6.3 × 2.0 cm, with a range of 9–13 cm in length and a range of 5–11 cm in width. However, thickness varies very little (1.2–3.3 cm), indicating that the selected pebbles from which the tools were made were chosen on the basis of their thickness (or rather thinness) and length/width ratio. The pebbles were modified by minimal crude flaking on one or both sides to produce a tool that was slightly narrower on one end, presumably for hafting. Microscopically visible striations all in the same direction indicate usage of the tool in sandy soil. In addition the general thinness renders the tool unfit for chopping any but the smallest branches. Interpretation of this tool as a hoe for cultivation is most consistent with its physical properties.

## SPACING

The sites are located on the 10 m river terrace where the open habitat of the terrace would have been an ideal location for cultivating wild open-habitat plants. Each site, representing a village of perhaps 50–100 inhabitants, has about 3 km of riverbank separating it from its nearest neighbor. This would provide adequate garden space for each village.

## CONCLUSION

From the internal evidence of the sites, in combination with environmental data, I conclude that the subsistence base of the Han River Chulmun period sites comprised hunting, fishing, and collecting, with plant cultivation in addition providing food for winter storage. Table 2 gives a synopsis of the logical steps which lead to this conclusion.

TABLE 2. PLANT CULTIVATION IN THE HAN RIVER CHULMUN SITES

| | SITE FINDINGS | ENVIRONMENT | CONCLUSION |
|---|---|---|---|
| 1. | Winter dwellings | most food available in spring, summer, fall | year-round settlements |
| 2. | Storage pots | no sufficient food supply in winter | food storage |
| 3. | Tool for cultivation<br>Locus for cultivation<br>Space between villages | no abundant natural food to store for winter | plant cultivation |

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Korean words are transliterated according to the McCune-Reischauer system of Romanization but omitting diacritical marks, except where other usage has become standard (e.g., Seoul). Amsari (ri = village) is now known as Amsadong (dong = division of a city, in this case Seoul), but the old usage has been kept because the site is known as Amsari in the literature.

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