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THE ORIGINS OF CYPRIOT FARMING*

New archaeobotanical finds from the late Xth millennium Cypriot sites of *Shillourokambos*¹ and *Mylouthkia*² provide evidence for the early introduction of an agricultural economy from the mainland. Given that our knowledge of old world agricultural development is still limited, the results shed new light on farming in both Cyprus and south-west Asia. The sites of *Shillourokambos* and *Mylouthkia*³ are contemporary with south-west Asian early farming sites such as PPNB Aswad, Dja'dé, Nevali Çori and possibly the very latest levels at Jerf el Ahmar (for site locations see **fig. 1**). The fact that the ancestors of most agricultural species (plants and animals) are not native to Cyprus implies that these species were introduced from the mainland. The evidence from charred plant remains, faunal remains and the archaeological finds indicates that settlers from the mainland brought livestock and viable seed for cereals and pulses. These were introduced as part of an agricultural baggage which included a tool assemblage and a well-established agricultural tradition. In order to approach the subject of the origins of Cypriot farming I shall attempt to answer some basic questions using the newly acquired archaeobotanical data from Cyprus and the Near East.

* Special thanks to Sue Colledge, Jean Guilaine, Daniel Helmer, Mary Anne Murray, Eddie Peltenburg, Danielle Stordeur and Jean-Denis Vigne for their enriching discussions and for making unpublished material available to me. Thanks also to the Cypriot Antiquities Department for their warm hospitality.

1. G. WILLCOX, « Présence des Céréales dans le Néolithique Précéramique de *Shillourokambos* à Chypre », *Paléorient* 26/1 (2000), p. 129-135 ; J. GUILAINE, F. BRIOIS, J.-D. VIGNE et I. CARRÈRE, « Découverte d'un Néolithique précéramique ancien chypriote (fin 9^e, début 8^e millénaire cal. BC), apparenté au PPNB ancien/moyen du Levant nord », *Comptes Rendus de l'Académie des Sciences de Paris. Sciences de la Terre et des Planètes* 330 (2000), p. 75-82.

2. Special thanks to Mary Anne Murray, Sue Colledge and Eddie Peltenburg for discussions and in supplying invaluable unpublished data on the rich archaeobotanical finds from *Mylouthkia*. See also E. PELTENBURG, S. COLLEDGE, P. CROFT, A. JACKSON, C. MCCARTNEY and M. A. MURRAY, « Neolithic Dispersals from the Levantine Corridor : a Mediterranean Perspective », *Levant* 33 (2001), p. 35-64.

3. E. PELTENBURG, S. COLLEDGE, P. CROFT, A. JACKSON, C. MCCARTNEY and M. A. MURRAY, « Agro-Pastoral Colonization of Cyprus in the 10th Millennium BP : Initial Assessments », *Antiquity* 74 (2000), p. 844-853.

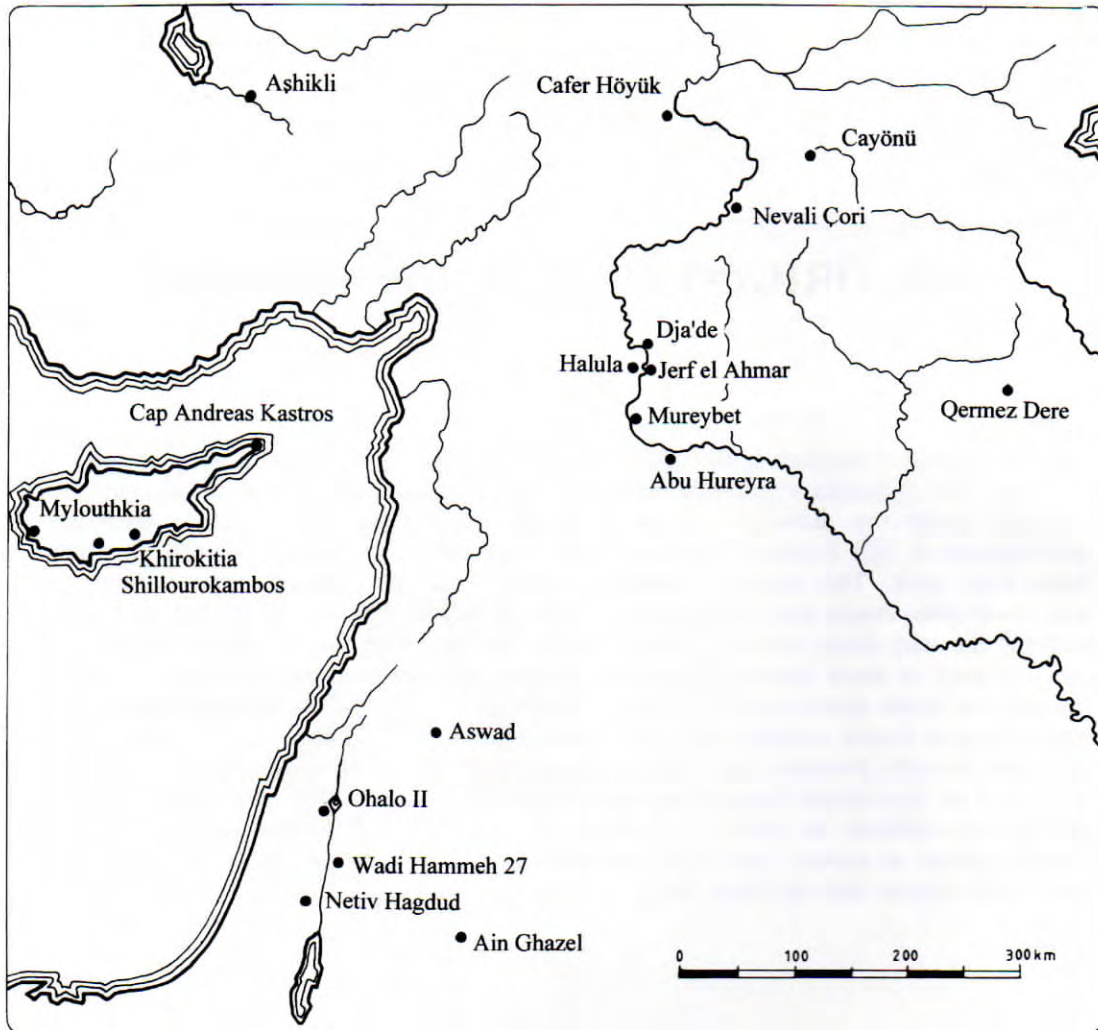


Fig. 1. — Map showing location of sites mentioned in the text.

WHAT WAS THE AGRICULTURAL STATUS OF SITES ON THE MAINLAND DURING THE EARLY PPNB?

It is not always clear whether the inhabitants of Early PPNB sites were fully fledged agriculturists or whether they still depended to some extent on gathering. In fact this may vary from site to site. At late Xth millennium sites⁴, morphologically wild cereals and pulses are common, and at some sites there is also evidence for morphological domestication.

4. Dates in the text are given in B.P. non calibrated. The corresponding B.C. cal. dates for major sites can be found in table 1.

Pre-domestic agriculture is indicated at a number of sites by the presence of agricultural weeds⁵. In the Near East as a whole during the Xth millennium, cereal assemblages vary between sites from different regions. This variation corresponds to differences in the natural habitats of wild cereals and implies that the cereals were of local origin, coming from the natural vegetation near the sites (see **table 1**)⁶. Thus barley is predominant at Jerf el Ahmar and Dja'dé⁷, single-grained einkorn at Nevali Çori and a mixture of einkorn and emmer at Cafer Höyük and Cayönü⁸. In the southern Levant, barley is dominant with some emmer. Even during the late Xth millennium high proportions of morphologically wild plants are present at most sites, which indicates that domestication was not always a rapid transformation. A good example to illustrate these mixed crops is to be seen in W. Van Zeist's work in the Damascus basin, where the wild type barley rachis segments are progressively replaced by domestic types over a period of two millennia (see **table 2**)⁹.

Table 1

THIS TABLE SHOWS HOW CEREAL ASSEMBLAGES FROM CYPRIOT AND NEAR EASTERN SITES VARY ACCORDING TO REGION. THIS VARIATION REFLECTS THE NATURAL DISTRIBUTION OF THE WILD CEREALS AND SHOWS THAT ON SITES DATED TO BEFORE THE END OF THE Xth MILLENNIUM B.P. (NON CAL.) LOCAL CEREALS WERE EXPLOITED AND IN A NUMBER OF CASES TAKEN INTO CULTIVATION

Region	Site	units	Date BP	einkorn 1g	einkorn 2g	emmer	barley	rye	BC cal.
Southern Levant	Ohalo II	1	19000	0	0	21	629		20500
	Wadi Hammeh 27		12200-11920	0	0	0	p		12200-11900
	Netiv Hagdud	8	9900-9400	0	0	27 (4)	541 (8)		9500-8700
	Aswad I	9	9800-9200	0	0	23 (6)	32 (6)		9300-7400
Middle Euphrates and Iraq	Abu Hureyra	24	1150-10000	0	>500(21)	0	0	p	11000-7000
	Qermez Dere		10100-9700	0	0	0	p		10100-9300
	Mureybet I-III	56	10,200-9600	0	744 (23)	0	116 (17)	p	10200-8500
	Jerf el Ahmar*	69	9700-9400	0	197 (25)	0	1132 (69)	p	9300-8900
	Dja'de*	18	9500-9000	0	309 (16)	?	662 (18)		8800-8000
Eastern Anatolia	Cafer Höyük XII XIII		9400-8800	p	p	p	0	p	8400-8000
	Cayönü g, bp, ch		9250-8500	p	p	p	p		8200-7500
	Nevali Cori	1	9250-9000	661	p	129	89		8200-8000
Cyprus	Mylothkia/Shillourokambos		9250-9000	p	p	p	p		8200-8000

	Possible domestication at this site.
0	Absence significant.
	Units = number of samples. 1g = single grained. 2g = two grained.
	Numbers not in brackets = absolute numbers of grains identified.
	Numbers in brackets (00) = number of samples in which a taxa is present.
	* preliminary results from author's unpublished data.

5. S. COLLEDGE, « Identifying Pre-Domestic Cultivation Using Multivariate Analysis », in A. DAMANIA, J. VALKOUN, G. WILLCOX and C. QUALET (eds.), *The Origins of Agriculture and Crop Domestication* (1998), p. 121-131; G. WILLCOX, « Archaeobotanical Evidence for the Beginnings of Agriculture in South-West Asia », *ibid.*, p. 25-38.

6. G. WILLCOX, « Geographical Variation in Major Cereal Components and Evidence for Independent Domestication Events in Western Asia », in R. T. J. CAPPERS, S. BOTTEMA (eds.), *The Dawn of Farming in the Near East, Studies in Near Eastern Production, Subsistence and Environment* 6 (1999), p. 133-140.

7. *Id.*, « Evidence for Plant Exploitation and Vegetation History from Three Early Neolithic Pre-Pottery Sites on the Euphrates (Syria) », *Vegetation History and Archaeobotany* 5/1-2 (1996), p. 143-152.

8. W. VAN ZEIST, G. DE ROLLER, « The Plant Husbandry of Aceramic Cayönü, E. Turkey », *Palaeohistoria* 33-34 (1994), p. 65-96.

9. W. VAN ZEIST, J. H. BAKKER-HEERES, « Archaeobotanical Studies in the Levant 1. Neolithic Sites in the Damascus Basin : Aswad, Ghoraiife, Ramad », *Palaeohistoria* 24 (1982), p. 165-256, pl. 18.

Table 2

CHANGES IN THE PROPORTIONS OF BRITTLE TO NON-BRITTLE RACHIS FRAGMENTS
FROM SITES IN THE DAMASCUS BASIN.

THIS APPEARS TO INDICATE THAT DOMESTICATION OF THIS SPECIES IN THIS AREA PROGRESSED VERY SLOWLY

Site	Date B.P.	Wild	Domestic	Undet.	N =
Ramad	8400-7800	33.5 %	50.6 %	30	539
Aswad I & II	9800-8500	62.5 %	26.6 %	11	128

At the very end of the Xth millennium we see the first definite humanly-induced spread of crops, which on the mainland is demonstrated by the sudden appearance of single-grained einkorn at Dja'dé, as well as in the very latest deposits at Jerf el Ahmar¹⁰. This movement is shown even more clearly by the introduction of emmer and einkorn to Cyprus at the same date.

Thus, by the end of the Xth millennium agriculture in south-west Asia was still in the process of becoming established. It is only during the IXth millennium that we see the spread of crops, particularly naked wheat, emmer and six-rowed hulled barley which emerge with the appearance of very large, well-established village sites such as Halula, Aşikli, Abu Hureyra and Ain Ghazel, to mention only a few. These sites were founded between 8800-8600 B.P. (Middle PPNB) and are evidence for the expansion of an established production economy, which led to a dramatic increase in surface area of the sites and probably a rapid increase in population. It must be stressed here that this phenomenon occurred after the earliest agricultural colonisation of Cyprus.

Within this setting we can suggest that farming spread to Cyprus when agriculture on the mainland was still in what might be interpreted as the consolidation stage, before the dramatic increase in the surface area of Middle PPNB sites. *Shillourokambos* and *Mylouthkia* are contemporary with the first wave of crop expansion, that is, of single-grained einkorn.

WHAT PLANTS WERE INTRODUCED TO THE ISLAND AT THE END OF THE Xth MILLENNIUM?

At *Shillourokambos* the preservation of the charred plant remains has been adversely affected by the precipitation of calcium carbonate which had encrusted the archaeological objects. Because the charred remains have a very porous structure the calcium carbonate penetrates the interior spaces and with crystallisation causes expansion and breaking up of the remains. Much of the evidence has therefore come from impressions in pisé.

The earliest levels at *Shillourokambos* produced brittle-rachised barley. This barley is morphologically wild. Barley is the only cereal which grows wild on the island today and it was probably part of the original vegetation. The barley from *Shillourokambos* in this case could be either local or imported. In contrast to barley there are no wild wheats on the island today. In south-west Asia the distribution of wild wheats has changed during

10. These two sites are under analysis and these recent finds have not yet been published.

the Holocene. On the one hand agriculture has encouraged einkorn to colonise new areas, while on the other hand climatic change has reduced their habitats in the arid zones. Wild wheats tend to prefer open habitats, and because Cyprus was probably covered with dense vegetation it is improbable that emmer and einkorn grew naturally on the island. Charred emmer grains and chaff were recovered from the EPPNB levels, but for the moment the remains do not allow a distinction between wild and domestic morphologies¹¹.

The identifications of einkorn in Near Eastern archaeobotanical assemblages are problematic. Theoretically, four morphotypes can be distinguished in ancient material. These consist of wild two-grained einkorn and its domestic equivalent, and wild single-grained einkorn and its domestic equivalent. In practice these distinctions are only possible with large well-preserved samples, which was not the case at *Shillourokambos*, where most of the results were obtained from impressions in pisé, in which chaff served as a tempering medium. Charred cereal remains from *Mylouthkia* dated to the same period have been studied by S. Colledge and M. A. Murray. These remains are more numerous and therefore more reliable; here there is excellent evidence for single-grained einkorn which is suggestive of a domestic morphology. The barley and the emmer are also reported as domestic on the basis of grain morphology¹². Thus the information from both *Shillourokambos* and *Mylouthkia* provides good evidence that already domesticated crops were introduced during the EPPNB. Wild barley at *Shillourokambos* could have been local or introduced since wild barley occurs on a number of agriculture sites on the mainland for this period.

Pulses were also introduced, but these may have not been easy to establish because they contain a symbiotic bacteria in their roots which is not transmitted with seed material. They require a culture of rhizobium bacteria which is specific to each species. However, lentil and pea are present. Flax was identified at *Mylouthkia* and was therefore probably introduced as part of the agricultural package. It is worth noting that this is one of the earliest finds of flax. Finally, it is highly probable that a weed assemblage was also inadvertently introduced.

WHERE DID THE INTRODUCED PLANTS ORIGINATE?

By comparing the cereal assemblages from the mainland with those from Cyprus it is possible to locate the region from which these crops appear to have originated. In general, when crops are introduced into new areas, in order to be successful they would have to be brought from an environment with similar climatic and edaphic conditions. The experimental fields at Jalès have demonstrated this principle by the failure of populations ill-adapted to conditions in southern France¹³. Thus populations from upland Anatolia would not be climatically adapted to the warm Mediterranean conditions of Cyprus.

11. G. WILLCOX, « Présence des Céréales dans le Néolithique Précéramique de *Shillourokambos* à Chypre », *Paléorient* 26/1 (2000), p. 129-135.

12. E. PELTENBURG, S. COLLEDGE, P. CROFT, A. JACKSON, C. MCCARTNEY and M. A. MURRAY, *loc. cit.* (*supra*, n. 3).

13. G. WILLCOX, « Agrarian Change and the Beginnings of Cultivation in the Near East : Evidence from Wild Progenitors, Experimental Cultivation and Archaeobotanical Data », in J. HATHER, C. GOSDEN (eds.), *The Prehistory of Food* (1999), p. 479-500.

The Cypriot EPPNB assemblage consists of three wheat taxa and barley. Sites in the southern Levant dated to the Xth millennium are all characterised by a barley/emmer assemblage including the most northerly site, that of Aswad¹⁴ in the Damascus basin. Sites in the Syrian Middle Euphrates are characterised by two-grained einkorn and barley. It is only at the sites situated in south-east Anatolia that the four cereals, emmer, two-grained einkorn, one-grained einkorn and barley are found together. This assemblage corresponds with the EPPNB Cypriot material. Perhaps more important is the presence of single-grained einkorn at *Mylouthkia*, because the centre of domestication of single-grained einkorn has been located with some precision. Converging data from DNA¹⁵ and archaeobotany indicates that single-grained einkorn was domesticated in south-east Anatolia where emmer and barley¹⁶ also occur. This is confirmed by finds of charred single-grained einkorn which are confined to south-east Anatolia for sites dated to the Early PPNB and Nevali Çori¹⁷ is the only site where this taxon represents the major cereal component. Thus south-east Anatolia is the only area where we find the corresponding combination of cereals (see **table 1**) which make up the Cypriot assemblage, and it appears highly probable that at least some of the cereal populations were introduced from this area. This hypothesis is confirmed by the faunal remains found at *Shillourokambos*, because the introduced animals, such as fallow deer and goat, come from wooded habitats which existed in south-east Anatolia at this time. Recently it has been suggested that this area is indeed a core area for agricultural development¹⁸.

HOW DID THE PLANT ECONOMY DEVELOP ON THE ISLAND OF CYPRUS DURING THE EPPNB?

This question can only be answered by examining the archaeobotanical data recovered from charred remains. But first it must be admitted that we do not know whether *Shillourokambos* and *Mylouthkia* were founder colonies. The first colonial expeditions were probably temporary and at this stage grain may have been imported. The first permanent settlements may also have initially relied on imported grain which could have been stored on a large scale¹⁹. Eventually land would have been cleared and surplus imported grain sown locally. Here the choice of soils would have been important and it is not surprising that the sites are located near areas with the kind of rich soils that the wheats require. Indigenous wild

14. W. VAN ZEIST, J. H. BAKKER-HEERES, « Archaeobotanical Studies in the Levant I. Neolithic Sites in the Damascus Basin : Aswad, Ghoraife, Ramad », *Palaeohistoria* 24 (1982), p. 165-256.

15. M. HEUN, R. SCHÄFER-PREGL, D. KLAWAN, R. CASTAGNA, M. ACCERBI, B. BORGHI and F. SALAMINI, « Einkorn Wheat Domestication Identified by DNA Fingerprinting », *Science* 14/278 (1997), p. 1312-1314.

16. There is some evidence from DNA finger printing which points to a centre of barley domestication in the southern Levant. Cf. A. BADR, K. MÜLLER, R. SCHÄFER-PREGL, H. EL RABEY, S. EFFGEN, H. H. IBRAHIM, C. POZZI, W. ROHDE and F. SALAMINI, « On the Origin and Domestication History of Barley (*Hordeum vulgare*) », *Molecular Biology and Evolution* 17 (2000), p. 499-510.

17. R. PASTERNAK, « Investigations of Botanical Remains from Nevali Çori PPNB, Turkey », in A. DAMANIA, J. VALKOUN, G. WILLCOX and C. QUALET (eds.), *op. cit. (supra, n. 5)*, p. 170-177.

18. S. LEV-YADUN, A. GOPHER, S. ABBO, « The Cradle of Agriculture », *Science* 288 (2000), p. 1602-1603.

19. The finds of domestic mice remains from *Mylouthkia* may indeed be evidence of this ; their introduction was probably linked to large scale importation. Cf. T. CUCCHI, *Première diffusion de la souris domestique vers Chypre au 9^e millénaire av. J.-C.*, Mémoire de DEA, Muséum d'Histoire Naturelle, Paris (2001).

barley could have been harvested from natural stands, as an alternative if crops failed or imports were curtailed. Once cultivation began, the inhabitants would have been obliged to settle permanently for the maintenance of the crops. Crop failure may have led to local harvests being supplemented by importation until a surplus was attained. Local native plants may have been added to the weed assemblage imported with grain from the mainland.

Gathered plants may also have been important, particularly since the natural vegetation on the island offers a wide variety of edible fruits. In comparison to most areas of the Near East, Cyprus provides a greater diversity of fruit trees concentrated in a relatively small area. Many of these species are present in the narrow Mediterranean zone on the mainland, but were not so readily accessible as those occurring in the rich Cypriot flora. Potentially exploitable fruits occurring in the wild include olives, grapes, figs, cherries, plums, sloes, *Amelanchier*, strawberry tree fruits, acorns, terebinth, hackberry and wild pears. Of these fruits at least seven taxa have been identified from charred material from the five early Neolithic sites which have been sampled on Cyprus.

WHAT IS THE EVIDENCE FOR THE EVOLUTION OF AN ENDEMIC AGRICULTURAL SYSTEM ON THE ISLAND?

Geographical isolation leads to the evolution of ecosystems with endemic species. Not surprisingly Cyprus is the home of a large number of endemic plant species. Prehistoric agriculture on the island may have developed to some extent in isolation, which could have led to agricultural systems evolving differently from the mainland. At present, results obtained from the EPPNB alone show affinities with south-east Anatolia. In the later Neolithic periods the Cypriot material from Khirokitia²⁰ and Cap Andreas-Kastros²¹ shows a divergence from sites in the Near East. At Khirokitia the preponderance of einkorn and the high frequencies of a rye-grass (*Lolium*) is particularly striking. But perhaps the most important difference is the consistent absence of naked wheat, which occurs commonly on mainland sites for this period. At Khirokitia and *Shillourokambos* the presence of *Prunus* sp, which is absent from mainland sites, is also characteristic of the Cypriot assemblages. Finally, finds of fruits such as fig, grape, olive and *Prunus* represent some of the earliest finds of these taxa for the Neolithic in the eastern Mediterranean region.

WHAT DOES THE EVIDENCE FROM CYPRUS TELL US ABOUT THE STATUS OF AGRICULTURE IN THE NEAR EAST?

First it tends to confirm that cereal cultivation was widely practised, even when morphologically wild plants are in evidence on many PPNB sites. Secondly it shows that agriculture was in an expansive stage by the end of the Xth millennium and that this

20. J. HANSEN, « Khirokitia Plant Remains : Preliminary Report (1986, 1988-1990) », in LE BRUN 1994, p. 393-409 ; J. HANSEN, « Khirokitia Plant Remains : Preliminary Report (1980-1981, 1983) », in LE BRUN 1989, p. 235-250.

21. W. VAN ZEIST, « Plant Remains from Cap Andreas-Kastros (Cyprus) », in LE BRUN 1981, p. 95-99.

expansion probably came from a core area in south-east Anatolia. The majority of known sites of this period in this area are restricted to the Euphrates valley. Thus it is possible that the absence of sites in the zone between the Euphrates and the Mediterranean may be due to lack of survey work, and that a survey in the rich river valleys and plains in this area could be rewarding.

CONCLUSION

The problem of distinguishing between wild and domestic cereals occurs on many sites for the Xth millennium, and not all specialists are in agreement. However it does appear that pre-domestic agriculture was widespread during the first half of the tenth millennium, and that for wheat and barley the first signs of morphological domestication appear during the second half of the tenth millennium at some sites²². But at many sites wild morphologies still continue to be present. The grain morphology of finds from *Mylouthkia* are strongly suggestive of domestication.

Given the situation on the mainland, both morphologically wild wheats and their domestic equivalents could have been introduced onto the island. Wild wheats (emmer and einkorn) are not found on the island today. We cannot know if they grew there in the early Holocene but because of the likelihood of a dense vegetation this seems improbable. Wild barley is common in many areas of Cyprus today, and it could have been used and taken into cultivation during the early Neolithic. At *Shillourokambos* there is definite evidence for the use of brittle-rachis wild barley during the earliest phases.

Finally, early colonists may have relied initially on imported grain but this is difficult to identify from the archaeobotanical remains. Given the evidence for the movement of raw materials such as obsidian, marine shells and possibly plant materials over considerable distances in the Near East importation of grain is a possibility. As we have seen Cyprus offers a particularly rich array of wild fruits and although archaeobotanical finds are rare numerically, these fruits were indeed exploited and may have been much appreciated by early settlers since these plant resources were less available and more difficult to obtain on the mainland.

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22. G. WILLCOX, *loc. cit.* (*supra*, n. 13); cf. M. KISLEV, « Pre-domesticated Cereals in the Pre-Pottery Neolithic A Period », in I. HERSHKOVITZ (ed.), *People and Cultural Change, BAR International Series 508* (1989), p. 147-151.