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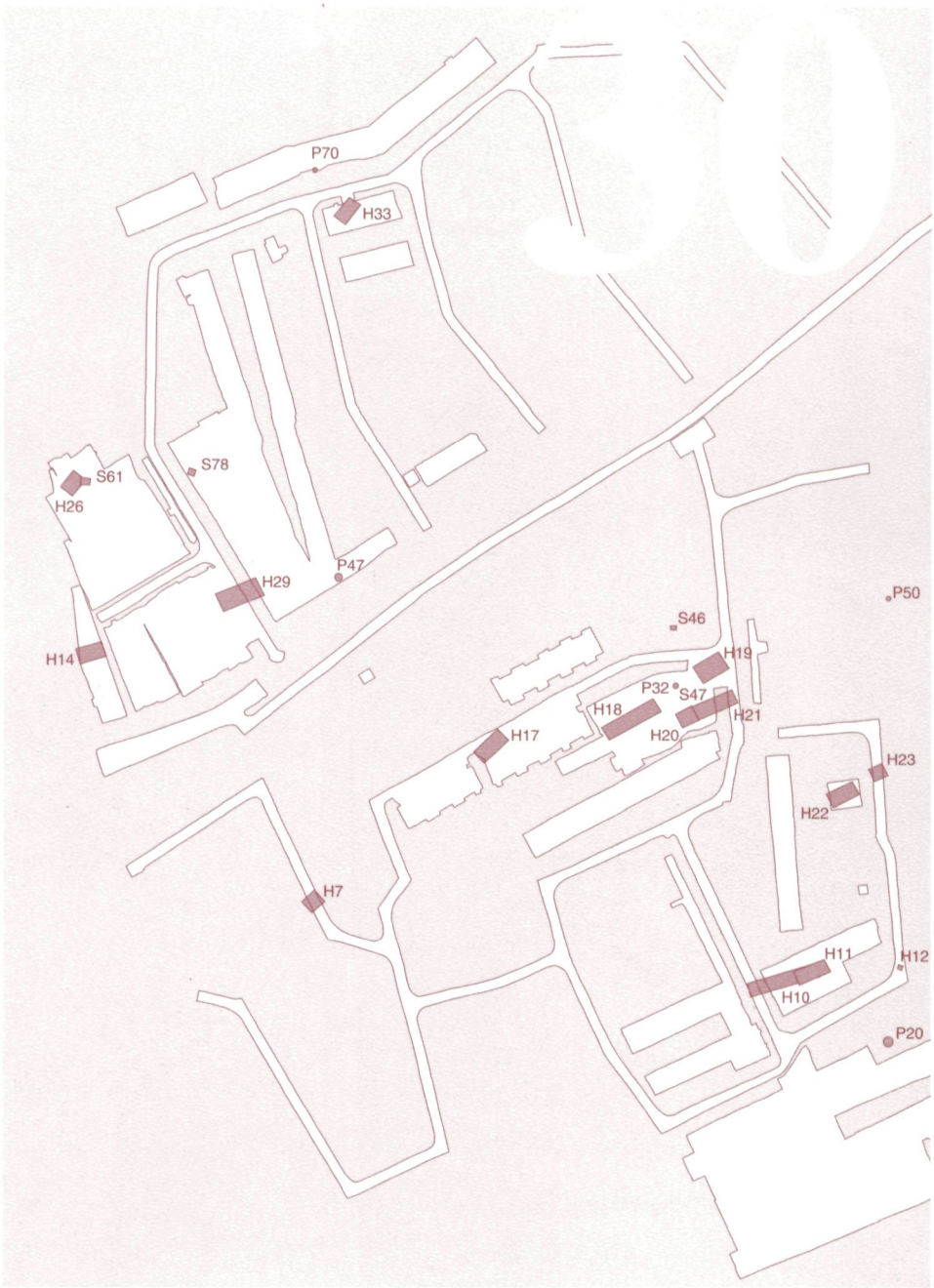

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THE USSEN PROJECT

THE FIRST DECADE OF EXCAVATIONS AT OSS

EDITED BY HARRY FOKKENS

LEIDEN UNIVERSITY 1998

To the local archaeologists who were our ears, eyes and hands:
Gerard van Alphen, Henk den Brok, Gerrit van Duuren, Mien van Eerd, Piet Haane, Piet van Lijssel, Wil Megens, Ans Otten, Lex Pinkse, Piet de Poot and Gerard Smits.

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contents

Corrie Bakels

Fruits and seeds from the Iron Age settlements at Oss-Ussen

1. Introduction

The extensive excavations at Oss-Ussen led to a steady flow of soil samples to the palaeo-ethnobotanical laboratory of Leiden. These samples came both from dry contexts, such as shallow pits and postholes, and from features extending to beneath groundwater level. Both were transported to the laboratory in plastic bags. The samples were reduced in volume as quickly as possible so as to enable them to be stored. This was done by manually sieving the samples through sieves with mesh widths of up to 0.25 mm with the aid of tap water. Where possible, the samples were sieved in the field already. The dry samples could have been analysed by means of flotation, but as the water-saturated samples could only be reduced by sieving, it was decided to use the same reduction technique for both types of samples. Many of the dry samples moreover came from features with small volumes and were hence relatively small. In the case of such samples sieving takes about as much time as flotation and moreover yields slightly more accurate results.

During the sieving, notes were made on the quantities of botanical remains and various conspicuous species were recorded. The residues were then stored until more information became available on their dates and archaeological contexts. Residues from dry sediments were stored under dry conditions, those from wet sediments under wet conditions. As the study of the evidence obtained in the excavations progressed, the residues were retrieved from storage for closer analysis. Some analyses were carried out in the context of students' theses. Ruth van de Laarschot, for example, studied the wells from the Bronze Age and the Early Iron Age, Okke Dorenbos those from the Late Iron Age and the Roman period, and Frank Vinkestijn concentrated on carbonised remains from pits and postholes. The results they obtained for the Iron Age have been gratefully used in this chapter. The analyst Johan Goudzwaard studied the Middle Iron Age wells. The lion's share of all the work was however done by Wim Kuijper. He arranged storage facilities for the samples, performed the preliminary analyses, kept the vast administration up to date, checked the other researchers' determinations and carried out any additional analyses required. I myself analysed various samples containing carbonised remains, I studied the grain impressions in pottery and compiled the contributions of the various researchers mentioned above.

It was decided to describe the remains per type of feature, per settlement and per period. Settlements IV, V and VI are the oldest, dating from the first half of the Early Iron Age (phases A-B). Settlements VII, VIII and IX date from the second half of the Early Iron Age (phases C-D). Settlements X, XI and XII were dated to the first half of the Middle Iron Age (phases E-F) and XIII, XIV and XV to the second half (phases G-H). The Late Iron Age is represented by settlements XVI, XVII and XVIII (phases I-L). Further information on these settlements is to be found in Schinkel (this volume, chapters 6, 7 and 8). To keep the terminology as simple as possible, I will, in the following discussion, use the term 'seeds' only, to refer to seeds proper, but also to all fruits and the like.

2. Seeds from the features of buildings

Only a limited number of samples from the features of buildings was available for research. One of the reasons for this is that it was later found that many of the postholes from which samples had been taken did not form part of the plans of recognisable buildings. A large proportion of these features moreover remained undated and were not further investigated. The second reason is that no samples were taken from very shallow features. The results of the available samples are summarised in table 1. All but two of these samples came from the postholes of houses and granaries. The other two came from a 'hearth' associated with house H68 in settlement XIII and a bedding trench of house H80 in settlement XVIII. None of the sampled features extended to beneath groundwater level and all the discussed remains were hence carbonised. Seeds that sometimes appear carbonised in recent or semi-recent contexts, too, were tested to see whether they were indeed carbonised. Notorious in this respect are seeds of *Chenopodium* species.

Early Iron Age samples are not represented in the table, for the simple reason that no samples containing remains from this period were taken, which is not surprising, considering the scarcity of recognisable Early Iron Age features and the shallowness of the postholes from this period. The Middle Iron Age features did not all yield botanical remains. Only one of the nine postholes of the nine-post granary S473, for example, yielded carbonised remains, and they comprised

Table 1. Carbonised seeds from the features of houses (H) and granaries (S). Not every sample did contain remains. Sample size refers to the sample with seeds.

period	Middle Iron Age									Late Iron Age													
settlement	X		XII			XIV			XV	XVII		XVIII											
building	S473	S474	H68	S174	S175	S147		S157	S33	H55	H63	H80				H81	H100			H114	H123	S337	
number of sampled features	9	8	1	1	2	2		1	1	2	2	6				1	3			1	1	1	
features with charred seeds	1	1	1	1	1	2		0	1	1	0	4				1	3			1	1	1	
sample size in liters	1.5	1.5	1	1	2	1.5	1.5	–	0.5	1	–	4	2	0.5	1	3	2	2	2	1	1.5	0.25	
Cultivated plants																							
Hordeum vulgare	–	–	1	21	–	8	–	–	7	–	–	–	2	–	–	8	–	–	–	71	1	1	
Hordeum vulgare, rachis fragments	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	20	–	1	–	1	–	–	
Hordeum, awns	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	
Panicum miliaceum	–	–	–	1	–	7	–	–	–	–	–	–	–	–	–	1	–	–	–	–	3	–	
Triticum dicoccum	–	–	–	13	–	2	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	
Triticum dicoccum, chaff	–	1	–	16	–	2	–	–	–	–	–	–	1	–	–	9	–	–	–	–	–	–	
Hordeum/Triticum	–	–	–	41	1	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	
Straw fragments	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	
fields, gardens, wastelands, paths																							
Anagallis arvensis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	
Avena sp.	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Avena, awns	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	
Capsella bursa–pastoris	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1	–	–	–	
Chenopodium album	–	–	–	1	–	3	–	–	2	5	–	–	–	–	–	5	1	–	–	1	–	48	
Chenopodium ficifolium	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	2	–	–	–	–	–	2	
Chenopodium polyspermum	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	
Digitaria ischaemum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	4	–	
Echinochloa crus–galli	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–	2	–	–	1	2	–	–	
Euphorbia helioscopia	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	
Lapsana communis	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	
Poa annua	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	
Polygonum aviculare	–	–	–	–	–	–	–	–	2	1	–	–	–	–	–	–	–	–	–	–	1	–	
Polygonum convolvulus	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	
Polygonum lapathifolium	–	–	–	7	–	3	4	–	–	16	–	–	–	1	–	5	–	1	1	2	3	–	
Polygonum persicaria	1	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	1	–	–	–	3	–	
Raphanus raphanistrum	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	
Rumex acetosella	–	–	–	1	–	–	–	–	–	4	–	–	–	1	–	2	–	–	–	2	1	–	
Setaria viridis/verticillata	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14	–	–	–	–	3	–	
Solanum nigrum	–	–	–	–	–	6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Spergula arvensis	–	–	–	–	–	4	–	–	–	6	–	–	–	–	–	1	–	–	–	2	–	–	
Vicia hirsuta	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Vicia hirsuta/tetrasperma	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	
Ruderal plants																							
Eleocharis palustris	–	–	–	–	–	–	–	–	–	35	–	–	–	–	–	3	–	–	–	–	–	1	
Juncus effusus	–	–	–	–	–	–	–	–	–	25	–	–	–	–	–	–	–	–	–	–	–	–	

period	Middle Iron Age									Late Iron Age														
settlement	X		XII			XIV			XV	XVII		XVIII												
building	S473	S474	H68	S174	S175	S147		S157	S33	H55	H63	H80				H81	H100			H114	H123	S337		
number of sampled features	9	8	1	1	2	2		1	1	2	2	6				1	3			1	1	1		
features with charred seeds	1	1	1	1	1	2		0	1	1	0	4				1	3			1	1	1		
sample size in liters	1.5	1.5	1	1	2	1.5	1.5	–	0.5	1	–	4	2	0.5	1	3	2	2	2	1	1.5	0.25		
Lycopus europaeus	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–		
Montia fontana	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
Polygonum hydropiper	–	–	–	–	–	–	–	–	1	5	–	–	1	–	–	–	1	–	–	–	–	–		
Polygonum minus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–		
Ranunculus repens	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–		
Trifolium repens/hybridum	–	–	–	–	–	–	–	–	–	6	–	–	–	–	–	2	–	–	–	–	–	–		
Waterplants and riparian plants																								
Cuscuta europaea	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	–	–	–	–	–	–		
Glyceria fluitans	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–		
Glyceria sp.	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–		
Forest and forest edges																								
Corylus avellana	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–		
Prunus spinosa	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
Grasslands																								
Bromus hordeaceus/secalinus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–		
Daucus carota	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–		
Festuca/Lolium	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–		
Gramineae sp.	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	4	1	1	1	–	–	–		
Holcus lanatus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–		
Medicago lupulina/sativa	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–		
Phleum pratense	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–		
Plantago lanceolata	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	1	–	–	–	–	–	–		
Poa sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–		
Trifolium arvense/campestre	–	–	–	–	–	–	–	–	–	4	–	1	–	–	–	2	–	–	–	–	–	–		
Trifolium pratense/medium	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–		
Vicia sativa ssp. nigra	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–		
Others																								
Carex sp.	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–		
Rumex sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–		
Stellaria sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–		
indeterminable	–	–	–	–	–	–	1	–	–	5	–	1	–	7	6	–	5	2	–	–	–	–		

only one seed. And only one of the eight sampled postholes of the nine-post granary S474 yielded remains. Nothing was found in the features of granary S157 or house H63 either. Neither did all of the samples from the features of the Late Iron Age settlements contain remains.

In table 1 the identified species have been arranged on the basis of the environments in which they are to be found most commonly nowadays. The species were classified more or less in accordance with the 1983 *Standaardlijst van de Nederlandse Flora* (Standard List of the Dutch Flora; Van der Meijden *et al.* 1983), supplemented with data from the *Nederlandse Oecologische Flora* (Dutch Ecological Flora; Weeda *et al.* 1985, 1987, 1988, 1991, 1994). The plants may have grown in other environments besides those specified for the individual species, and the environments need moreover not have been exactly the same in the Iron Age as they are today. Especially the environments disturbed by man may have undergone changes over the ages. It for example proved difficult to distinguish between field weeds and ruderals at Oss-Ussen. In two cases, common nipplewort *(Lapsana communis)* and sheep's sorrel *(Rumex acetosella)*, the present-day classification has not been followed, because the two species are in prehistoric contexts so frequently associated with cereals that they are to be regarded as field weeds. Sheep's sorrel is indeed mentioned as a problematic weed in rye fields in historical sources.

Most of the seeds derive from species that grew in fields and gardens, on wasteland and along paths. Cultivated plants were well represented. They include hulled barley *(Hordeum vulgare)*, emmer *(Triticum dicoccum)* and millet *(Panicum miliaceum)*. The long rachis segments show that the barley was of a variety with lax ears. Oat *(Avena* sp.) may have been cultivated, too, but it has here been classed as a weed, because although the carbonised remains do not show the required diagnostic features, the impressions in pottery and a few seeds recovered from wells show that especially wild oat *(Avena fatua)* was present at the site. Another species that may have been cultivated, corn spurrey *(Spergula arvensis)*, has also been classed as a weed here, like *Setaria viridis/verticillata*, which may theoretically also have been Italian millet *(Setaria italica)*, but more probably represents the wild green bristlegrass *(Setaria viridis)*.

The weed remains derive from species with varying habitat requirements. One component clearly points to the use of light, more or less acid sandy soils. The flora of such soils is represented by for example corn spurrey *(Spergula arvensis)*, the wild millet species cockspur, green bristlegrass and smooth fingergrass *(Echinochloa crus-galli, Setaria viridis* and *Digitaria ischaemum*), sheep's sorrel *(Rumex acetosella)* and pale persicaria *(Polygonum lapathifolium)*, if the encountered seeds indeed derive from the *pallidum* subspecies. The combination of black bindweed *(Polygonum convolvulus)*, hairy tare *(Vicia hirsuta)* and wild radish *(Raphanus raphanistrum)* points to the use of soils with higher nutrients contents. Even richer and less dry soils are represented by red shank *(Polygonum persicaria)*, scarlet pimpernel *(Anagallis arvensis)* and sun spurge *(Euphorbia helioscopia)*. There were also extremely nutritious environments in which grew for example *Chenopodium* species and black nightshade *(Solanum nigrum)*. All these soils were regularly tilled, and will hence have formed part of fields or gardens. Some of the plants are assumed to have accompanied crops sown in the autumn, others those sown in the spring. The barley and emmer may have been grown as winter cereals, while millet is a typical summer cereal. Unfortunately the remains from Oss-Ussen cannot be used to demonstrate any correlations between specific crops and weeds.

The next category consists of open environments with varying groundwater levels that were disturbed by man. A common plant of these environments is water-pepper *(Polygonum hydropiper)*. Nowadays this plant thrives on the banks of ditches that are regularly dredged. It is of no economic importance and is not even consumed by cattle. At Oss-Ussen such wet ruderal environments are thought to have been situated in the immediate surroundings of wells and watering places, which must have been contaminated and sodden.

Water plants proper were entirely absent, and of the plants that grew along water edges only manna-grass *(Glyceria fluitans)* was represented. This species is very suitable for human consumption. The large seeds of this grass are known to have been collected in historical times (Dembinska 1976) and they are thought to have been consumed in the Iron Age, too (Brinkkemper 1991: 59). In the case of Oss-Ussen, manna-grass may also be regarded as a food plant that was gathered in the wild. Another plant identified among the remains which may have grown along water edges is greater dodder *(Cuscuta europaea)*. This plant, which grows as a parasite especially on nettles, is most commonly found on river banks, but it grows elsewhere, too.

Grassland is only moderately well represented, even to a lesser extent than suggested by the table, because the remains identified as *Bromus hordeaceus/secalinus* may also derive from chess-brome *(Bromus secalinus)*, a weed associated with cereal, and the grass meadow cat's tail *(Phleum pratense)* is also known to have grown in prehistoric fields (Knörzer 1971), while ribwort plantain *(Plantago lanceolata)* is also found on falloow land.

The two representatives of forest soils, hazelnut *(Corylus avellana)* and sloe *(Prunus spinosa)*, were gathered for consumption.

To summarise, the carbonised Middle and Late Iron Age seeds found at Oss-Ussen come from environments that were severely affected by human activities. They tell us what grew in the fields and farmyards. No changes are observable

through time, except that the grassland component seems to have made its appearance only at the beginning of the Late Iron Age. But as the grassland species are poorly represented, we cannot draw any conclusions from this in the absence of further evidence.

The carbonised seeds can tell us nothing about the functions of the buildings in whose features they were found. The seeds were not specifically recovered from the fills of the holes that originally held the wooden supports because it was impossible to distinguish the soil of these fills from that of the pits that held the posts' packing.[1] So the remains do not provide a reliable picture of activities in the granaries and the houses. A high proportion of the remains will have already been lying around on the soil in the areas where holes were dug for the posts, and will hence predate the structures' construction. But as the seeds were not worn, only little time can have elapsed between their carbonisation and the erection of the buildings, so their dates may be considered reliable. All the assemblages of seeds included in table 19 presumably represent the remains of burned refuse already present on the settlement site. In the case of granary S174 and house H114 this refuse was a carbonised batch of cereal. House H55 was built at a site where weeds had been burned, while the site at which house H81 was constructed was littered with carbonised threshing remains, farmyard refuse and possibly some hay or burned dung.

3. Seeds from wells, watering places and other deep pits

A large number of samples was taken from wells, watering places and other pits extending to beneath groundwater level. They are the best datable features and plant remains were visible in them during the excavation already. But samples from wells do not automatically yield botanically interesting results. At Oss, the contents of the samples proved to be greatly dependent on the depth at which the samples had been taken. Only sediments that had remained permanently saturated with water to the present proved to contain a wide variety of remains. Most of the samples taken from other sediments contained only decay resistant seeds and carbonised remains. This difference is assumed to be the result of differences in preservation and not of another possibility, namely that the greater proportion of plant remains ended up at the bottom of the wells.

Table 2 shows the differences between samples from well P496 (EIA phase A), deep pit P64 (EIA phase C), watering place P427 (MIA phase F), well P252 (LIA phase J) and watering place P271 (LIA phase K). The samples were taken from the centres of the features, where possible from inside the lining, and the indicated depths are relative to the surface exposed in the excavation; the old land surface will have lain at a higher level. The plants have again been arranged on the basis of the environment in which they grew. Not indicated in the table are the results of the analyses of the samples that were taken from the fills of the pits into which the linings were inserted. Those samples contained no, or virtually no, seeds, irrespective of the depth at which they were taken. The botanical contents of the samples included in the table hence relate to the period in which the wells were used and the time after that.

The lists may be regarded as representative of all the samples. Column 1 shows the complete list of species, based on the results of all the wells investigated in the 15 settlements. It comprises at least 131 species. No, or only minor distinctions have been made within taxa like *Carex, Juncus* and Gramineae, so the actual number will be even greater. Only the somewhat rarer species were not represented in the five aforementioned wells. The contents of the other samples have not been indicated in the table as it would otherwise have become too large for publication.

Surveys of the results per period are presented in the three columns showing the frequencies of the individual species in each of the three periods. These frequencies indicate the percentages of samples in which the species in question was encountered. No attention was paid to the numbers of seeds in calculating these frequencies, so whether a sample contained only one seed or a large number of seeds was considered irrelevant. This approach was taken to avoid the risk of species that produce large quantities of seeds being overrepresented. It does however involve the risk of rare species being overemphasised.

Only samples taken from depths of at least 65 cm beneath the exposed surface were considered in calculating the frequencies, because it was assumed that the risk of the selective disappearance of species would be smallest in the case of these samples, and that they would hence be best comparable. The number of species found per period is indicated at the end of each ecological subgroup. A few species were encountered not in the samples used for the frequency table but in the other samples. They were given the frequencies 0, 0, 0. It was decided to calculate the frequencies per period rather than per phase because of the limited number of samples suitable for calculation purposes.

The wells were found to contain the remains of five to six more cultivated plants than the features of buildings. These additional cultivated plants are gold of pleasure *(Camelina sativa)*, linseed/flax *(Linum usitatissimum)*, poppy *(Papaver somniferum)*, spelt *(Triticum spelta)*, broad bean *(Vicia faba)* and rapeseed *(Brassica rapa)*. It is assumed that the last species was grown in the Iron Age already (Brinkkemper 1991: 57), but the remains may also derive from a field weed. All the cereal species and the linseed were also represented by threshing remains in the form of chaff, awn fragments, rachis

Table 2. Seeds from wells, watering places and other deep pits. The left part of the table shows the contents of five wells (P), represented by 11 samples. Charred seeds are indicated by an asterisk. The right part presents the frequency (in %) of all species found in wells and other deep pits. The calculations are based on samples taken from depths of at least 65 cm beneath the exposed surface. Species encountered in both a waterlogged and a carbonised form are indicated by an "X". Bromus hordeaceus/secalinus and Matricaria maritima occurred only charred.

	Iron Age											Iron Age			
	Early					Middle		Late				Early	Middle	Late	
number	P496			P64		P427		P252		P271					
cm below surface	50	60	85	70	90	40	85	90	105	50	90				
sample size in liters	0.5	0.8	2.5	2	3	2	0.2	2	3.5	1	1	frequency			
number of species	0	12	38	2	20	0	39	15	55	6	64	N=5	N=9	N=8	
Cultivated plants															
Brassica rapa	–	–	–	–	–	–	–	–	–	–	3	0	0	25	
Camelina sativa	–	–	–	–	–	–	–	–	–	1*	–	20	22	13	×
Hordeum vulgare	–	–	–	1*	1*	–	1*	1*	–	–	–	40	67	63	×
Linum usitatissimum	–	–	–	–	–	–	5	–	50	–	6	20	33	50	
Panicum miliaceum	–	–	–	–	–	–	1*	–	70	–	6	40	33	63	×
Papaver somniferum	–	–	–	–	–	–	–	–	–	–	–	40	0	0	
Triticum dicoccum	–	–	1*	–	–	–	–	–	–	–	–	20	44	13	×
Triticum spelta	–	–	–	–	–	–	–	–	–	–	–	20	33	13	×
Vicia faba	–	–	–	–	–	–	–	–	–	–	–	0	11	0	×
N = 9												**7**	**7**	**7**	
Fields, gardens, wastelands, paths															
Aethusa cynapium	–	–	–	–	–	–	1	–	–	–	1	0	22	13	
Anagallis arvensis	–	–	–	–	–	–	–	–	–	–	4	0	11	25	
Atriplex patula/prostrata	–	–	–	–	–	–	2	10	16	–	6	20	44	63	×
Atriplex sp.	–	–	–	–	–	–	–	–	–	–	–	0	11	0	×
Avena sp.	–	–	–	–	–	–	–	–	–	–	–	0	33	13	×
Capsella bursa–pastoris	–	–	–	–	–	–	–	–	269	–	38	0	11	50	
Chenopodium album	–	–	2	–	7	–	31	–	273	–	415	80	78	88	×
Chenopodium ficifolium	–	–	–	-	2	-	11	-	486	-	95	40	33	88	×
Chenopodium polyspermum	-	-	-	-	2	-	1	-	225	-	-	40	33	25	
Conium maculatum	-	-	-	-	-	-	-	-	5	-	2	20	11	25	
Corrigiola litoralis	-	-	-	-	-	-	-	-	-	-	-	20	0	0	
Cuscuta epilinum	-	-	-	-	-	-	-	-	5	-	1	0	0	38	
Digitaria ischaemum	-	-	-	-	-	-	-	-	-	-	2*	0	11	25	×
Echinochloa crus-galli	-	-	25	-	-	-	-	-	-	-	2*50	40	33	38	×
Erodium cicutarium	-	-	-	-	-	-	-	-	-	-	-	0	0	0	
Euphorbia helioscopia	-	-	-	-	-	-	-	-	-	-	-	0	0	25	
Galeopsis speciosa/tetrahit	-	-	-	-	1	-	1	2	-	-	10	40	33	50	
Hyoscyamus niger	-	-	-	-	-	-	-	-	-	-	1	0	0	13	
Lamium purpureum-t.	-	-	-	-	-	-	-	-	7	-	-	0	0	13	
Lapsana communis	-	-	-	-	-	-	-	-	-	-	7	0	0	13	
Matricaria maritima	-	-	-	-	-	-	-	-	-	-	-	0	44	0	×
Poa annua	-	-	11	-	-	-	9	-	200	-	76	40	11	63	×
Plantago major	-	-	8	-	-	-	4	-	60	-	34	60	33	63	×
Polygonum aviculare	-	1	76	-	2	-	10	-	7	-	20	60	56	63	×
Polygonum convolvulus	-	-	-	-	-	-	-	-	3	-	-	0	22	38	×
Polygonum lapathifolium	-	3	44	-	24	-	25	2	55	4*	175	100	89	88	×
Polygonum persicaria	-	-	-	-	20	-	-	1	15	-	-	40	33	38	×
Raphanus raphanistrum	-	-	-	-	-	-	-	-	1	-	3	0	0	50	
Rumex acetosella	-	-	1	-	-	-	-	-	82	-	6	40	56	75	×
Sagina sp.	-	-	2	-	-	-	-	-	-	-	-	20	0	13	
Senecio vulgaris	-	-	-	-	-	-	-	-	38	-	-	0	0	25	
Sisymbrium officinale	-	-	-	-	-	-	-	-	40	-	3	0	0	25	
Solanum nigrum	-	-	2	-	-	-	2	-	33	-	253	60	78	63	×

	Iron Age											Iron Age			
	Early					Middle		Late				Early	Middle	Late	
number	P496			P64		P427		P252		P271					
cm below surface	50	60	85	70	90	40	85	90	105	50	90				
sample size in liters	0.5	0.8	2.5	2	3	2	0.2	2	3.5	1	1	frequency			
number of species	0	12	38	2	20	0	39	15	55	6	64	N=5	N=9	N=8	
Sonchus asper	-	1	1	-	-	-	2	-	13	-	81	20	11	50	
Spergula arvensis	-	-	15	-	3	-	5	-	46	-	49	80	78	63	×
Stachys arvensis	-	-	-	-	-	-	-	-	-	-	-	0	11	0	
Stellaria media	-	-	10	-	5	-	5	1	330	-	49	80	44	63	×
Thlaspi arvense	-	-	-	-	-	-	-	-	21	-	-	0	11	13	
Urtica urens	-	-	1	-	-	-	1	-	19	-	37	20	22	63	×
Vicia hirsuta	-	-	-	-	-	-	-	-	-	-	-	0	11	13	×
Vicia tetrasperma	-	-	-	-	-	-	-	-	-	-	-	0	33	0	×
Viola arvensis/tricolor	-	-	-	-	3	-	-	-	-	-	-	20	0	0	
N = 42												**21**	**30**	**35**	
Ruderal plants															
Bidens tripartitus	-	-	2	-	-	-	-	-	11	-	19	0	22	50	
Bidens sp.	-	-	-	-	-	-	-	-	-	-	-	60	0	13	
Cyperus fuscus	-	-	-	-	-	-	-	-	-	-	2	0	0	13	
Eleocharis palustris	-	-	-	-	1	-	-	-	74	-	21	40	44	63	×
Hydrocotyle vulgaris	-	-	-	-	-	-	1	-	-	-	-	0	11	0	
Juncus bufonius	-	-	11	-	-	-	-	-	20	-	285	20	11	38	×
Leontodon autumnalis	-	-	-	-	-	-	-	-	-	-	2	0	0	13	
Lycopus europaeus	-	5	51	-	-	-	4	-	-	-	4	60	22	50	
Mentha aquatica/arvensis	-	-	-	-	-	-	3	-	-	-	22	0	33	38	
Montia fontana	-	-	-	-	-	-	-	-	-	-	-	20	33	13	
Myosoton aquaticum	-	-	-	-	10	-	21	-	-	-	10	40	11	13	
Polygonum hydropiper	-	16	292	-	3	-	9	-	113	-	249	100	67	88	×
Polygonum minus	-	13	287	-	-	-	2	-	175	-	1	40	56	63	
Pulicaria vulgaris	-	-	-	-	-	-	-	-	20	-	2	0	0	38	
Ranunculus flammula	-	10	351	-	-	-	1	1	20	-	1	40	22	63	
Ranunculus repens	-	-	3	-	-	-	2	-	11	-	5	40	22	50	
Ranunculus sardous	-	-	-	-	-	-	2	-	23	-	2	0	33	63	×
Ranunculus sceleratus	-	-	-	-	-	-	-	-	-	-	-	0	0	0	
Rorippa palustris	-	-	-	-	-	-	-	-	-	-	-	0	0	38	
Scirpus setaceus	-	-	-	-	-	-	-	-	21	-	-	0	0	50	
Trifolium repens	-	-	-	-	-	-	-	-	-	-	1	20	11	13	×
Urtica dioica	-	-	2	-	-	-	5	26	-	-	525	20	11	50	
N = 22												**12**	**15**	**20**	
Waterplants and riparian plants															
Alisma sp.	-	-	-	-	-	-	-	-	-	2*	4	0	11	13	×
Callitriche sp.	-	-	-	-	-	-	-	-	-	-	2	20	0	13	
Galium palustre	-	-	-	-	-	-	-	-	-	-	-	0	11	25	×
Glyceria fluitans	-	-	54	-	-	-	-	-	-	-	2	40	22	38	×
Glyceria maxima	-	-	3	-	-	-	1	-	5	-	-	20	11	25	
Lemna sp.	-	-	-	-	-	-	2	-	-	-	-	0	11	0	
Lythrum salicaria	-	-	321	-	-	-	-	-	-	-	25	40	0	50	×
Potamogeton sp.	-	-	-	-	-	-	-	-	-	-	-	0	0	0	
Ranunculus sg. Batrachium	-	-	-	-	-	-	-	-	5	-	5	20	11	25	
Scirpus lacustris	-	-	-	-	-	-	-	-	-	-	-	0	0	0	
Solanum dulcamara	-	-	-	-	-	-	3	3	13	-	-	0	11	25	
Sparganium erectum	-	-	-	-	-	-	-	-	-	-	-	0	0	25	×
Stachys palustris	-	-	-	-	-	-	1	-	-	-	-	0	11	0	
N = 13												**5**	**8**	**9**	

	Iron Age											Iron Age			
	Early					Middle		Late				Early	Middle	Late	
number	P496			P64		P427		P252		P271					
cm below surface	50	60	85	70	90	40	85	90	105	50	90				
sample size in liters	0.5	0.8	2.5	2	3	2	0.2	2	3.5	1	1	frequency			
number of species	0	12	38	2	20	0	39	15	55	6	64	N=5	N=9	N=8	
Forests and forest edges															
Alnus glutinosa	-	-	-	-	-	-	-	-	-	-	-	20	0	25	
Betula pendula/pubescens	-	-	1	-	-	-	-	-	-	-	2	20	0	25	
Corylus avellana	-	-	1	-	-	-	-	-	-	-	-	20	0	0	
Moehringia trinervia	-	-	-	-	-	-	-	167	-	-	-	0	0	13	
Prunus spinosa	-	-	-	-	-	-	-	-	-	-	-	0	0	13	
Quercus sp.	-	-	-	-	-	-	1	-	3	-	2	20	22	28	×
Rubus idaeus	-	-	-	-	4	-	-	-	-	-	-	20	0	13	
Rubus fruticosus	-	1	7	-	12	-	4	3	2	-	1	60	22	75	
Salix sp.	-	-	-	-	-	-	-	-	-	-	-	0	0	13	
Sambucus nigra	-	-	-	-	2	-	-	3	3	-	7	20	0	50	
Stachys sylvatica	-	-	-	-	-	-	-	-	-	-	-	0	0	13	
N = 11												**7**	**2**	**10**	
Grasslands															
Achillea millefolium	-	-	-	-	-	-	-	-	-	-	2	0	0	25	
Alopecurus geniculatus	-	-	-	-	-	-	1	-	20	-	16	0	11	50	
Bromus hordeaceus/secalinus	-	-	-	-	-	-	-	-	-	-	-	0	0	13	×
Daucus carota	-	-	-	-	-	-	-	-	7	-	-	0	11	13	
Festuca/Lolium	-	-	-	-	-	-	-	-	-	-	-	20	33	13	×
Filipendula ulmaria	-	-	-	-	-	-	-	-	-	-	-	0	0	13	
Gramineae sp.	-	-	-	-	-	-	-	-	-	5*	-	20	11	25	×
Leucanthemum vulgare	-	-	-	-	-	-	-	-	-	-	-	20	0	0	
Lychnis flos-cuculi	-	-	-	-	-	-	-	-	20	-	-	0	0	13	
Plantago lanceolata	-	-	-	-	-	-	-	-	-	-	-	0	11	0	×
Poa pratensis/trivialis	-	-	-	-	-	-	-	1	2	-	2	20	0	0	
Poa sp.	-	-	1	-	-	-	1	3	190	1*	4	40	33	38	×
Prunella vulgaris	-	-	-	-	-	-	-	-	-	-	2	0	0	38	
Saxifraga sp.	-	1	-	-	-	-	-	-	-	-	-	20	0	0	
Scirpus sylvaticus	-	-	-	-	-	-	2	-	-	-	-	0	11	0	
Stellaria graminea	-	-	-	-	-	-	-	-	-	-	-	0	0	13	
Trifolium arvense/campestre	-	-	-	-	-	-	-	-	-	2*	-	0	0	25	×
N = 17												**6**	**7**	**12**	
Others															
Bromus sp.	-	-	-	-	-	-	-	-	-	-	-	0	11	0	×
Calluna vulgaris	-	-	-	-	-	-	-	-	-	-	10	0	0	38	
Carex sp. div.	-	-	13	-	5	-	2	1	25	-	2	60	33	75	×
Centaurea sp.	-	-	-	-	-	-	-	-	-	-	-	0	11	0	×
Cerastium sp.	-	-	4	-	-	-	1	-	60	-	5	20	22	25	
Euphrasia/Odontites	-	1	37	-	-	-	-	-	5	-	1	40	0	50	×
Hypericum sp.	-	-	1	-	-	-	-	-	-	-	-	20	11	0	
Juncus sp. div.	-	-	26	-	-	-	-	-	60	-	30	40	22	63	×
Potentilla erecta-t.	-	1	20	-	5	-	-	-	5	-	-	80	0	63	
Rumex sp.	-	-	-	-	-	-	-	-	-	-	-	20	11	25	×
Sphagnum sp.	-	-	-	-	-	-	-	-	-	-	-	20	0	0	
Stellaria sp.	-	-	-	-	-	-	-	-	-	-	-	0	11	13	×
Trifolium sp.	-	-	-	-	-	-	-	-	-	-	-	0	11	0	×
Umbelliferae sp.	-	-	-	-	-	-	-	-	-	-	-	0	0	13	×
Veronica officinalis/scutellata	-	-	3	-	-	-	-	-	-	-	-	20	0	0	
Veronica sp.	-	-	-	-	-	-	-	20	-	-	-	0	0	13	
Viola sp.	-	-	-	-	-	-	-	-	10	-	-	0	0	25	
N = 17												**9**	**9**	**11**	

segments and capsule fragments. The barley was a hulled variety with lax ears.

The poppy was a subspecies that produced seeds measuring more than one mm, which were of a dark colour, possibly blue. Only two poppy seeds were incidentally found. Broad bean, represented by only two – carbonised – beans, was of the small variety also known as 'Celtic' bean.

The difference with respect to the remains recovered from the features of buildings is partly attributable to the fact that no carbonised remains of rapeseed, linseed and poppy were found; the chance of these oil-bearing seeds becoming carbonised (and remaining identifiable) was evidently small. Species which were encountered in the wells in a carbonised form, too, are indicated by an 'x' in the last column of table 20. The aforementioned argument does not hold for spelt and gold of pleasure, but both show relatively low frequencies in the samples from the wells, so their absence from the postholes could be merely coincidence.

The list of wild species is long. Duckweed *(Lemna* sp.), starwort *(Callitriche* sp.), water crowfoot *(Ranunculus* sg. *Batrachium)* and pondweed *(Potamogeton* sp.) and the many remains of water fleas found in the wells show that the wells indeed held water. It is however unlikely that the last two plants grew inside the lining of a well while it was in use. They may have grown in puddles at watering places, but as water crowfoot was also found inside the lining of a true well, it is more likely that these plants grew in wells that had recently fallen into disuse.

The vast majority of the remains fell or were thrown into the wells after people had stopped drawing water from them. In some wells they had accumulated into peaty layers. Some of these layers consisted of leaves, especially oak leaves. Most however consisted of remains of plants which we would now class as weeds. The ten plants with the highest frequencies are, irrespective of the period in which they grew, black nightshade *(Solanum nigrum)*, common chickweed *(Stellaria media)*, corn spurrey *(Spergula arvensis)*, fat hen *(Chenopodium album)*, fig-leaved goosefoot *(Chenopodium ficifolium)*, greater plantain *(Plantago major)*, knotgrass *(Polygonum aviculare)*, pale persicaria *(Polygonum lapathifolium*, which shows the highest frequencies), sheep's sorrel *(Rumex acetosella)* and water-pepper *(Polygonum hydropiper)*. As already mentioned above with reference to the remains from features of buildings, they represent different types of environments, with plants from overgrown land and paths inside the settlements predominating.

Species from forests and forest edges are limited in number. Pips of bramble *(Rubus fruticosus)* were represented the most. The fruits were undoubtedly consumed. The same holds for hazelnuts *(Corylus avellana)*, sloes *(Prunus spinosa)*, acorns *(Quercus* sp.), raspberries *(Rubus idaeus)* and elderberries *(Sambucus nigra)*. The remains of leaves found in the wells show that oaks grew inside the settlements and the same probably holds for elders. The only exceptional plant in the list of forest species is three-veined sandwort *(Moehringia trinervia)*, which favours shady spots on sandy soil that is neither too wet nor too dry, and is often to be found in small clearances. This plant and hedge woundwort *(Stachys sylvatica)*, which favours forest edges, are the only plants in the forest category that cannot be associated with any economic use, unless the seeds ended up in the wells via dung and hence indicate that cattle were pastured in the forests.

Plants of grassland species are poorly represented.

When we consider the differences per period, we note that the Late Iron Age is represented by the widest range of species. Leaving aside the forest category, this holds especially for the weed flora in a wide sense and for the grassland flora. This could mean that the surroundings of Oss-Ussen came to comprise an increasingly greater variety of semi-natural and anthropogenic environments in the course of the Iron Age, which would have resulted in a wider range of species and a higher chance of their remains ending up in a settlement.

4. Seeds from the other features

Only a small number of features not covered by the above groups was sampled. They include three cylindrical pits with flat floors that did not extend to beneath groundwater level and may have been storage pits. They are pit P363 in settlement VIII, which contained half of a cereal grain, and pits P261 and P473 in settlement XVIII, the first of which yielded one fragment of a cereal grain and the second a rachis segment of barley. In all three cases one litre of the sandy fill was sieved. These remains are of course in no way indicative of the pits' original functions; they formed part of the litter that lay scattered around inside the settlements (Bakels 1991).

The other investigated pits in this category contained little more. What is comparatively the richest pit is P112 in settlement VII, which contained five indeterminable cereal grains, seven millet grains, two remains of the chaff of emmer, one fat hen seed *(Chenopodium album)* and one water-pepper seed *(Polygonum hydropiper)* in one litre of fill. All that can be said about two pits in settlement VIII is that one, P365, contained clean sand and the other, P406, one awn fragment of oat *(Avena* sp.). Pit P45 in settlement IX yielded nothing whatsoever and pit P217 contained two remains of the chaff of emmer and one sorrel seed *(Rumex* sp.).

The fill of the ditch of the ritual structure R26 likewise yielded virtually no evidence: one two-litre sample contained one cockspur seed *(Echinochloa crus-galli)* and indeterminable remains and a second sample of the same size yielded nothing whatsoever. All the remains mentioned above were carbonised.

The only pit that did not reveal the usual litter is P52 in settlement XIV, which contained a large batch of carbonised

Table 3. Seed impressions in the local pottery produced without the aid of a potter's wheel

	Iron Age			
	Early	Middle	Late	general
Hordeum vulgare grain in chaff	5	6	2	–
Hordeum vulgare grain	2	1	1	1
Triticum dicoccum fragment ear	–	–	–	1
Triticum dicoccum spikelet	–	2	–	–
Triticum dicoccum grain	1	5	1	–
Triticum monococcum-type grain	1	1	–	–
Triticum spelta spikelet	–	1	–	–
Triticum aestivum/spelta grain	–	1	–	1
Hordeum/Triticum	1	1	–	–
Panicum miliaceum/Echinochloa crus-galli	–	1	–	–
Linum usitatissimum	–	1	–	1
Vicia faba	–	1	1	–
Avena fatua in chaff	1	–	–	1
Avena sp.	–	–	1	–
Bromus sp. with round apex	–	1	–	–
Gramineae inflorescence fragment	–	1	–	–
Gramineae grain in chaff	1	2	–	1
Polygonum lapathifolium	–	1	–	–
Total	12	26	6	6

acorns. They were presumably burned during the parching that is required to make them edible. Acorns are known to have been parched to make flour in historical times. Many other examples of Iron Age pits containing carbonised acorns are known, for example from Ommen (Van Zeist 1970), but similar pits dating from other prehistoric periods are also known.

5. Seed impressions in pottery

Impressions in pottery constitute a separate find category. During the description of the pottery sherds found at Oss-Ussen many cavities were observed, which, after being filled with silicone latex, produced well-determinable casts. The results are presented in table 21. Impressions in pottery that was evidently imported have not been included, as the table is intended to present a picture of the seeds that lay scattered about in the surroundings of the local Oss-Ussen potter. The seeds did not form part of the temper.

Seed impressions may sometimes more accurately represent the ratio of the crops grown in an average settlement than carbonised remains, as the latter owe their preservation to the fortuitous circumstance that they came into contact with fire. But this will be the case only if the pots containing the impressions were produced in average households or in average settlements. This was probably true at Oss-Ussen. Only reasonably large impressions were analysed, as small cavities were difficult to detect.

The range of cultivated plants shown in the table is the same as that represented in the wells, except that gold of pleasure and poppy are absent. Barley and emmer are the dominant cereals. Interesting are the einkorn-like grains, which however presumably derive from single-grained emmer spikelets. The glume bases of oat were clearly visible, so the oat was identified as *Avena fatua*. Millet is probably underrepresented in this find category because its grains are so very small. 'Celtic' bean was observed twice. This legume was probably far more important than suggested by the two carbonised beans recovered from a well.[2] The bean is probably best represented by the impressions. The absence of poppy is due to the comparative rarity of this plant and the small dimensions of its seeds. Gold of pleasure impressions have been observed elsewhere, so any impressions of seeds of this plant would presumably have been observed in the pottery from Oss-Ussen, too. The plant may have been fairly unimportant.

A final interesting observation is that the plant that was most common according to the evidence from the wells, *i.e.* pale persicaria *(Polygonum lapathifolium)*, was represented in impressions, too.

6. The plant world around and in Oss-Ussen

The economy of the occupants of the various settlements was undoubtedly partly based on crop cultivation. Chaff of barley, emmer and to a lesser extent also spelt lay scattered around all

over the place and some of it ended up in pits and wells in burned or unburned condition. This refuse could theoretically have been produced in the threshing of grain imported from elsewhere, but in the case of Oss-Ussen that is a far-fetched assumption. The many finds of fragments of capsule fragments of flax and one fragment of a stem of flax demonstrate that this plant was also grown locally. This is indeed also evident from the finds of remains of a weed like flax dodder *(Cuscuta epilinum)*, which is typically associated with flax. There is no reason not to add gold of pleasure, 'Celtic' bean and rapeseed to the list of cultivated plants, although only the seeds of these plants have been found. All the plants mentioned so far belong to the normal Iron Age range (Bakels 1991b).

Less common is poppy, especially in Early Iron Age contexts. Poppy was grown in the Netherlands in the Neolithic, but in the bristled *setigerum* form. No poppy finds are as yet known from the Bronze Age and until recently it was assumed that the plant was reintroduced by the Romans, in a variety with larger seeds of the kind that has now been found at Oss-Ussen. It is extremely unlikely that the poppy remains found at Oss-Ussen are Roman-period contaminations. So the plant must have been known in the Iron Age already, but that is not to say that it was actually grown locally. The absence of poppy from lists of botanical remains published so far could be due to the limited amount of research that has been done in settlements in the higher parts of the Netherlands. Another possibility is that the poppy seed was obtained from other parts of Europe via barter. But this seems rather unlikely in the case of Oss-Ussen, where it was most probably a local crop.

Exactly where the fields were situated we do not know. As explained in section 2, the weed flora represents different types of environments. Which cultivated plants are to be associated with which environments is difficult to say. The only concentration of cereal, which was found in house H114 (settlement XVIII), was associated with the seeds of various weeds, the majority of which favoured light, more or less acid sandy soils. It is not entirely certain that these seeds were mixed with this cereal – barley – from the outset; they may have ended up in the pit independently, as part of the litter that lay scattered around within the settlement. Another complicating factor is that the weeds in question are usually associated with summer cereal, whereas hulled barely is usually regarded as a winter cereal. If the weeds however do represent the barley field, it must have been situated on the higher sandy soils in the surroundings of Oss-Ussen.

The collection of cereal which was found in granary S174 and which comprised the remains of three different types of cereal was probably formed by chance and no conclusions can hence be drawn from it. As already mentioned in section 2, none of the other finds provided any useful evidence in this respect.

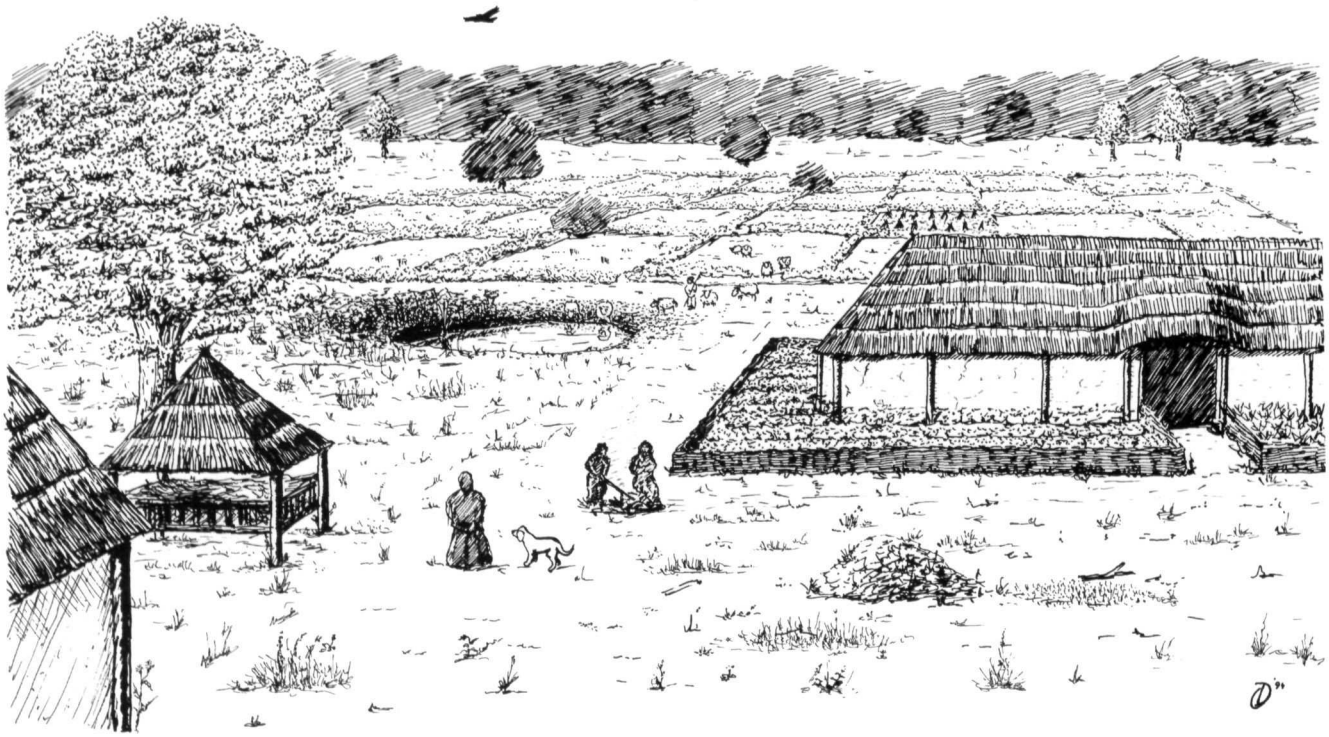

Figure 1. Artist's impression of a Late Iron Age settlement and its surroundings.

There were also pastures in the surroundings of Oss-Ussen. In both the carbonised remains and the remains found in the wells the grassland component was best represented in Late Iron Age contexts. In the case of the wells it was checked whether the reason for this was perhaps that a comparatively greater proportion of watering places dating from this period had been investigated, for any dung deposited in watering places would have increased the grassland component without there actually having been a higher proportion of pastureland in the surrounding landscape. But the number of investigated watering places from the Late Iron Age proved to be no greater than that from other periods, so we assume that the amount of pastureland in the surroundings of Oss-Ussen had indeed increased. Most of the grassland indicators point to moist soils, and hence to the Meuse valley. The forests that grew here will have slowly given way to open land, the highest degree of deforestation having occurred in the Late Iron Age. Such a development is in accordance with the findings of D. Teunissen in the surroundings of Nijmegen (Teunissen 1982).

The forest component of the landscape cannot be reconstructed on the basis of the seeds.

Most of the botanical remains came from the settlements themselves, where the soil had a fairly high nutrients content. Many of the plants could have been garden weeds, so there may well have been gardens in the settlements. If so, the 'Celtic' bean and the poppy may have been grown there, and possibly also medicinal plants such as henbane *(Hyoscyamus niger)*.

Paths bordered by knotgrass *(Polygonum aviculare)*, greater plantain *(Plantago major)* and supine meadow-grass *(Poa annua)* ran across the settlements and the yards, just as K.-H. Knörzer (1984) has described with reference to present-day farms. There were also trees, mainly oaks, whose leaves fell into the wells. Unfortunately there is no evidence to show whether elder bushes grew near wells, as proposed for Oss-IJsselstraat (Bakels 1980). There is no evidence whatsoever for fruit trees. It is commonly assumed that fruit cultivation proper was introduced by the Romans (Van Zeist 1991). The remains recovered from the wells suggest that the occupants of Oss-Ussen still gathered their fruits in the wild.

There were many messy spots, especially contaminated wet areas. They must have lain in the immediate surroundings of watering places. The flora of such areas is best described as a dirty mud flora.

This completes the description of the farmyards, settlements and surrounding land *(fig. 1)* insofar as can be inferred from the recovered seeds. The question is whether the description holds equally for all three of the periods covered here. The time factor has already been briefly mentioned with respect to grassland, and increasing variation in semi-natural environments was proposed at the end of section 10.1.3. This is undoubtedly connected with the occupants' increasing impact on their surroundings and it implies that the site of Oss-Ussen was continuously occupied. The picture of the settlements themselves, and the botanical evidence reflecting the occupants' activities seem to show no changes. There is no appreciable difference between the Early, Middle and Late Iron Age. In a botanical respect, the way of life did not change in any way.

notes

1 Where possible, in referring to postholes, I will make a distinction between the pit in which a post was erected and the hole that remained when a post disintegrated or was pulled out of the ground. There where no distinction can be made I will simply speak of 'postholes'.

2 For a previous report on the occurrence of broad bean at Oss-Ussen see Bakels 1987.

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