Nikolah Gilligan BA Hons. MSc.

Licensed Archaeologist and Archaeobotanist

Phone: 0879171105 E-mail: nikolahg@gmail.com VAT No. IE 7318329U

Archaeobotanical Analysis of Charred Plant Remains,

Seagrange Road,

Baldoyle,

Co. Dublin.

By

Nikolah Gilligan

On behalf of Grassroots Archaeology and The Royal Irish Academy

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Tables and Figures

1 Introduction

1.1 This report describes the results of the analysis of charred archaeobotanical material retrieved during excavations at Seagrange Road, Baldoyle Co. Dublin. Soil samples from five test-trenches, ranging in size, were collected and two were processed during this stage of post-excavation. These samples, 1 and 2, produced archaeobotanical remains and the results form the basis of this report.

1.2 The excavations in Seagrange were carried out by Paul Duffy of Grassroots Archaeology in 2013 as part of an ongoing community-based research project funded by The Royal Irish Academy (Licence No. 13E238). The excavation was targeted to identify remains associated with a possible medieval moated site (RMP DU015-018; sub-rectangular cropmark), visible in a Cambridge University (CUCAP) photograph (1970-CUCAP AIG 95-c) taken prior to the construction of the Seagrange housing estate in the 1970's. The 2013 excavation produced evidence for medieval and post-medieval activity in the area in the form of medieval pottery sherds, glass and iron slag. Environmental evidence comprised seashells, animal bones, charred seed fragments and charcoal.

1.3 The charred macrofossils were retrieved from the upper (C4) and lower (C5) fills of a gully (C3) present in Test Trenches 1 and 2. The gully truncated an earlier feature (C7 and C26), which may have been the remains of a medieval glass kiln. The basal fill (C5) of the gully was dated to 858- 983 cal. AD (UBA-24110) by a charred specimen of common orache (*Atriplex patula*).

1.4 The macrofossils comprised cereal grains, such as cultivated barley (*Hordeum vulgare*), cultivated/wild/bristle oat (*Avena sativa/fatua/strigosa*) and free-threshing wheat (*Triticum* sp.), as well as arable weeds and ruderal taxa, including common orache (*Atriplex patula*), white clover (*Trifolium repens*) and pea/vetchlings (*Lathryus/Vicia*). Hedgerow species included a fragmented endocarp of a bramble drupe (*Rubus* sp.).

2 Methodology; Processing, Identification and Analysis

2.1 The samples were collected and stored in plastic sample bags by Paul Duffy. The soil was then floated by Gill McLoughlin and poured into geological sieves measuring 2mm and 0.5mm. The flots were analysed by the author at magnifaction x7 to x40. Initial identifications were made using a variety of literary and digital sources, including the Seed Identification Handbook of the National Institute of Agricultural Botany (NIAB 2004), Jacomet *et al.* (2006), Cappers and Neef (2012) and Van Zeist and Bakker-Heeres (1985). Further in-depth identification was carried out by comparisons with the author's reference collection. The retent was also sorted through and any additional material was taken out.

2.2 The results of identification are presented in the table on p3 of this report. The plant remains listed in the table are listed in Latin, followed by the English name. In order to facilitate easy reading of this report, when first mentioned the plants/families are named in English first, followed by Latin. From that point forward, all names are written in English only. The nomenclature of species is generally arranged according to the *New Flora of the British Isles* (Stace 1997).

2.3 Each seed and fragment was counted and listed in the table accordingly. Where possible, identifications were made to genus and species. However, where these identifications were proved impossible, as much of the assemblage was extremely carbonized, seeds are listed as 'Family sp.' or *Genus* sp. (e.g. Ranunculaceae sp. and *Ranunculus* sp.). In some cases, although much of the definitive identification criteria were missing, some remains were hesitantly recognizable and are denoted by the letters 'cf'.

2.4 In order to assess the number of cereals present, embryos or the apices of fragmentary grains were counted where possible. If this could not be done, the fragments were weighed; an intact cereal caryopsis was then weighed and an estimate was then made of the number of whole grains which may originally have been present. These estimated figures are shown within square brackets in the table.

2.5 The table also includes information about the samples, including the phase they were associated with, the size of the sample and the flot, as well as the total identifiable count and total specimen count (seeds and fragments combined). The density per litre of each sample was also calculated by dividing the amount of specimens noted per sample by the volume of the sample. This can be useful in assessing whether the assemblage was formed by a gradual build-up, such as waste deposition, or was the result of a single episode, like an accidental conflagration. The higher the percentage of specimens per litre, the quicker the assemblage formation is believed to be.

3 Formation of Archaeobotanical Assemblages

3.1 This report is based upon the principles of scientific identification, analysis and interpretation of archaeobotanical remains retrieved from Seagrange, Baldoyle, Co. Dublin.

3.2 It is important to understand that **archaeobotanical assemblages** have predominantly been created by human hands. Archaeobotanical assemblages represent a very small part of the plant world which the people would have known and utilised. Seeds of plants and trees are preserved on archaeological sites through a variety of methods; including becoming charred, waterlogged or desiccated. This report is concerned with charred assemblages; these are the result of seeds becoming carbonised under oxygen-poor conditions, which leaves behind carbon skeletons of the seeds (Moffett 2009, 41). This occurs when they are burnt as a result of their interaction with fire.

3.3 Typically, because they are the result of people's interaction with them, the most **common components** of an archaeobotanical assemblage are cereal crops, chaff and weed seeds (Knörzer (1971 in Fuller, McClatchie and Stevens in press). The most common ***'modes of entry'*** of seeds into the archaeological record include food processing, preparation, consumption and storage as well as through fuel, animal dung, building materials and ritual (van der Veen 2007; Matthews 2009). Primarily, seeds which have been charred are retrieved from ditches, gullies, drying chambers of corn drying-kilns, pits and floors. Kilns and hearths were the location of **primary activities** concerned with food processing, where seeds may have been ground into flour, waste was discarded and the final products prepared for consumption.

Gullies, pits, ditches, floors and fire chambers of cereal drying-kilns show evidence for **secondary deposition**, as they tend to contain discarded waste from a kiln or hearth. Assemblages retrieved from such contexts tend to be much disturbed after they are deposited, as a result of human activity (Moffett 2009, 42). Because many assemblages are secondary in nature, they cannot be safely used to indicate the environment within which they were found; rather they suggest the environment from which they came, and the processes which resulted in their deposition.

4 Results of the Analysis

The samples were dominated by charred cereal remains (Table 1 and Figure 1), which formed 87% of the assemblage, indicating the importance of cereal cultivation, processing and consumption in the area during the period the assemblage was formed.

Context			**4**	**5**	
Feature type			**Upper fill of gully**	**Basal fill of gully**	
Date of context			**Medieval**	**Medieval**	
Volume sampled (l)			**20**	**27**	
Volume of flot (ml)			**80**	**50**	
Weight of flot (g)			**0.9**	**1.35**	
Sample No.			**1**	**2**	
Botanical Name	**Other**	**Plant part**			
Poaceae					
Triticum hexaploid/tetraploid cf	Rivet/bread/durum wheat	caryopsis	5		**8**
		fragments	1[1]	2[2]	
Avena sativa/fatua L.	Cultivated/Wild Oat	caryopsis	8		**22**
	cf	fragments	12[11]	3[3]	
Hordeum vulgare L.	Hulled Barley (asymmetrical)	caryopsis	9	1	
Hordeum sp. L.	Hulled Barley (symmetrical)	caryopsis	2	2	
	Naked Barley (symmetrical)	fragments	1		
Hordeum sp. L.		caryopsis		4	
		fragments	8[8]	2[2]	
	cf	caryopsis	2		
		fragments	1[1]	2[2]	**34**
Triticum sp./*Hordeum* sp.		caryopsis	3		
		fragments	14[13]	1[1]	**17**
Secale cereale L. cf	Rye	fragments	1		**1**
Unidentifiable Cereal grain		fragments	[18]	[5]	**23**
Lolium sp. L.		caryopsis	3[3]		**3**
Poa sp. L. Cf.	Meadowgrass	bract	1		**2**
Indeterminate Poaceae	Grasses	caryopsis			
		fragments	4[4]	5[1]	**5**
Chenopodiaceae					
Atriplex cf. *patula L.*	Common orache	seed	1	5	**6**
Polygonaceae					
Rumex cf. sanguineus L.	Wood dock	nutlet		1	**1**
Caryophyllaceae					
Silene sp. L.	Catchfly/Campion	seed	1		**1**
Rosaceae					
Rubus sp. L.	Bramble	fragment		1	**1**

Fabaceae					
Lathyrus /Vicia sp. L.	Field pea/vetch	fragments	1		**1**
Trifolium repens L.	White clover	nutlet	2		**2**
Miscellaneous					
Miscellaneous Inidentifiable fragments			49	29	
Total identifiable			**96**	**31**	**122**
Total			**145**	**60**	**200**
Density per litre			**7.25**	**2.22**	

Table 1: Species present in the assemblage

Hulled barley was the most ubiquitous grain of the assemblage, forming almost one third of the identifiable charred remains. Oat was also present (18%), although the grains could be not definitively identified as cultivated oat as floret bases are required to distinguish wild varieties from cultivated and it is quite rare that they survive in archaeobotanical assemblages. A minimal amount of free-threshing wheat was present. The diagnostic chaff is needed to assign free-threshing varieties to definitive species. One possible caryopsis of rye (*Secale cereale*) was noted. Many cereal grains were extremely charred and a number were assigned to the 'Unidentifiable Cereal' category. A small number of grass weeds were noted; there were a number of unidentifiable fragments which were assigned to the 'Unidentifiable Poaceae' category.

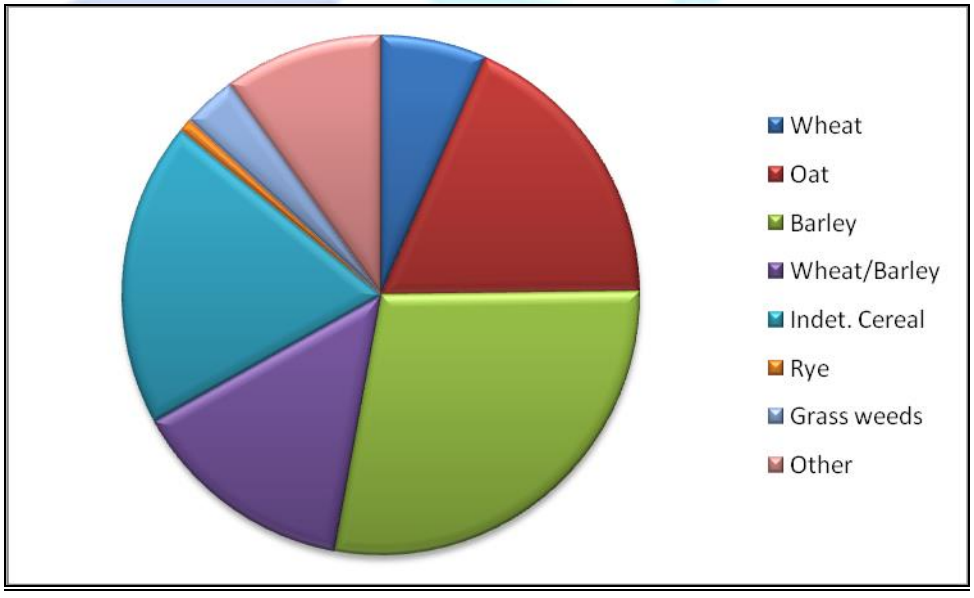

Figure 1: Relative frequencies of cereal grains and weed seeds in the assemblage

Other small weed seeds were also present – those traditionally recorded as weed seeds or ruderal taxa. These predominantly consisted of common orache. Small legumes such as white clover and pea/vetchlings were also present. One endocarp fragment of a species of bramble drupe and a nutlet of possible wood dock were also noted.

4.1 **Sample 1**

The sample was retrieved from the upper fill (C4) of gully C3. It post-dated the basal fill (C5) which was dated to 858- 983 cal. AD (UBA-24110) by a charred species of common orache. Other material retrieved from this fill during the excavation included cockle shells and animal bone.

The sample contained more charred remains than the basal fill, although it did not contain more varieties of plant seeds. Much of the sample comprised the charred caryopses of cereals, including barley, wheat, oat and possible rye (Figure 2). It also contained weed seeds such as small legumes and common orache.

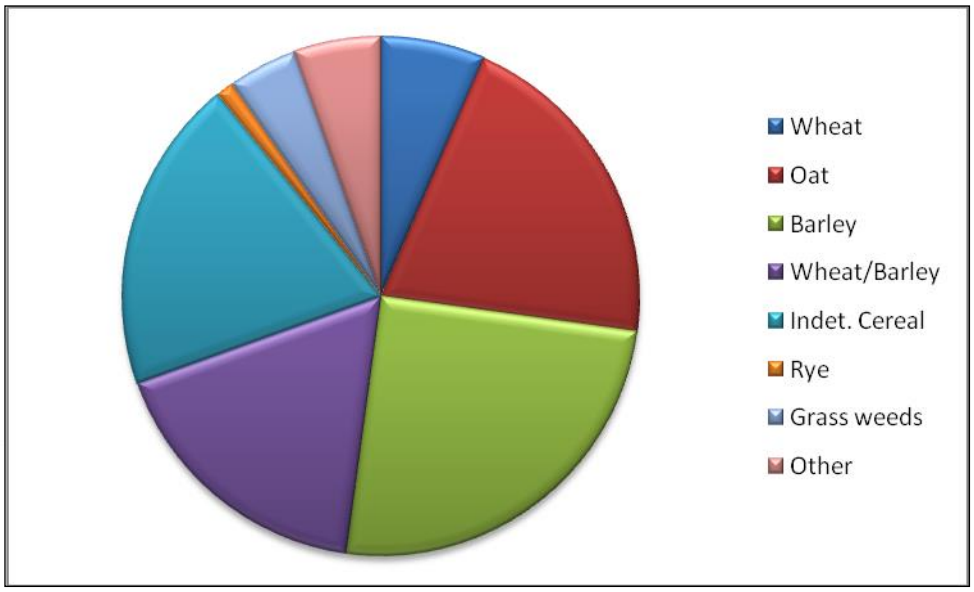

Figure 2: Relative frequencies of cereal grains and weed seeds in Sample 1

Grain

Almost all of the assemblage (98%) retrieved from the fill (C4) comprised cereal grain. The relative frequencies of identifiable caryopses show that barley was the most common cereal type (Figure 3). A few of these grains could be identified as hulled barley; it is also likely that they were of the six-row variety (*Hordeum vulgare subsp. hexastichon*). Just over one fifth of the identifiable grains consisted of oats; however, it is not possible to assign them to a definitive species as there are no floret bases present to distinguish between wild and cultivated varieties. It is likely however, that at least some of the grains are those of cultivated oats, while some were weeds gathered with the harvest.

A minimal amount of free-threshing or naked wheat (*Triticum turgidum/aestivum/durum*) was also noted. No chaff remained with which to distinguish the variety. Distinguishing characteristics of 19% of the cereal grains, such as embryos and ventral grooves, were highly distorted by charring and it was impossible to distinguish between those of wheat or barley. One possible fragment of rye was present. No cereal chaff was present.

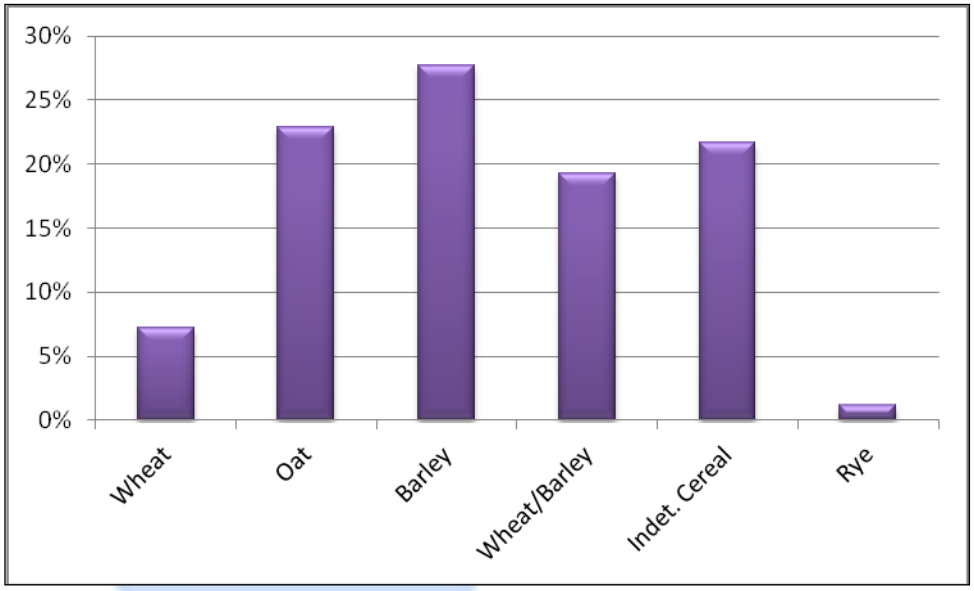

Figure 3: Relative frequencies of identifiable cereal grains in Sample 1

Weeds and Wild food

Weed seeds in the context of archaeobotanical assemblages means those plants which were not cultivated in the way that cereal crops and large legumes were. However, some of the weeds which grew alongside the cereal crops were probably tolerated and treated as food-sources. Despite this tolerance, they were not actually cultivated. Other modern weeds and brambles which have made their way into diets throughout history can also be termed wild foods, such as sloes, blackberries and hazelnuts. Equally, many of these were not cultivated but formed part of the historic diet and are often found in the modern diet also.

Only 5% of the Sample 1 assemblage contains seeds which were not those of cultivated cereals. Species which were present include common orache and two varieties of small legumes – white clover and pea/vetch. These species can be eaten by humans, although it is likely in the case of this assemblage that they represent processing waste.

Other weeds which were identified were those of grass seeds and arable weeds. There are varieties of *Lolium* sp. (*Lolium temulentum*; darnel) which are poisonous to humans. A bract of meadowgrass (*Poa* sp.), rather than a caryopsis, indicates the presence of this weed– it is too small to have added any bulk to the diet. A species of catchfly was also present, which is an arable weed and has not been recorded as a plant typically consumed by humans.

4.2 Sample 2

The sample was retrieved from the basal fill (C5) of gully C3. It was dated to 858- 983 cal. AD (UBA-24110) by a charred species of common orache. Fragments of cockle shells and animal bones were also retrieved from this fill, as well as a bone implement which may have been used for opening/eating the shellfish.

The sample contained less charred remains than the upper fill (C4), although it had a similar number of seed varieties. Much of the sample comprised the charred caryopses of cereals, including barley, wheat and oat (Figure 4). It also contained weed seeds such as small common orache, wood dock and bramble.

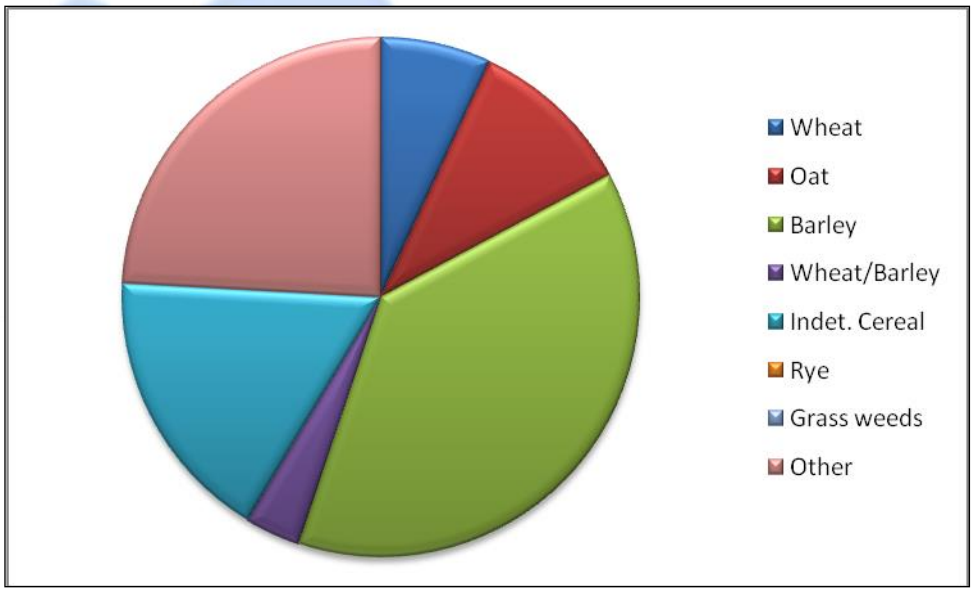

Figure 4: Relative frequencies of cereal grains and weed seeds in Sample 2

Grain

Over three quarters of the assemblage from Sample 2 (75%) comprised cereal grain. The relative frequencies of identifiable caryopses show that, similarly to Sample 1, barley was the most common cereal type (Figure 5) with half of identifiable cereal grains consisting of barley. A few of these grains could be identified as hulled barley; it is also likely that they were of the six-row variety. One tenth of the identifiable cereals contained oats; however, again it is not possible to assign them to a definitive species as no floret bases were present to distinguish between wild and cultivated varieties. It is likely however, that at least some of the grains are those of cultivated oats, while it is probable that some were weeds.

A minimal amount of free-threshing or naked wheat was also noted, but no chaff remained with which to distinguish the variety. As with Sample 1, distinguishing characteristics of a percentage of cereal grains (in this case 3%), such as embryos and ventral grooves, were highly distorted by charring. Therefore it was

impossible to distinguish between those of wheat or barley. No rye was identified in the assemblage and there was no visible cereal chaff.

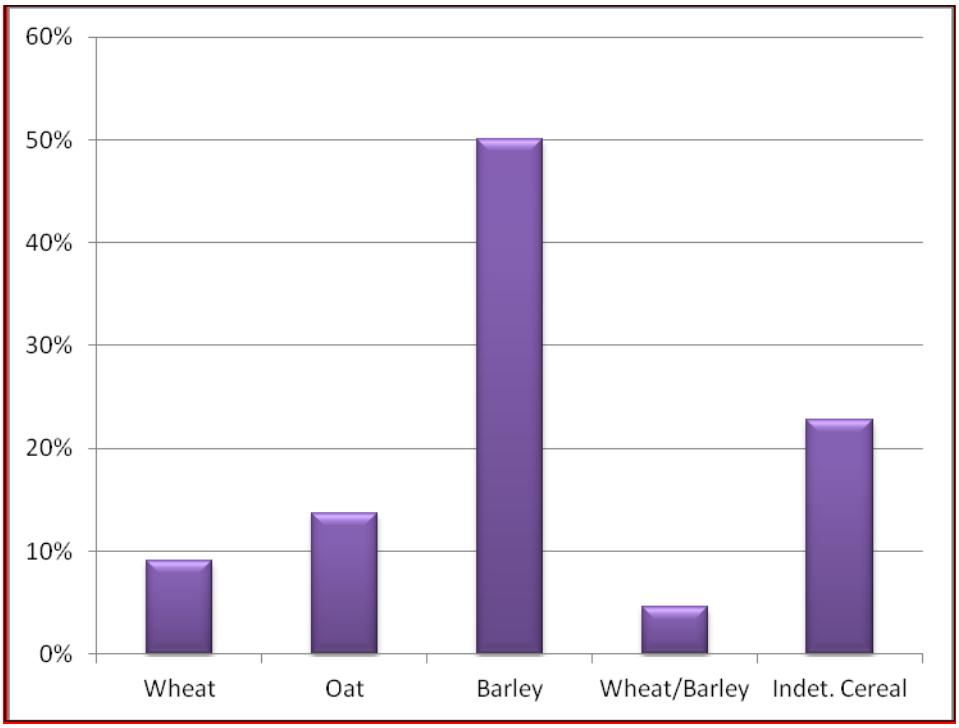

Figure 5: Relative frequencies of identifiable cereal grains in Sample 2

Weeds and Wild food

One quarter of the Sample 2 assemblage contained seeds which were not those of cultivated cereals. A number of common orache seeds were present within the sample. An endocarp fragment of a species of bramble and a nutlet of possible wood dock were also noted.

Sample 2 differed from Sample 1 in the fact that no identifiable arable grass weeds were noted.

5 Discussion of the Assemblage

5.1 **Barley** was the most ubiquitous cereal type noted in both samples. This grain appeared to be the most commonly occuring cereal in medieval assemblages (Monk 1991, 317). Although both naked and hulled two (*Hordeum vulgare ssp. distichon*) and six-row barley have been identified, six-row hulled barley) appears to be the most commonly cultivated variety at this time; it is likely that the barley identified from Seagrange is of the latter species. It is coarser and hardier than two-row; the latter was listed fourth out

of seven in the hierarchy of crops in the early medieval law tracts, while six-row was placed second from the bottom (Kelly, 2000, 219). Its hardiness ensured that it could tolerate wet and dry soils and climate (Riehl, 2009). Barley can be used to make coarse bread and cakes or malt. Malted barley is extremely nutritious and may have added essential vitamins to the medieval diet through food and alcohol (Katz and Voigt 1986, 30). However, there was no indication that the barley in this assemblage had germinated, a process which is necessary to produce malt for alcohol production. Barley was also used as animal fodder and in the medieval period barley and oats were often grown together to form a buffer in case one cereal failed. They were processed and ground together to make porridge, bread, biscuits and cakes (Stone 2009, 13).

5.2 **Oats** were also common in both assemblages; this grain is able to grow in damp climates and does not require very fertile soils; it therefore suits many Irish soils. While it is necessary to have the floret base to fully distinguish the wild and cultivated varieties, it is likely that at least some of these are cultivated, while others were persistent weeds. By the end of the medieval period oats appear to have formed an important part of the diet. The fact that they are both listed in the early medieval law tracts, albeit as one of the lowest ranking cereals (Kelly 2000, 219) and the fact that they are commonly identified from assemblages, even when no other weeds are present, suggests their consumption. They are, in fact, very nutritious and were probably widely consumed in porridges, stews, pottages and biscuits (Sexton, 1998; Monk 2011). Scientific analysis of what was thought to be a pottery fragments retrieved from a hearth and stakehole fill in Lisleagh 1 ringfort in Co. Cork, revealed them to have originated from an oat and dairy (probably whey) biscuit (McClaren *et al.* 2004). The stakehole was dated to the seventh century AD. Oats were often grown alongside barley as dredge which was used for breads and malt; they were also used as fodder (Murphy and Potterton 2010, 313). The emergence of oats as a ubiquitous grain in the early medieval period is suggested by some as linked with the upsurge in kiln construction, as it is much more susceptible to decay than other cereals (Monk 2011, 39).

5.3 Species of **free-threshing wheats** were found in the samples. The increase of free-threshing wheats throughout the medieval period probably led to the decline in **glume wheats**, such as emmer. Glume caryopses are tightly enclosed in a glume which allows protection from decay or infestation. This type of wheat can grow in adverse conditions, but it requires additional processing to remove its glumes. However, free-threshing or naked wheats lack a thick glume, which means that while processing is easier, the lack of a protective cover renders the grains susceptible to decay or infestation – this was typically solved in Ireland by heating them in a cereal-drying kiln. Varieties of free-threshing wheat are distinguished by the distinctive scar which is left behind on the rachis after crop-processing; however as there were no rachises or associated chaff within the assemblage, the exact variety of naked wheat could not be ascertained but it is likely to have been bread-wheat. This type of wheat is sensitive to bad weather and poor soils and has a high gluten content, which meant that when it was first introduced to Ireland it would have been a fairly high-status product (Kelly 2000, 120).

5.4 Possible **Rye** was found. This crop is able to grow in poor soils and was listed as second highest of the cereals in the early medieval law texts (Kelly 2000, 219). It is suitable for growing over winter and can therefore produce grain at a time when spring-sown crops cannot. The crop has been found in early medieval sites in Ireland, although it is not as ubiquituous as the other cereals.

5.5 *Lolium* sp. comprise species of arable weeds which were common in the past and are still present in contemporary fields; they were often gathered with the harvest. They were probably removed at later stages of crop-processing as their size may not have led to their removal during threshing or winnowing. While species of *Lolium*, such as *Lolium perenne* (ryegrass) are consumed by cattle along with other arable grasses/weeds, one species; that of darnel, is often poisonous. A fungus often infects this grass and throughout history the infected seeds have made their way into the food chain as a result of the grass' similarity and size to wheat, which makes it difficult to recognize and remove during processing. However, Nicholas Culpeper lists the benefits of darnel in 17th century Britain, incldluing the instructions for use as a poultice for broken bones and gangrene (Vowles 2010, 133).

5.6 Meadowgrass comprises various species of small-seeded arable weeds and the specimens found in the assemblage are likely to have been gathered mistakenly during harvest. Species of meadowgrass have been identified in other medieval samples (MCormick *et al*. 2011, 64). It is interesting to note that Hall and Pilcher (2007, 94) suggest a previous decline in these and similar species, which are now seeing a resurgence as modernisation of the road network and the allowance of natural growth on roadside verges have created the "conditions of an old hay meadow".

5.7 Common orache is found on arable lands and gardens, as well as coastal land and river banks. Devlin (2011, 68) records it as an introduced plant. It was known as garden arrach in the past and was consumed as a vegetable, herbal drink and applied as a poultice (Vowles 2010, 33). White clover is often found in good grassland and can be eaten by animals. Doogue and Kreiger (2010, 53) note that it is often included in modern agricultural seed mixes for silage along with ryegrass, which has a bad effect on biodiversity as white clover can spread efficiently.

5.8 Vetches and similar legumes are difficult to distinguish when charred and fragmented. Vetches are found in arable fields and disturbed lands, which are generally dry and include varieties which are used to feed animals. Wood dock is found in arable ground, wasteland and woods. Culpeper (Vowles 2010, 138) notes that many varieties of these were extremely well-known in the 17th century and the roots, leaves and seeds could be used for a variety of ailments and illnesses, including blood-cleansing and liver-strengthening. The endocarp of a bramble drupe indicates the presence of scrubland in the vicinity of the site. Bramble species have been consumed throughout history and the tradition of blackberry picking, for example, continues today. The drupe may also indicate the use of scrubland twigs to fuel the fire within which the assemblage was formed.

Harvesting and crop-processing

5.9 As noted above, it is important to understand that the components of an **archaeobotanical assemblage** are predominantly determined by human activity. The fragments are most typically indicative of processing, preparation, consumption and storage and in particular they can shed light on farming and agricultural practises. Analysis of such requires an understanding of the activities as the methods of soil preparation, sowing and harvesting have an effect on the components of an archaeobotanical assemblage. It is likely that steps involved in these activities in the present day do not differ too greatly from those of the early medieval period; it is merely the machinery which has changed.

5.10 The sowing and the harvesting seasons are the most important times of the year for economies dependent on crops. Ploughing takes place in the spring, when the soil is damp after the winter frosts. Until the early medieval period a simple wooden ard-plough and oxen were used to prepare the ground (McCormick *et al.* 2011, 24). The arrival of Christianity may have led to the introduction of the iron coulter, which allowed the earth to be cut more efficiently. These and other later changes meant that soils produced higher yields, because they were deeper and richer in nutrients (Feehan, 2003, 23). The change in technology also instigated a change in the weed varieties which grew alongside the cereals (Mitchell, 1987, 10). These changes can typically be reflected in an archaeobotanical assemblage.

5.11 Most crops are sown in the spring time and are harvested during the late summer or early autumn months; although as noted above, rye is suitable for growing over winter and there are varieties of barley which may have been grown at the same time to supplement the diet (Murphy and Potterton 2010, 311). Harvesting entailed the reaping of the stalks, which was probably done with a sickle just below the ear. This would have meant that only those weed seeds which grew to a similar height as the cereals would have been harvested alongside the latter. It also meant that less stalks and culms would need to be removed during processing. Removing the stalks during the harvest would have allowed for hay and material for thatching, bedding and perhaps floor coverings. However, it is generally thought that animals were allowed to graze all year round in medieval Ireland and that that hay-making was introduced into Ireland by the Anglo-Normans, although some researchers believe that it may have been a Viking practice (Hall 2011, 124). It is suggested that the success of early medieval grazing management is indicated by the apparent surplus of hides used to produce vellum for monastic manuscripts (Hall and Pilcher 2007, 89).

5.12 It would appear that in early medieval Ireland the cereal heads were gathered directly into a basket for the first phase of processing. Crop-processing is an important process for archaeobotanical analysis as the steps required have not been altered much throughout history. The by-products of each step are often found in archaeobotanical assemblages, as they tend to be discarded into fires and subsequently found in hearths, floors, pits and ditches. Therefore, many secondary deposits are formed by the deposition of waste of harvesting and crop processing; by understanding each step and the by-products which result from these steps, the stage of processing can be inferred.

The main steps were outlined by Hillman (1981), following ethnographical studies of pre-industrial techniques of harvesting and processing in farming communities in Greece. The basic steps include; (1) Threshing; (2) Raking; (3) Winnowing to remove light weed seeds and awns, which may be used as fodder later; (4) Coarse sieving to remove weed seeds, unbroken ears and straw fragments; the unbroken ears are re-threshed; (5) Fine sieving to remove small weed seeds and awns; (6) Pounding; (7) Winnowing to remove lemmas and paleas; (8) Coarse sieving to remove spikelet forks and unbroken spikelets, which are re-pounded; (9) Fine sieving to remove glumes bases, awns, small weed seeds; (10) Hand-sorting to remove grain-sized weeds by hand. In Ireland the practice of dousing the ears with fire rather than threshing was recorded in the 16th century; however it is not known how widespread this practice was or whether it was carried out in early medieval Ireland (Kelly 2000, 241). In the damp environment of Ireland, it is likely that processing probably always entailed the use of a cereal-drying kiln.

5.13 Therefore, an assemblage which contains some small weed seeds and straw fragments are indicative of the by-products of a crop which was only at the first stage of cleaning. Likewise, these steps can also suggest the manner in which the crops were stored. This can be particularly useful for assessing whether crops were being processed at the time of harvest, which infers that a large workforce was available at the time. It also shows whether sites were producing food for themselves or for trade. However, as the assemblage from Seagrange appears to consist of secondary deposits i.e. not in their original place of charring, we can only surmise about what stage of processing was carried out and how they were to be stored.

Figure 6: Steps of crop-processing (after Stevens 2003, 63).

5.14 The assemblage of both samples from Seagrange differed in content and size. Sample 1 was retrieved from the upper fill of gully C3 and contained a higher variety of cereal grains than Sample 2, as well as containing grass weeds, such as *Lolium* sp. and meadowgrass. It is likely that a portion of the oats is of the non-cultivated variety as they are a persistent crop weed. The size and appearance of the weeds

suggest that the later stages of crop-processing are being carried and discarded. It is noted that in the early medieval period cereals were gathered directly into baskets from the field, so they were probably brought back to an area close to the site, cleaned and the waste discarded into a fire, which was then thrown into gully C3. The idea that this gully was used for rubbish disposal is also suggested by the presence of animal bones and shells. Equally, the harvested crops could have been dried in a kiln and the components of this sample could have come from the waste which was used in the firing chamber, which were then swept out and discarded. Cereal-drying kilns produce many of the medieval assemblages in Ireland (Monk and Kelleher 2005). The rate of deposition is much higher for this sample than Sample 2 and it suggests an association with an assemblage that was formed quickly.

5.15 The sample retrieved from the basal fill of gully C3 differed somewhat from that of the upper layer. There was a lack of arable weeds; ruderal taxa associated with the fringes of land and the local environment were present, including wood dock and common orache. It is likely that this sample was formed by the similar processes to those of the upper layer. It could be surmised that the gully was associated with activities which were not located immediately within a settlement, as it is probable that crop-processing took place away from the home. Further excavations in the area may uncover further archaeological features which could shed light on the origin of this charred assemblage.

Comparisons with early medieval assemblages

5.16 The site at Seagrange is thought to be located in the same general area as the church of Bearach, although it is not clear exactly where this site lay. The activity noted during the 2013 excavations may be associated with the ecclesiastical foundation. Equally, it may have been more secular in nature, as there is a suspected univallate ringfort (DU015-083) located 1km west of Seagrange in Raheny. It is also probable that there were scattered settlements around the area also; further excavations may fill in existing gaps in knowledge of local habitation.

5.17 Much analysis has been carried out on early medieval sites in Ireland and there is a large body of material for comparison, comprising both ecclesiastical and secular sites. Research excavations and the multitude of excavations associated with construction and development in the late 1990's and 2000's have created a wealthy database of information, which can be supplemented with written sources from the period concerning cultivation, harvesting and storage practises.

5.18 The assemblage of Seagrange is similar to those retrieved from early medieval ecclesiastical and secular sites in Dublin and beyond. Such assemblages tend to comprise a mix of barley, oats and wheat, with a low presence of rye, but the general pattern is of barley dominance in the earlier period followed by an increase in oats. Weed seeds, such as common orache, docks and clover are also ubiquitous in the assemblages. Mick Monk (1985/6, 33) correlated twenty-two early medieval assemblages in the 1980's and barley was found to be the most dominant of the cereals in this assessment. These sites included monasteries, ringforts and crannógs, including Church Island, Co. Kerry, Lisleagh, Co. Cork, and Moynagh Lough Crannóg, Co. Meath, respectively. Monk also notes the presence of rye with a minimal frequency of

wheat. Nutlets belonging to the Polygonaceae family, seeds of fat-hen, as well as fragments of hazelnuts, were noted; they are indicative of ruderal taxa, but may also suggest country-wide choices for wild foods (Monk, Tierney and Hannon 1998, 68). The 2013 Early Medieval Archaeology Project report contains data gathered from excavations of medieval sites in Ireland and a similar picture is presented (McCormick *et al.* 2011). A large amount of arable weeds, ruderal taxa and possible wild food remains were also noted in this compilation of sites.

5.19 Assemblages gathered from early medieval ecclesiastical sites include an assemblage from a pit associated with early *Cill Chainnigh* (Gilligan 2011). The pit was dated to 1000-1140 cal BC (Beta-306021) from an antler tine discarded within the fill (O'Drisceoil 2011). As with Seagrange, this pit was dated to a transitory period, on the cusp of the arrival and settlement of Anglo-Normans in Ireland. Hulled barley and oat grains were present (although the latter could not be definitively identified as cultivated oats), as well as legumes and arable weeds. Hazelnut shell fragments and possible pips from an apple/pear (*Malus* sp./*Pyrus* sp.) were also noted. Illanloughan Island (Plunkett, Bentley and Collins 2005) and Skellig Michael, Co. Kerry, (Allen 2011) were the sites of early medieval monasteries and samples retrieved during excavations show a dominance of oats over barley, although again, not all could be definitely identified as cultivated oats. The sites of Clonfad and Ballykilmore, Co. Westmeath, contained higher numbers of barley grains and interestingly, Clonfad also had high levels of wheat grains, which is unusual for this period and site-type (Vaughan-Williams 2009).

5.20 The high levels of barley associated with some of the latter sites, as compared to oats, is interesting as oats are commonly associated with ecclesiastical sites and monasteries (Kelly 2000, 219). Rules governing the lives of monks in early medieval Ireland indicate the importance of this grain in the diet and medieval stories compound this association; St. Ciarán is reputedly said to have miraculously transformed a bag of oats into valuable wheat, while the scholar Aniér Mac Conglinne was unhappy with the oat ration he received when visiting a Cork monastery (Meyer 1974 in Murray and McCormick 2005, 75). However, the heavy bread made from barley flour seems to have been heavily associated with ascetic diets (Feehan 2003, 150). It was recorded that St. Tigernach of Clones lived on barley bread and watercress, although this minimal diet was not condoned (Gwynn and Purton 1912, in Murray and McCormick 2005, 75).

5.21 Similarly to Seagrange and the ecclesiastical sites, assemblages associated with secular sites of the early medieval period often contain barley, oats and wheats, with a small presence of rye. Oats were predominantly present in the assemblage from Rochfort Demesne, Co. Westmeath, which was composed entirely of cereals (Stevens and Channing 2012, 146). Oats and a number of flax seeds were identified from Baysrath, Co. Kilkenny, suggesting cultivation of the latter for food and clothing (McClatchie 2011b). The plant remains in the ringfort sites of Mackney and Loughbown, Co. Galway, are also dominated by oats (57% and 60% respectively). Barley made up most of the remaining cereal grains, although there was some naked wheat and rye present also. In a similar manner to Seagrange, there were fragments of legumes in the Mackney samples, which included clover and vetches.

5.22 The assemblages from cereal-drying kilns paint a similar picture. Monk and Kelleher's study of the features (2005, 83; albeit not all early medieval) includes a list of cereal remains found during excavation of the kilns. They include wheat, barley, oats and a very small number of rye grains. The grains vary in dominance; an assessment of cereal grains from six early medieval cereal-drying kilns associated with secular enclosures in Sallymount, Co. Limerick, and Killilane and Gortybrigane, Co. Tipperary, suggests a dominance of hulled barley in the earlier features (*c.* 400's-600's AD; Long 2009, 20). The assemblages in the later two kilns (600's-800's AD) contain higher levels of oat. As noted earlier, there are suggestions that oat consumption increased towards the end of the early medieval period. This seems to be the case with the samples retrieved from the settlement cemetery site located in Raystown, Co. Meath (Lyons in Seaver 2010, 275). Raystown comprised a burial site as well as extensive domestic and agricultural features; the latter included eight watermills and watercourses, as well as a large number of kilns. The early medieval phases dated from *c.* 380-980AD. The earliest phase (400's-500's) contained more barley than oats with small frequencies of wheat and rye. This was followed by an increase in oat presence, with less frequencies of barley and small quantities of wheat. Interestingly, the third phase saw a huge increase in oat and barley production as well as a higher frequency of wheat presence.

5.23 The assemblage found in both levels of the gully C3 appear to correlate with assemblages of this period. It highlights the importance of grains in the diets of medieval Ireland – in particular barley and oats. While the oats in the assemblage cannot be identified to type, it is likely that they are a mix of both cultivated grains and arable weeds. The assemblage also informs upon weeds and ruderal taxa present in early medieval Seagrange. It is likely that the much of the remains identified were either the waste from crop-processing which had been swept into a fire and discarded into the gully C3 or were the sweepings from a cereal-drying kiln. The charred macrofossils were associated with other forms of food waste such as animal bones and seafood shells. The gully, therefore, appeared to be associated with waste disposal and industrial work. A probable glass kiln was located here prior to the creation of the gully and the two features suggest that activites taking place here were not associated with domestic use. It can be surmised that crops were processed here before transferring them to a barn within the confines of a settlement. Future analyses of samples gathered during additional excavations will add to this basic picture of Seagrange.

6 Conclusions and Recommendations

6.1 Analysis of an assemblage from an excavation at Seagrange Road, Baldoyle, Co. Dublin was carried out. Samples from two fills (C4 and C5) within a gully (C3) produced archaeobotanical remains. Radiocarbon-dating of a common orache seed placed the basal fill C5 in the early medieval period (858- 983 cal. AD; UBA-24110). Analyses of the samples retrieved from the feature revealed the remains of cereals and grasses, including barley, wild/cultivated oat, wheat and arable weeds and ruderal taxa.

6.2 It is recommended that the flot samples and sorted plant remains retrieved from Seagrange, Co. Dublin are permanently retained by the National Museum of Ireland. This is in accordance with the National Monuments Act 1930 (Section 2) and the National Monuments Act 1994 (Section 9) and will allow for future archaeobotanical research to be undertaken. The material is part of an ongoing project funded by the Royal Irish Academy and it is likely that the assemblage will be reassessed in terms of future findings. Equally, scientific analysis is constantly evolving and new techniques of archaeobotanical analysis may be possible in the future for any retained material.

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