

Wood Use and Resource from Medieval Corn Drying Kilns in Ireland (400-1400 AD): Interpretation and Analysis using archaeological wood charcoal

Introduction

The number of corn drying kilns recorded from archaeological excavations in Ireland has risen exponentially in the last 20 years as a result of our development-led construction industry. Over 800 kilns have now been identified nationally, the majority of which date to the medieval period (c.4th -13th century AD) (Figure 1). Traditionally, research agendas have focused on the charred plant remains recovered from these features, while the charcoal component has remained largely under researched.



Figure 1 Examples of medieval corn drying kilns from this study (clockwise from top: Hughes Lot East & Borris/Blackcastle, Co. Tipperary; Scart & Ballykeaghan, Co. Kilkenny)

Charcoal offers valuable information on explicit wood selection for site-related activities, and in areas where pollen records are unavailable, it can provide the only source of information for woodland reconstruction. The increase in charcoal sampling from kilns has produced a significant corpus of primary data which offers a unique opportunity to evaluate the nature and composition of wood selection for kiln construction and operation. In turn, this can help with interpreting the profile of local woodlands, the changes to wood use that occurred and the factors that influenced these changes.

Study

This research is using archaeological charcoal to gain a better understanding of woodland resource use and wood management strategies during the medieval period. The focus of this investigation is a series of medieval settlement sites excavated along the N8/M8 Cullahill to Cashel in Co. Tipperary and the N9/N10 Knocktopher to Powerstown in Co. Kilkenny (Figure 2). A total of 45 corn drying kilns from 21 sites were recorded from these road schemes. The majority of these date between the 4th and the 14th century AD (Figure 3).

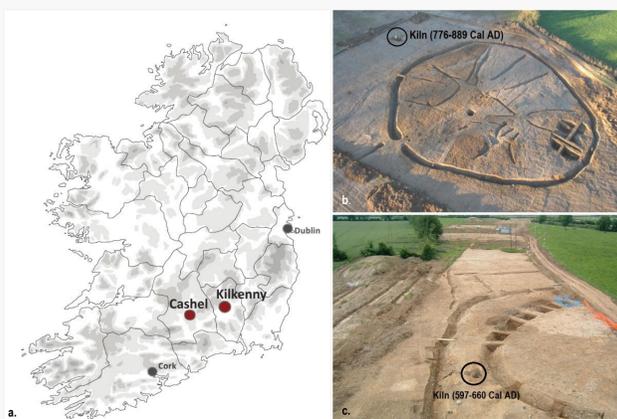


Figure 2 a. Location map; b. Medieval enclosure at Knockadrina, Co. Kilkenny; c. Medieval enclosure at Hughes Lot East, Co. Tipperary

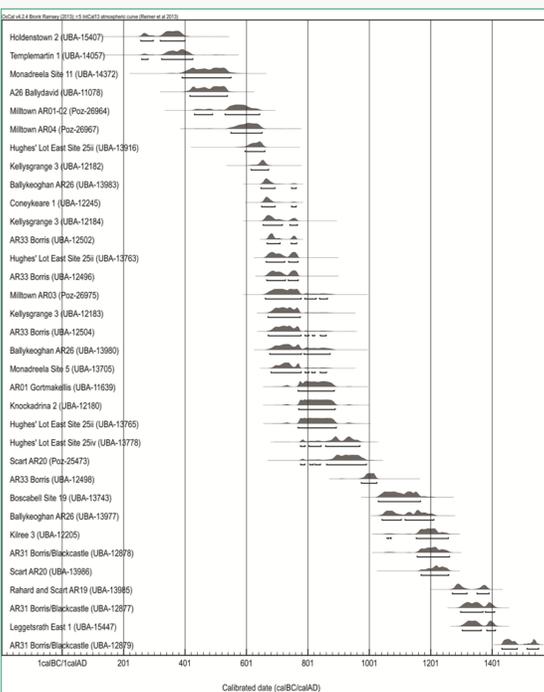


Figure 3 Summed probability distribution of C14 dates from crop drying kilns in this study (OxCal)

Methodology

The main objectives of the charcoal analysis was to: i) correlate the data to identify wood species diversity for fuelwood and define cultural selection; ii) to establish the species used in kiln construction; and iii) conduct an assessment of annual growth ring trends to determine growth patterns and evidence for wood management. A total of 172 charcoal samples from well stratified kiln deposits were analysed for inter-site comparison. Standard methods of charcoal quantification were implemented to assess species diversity, sampling sufficiency and taxa presence (Asouti & Austin, 2005; O'Donnell, 2011; O'Carroll, 2012). Species identifications were made using an episcopic illumination microscope up to 400x. An optimum minimum of 50 charcoal fragments was set as the quantifiable and most objective form of sample measurement. Where the number of available fragments fell below this figure all fragments present were counted. Where applicable, annual growth rings (AGR) were counted from whole charcoal fragments to establish information on growth patterns and cutting cycles (Marguerie & Hunot, 2007).

Results

A total of 4533 charcoal fragments were analysed. Thirteen wood taxa were identified from all sites. The major species recorded from kiln deposits were: oak, hazel, ash and pomaceous fruitwoods (e.g. apple, hawthorn, sorbus). Values for cherry and blackthorn were also relatively high from some sites (Figure 4).

Taxon	Total counts	% of Total	N8/M8 Tipperary	N9/N10 Kilkenny
Quercus sp. (oak)	1621	35.69	545	675
Corylus avellana (hazel)	1159	25.50	525	634
Malvaceae spp. (pomaceous fruitwood)	508	11.18	152	356
Fraxinus excelsior (ash)	471	10.39	253	218
Prunus sp. (cherry)	283	6.23	183	100
Salix sp. (willow)	174	3.83	136	38
Prunus spinosa (blackthorn)	147	3.23	34	113
Alnus glutinosa (alder)	91	2.11	33	58
Betula sp. (birch)	23	0.51	14	9
Euonymus europaeus (spindle)	21	0.46	21	0
Ilex aquifolium (holly)	20	0.44	4	16
Ulmus sp. (elm)	8	0.18	4	4
Rhamnus frangula (elder buckthorn)	6	0.13	3	3
Taxus baccata (yew)	1	0.02	0	1
Total	4533	100	2398	2225

Figure 4 Summary results of identified taxa

The charcoal data revealed a similar suite of taxa from both regional schemes, however variation was evident on a site by site basis. Overall, the kiln data compared well to charcoal results from other contexts at each site, for example structures, pits, hearths and ditches (Figure 5), suggesting it was closely linked with contemporary activities such as building, manufacture and cooking. This supports the 'Principle of Least Effort' model, where firewood is collected from as close to a site as possible (Shackleton & Prins, 1992).

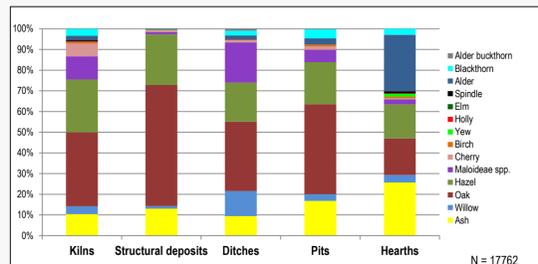


Figure 5 Comparison of wood taxa frequencies by feature

The results also revealed some differences in wood composition from kilns dating pre-10th century AD and those dating after the 10th century AD. Notable patterns include the significant decline in ash values from earlier to later kilns, hazel values also decrease in the later period, while oak, pomaceous woods and cherry values increase after the 10th century (Figure 7). Kilns dating pre-10th century contained an admixture of wood taxa compared to later kilns, where a single dominant species admixture (oak) was identified from many of the kilns analysed.

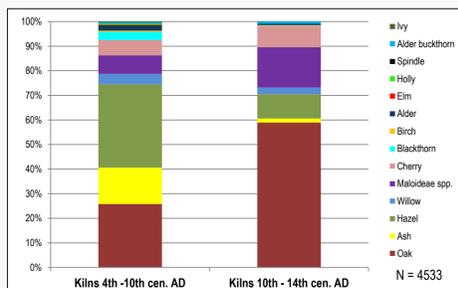


Figure 6 Distribution of wood taxa from kilns pre-10th century AD and post-10th century AD

The trend of high species diversity from earlier kilns seems to reflect low selectivity. While kiln fuelwood appears to be determined by local wood availability, wood selection also seems sporadic and varied, suggesting that kiln activity was less formal at this time. While the shift to a dominant oak presence from the 9th/10th century could relate to changes in local access, it is also possible that there is a transition to more formal kilning activity requiring better quality fuel. Pomaceous woods and cherry wood feature prominently in kilns dating from the 5th/6th century AD and continue to rise into the later period. The regular pruning of fruit trees would have provided a good supply of firewood for kiln operation. If kiln wood is a measure of on-site activities then this is strong evidence for the presence of orchards or gardens, both areas of medieval settlement that currently remain under researched.

Results

An interesting observation at many sites was the disparity in the appearance of oak and ash from kiln data. Results revealed that ash values were higher when oak values were lower and vice versa (Figure 6). This was particularly evident on sites dating between the 6th and mid 9th century AD. Ash values then decline from the late 9th century, while oak values continue to increase intermittently until the 14th century. This could demonstrate that ash was being used instead of oak at some sites, which raises questions about the availability and quality of oak during the early part of the medieval period.

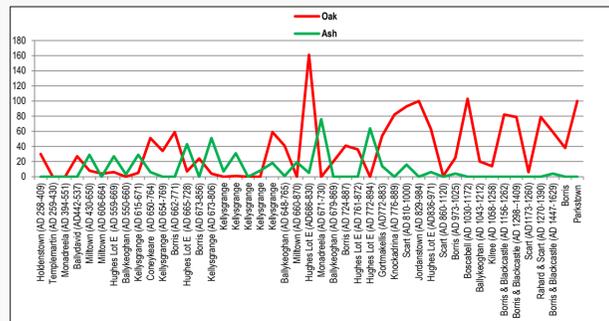


Figure 7 Comparison of oak and ash values from the kilns in this study

The taxa composition from the different internal features of the kiln (bowl, flue and fire-pit) showed some variation:

- High species diversity dominated by oak and ash in the flue and fire-pit, reflecting the main fuel stock used
- Hazel charcoal dominated within the bowl strongly indicating charred structural remains

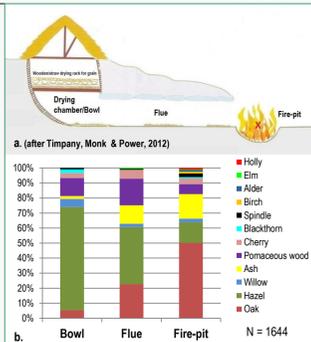


Figure 8 a. Main internal features of a crop drying kiln; b. Distribution of taxa from internal kiln features (based on 21 kiln examples)

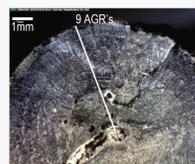
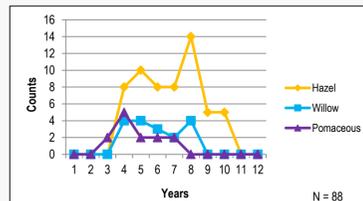


Figure 9 (above) AGR data by taxa

Figure 9 (left) A whole fragment of young hazel charcoal with 9 AGR's (10x)

The results of the AGR assessment revealed:

- 17% of the charcoal assemblage from bowl and flue deposits was young hazel, willow and pomaceous woods
- A count range of 4-10 rings suggests a short cutting cycle perhaps management
- Strong evidence for structural wood remains (Figure 9 & 10)

Conclusion

This research is helping to improve the theoretical framework for medieval wood management strategies, acquisition and use. Charcoal results from medieval crop drying kilns have revealed some new insights into the woods used to fuel and operate these features.

Some of the main findings have generated new information on the following:

- Kiln activity was closely linked to on-site wood use
- The role and selection strategies of ash and oak in the early medieval period
- The sudden decline in ash after 10th century AD - culturally or environmentally driven
- The rise in oak suggest kiln activity may have become more formal from the 9th/10th century AD. Suggests increased oak management
- Kiln construction used young hazel rods, along with possible willow and pomaceous fruitwood
- The wood data has contributed to understanding the role of fruit-bearing trees in the archaeological record and provides new evidence for the presence of gardens and orchards

References

Asouti, E., Austin, P., 2005. Reconstructing woodland vegetation and its exploitation by past societies, based on the analysis and interpretation of archaeological wood charcoal macro-remains. *Environmental Archaeology* 10, 1-18.

Marguerie, D. and Hunot, J.Y., 2007. Charcoal analysis and dendrology: data from archaeological sites in north-western France. *Journal of Archaeological Science* 34, 1417-1433.

O'Carroll, E., 2012. *Quantifying woodland resource usage in the Irish midlands using archaeological and palaeoecological techniques*. Unpublished PhD thesis, Botany Dept. Trinity College Dublin.

O'Donnell, L., 2011. *People and woodlands: an investigation of charcoal remains as indicators of cultural selection and local environment in Bronze Age Ireland*. Unpublished PhD thesis, University College Dublin.

Shackleton, C.M. and Prins, F., 1992. Charcoal analysis and the "Principle of least effort"—A conceptual model. *Journal of Archaeological Science*, 19(6), 631-637.

Timpany, S., Monk, M. and Power, O., 2011. Agricultural boom and bust in medieval Ireland: plant macrofossil evidence from kiln sites along the N9/N10 road scheme. In Conran S., Danaher E. and Stanley M. (eds.) *Past times, changing fortunes* National Roads Authority Monograph Series No. 8 National Roads Authority Dublin, 73-84.

Acknowledgements

The Irish Research Council, Dr Benjamin Gearey (UCC), Mick Monk (UCC), Nick Hogan (UCC), Dr Ellen O'Carroll, Dr Lorna O'Donnell, Irish Archaeological Consultancy Ltd (IAC), Richard O'Brien (TII), Transport Infrastructure Ireland (TII)