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Post-Roman crop production and processing: Archaeological evidence from Goldthorpe, South Yorkshire

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The remains of a ditched field system dating from the late Iron Age to the early post-Roman period, and two associated corn drying ovens (dating to the 5th–6th centuries AD) were revealed during archaeological excavations at Goldthorpe, South Yorkshire. The site was excavated during 2012 and 2013, during which bulk environmental samples were taken in order to retrieve any surviving botanical remains from deposits associated with the corn drying ovens, and other features across the excavated area. Early post-Roman occupation is under-represented in the archaeological record, especially in northern England, as such human activity and subsistence during this period are currently not well understood. This paper combines evidence for the field system, the physical remains of the corn drying ovens and their associated botanical remains to further understand early post-Roman change and continuity in landscape use and crop production and processing practices.

Keywords: Post-Roman, Early medieval, Corn drying oven, Field system, Crop production, Crop processing

Introduction

Archaeological excavations were undertaken in advance of commercial development on land to the west of Goldthorpe Industrial Estate, Goldthorpe, South Yorkshire, centred on grid reference NGR SE 4470 0350 (Fig. 1, location map). The archaeological features encountered at Goldthorpe dated predominantly to the late Iron Age and Roman period, and were located across the full extent of the excavation area. Features were radiocarbon dated using charred cereal grain (see Table 1 for a summary), as well as by diagnostic ceramics. The features included an extensive field system, which was consistent with the series of linear responses identified during geophysical survey, and two corn drying ovens. The field system comprised large fields delimited by four principal ditches, which were orientated north-east to south-west and north-west to south-east. The fields were subdivided by a series of smaller ditches and the results of the excavation indicated that either the entire field system had been laid out contemporaneously, or that the subdivisions were added and that the ditches were cleaned together routinely. An additional corner enclosure, or corral, was identified at the intersection of two of the principal ditches, within which a series of pits were encountered.

The underlying solid geology consisted of Upper Westphalian coal measures of the Carboniferous period (BGS 1977). The soils and drift geology in the area have not yet been surveyed (Jarvis *et al.* 1984; SSEW 1983).

The archaeological and historical background

The archaeological potential of the site was first recognised in 2001 (Davies and Sayer 2001). Cropmarks relating to an extensive ditched field system extended across and beyond the boundaries of the site. Where these had been investigated within this region, they had proved to be Iron Age or Roman in date. A sample geophysical survey of approximately 50% of the area (Webb 2001), followed by a limited trial trench evaluation (WYAS 2003), confirmed the presence of infilled ditches. In the western part of the site, geophysical survey confirmed the continuation of the field system and that it extended beyond the site to the south and west (Biggs 2011). The combined geophysical surveys (from 2001 and 2011) suggested the division of the land into rectangular fields radiating from a principal north-east to south-west aligned ditch. Toward the southern end of the site, the line of this principal ditch had been diverted before resuming its course, resulting in a localised arc.

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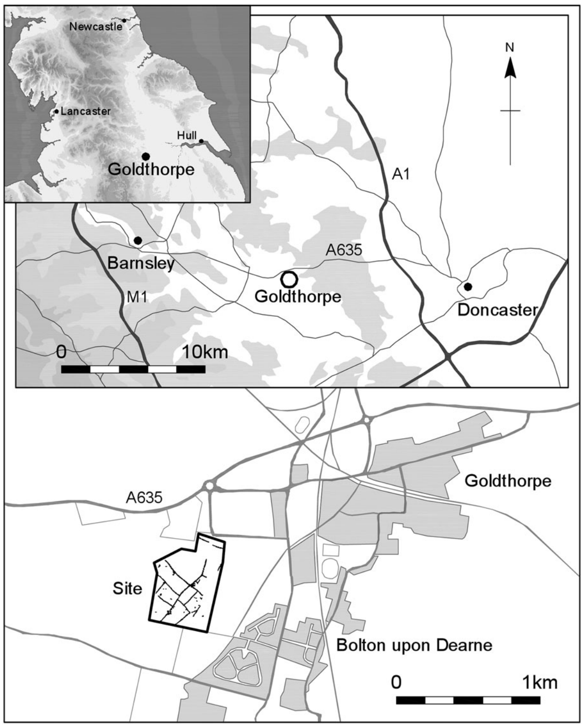

Figure 1 Location of the site at Goldthorpe.

More widely, the site is located within a landscape of late Iron Age to Roman settlement enclosures and field systems (Fig. 2). These have been recognised, for the most part, from cropmarks, with the nearest being ca. 500 m north at Holly Grove Farm (Merrony 1993) and 1·6 km to the north-east at Thurnscoe (Neal and Fraser 2004). A number of these, including Thurnscoe, Jump (Robinson forthcoming) and Upper Woodhead Farm, both near Wombwell (Northamptonshire Archaeology 2003), Armthorpe (WYAS 2004) and Parrot's Corner, Doncaster (NAA 2010), have been confirmed by archaeological excavation (Fig. 3). The site at Holly Grove Farm was also confirmed through geophysical survey and trial trench evaluation, and included at least two enclosures, a droveway and field boundary ditches. Some of these boundary ditches appeared to lead south, across the A635 toward Goldthorpe Industrial Estate and may form part of the same field system found at Goldthorpe.

The field system

The late Iron Age to Roman period field system excavated at Goldthorpe forms part of the widespread agricultural system that has been identified across South and West Yorkshire. This system has been mapped as cropmarks as a result of an extensive programme of aerial photography (Riley 1980) and has been confirmed in some cases through geophysical survey and excavation. In order to provide a descriptive framework, Riley (1980) defined three different

Table 1 Radiocarbon dates from Goldthorpe

Context	Feature	Sample material	SUERC code	^{14}C age BP	Calibrated date (95·4% unless stated)
345	Fill (lower northern chamber) of corn drying oven 343	Charred barley *Hordeum* sp.	SUERC-48116	1646 ± 30	331–533 cal. AD (at 93·7%)
346	Fill (lower southern chamber) of corn drying oven 343	Charred barley *Hordeum* sp.	SUERC-48117	1565 ± 30	422–561 cal. AD
474	Lower fill of corn drying oven 473	Charred barley *Hordeum* sp.	SUERC-48119	1532 ± 30	432–598 cal. AD
529	Fills of pits cutting deposit (555) within stock corral – later than pit [494] which is of different form and cut into natural	Charred barley *Hordeum* sp.	SUERC-48126	1502 ± 30	440–637 cal. AD
299	Fill of ditch adjacent to corn drying oven 343(fill two of three)	Charred barley *Hordeum* sp.	SUERC-48114	1480 ± 30	540–644 cal. AD
485	Fill of ditch at main intersection – latest ditch (fill two of five)	Charred wheat *Triticum* sp.	SUERC-48120	1507 ± 30	436–635 cal. AD
519	Fill of curvilinear ditch (fill one of three)	Charred wheat *Triticum* sp.	SUERC-48125	1984 ± 30	46 cal. BC–76 cal. AD

Calibrated using OxCal4 (Bronk Ramsey 2010; Reimer *et al.* 2009).

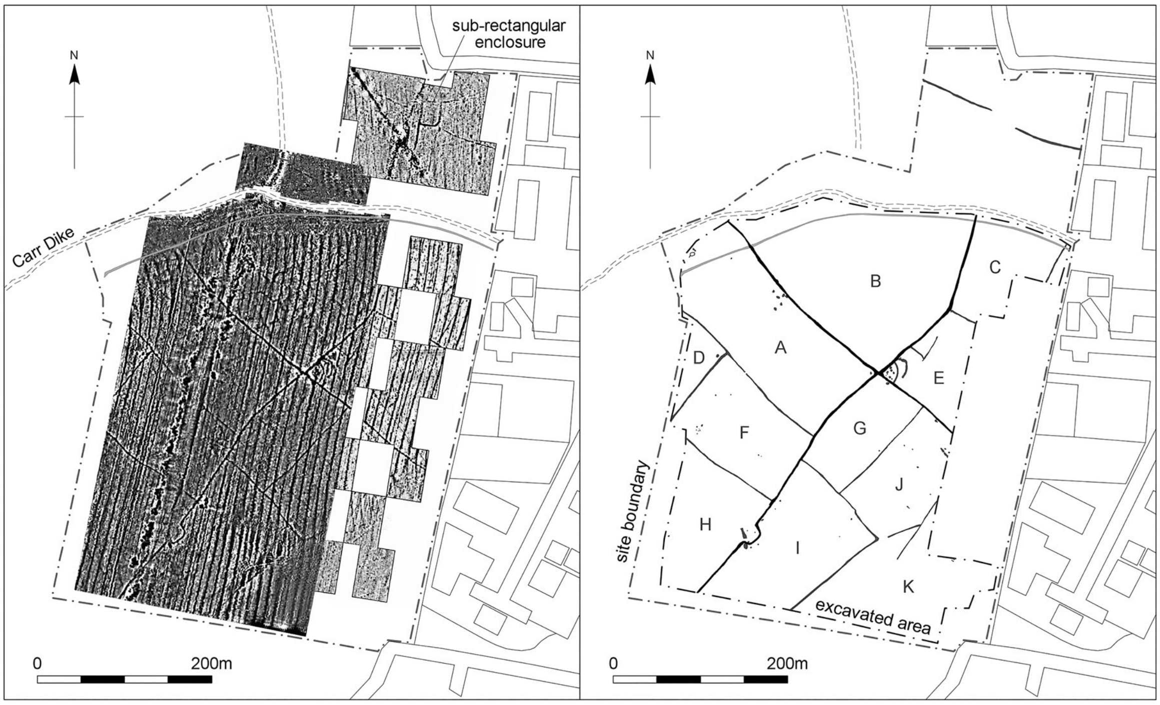

Figure 2 The site at Goldthorpe showing results of geophysical survey (left) and archaeological excavations (right).

types of field system across his study area; the brickwork, nuclear and irregular plan fields. The brickwork plan was the most ubiquitous and comprised long boundaries with short cross boundaries dividing the strips into fields which are up to 3 ha in size.

The nuclear plan fields were composed of a small, well-defined enclosure, forming the 'nucleus' of a block of fields radiating from it. It was assumed that the enclosure represented the farmstead at the centre of the associated field system. The irregular plan fields were more or less rectangular in shape, but arranged without an obvious order. In some cases they were identified near streams or on low ground and often had lanes running through them (Riley 1980). However, more recent work by Chadwick (2010) has shown that these typological categories are perhaps too simplified and that actual land allotment was more mixed. Chadwick proposes an 'attenuated' type as a more appropriate term for landscapes that were fixed by major long linear boundaries, and that this would equally fit many of the established typologies (Chadwick 2010, 180).

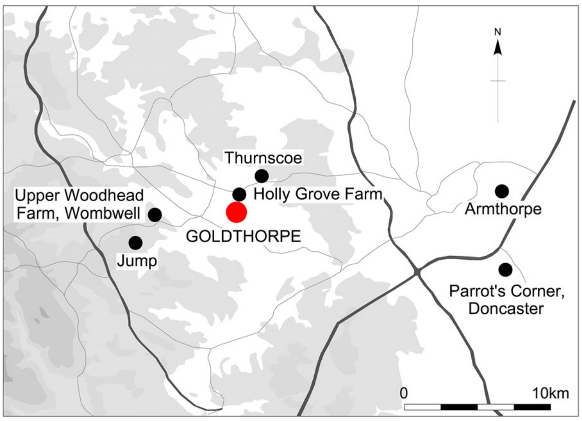

Figure 3 Other sites mentioned in connection with Goldthorpe.

The results of the geophysical survey at Goldthorpe Industrial Estate (Stratascan 2011; Webb 2001) indicated that the field system in this area radiated from a small sub-rectangular enclosure, which measured approximately 25 m by 20 m and was situated on the higher ground on the north side of Carr Dike (Fig. 2). It is debatable whether the extensive field system encountered south of Carr Dike is part of the 'nuclear' field plan, radiating from the possible settlement or an 'attenuated' landscape structured from one of the principal linear ditches or boundaries. However, the north-east to south-west aligned principal boundary ditch did turn slightly at its junction with a ditch to head almost directly northward towards the ditch projecting from the south-western corner of the small enclosure. This suggests that they are part of the same field system and the slight difference in the alignment in plan may be due to the local topography.

The field system at Goldthorpe was formed by four principal ditches (561, 567, 568 and 569), which were orientated north-east to south-west and north-west to south-east (Fig. 4). The dimensions of these ditches varied from 1·45 to 2·55 m in width and from 0·53 to 0·91 m in depth and for the most part the ditches were cut into the natural bedrock. The majority of the excavated sections contained a single, mid-brown, silty sand fill but in places, dark-brown, silty sand was observed overlying this, having accumulated

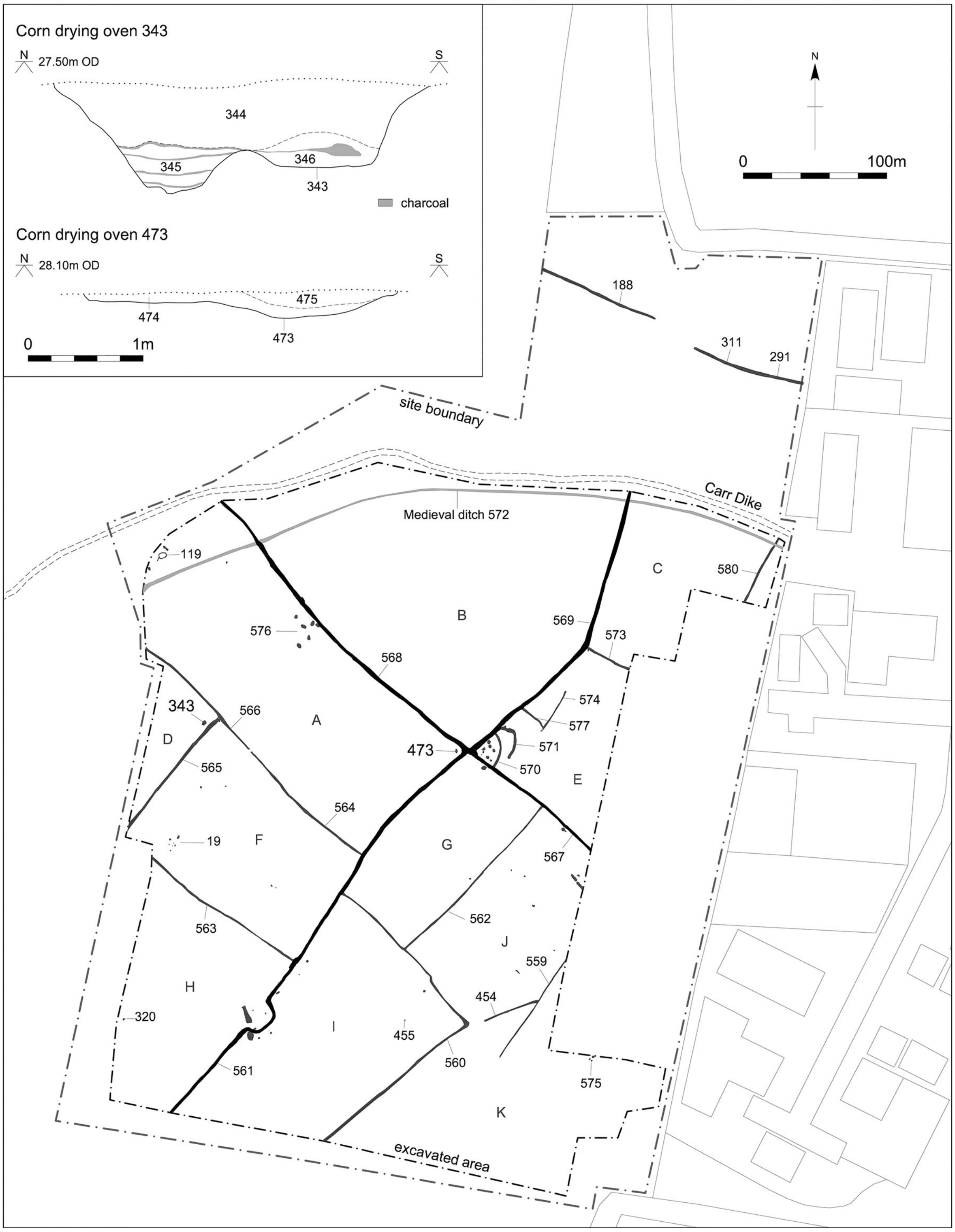

Figure 4 Excavated features at Goldthorpe showing field and group numbers. Top left: section drawings of corn drying ovens 343 and 473.

in depressions left following the compaction of the original fill; there was no evidence of differential filling suggestive of an earth bank to one side. Some evidence for re-cutting of the principal ditches was observed but only within 20 m of the intersection, where the ditches were at their deepest (Fig. 5).

The areas delimited by these major ditches were further subdivided into 11 fields (A–K) of varying dimensions by a series of smaller ditches which generally ran parallel and perpendicular to the larger ditches (Fig. 4). Excavation at the intersections, where the lesser ditches joined the principal ditches, confirmed that the field system was contemporaneous or at least these were added and then regular cleaning had removed the evidence. The lesser ditches were also filled by a single fill of mid-brown sandy silt. The dimensions of these ditches varied from 0·80 to 1·55 m in width and from 0·24 to 0·38 m in depth. Only

Figure 5 Excavated field system at Goldthorpe showing ditch intersection. Photograph taken facing south-west.

one definite field entrance was recorded, and this was a 2-m wide gap through ditch 564. It was probable that the field system was set out in the late Iron Age or very early Roman period as pre-Roman Iron Age pottery sherds were recovered from low within the primary fills (251 and 243) of the ditches (233 and 242, respectively). These were crucially located at the intersection of the main ditches providing a good date for the earliest use of the field system. Two joining rim sherds of a jar type prevalent in Lincolnshire from the mid-1st to mid-2nd century AD (Cumberpatch and Leary 2014) were also recovered from the primary fill (280) of principal ditch group 561, where it diverted around a Bronze Age cairn. Further pottery recovered from the fills of the principal ditches in group 568 included 19 sherds of pre-Roman Iron Age pottery, a Roman base sherd in an oxidised sandy ware and a grey ware jar base, dating from the late 1st to the mid-4th century AD. This dating evidence suggests that the field system was probably open throughout the Roman period. A charred wheat (*Triticum* sp.) grain recovered from one of the fills (485) of the latest ditch re-cut (484) at the main intersection (adjacent to corn drying oven 473) returned a date range of 436–635 cal. AD (SUERC-48120), revealing that the principal ditches of the field system were still open into the post-Roman period.

A comparable nuclear field system was identified through aerial photography at Hesley Hall, Rossington, approximately 22 km to the east of Goldthorpe (Riley 1980, 46). The aerial photograph revealed a similar sub-rectangular enclosure with field boundary ditches radiating from it. This nuclear field system was crossed at an acute angle by the Roman road from Lincoln to Doncaster implying a field system earlier than the road (Garton 1987); an early Roman or pre-Roman date for this field system is a closely comparable example to the origin of the field system at Goldthorpe Industrial Estate. It was possible to calculate the average size of the fields constituting the nuclear settlement at Hesley Hall, as the extent of 17 fields was visible on the aerial photograph. The usual field size is between 1·0 and 1·6 ha, which is a little smaller than the brickwork plan fields (Riley 1980, 19). At Goldthorpe Industrial Estate, the complete dimensions of only two of the fields (F and G) could be ascertained within the stripped area, these measured 1·4 and 0·9 ha, respectively. This is reasonably consistent with the averages suggested by Riley (1980), although Fields F and G appear to be smaller than the other fields surrounding them, so the average field size for this site was larger.

It is likely that the field system excavated at Goldthorpe formed part of the same system identified approximately 500 m to the north, at Holly Grove Farm. Following excavation, the site at Holly Grove Farm remained undated and it was suggested that the lack of dateable material indicated a pre-Roman Iron Age date for the site (Merrony 1993). The field system investigated at Goldthorpe Industrial Estate follows the same alignment as the field boundary ditches investigated at Holly Grove Farm, supporting the likelihood that the two sites were part of the same wider field system complex.

A number of further cropmark sites in the area have been confirmed and dated by archaeological excavation. Approximately 1·6 m to the north, at Thurnscoe, a settlement comprising a sequence of ditched rectilinear enclosures linked to a trackway and field system elements was confirmed as a Roman period farmstead, occupied from the 2nd to the 4th century AD (Neal and Fraser 2004, figure 3). The droveway and field boundary ditches excavated at Thurnscoe were found to be of similar dimensions to those identified at both Goldthorpe Industrial Estate and at Holly Grove Farm, indicating that they too formed part of a widespread field system across this area. The overall evidence from cropmark sites which have been excavated across South Yorkshire and Nottinghamshire suggests, however, that the field system was not imposed upon the landscape in a single phase but was gradually expanded and altered during both the late Iron Age and the early Roman period (Chadwick 2010). At Dunston's Clump in Nottinghamshire (Garton 1987), the field system was found to originate in the late Iron Age but had enclosures appended to it in the 1st century AD and continued in use into the 3rd century AD. Similarly at Armthorpe in South Yorkshire, it was proposed that although the first definitive enclosure of land was dated to the 2nd century AD, elements of the field system may have been associated with earlier, apparently unenclosed, late Iron Age activity, given the potential for largely aceramic occupation at this time (Richardson 2008). The field system at

Armthorpe also revealed evidence for modification in the late 3rd–4th century AD, confirming the continued use of such sites from the late Iron Age through to the late Roman period. Approximately 5 km to the west of Goldthorpe, excavations at Jump (Robinson forthcoming) revealed a late Iron Age/Roman period enclosed farmhouse, including a rectangular dwelling which was replaced during the Roman period by field boundaries and droveways. In the light of this combined evidence, an origin in the very late Iron Age should be considered for the field system at Goldthorpe Industrial Estate.

Corner enclosure

A corner enclosure was identified within the north-eastern corner of Field E (Fig. 4). The enclosure was delimited by two concentric curvilinear ditches (Group numbers 570 and 571, Fig. 6), which enclosed areas with a radius of approximately 16 and 28 m, respectively. The interior of the area delineated by the inner ditch (570) had been eroded and filled by a layer of silty sand, indicative of trample within a stock corral. This inner ditch was steep-sided with an average width of 1·4 m and an average depth of 0·6 m. The ditch contained a single fill of mid-brown, sandy silt, with occasional sandstone fragments and heat-affected cobbles throughout. No finds were present within the ditch fill.

The outer ditch (571) was discontinuous and terminated approximately 10 m from a boundary ditch 567. Ditch 571 was also steep-sided and was on average 1·85 m wide and 0·8 m deep. Its fills were generally consistent throughout and comprised an accumulation of dark-brown, sandy silt, overlain by light-brown, silty sand, which appeared to represent an episode of intentional backfilling.

Within one excavated portion of the outer ditch (cut 516) was a primary fill of mid-brown silty sand that contained a high frequency of large sandstone boulders; this was unlike any other section of ditch excavated elsewhere at the site. It is probable that the stones were derived from a structure in the near vicinity, for which no other trace remained. An unusually large pivot stone (Fig. 7) was recovered from the upper backfill (509) of the ditch terminal (507). This stone may have either been from a stone structure, perhaps a gate because of its size, or it was deliberately placed within the ditch terminal as some form of ritual; placed deposits, such as round objects, in ditch terminals as part of the backfilling process are a recognised phenomenon within the Iron Age and Roman periods. The underside of the stone had broken off and this had removed the base part of the pivot 'bowl', leaving a hole through the stone. There had been some re-cutting of these linear ditches indicating the importance of maintaining the boundary in this area. A sample of charred wheat grain from the primary fill of the outer curvilinear ditch was radiocarbon dated to 46 cal. BC–76 cal. AD (SUERC-48125), indicating that the corral may have been created in the late Iron Age or early Roman period, presumably when the system of land division was first laid out.

Evidence for disturbance, probably attributable to use of the enclosure as a stock corral, was encountered within the area defined as the principal boundary ditches (567 and 569) and the inner curving ditch (570). Apart from a narrow area against ditch 567, the original ground level within the interior of this enclosure appeared to have been eroded and reduced, probably by trampling from the corralled cattle. This trampling had created a 'bowl' filled by an

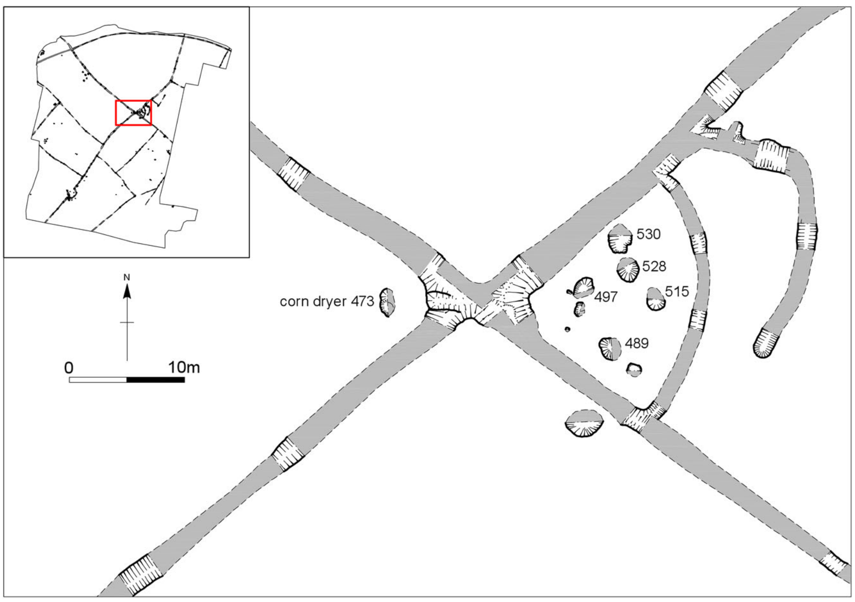

Figure 6 North-eastern corner of Field E.

Figure 7 Large broken pivot stone in ditch terminal 507.

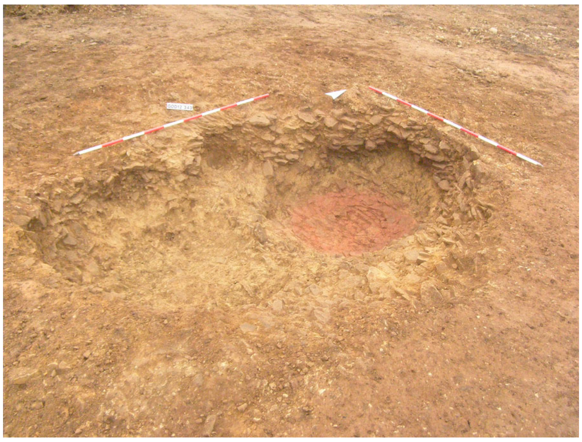

Figure 8 Excavated corn drying oven 343 showing heat-affected northern chamber, southern chamber and posthole.

accumulation of mid-brown, silty sand (555) to a depth of approximately 0·4 m.

Five large pits (489, 497, 515, 528 and 530 – Fig. 6) were cut into the upper surface of the accumulated layer (555) and relate to a later use, suggesting that the corner enclosure was maintained. The pits were in two roughly parallel rows, aligned north-west to south-east, and their centres were 6 m apart; the eastern row consisted of three pits (515, 528 and 530) and the western row of two pits (489 and 497). The pits were all broadly the same size, on average 2·0 m in diameter and 0·55 m deep but contained no finds or deposits to indicate their purpose. It is possible that they were left open, as the two western pits contained a primary fill derived from weathering. A sample of charred barley grain from the fill of pit 528 (529) was radiocarbon dated to 440–637 cal. AD (SUERC-48126) indicating that the final activity within the corner of this field was post-Roman.

The corn drying ovens (343 and 473)

The below ground remains of two corn drying ovens were revealed during excavation. One corn drying oven (343, Fig. 8) was identified in the north-eastern corner of Field D (Fig. 4). It was a figure-of-eight shaped oven located within a wider, but shallower, roughly rectangular cut, within which the superstructure was presumably housed. This outer cut was approximately 4 m long by 3 m wide, and extended 0·6 m to the south of the oven. The oven was composed of two adjoining contemporary chambers; a fire chamber (northern chamber) and a drying chamber (southern chamber). The overall dimension of the structure was 3·4 m by 2·94 m. A posthole (seen clearly in Fig. 8) was located against the western edge, where the two chambers adjoined. Both chambers were cut into the natural bedrock, with a slight ridge of bedrock between them. The northernmost chamber was slightly deeper at 0·98 m, and the sides and base of this chamber were scorched by intensive burning, leaving the natural stone heat reddened (Fig. 8). There was no evidence for a flue between the chambers, which would have enabled the hot air to flow into the drying chamber on which grain would have been spread across a suspended floor to dry. It was clear that the oven structure had collapsed during its last use, and had presumably smouldered under the daub of its superstructure. Within the southern drying chamber, this had caused charring of the grain and a quantity of willow/poplar charcoal, which had possibly formed part of a wattle frame or the drying floor.

The primary fill of the southern chamber was a light-brown, silty sand, containing up to four thin bands of charcoal and charred grain; the most substantial lens of charred material sat on the top of the silty sand. The primary fill of the northern chamber was a burnt, dark-reddish, silty sand, containing burnt stone fragments and charcoal, along with a quantity of charred grain.

Another corn drying oven (473, Fig. 9) was located in the north-eastern corner of Field A, to the west of the corner formed by the intersection of the two principal field system ditches, and opposite to the stock corral. The sub-surface remains, which also consisted of two chambers, measured 2·8 m by 1·4 m, however, heavy truncation had left a maximum depth of only 0·25 m. As with corn drying oven 343, there was no surviving evidence of any above ground elements to the superstructure (Fig. 9). The base of the deeper southern chamber had been scorched. The fills were composed of brown, silty sand and contained a large quantity of charred grain.

The drying ovens were located in the corners of fields so that grain did not have to be transported over long distances for drying. It could be dried in the fields in which they were grown, ready for milling. The form of the corn drying ovens is similar

Figure 9 Corn drying oven 473, showing heat-affected southern chamber.

to Roman keyhole-shaped examples, with the fire set in one chamber, which was linked by a flue, to a second chamber, where the grain was laid over a suspended floor for drying. However, the two Goldthorpe examples both had conjoined chambers with no obvious connecting flues, so these must have been incorporated into the structure in a way that has left no trace. Unfortunately, there was little evidence for a superstructure for either oven; though a single posthole was located on one side of the better preserved oven (343) in Field D. The fire chambers were deep in both ovens and clay formed the bulk of the upper infill deposits. This clay presumably resulted from the collapsed daub superstructure, which would have been domed over the drying chamber, and presumably vaulted over the fire chamber, with an open end to create a draw.

Palaeoenvironmental remains

Methods

Sixty bulk environmental samples, with volumes between 17·5 and 37·5 L, were taken during the course of archaeological excavations at the site (Table 2). The samples were processed with 500 µm meshes using the Siraf method of flotation (Williams 1973). These were sorted using a 4-mm mesh when dried. The fine fractions (<4 mm) from the corn drying oven samples were re-floated in order to maximise the archaeobotanical yield. Wood charcoal was sieved using 2 and 4 mm meshes, with the larger of those (>4 mm) used for identification purposes. Archaeobotanical remains were retrieved from the samples under ×45 magnification. The results of the analysis of the palaeobotanical remains were assessed in accordance with Campbell *et al.* (2011) and English Heritage (1991). The plant remains and charcoal were identified to species as far as possible, using Cappers *et al.* (2006), Cappers and Neef (2012), Hather (2000), Jacomet (2006), Schoch *et al.* (2004) and the NAA reference collection. Nomenclature for plant taxa followed Stace (2010), whilst grain followed Cappers and Neef (2012).

The identification to species for oat (*Avena* sp.) is very difficult as it requires the presence of floret bases to be able to differentiate between the common oat (*Avena sativa*), bristle oat (*A. strigosa*) and wild oat (*A. fatua*). The lack of floret bases at Goldthorpe allowed no distinction between the cultivated and weed type, hence the assigning of *Avena* sp. The barley assemblage presented straight grains only, thus tentatively identified as two-rowed barley

Table 2 Sample details for corn drying ovens at Goldthorpe

	Corn drying oven 343			Corn drying oven 473	
Context Sample code	344 AA	345 AA	346 AA	474 AA	475 AA
Feature	Upper fill	Lower (northern chamber) fill	Lower (southern chamber) fill	Lower fill	Upper fill
Sample volume (litres)	32·25	32·75	17·5	18	19
Cereals					
Avena sp. oat	7	583	229	1	8
Avena sativa floret bases	–	1	–	–	–
Avena sativa lemma	–	2	2	–	–
Triticum sp. *wheat*	71	815	449	170	81
Hordeum sp. barley	214	2844	1959	115	229
Rachis internodes	–	2	1	–	–
Total grain count	292	4242	2637	285	318
Weight (g) identified	2·2	29·2	18·7	2·9	2·7
Weight (indet.)	1·3	21·3	0·7	2·2	2·2
GPL	8	129	151	158	18
Non-economic plants					
Chenopodium sp. goosefoot	–	2	–	–	–
Carex sp. sedges	–	12	–	–	–
Plantago lanceolata ribwort plantain	–	4	–	–	–
Poaceae grass	–	2	–	–	–

Table 3 Identified wood charcoal remains (actual count) from corn drying ovens 343 and 473

	Context				
	Corn drying oven 343			Corn drying oven 473	
Species	344 (upper)	345 (lower N)	346 (lower S)	474 (lower)	475 (upper)
Quercus sp. Oak	6	15	27	22	5
Corylus avellana Hazel	30	1	19	17	10
Salix/Populus Willow/poplar	5	27	5	10	6
Fraxinus excelsior Ash	4	4	0	0	0
Betula sp. Birch	2	0	0	0	0
cf. *Prunus*-type Sloe, wild cherry, etc.	0	0	0	0	1
Non-wood charcoal					
Calluna vulgaris Heather	1	11	2	1	0
Hazelnut shell fragment	0	0	4	2	0
Indeterminate	0	3	7	8	1
Total	48	61	64	60	23

(*Hordeum vulgare* ssp. *distichon*), especially since there was a lack of rachis fragments which, if present, would have allowed a positive identification.

Results

Uncharred plant remains were common throughout the samples. These included goosefoot (*Chenopodium* sp.), ivy-leaved speedwell (*Veronica hederifolia*), common chickweed (*Stellaria media*), elder (*Sambucus nigra*) and common fumitory (*Fumaria officinalis*). These were thought unlikely to have survived the aerobic soil conditions, and thus were deemed intrusive.

The samples taken from deposits within the two corn drying ovens, and associated ditches, contained charred cereal grains and charcoal (Tables 2 and 3), only the lower fill of the northern chamber (345) of corn drying oven 343 yielded charred weed seeds/fruits. All samples discussed contained a significant number of indeterminate grains due to poor preservation (these tended to be presented as either showing charred grain fragments and/or severe abrasion).

Corn drying oven 343

Three contexts were recognised within the fill of corn drying oven 343. These included an upper fill (344), and then lower fills in each of the two chambers; lower fill of the northern chamber (345), and lower fill of southern chamber (346) (Fig. 4, top left).

The upper fill of corn drying oven 343 (344, see Fig. 4, top left; Fig. 8; Tables 2 and 3) contained the least amount of charcoal and other charred plant material. Barley grains were the most abundant with 214 identified. Free-threshing wheat, possibly bread wheat (*T.* cf. *aestivum* ssp. *aestivum*), presented 71 grains. Oat was the least abundant taxon with only seven grains identified. There were eight identifiable GPL (grains per litre) within this sample. The identified charcoal assemblage (Table 3) was dominated by hazel (*Corylus avellana*), with small amounts of oak (*Quercus* sp.), willow/poplar (*Salix/Populus*), ash (*Fraxinus excelsior*), birch (*Betula* sp.) and heather (*Calluna vulgaris*) also present.

The lower fill from the northern end of the feature (345, see Fig. 4, top left; Fig. 8; Tables 2 and 3) yielded 4242 identifiable grains, with barley grains totalling 2844, bread wheat 815 grains and 583 oat grains. Indeterminate grains from this sample were not counted due to their large quantity; however, the weight of the identifiable grains was 29·2 g, with indeterminate grains weighing 21·3 g (42% of the sample's charred grain assemblage). There were 129 identifiable GPL. This sample also contained the greatest amount of charred weed seed and chaff; however, these were minimal in quantity. A single oat floret base and two lemmas from *Avena sativa* were present which suggested that the oat grains in this sample may be the cultivated common oat rather than the weed forms. This sample yielded the greatest amount of charcoal from the feature. Willow/poplar was the most prevalent species, with the largest willow/poplar fragment measuring 55 mm by 90 mm by 25 mm. Oak and heather charcoal fragments were also present, with small amounts of ash and hazel.

The sample from the lower fill on the southern side (346, see Fig. 4, top left; Fig. 8; Tables 2 and 3) contained 1959 barley grains, 449 wheat grains and 229 oat grains, totalling 2637 identifiable grains. The weight of the indeterminate grains was 0·7 g compared with 18·7 g of identifiable ones. There were 151 identifiable GPL. Two common oat lemmas and a small fragment of rachis internode were also present. In terms of charcoal, oak was the most abundant, followed by hazel, with heather and willow/poplar in smaller amounts. Four fragments of hazelnut shell were also present in this sample.

Corn drying oven 473

Two discreet contexts were recognised within corn drying oven 473, with a lower fill (474) and an upper fill (475), see Fig. 4, top left. Collectively the samples from them yielded 603 identifiable grains (Fig. 9; Table 2).

The greatest quantity of grain from sample 474 was bread wheat with 170 grains. Barley had 144 grains, with only one oat grain present; these yielded 15·8 GPL. The 2·1 g of charcoal present provided evidence for oak, hazel, willow/poplar and heather with two hazelnut shell fragments also present (Table 3).

The sample from 475 yielded 229 grains of two-rowed barley, 81 wheat grains and 8 oat grains (Table 2); producing an identifiable GPL count of 18. The 2·1 g of charcoal was identified and included oak, hazel, willow/poplar and possible sloe, wild cherry, etc. (cf. *Prunus*-type).

Other plant and charcoal remains

The archaeobotanical yield from the remaining 55 samples was poor. Only a further four samples contained any charred plant remains. Barley grains were observed in the secondary fill of ditch 297 (299) n = 20 (10 m to the north-east of corn drying oven 343), with 11 grains presented from fill 496 of ditch 495 – 20 m to the east of corn drying oven 473. A single wheat grain was found in a fill of a cremation pit 328 (329) whilst in fill 228 of a possible cremation 227 two naked wheat grains were observed along with three false oat-grass tubers (*Arrhenatherum elatius*).

Charcoal was present in 23 samples, however there was less than a gram each from 18 of those. All the charcoal fragments identified to species were also presented in the corn drying oven samples.

Interpretation of the charred archaeobotanical remains from the corn drying ovens

Barley grains dominated in all three samples from corn drying oven 343 and the upper fill of oven 473. Monk (1977), cited in Carruthers and Hunter (2001, 8–9), suggested that barley was the dominant cereal throughout the early medieval period, although this was specific to southern England. Barley being the overall most prolific taxa represented in corn drying ovens 343 and 473 (Table 2, Figs. 10 and 11) might

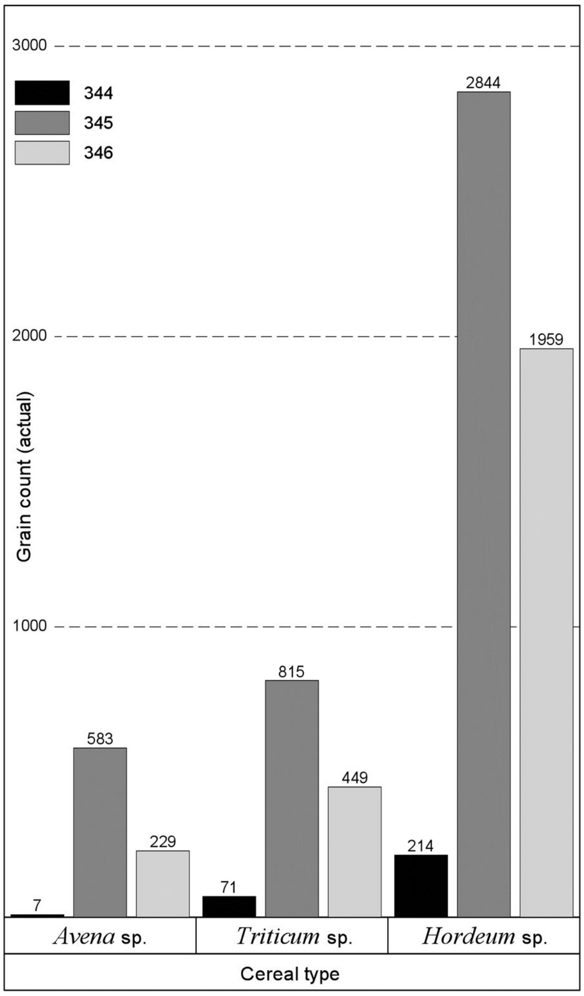

Figure 10 Distribution of charred cereal grains from corn drying oven 343 (actual count).

have been expected based on its known occurrence on sites of this period (barley also being the main cereal crop from the Iron Age onwards; Jaqui Huntley, pers. comm.). The preference of bread wheat over emmer (*Triticum turgidum* ssp. *dicoccon*) or spelt (*T. aestivum* ssp. *spelta*) increased throughout the medieval period (Hall and Huntley 2007, 93) and oat became a considered crop during the Roman period (Carruthers and Hunter 2001, 10). However, it is perhaps unexpected to find bread wheat rather than emmer or spelt present in the assemblage given the early date of the dryers.

The charred layers present in oven 343 may have been the rakings from the oven floor. The northern chamber (346) has significantly lower volume of charcoal and only one dump of grain, which suggested that this directly related to its last use. The southern chamber, with its four visible charred layers (these were not sampled individually due to time restraints on site), may indicate the rakings between firings (Fig. 3, top left). It is not beyond reason that the fire pit (345) may have been allowed to reach a certain depth before being cleaned out, so these may represent at least four firings of the oven. Sample 345 had the

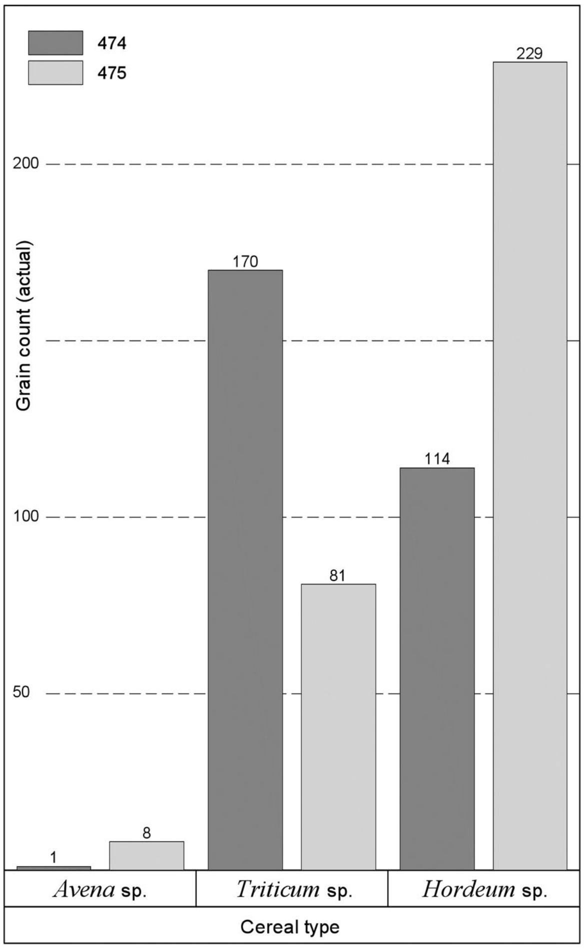

Figure 11 Distribution of charred cereal grains from corn drying oven 473 (actual count).

greatest weight of indeterminate grains compared with the others from corn drying oven 343. High frequency of indeterminate grains may result from high temperatures and the constant agitation of maintaining the fire, as the grains would be mixed causing breakage and introducing oxygen to re-ignite them.

The upper fill (344) may represent the final back filling of the corn drying oven 343 when no longer required. The grain is much less concentrated, an identified GPL of only eight (indeterminate grains were also significantly less prolific in this sample). The identified charcoal saw the introduction of other species not seen in the lower fills (345 and 346) and may reflect the clearing up of the area surrounding the oven after it was de-commissioned.

The charred plant assemblage from corn drying oven 473 was clean, with no chaff or weed seeds present. The upper fill (475) yielded more barley grains than wheat, this changed in the lower fill (474) where wheat was the dominant cereal grain. However, the lower fill had a greater percentage of indeterminate cereal grain then the secondary fill (114 in 474 and 229 in 475). It may have been possible that the indeterminate cereal grain may have been wheat as some of them were a squat, rounded grain; however, the grains are so badly damaged that this cannot be positively stated. There was less charcoal in the lower, primary fill and the predominance of hazel and willow/poplar over oak may indicate kindling. What remains represents the last few firings of the corn drying oven. The charcoal was very small and a significant amount of very badly charred and abraded cereal grains would be indicative of a thorough raking-out between repeated firings. This feature was heavily truncated and may be the reason why the grain count was lower for this feature than 343.

Overall, the lack of oat is noticeable throughout the samples. Three possibilities could explain this pattern. Firstly, oat, for whatever reason, was not being grown as frequently as other cereal crops in this area at this time. Secondly, while oat was being grown, it was not frequently being used as a dietary resource for humans, thus not requiring thorough drying and, thirdly, that oat is present through incorporation with other cereals as a weed. However oat representation in 345 and 346 is not significantly less than wheat. That the assemblage was virtually absent of weed seeds/fruits and chaff inferred that crop processing activities occurred at some distance before reaching the dryers.

The two dryers shared similarities. The only charred hazelnut shell fragments from the site were present in all the lower fills. Oak dominated the charcoal assemblage in the lower fills, with hazel and heather present in smaller quantities.

The paucity of weed seeds from the corn dryers should be noted. It maybe hypothesised that the processing, i.e. cleaning of the grain, occurred elsewhere prior to the kilns used for drying or, perhaps, even tentatively suggest that the crops were grown in non-weedy fields.

Ethnographic examples of the construction of corn drying ovens show that the drying floor was constructed of wooden cross bars (kiln trees) with a few inches space between them. They are then topped with a few inches of straw and sacking then covered with the grain placed on the surface (Fenton 1997, 376). The largest fragment of charcoal from the corn drying ovens charcoal assemblage measured 90 mm by 55 mm by 25 mm and was from the lower fill of 343 (345), which contained timbered willow/poplar. This perhaps suggests that a similar methodology may have been employed at Goldthorpe and that the 'kiln trees', based on the identification of wood charcoal, were willow/poplar.

Dating the ovens and associated field boundaries

Samples of charred barley grain from each of the primary fills of both chambers of corn drying oven

343 were submitted for radiocarbon analysis. The resulting dates for fills 345 and 346 were 331–533 cal. AD (SUERC-48116) and 422–561 cal. AD (SUERC-48117), respectively, which revealed that the corn drying ovens almost certainly dated to the post-Roman period. A charred grain recovered from the fill of ditch 297 adjacent to corn drying oven 343 was also radiocarbon dated and this returned a date of 540–644 cal. AD (SUERC-48114), relatively comparable with the dates at the latter end of the range obtained from the fills of the corn drying oven. Its presence within the ditch may be attributed to wind-blown deposition from the corn drying oven, but suggests that the field system was maintained through the 5th and into the 6th century.

The radiocarbon analysis of a charred barley grain from corn drying oven 473 also returned an early post-Roman date of 432–598 cal. AD (SUERC-48119), indicating that the two corn drying ovens were broadly contemporary. Analysis of the charcoal from this feature revealed that oak, hazel, willow/poplar and heather had potentially been used as fuel.

Goldthorpe in an early post-Roman context

There was probably little immediate impact on the lives of those within rural communities following the end of Roman administration in Britain (Chadwick 2010, 442). This was manifest at Goldthorpe with the maintenance, at least partially, of the field system and corner enclosure into this immediate post-Roman period, supporting the suggestion of continuity of the long-established rural-based economy. The need to dry grain following harvest would have been an essential part of this economy, as it traditionally had been throughout the later prehistoric and Roman periods. Evidence for corn drying ovens in the post-Roman period is nationally rare, making the 5th–6th century Goldthorpe corn drying ovens an extremely important discovery. Of the few post-Roman corn drying ovens so far recorded elsewhere in Britain, the majority date to slightly later in the period than those at Goldthorpe. The closest parallels are to be found at Poundbury in Dorset, where five, 5th-century corn drying ovens were identified (Monk and Kelleher 2005) and at Hilary Breck, Wallasey where a 6th-century example has recently been discovered (Museum of Liverpool 2014). A dump of charred grain found near to a corn drying oven in Alchester, Oxfordshire, sealed early Anglo-Saxon pottery suggesting that this dryer was in use into the 5th century (Hamerow 2012, 146) (Fig. 12).

A number of early medieval corn drying ovens were also identified at a settlement site in Hoddom, Dumfriesshire and the earliest group on this site dated to the 7th century AD (Lowe 2006). These differed from those at Goldthorpe as they were housed within rectangular timber buildings. A number of more comparable freestanding keyhole pit ovens set within an enclosure were also identified, but these were dated to the 12th century AD and were therefore much later than the dryers at Goldthorpe. Late post-Roman corn drying ovens have also been identified at Stafford, Feltham, Renhold and Springfield Lyons (Hamerow 2012, 151–2) (Fig. 12).

During the 5th and possibly into the 6th centuries, when the corn drying ovens were in use, Goldthorpe was located within the independent Brittonic Kingdom of Elmet, rather than under direct Anglo-Saxon rule. It has been estimated that Elmet covered a region bounded by the Pennines to the west, the

Figure 12 Locations of other post-Roman period corn dryers mentioned in the text.

Rivers Don and Sheaf to the south, the Kingdom of Deira to the north and the Humberhead Levels to the east (Manby *et al.* 2003). This reconstruction was based on known topographical features and also by the survival of place names with P-Celtic origins and the affix 'in Elmet' (Faull 1977; Higham 1993, figure 13; Jones 1975). Archaeological evidence that Elmet had already been established by the late 5th century has been found in the form of an inscription on a stone grave memorial in Llanaelhaearn, Gwynedd, North Wales. The inscription reads *Aliortus Elmetiaco Hic Iacet*, i.e. Here lies Aliortus of Elmet (Westwood 1876–1879, 179). It has been demonstrated that the *Hic Iacet* formula was in use for a short period of time, terminating by the end of the 5th century (Knight 1996, 111) and therefore providing a date for the Llanaelhaearn inscription. Bede describes in his Historia Ecclesiastica, the final expulsion of the British king Ceretic from his Kingdom of Elmet, as it was annexed by King Edwin of Northumbria in AD 616. This indicates that for a period of approximately two centuries after the Roman period, this area of Yorkshire enjoyed independence, making it the most enduring of Yorkshire's post-Roman British territories.

Although evidence is sparse, recent excavations have identified some activity in the local area dating specifically to this early post-Roman period. These include water management features dating from the 5th to 6th century at Wellgate, Conisbrough (Andy Lines (SYAS), pers. comm.). Slightly further north at Parlington Hollins, two sunken-featured buildings were excavated as part of the M1-A1 Link Road project (Roberts *et al.* 2001). Radiocarbon dates obtained from part of a pig (*Sus domesticus*) skeleton from the backfill of one structure and from a piece of antler from the other indicated that they had been backfilled between the mid-5th and mid-7th centuries AD. A large quantity of residual Roman period finds within the structures reflected their location within a series of Roman enclosures and the continuity of settlement from the later prehistoric period right through to the post-Roman period.

Discussion and conclusion

The very early medieval dates returned from AMS radiocarbon dating (early 4th century to late 6th century AD, Table 1) make the discovery of the two corn drying ovens at Goldthorpe a rare phenomenon. However, this may be due to a paucity of excavations and published data for this period. van der Veen (1989, 315) considers corn drying ovens to be a '*largely Roman phenomenon*'. The known corn dryers (ovens/malting ovens) from the early medieval period tend to be much later, for example, the late Saxon ovens in Stafford (Moffett 1994, 61). Hamerow (2012, 151) listed others; Feltham (Middlesex), Renhold, Water End West and Springfield Lyons, but these also all dated to the mid- to late-Saxon. Poundbury, Dorset may have the closest parallels with five post-Roman, 5th century, dryers (Monk and Kelleher 2005, 78). The lack of (published) sites, which was also noted in Hall and Huntley (2007, 94), imparts greater significance to the Goldthorpe corn drying ovens.

Grain was dried for various reasons; when needed for next year's seed crop, drying malt and prior to grinding (Fenton 1997, 375). The paucity of any germinated grain at Goldthorpe suggests that these ovens were not used for malting. They are therefore more likely to have been utilised for either drying for seed, storage or pre-grinding. The climate in this period was becoming cooler and wetter (van der Veen 1992, 5), so drying grain for storage would have been even more important to prevent spoiling.

The corn drying ovens were positioned within the corners of fields created in the late Iron Age, suggesting the community maintained a local agricultural economy, including production and processing, that continued at least into the 5th and 6th centuries AD. This community utilised the long-established enclosure landscape and continued a way of life established approximately 600 years earlier. In addition, the fossilisation of the late Iron Age and then Roman field system suggests a degree of continuity in territorial land ownership; it was unlikely that this was a fortuitous re-use of an abandoned Roman field system, but simply the maintenance of long-established working farmland. This evidence for a settled and unchanged rural economy in the years following the collapse of the Roman Empire is therefore an exciting discovery and should, perhaps where there is opportunity, prompt a review of previous fieldwork and provide a basis for future research.

Excavation and research at Goldthorpe have provided significant archaeological evidence for continuity in landscape use from the late Iron Age to post-Roman period. They have contributed to our understanding of the form and chronologies of these landscapes, which within the region are predominately recorded as undated cropmark sites only.

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