3.9. GRAINS OF TRUTH

Neolithic farming on Mesolithic Sites. New Insights into Early Agriculture in Southeast Norway

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INTRODUCTION

The shift from a lifestyle based on hunting, fishing and gathering to a lifestyle economically based on agriculture has been an objective in Scandinavian Stone Age research for over a century (*e.g.* Rygh 1999 [1885]; A.W. Brøgger 1906; Gjessing 1945; Mathiassen 1948, 1959; Hinsch 1955; Mikkelsen 1984, 1989; Østmo 1988, 1998; M. Larsson 1992; Prescott 1996; Persson 1999; Price 2000; Fischer & Kristiansen 2002; Malmer 2002; Hallgren 2008; Glørstad & Prescott 2009). It is well documented that farming as a mode of production was already introduced in Denmark and southern and central parts of Sweden from the beginning of the Early Neolithic, i.e. 3900–3700 cal. BC (Fischer 2002; Hallgren 2008; Sjögren 2013; L. Sørensen 2014b; Sørensen & Karg 2014). The case for Southeast Norway, however, is ambiguous. Several pollen analyses have documented pollen indicative of both cereal cultivation and animal husbandry, albeit on a small scale, from the onset of the Early Neolithic (see Solheim 2012a: Fig. 4; Glørstad 2010: Table 9.1 for compilations). However, the interpretation of these palynological data is disputed, as unquestionable direct evidence of farming, such as charred cereals and bone material from domesticated animals, predating the Middle to Late Neolithic transition, is lacking (Prescott 2009). Hence, the extent and the character of Early- or Middle Neolithic farming are unknown.

Due to a low number of excavated settlement sites, stray finds of axes for long constituted almost all the available data for studies of the Neolithic period[1]. The distribution of stray finds has been interpreted as reflecting a settlement pattern based on farming (e.g. A.W. Brøgger 1906; Hincsh 1955; Østmo 1988; Mikkelsen 1989). In recent years, however, several major archaeological rescue excavation projects have been carried out along the Oslo Fjord, preceding large-scale infrastructural constructions like motorways and railways (Berg 1995, 1997; Ballin 1998; Glørstad 2004a; Jaksland 2012a, 2012b; Solheim & Damlien 2013; Jaksland & Persson 2014; Melvold & Persson 2014a; Reitan & Persson 2014; Solheim 2017; *cf.* Reitan, chapter 3.1, this volume). These excavation campaigns have yielded a significant amount of data on the Stone Age settlement in the region. Due to the concurrence of settlement site location patterns in the Stone Age and the positioning of the modern technical structures in the landscape, along with a continuous postglacial land rise in the region (Reitan, chapter 2.1; Romundset chapter 3.2, this volume; *cf.* Glørstad 2004a: 59–61, 211–213; Jaksland 2012a, 2012b; Solheim & Damlien 2013), the investigated settlement sites are predominantly of Mesolithic age. This is also the case with the excavation project presented in this publication. However, a few sites from the Neolithic period have been investigated in lower-lying areas, such as the Krøgenes sites D1, D5, D7 and D10 (Reitan & Solberg, chapters 2.5.2 and 2.5.3; Stokke & Reitan, chapter 2.5.5, this volume). These have not yielded any new insight into early farming. The above-mentioned Neolithic Krøgenes sites have been located immediately adjacent to the contemporary shoreline in the same manner as the Mesolithic sites, a feature they have in common with nearly all previously investigated Early and Middle Neolithic sites in the coastal areas of Southeast Norway (*e.g.* Jaksland & Tørhaug 2004; Johansen 2004; Glørstad 2004a: 66–69; Østmo 2008: 131–211; Reitan 2014a, 2014b).

Overall, the examined Neolithic settlement sites therefore give a picture that differs from the one suggested by the distribution of the stray finds of axes, namely one of a lifestyle still based on fishing, hunting and gathering in a coastal environment. This is further enhanced by the small-tool inventory collected from the region's Early and Middle Neolithic sites, normally encompassing numerous knives, scrapers and projectile points, as well as the bone material, when preserved (e.g. Skjølsvold 1977; Østmo *et al.* 1997; Jaksland & Tørhaug 2004; Østmo 2008; Reitan

1. In this paper "Neolithic" refers to the chronological sense of the term, with no connotations of economy or material culture.

2014a) and preserved charred organic residue ("food crust") on potsherds (e.g. Østmo 2008; *cf.* Glørstad 1996: 42–45; Åstveit 1999: 56–60; Ø. Amundsen 2000; Reitan 2014a: 200–201).

During the excavations carried out by the *E18 Tvedestrand–Arendal project* in 2014–2016 charred cereal grains radiometrically dated to both the Middle Neolithic A and the Late Neolithic were found, as well as possible traces of field manuring in the Late Neolithic. Additionally, an early growing of oats was recorded (*cf.* Sandvik 2008: 72–74, with references; Kanstrup *et al.* 2014: 119; L. Sørensen 2014a: 60; see however Soltvedt *et al.* 2007: 49). These traces of Neolithic farming were uncovered on sites where such data were unexpected – that is, sites situated at what can be referred to as "Mesolithic altitudes" and which have not been shore-bound during the Neolithic.

The principal objective of this paper is to present this set of new data and to discuss their implications in the context of the present research status including palynological data, settlement site material and stray finds. We do not intend to suggest a new explanation model for the transition to farming, but rather to discuss what traits may have characterised the first farming practice.

The results from Tvedestrand and Arendal will also be discussed with reference to a small number of possible other Neolithic farming sites previously investigated in the inner Oslo fjord area. These sites provide us with glimpses into a Neolithic settlement pattern of which very little is known, but which can be argued to have been more widespread than previously thought (*cf.* Mjærum *et al.* 2008: Fig.3): it is likely that such sites constitute the contexts from which the Neolithic stray finds originally stem (e.g. Rønne 2003b: 190, fig. 102). In connection with this the Neolithic stray finds from Aust-Agder county will also be taken into consideration (figs. 3.9.1 and 3.9.2). Consequently, it is legitimate to question the representativeness of the excavated shore-bound Early and Middle Neolithic sites with regard to the full picture of the subsistence strategies of the period. The question is whether future excavations of shore-bound Neolithic sites will merely reproduce and amplify the picture of a persisting subsistence economy based on hunting, gathering and fishing, or if traces of the earliest farming should be sought elsewhere.

THE MESOLITHIC BACKDROP

According to the established chronology for Southeast Norway, the Late Mesolithic (*c.* 6350–3800 BC) can be divided into two phases, namely the *Nøstvet phase* (*c.* 6350–4650 BC) and the subsequent *Kjeøy phase* (*c.* 4650–3800 BC) (Jaksland 2001; Glørstad 2004a; *cf.* Mikkelsen 1975a). A recent reassessment has, however, challenged this chronological scheme, and *i.a.* a backdating of the Mesolithic–Neolithic transition to 3900 BC has been suggested (Reitan 2016).

When compared to earlier phases, the occupational sites in the Nøstvet phase seem to cluster in smaller areas along the fjords, a tendency interpreted as an increasing degree of semi-sedentism. The settlement pattern is closely tied to the contemporary shoreline. The single most characteristic artefact of the late Nøstvet phase is a coarse stone adze, termed *Nøstvet adze*, which on some sites appear by the hundreds (e.g. Tørhaug 2003; Jaksland 2005: Table 1; Glørstad 2010; Eigeland & Fossum 2014; *cf.* Mansrud *et al.*, chapter 2.4.1, this volume). The adzes are interpreted as tools for hollowing out log boats, thus underlining the marine orientation of the lifestyle (Jaksland 2005; Glørstad 2010: 170–180).

Around 4600–4500 BC, the artefact inventory changes along the coast of Southeast Norway. These changes mark the transition to the Kjeøy phase. The most important novelty is the introduction of transverse and oblique arrowheads, as well as tanged projectile points. This may indicate that new hunting strategies were established in this final phase of the Late Mesolithic (Glørstad 2010: 261–269; *cf.* Solheim 2012b). Furthermore, the increased flint ratio in the artefact assemblages and the higher-quality flint in use arguably reflect that the region was part of new exchange and prestige networks in Scandinavia (Eigeland 2015: 379). In spite of the possible new hunting strategies, the locations of the sites from this final Mesolithic stage still express a subsistence strategy mainly focused on marine resources (Glørstad 2004a, with references; *cf.* Boaz 1997; Persson 2009; Stene *et al.* 2010 on inland Kjeøy phase sites; for a parallel, two-phased development in the Late Mesolithic in neighbouring coastal areas of western Sweden, see e.g. Jonsäter 1984; Sjögren 1991; Nordqvist 1998, 2000; Knutsson *et al.* 1999; M. Larsson 2017).

Increased sedentism and new cultural networks constitute the Late Mesolithic backdrop against which several scholars consider the beginning of the Neolihic period (e.g. Mikkelsen 1984; Nærøy 1999; Glørstad 2009, 2010). New technologies – the introduction of ceramic vessels, polished point- and thin-butted axes of flint and other lithic materials as well as the increased blade and arrowhead production – were introduced at the transition to the Early Neolithic, *c.* 3900 BC. This development is viewed as representing a continuation of long-term processes that can be traced

back to the Late Mesolithic. Accordingly, the first farming in Southeast Norway followed in the wake of the same developments, a process interpreted as a local response to an increasing contact with farming communities in South Scandinavia (Nærøy 1999: 498–499; Østmo & Skogstrand 2006; Glørstad 2009: 157–159; *cf.* Mikkelsen 1984). As such, Southeast Norway is considered as the northwestern fringe of the Funnel Beaker Culture (Glørstad 2005; Østmo 2007b; Bergsvik 2011; Glørstad & Sundström 2014; Glørstad & Solheim 2015).

This explanation model for the first farming in the region has a weak point: big sites rich in finds are well documented from the Nøstvet phase, but such big sites are lacking from the final Late Mesolithic Kjeøy phase (*cf.* Juhl 1990; Dekov 2007 for a possible exception at the site *Halden lok. 5*, Østfold county). Besides, in a recent comprehensive technological study of Late Mesolithic and the Early Neolithic settlement site material from the inner Oslo fjord area a significant technological shift at the transition to the Kjeøy phase has been pointed out (Eigeland 2015): the introduction of flint arrowheads, an increased blade production, a sudden cease in the production of Nøstvet adzes and a general decline in the use of local raw materials have led Eigeland (2015: 379) to suggest an immigration of people from South Scandinavia to Southeast Norway, although the locations of the sites seem to express continuity in the settlement pattern. Bearing this in mind, a gradual and unilinear development beginning in the Nøstvet phase and leading up to the first farming in the Neolithic seems little convincing.

EARLY FARMING: FRAMEWORK AND RESEARCH STATUS

Landscape and geological preconditions

The areas geologically and climatically best suited for modern agriculture in Southeast Norway are concentrated in areas with cambro-silurian bedrock which feature good arable soils rich in alkaline, i.e. around the big lakes and the lower-lying uplands north of Oslo and along the coast (Hafsten 1956: 17–25; Låg 1957, 1983; Sigmond *et al.* 1984; Aune 1993). Farmland constitutes about 3 % of today's Norwegian mainland, and only ⅓ of this is used for cereal cultivation, according to official statistics (Rognstad & Steinset 2012: 25–30). As for the present ratio of cultivated area in the different counties of Norway, Aust-Agder county is at the lower end of the scale, second only to Finnmark, the northernmost county (Rognstad & Steinset 2012: Fig. 2.2.1). The geology of the Aust-Agder coastline is characterized by acidic bedrocks and mainly marine sediments. The sandy marine deposits are concentrated in smaller areas with more exposed bedrock ridges compared to areas further northeast along the coast, but sandy deposits are also present along the rivers and lakes in the interior (Romundset, chapter 3.2 with references, this volume, *cf.* Sigmond *et al.* 1984; Hofsten *et al.* 2010; NGU 2018). These light soils may have been suitable for early cereal growing. However, the acidic character of the bedrock will have had a negative effect on the preservation of agricultural ecofacts like cereal macrofossils and direct traces of domesticated animals, and arguably also pottery (*cf.* Nielsen-Marsh *et al.* 2007; Crow 2008; Beck 2015).

Stray finds: distribution and scientific value

As already mentioned, Norwegian studies of the transition to farming have often focused mainly on stray finds of axes of Neolithic types which appear rather abundantly, especially around the Oslo fjord (e.g A.W. Brøgger 1906; Hinsch 1955; Mikkelsen 1982, 1984, 1989, Østmo 1988; Ø. Amundsen 2000; Reitan 2005, 2009a; see Ø. Amundsen 2000; Kilhavn 2013; Nielsen & Åkerstrøm 2016 for axes recorded in Aust-Agder). Due to the lack of locally available flint resources of suitable size and quality (*cf.* Eigeland 2015: 45–53; Berg-Hansen 1999; see however E. Johansen 1956), it is generally agreed that the flint axes have been brought to Norway as finished axes from South Scandinavia, or in some cases as unpolished blanks (Mjærum 2004; *cf.* Hougen 1946; see however Reitan & Solberg, chapter 2.5.3 this volume).

The equally numerous axes of local rock may be seen as local translations of Early Neolithic flint ideals, albeit with some adaptions to raw material requirements (A.W. Brøgger 1906: 32; Østmo 1988: 43–46; Reitan 2005: 42–47; *cf.* Sundström & Apel 1998).

The representativeness of the geographical distribution of the stray finds relies on their sheer number in addition to the assumption that they have been deposited (intentionally) close to contemporary settlements. Consequently, their distribution is assumed to mirror important characteristics of the settlement pattern of the period, pointing towards a connection to light and easily tillable, sandy soils well suited for early agriculture in the Early Neolithic (e.g. A.W. Brøgger 1906; Hinsch 1955; Østmo 1988).

Generally in Southeast Norway the stray finds from the Middle Neolithic A, *c.* 3300–2800 BC, seem to display a closer relation to the shoreline than the Early Neolithic ones. These tendencies are referred to as possible signs of a "de-neolithisation", implying

that farming as a way of living lost ground when people went back to fishing, hunting and gathering as the main subsistence strategies (Bjørn 1928: 44–55; Hinsch 1955: 104; Østmo 1988: 225–226; *cf.* e.g. Hinz *et al.* 2012).

In the Middle Neolithic B, *c.* 2800–2300 BC, the finds increase in number, and the stray finds of axes clearly express a settlement expansion. A noticeable number of axes are recorded from from areas further inland, including the mountain valleys of Southeast Norway (*e.g.* Hinsch 1956; Malmer 1975; Ø. Amundsen 2000; Reitan 2005, 2009a; Gundersen 2013; Kilhavn 2013; Nielsen & Åkerstrøm; *cf.* fig. 3.9.1). Partly based on this, several studies suggest that the late Middle Neolithic was a phase in which farming in the form of pastoralism may have been established (Hinsch 1956; Malmer 1962, 1975; Mikkelsen 1989; Østmo 1988; Prescott & Walderhaug 1995; Kilhavn 2013).

In the Late Neolithic, *c.* 2300–1700 BC, the impression of settlement expansion is further enhanced, most notably demonstrated by the wide distribution of simple shaft-hole axes and flint daggers (Østmo 1978; Scheen 1979; *cf.* fig. 3.9.2; see also Berg-Hansen 2010). This phase is also widely recognized as the final agricultural breakthrough, as proven by direct evidence like charred cereals, bones from livestock, fossilised cultivation layers and clearance cairns as well as finds of flint sickles for harvesting crops. The consolidation of farming as a mode of production is accompanied by other multi-faceted changes, such as bifacial lithic technology, new pottery styles and the building of two-aisled long-houses (e.g. Rønne 2003a, 2003b; Glørstad 2004a: 69–77; Østmo 2005; Prescott 2009; Mjærum 2012a).

The maps in the figures 3.9.1 and 3.9.2 display the distribution of selected macro-tools, predominantly stray finds, from the Early- and Middle Neolithic, and the Late Neolithic, respectively, recorded from Aust-Agder county. At first glance the finds seem to relate to the coastline or rivers and lakes. On a closer examination, however (Riiber & Bergstrøm 1990;

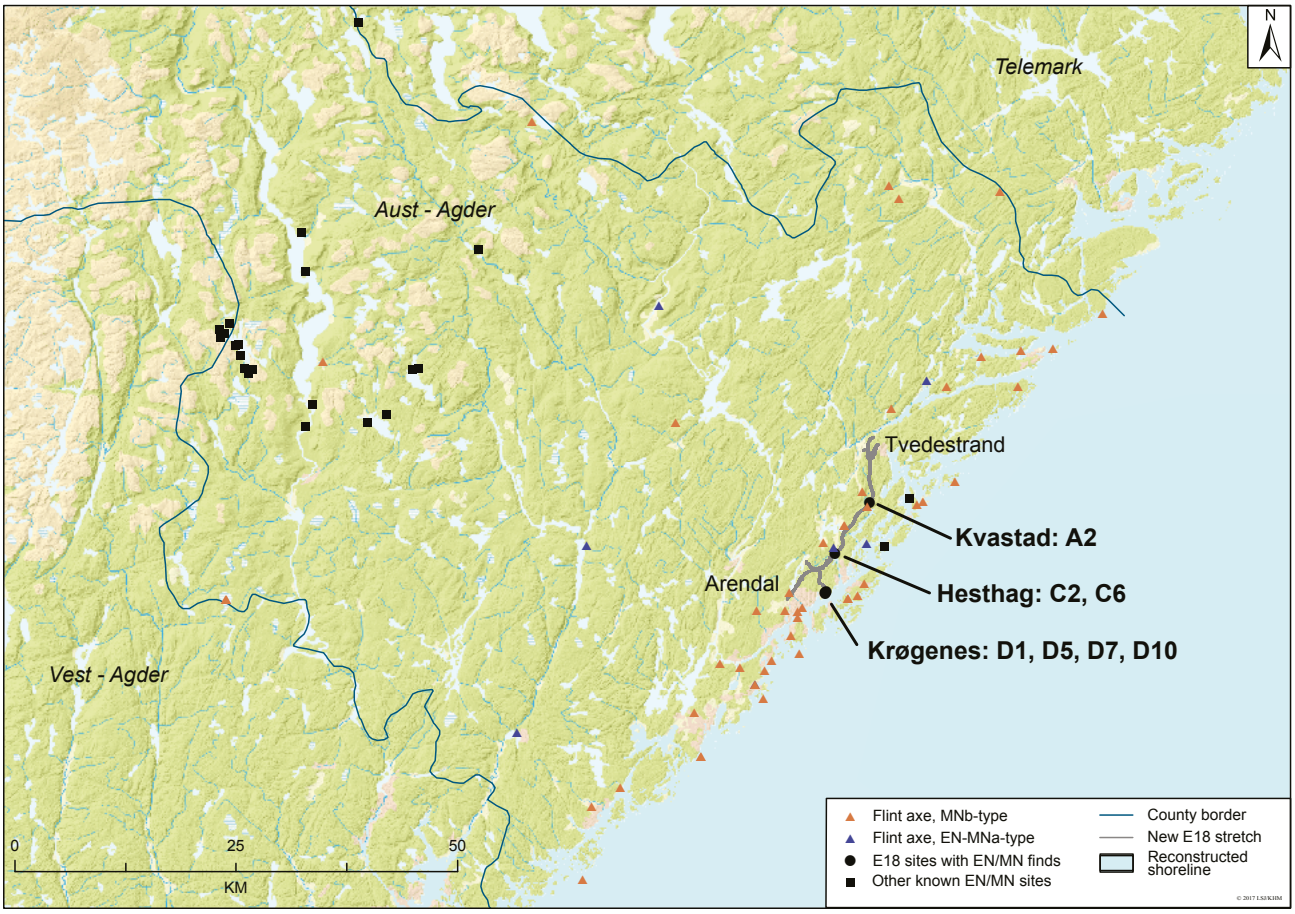

Figure 3.9.1: Map displaying stray finds of Early- and Middle Neolithic flint axes in Aust-Agder county. Sea level reconstructed at 15 m above present, corresponding to *c.* 3000 BC (*cf.* Romundset, chapter 3.2, this volume). Find distribution based on information from Mikkelsen (1984), Østmo (1984), Ø. Amundsen (2000), Kilhavn (2013), and Nielsen & Åkerstrøm (2016). Ill.: L.S. Johannessen / KHM.

NGU 2018), they demonstrate a notable conjunction with deposits of easily tillable, sandy soils throughout the Neolithic. As already mentioned, it is widely accepted that the farming economy was established throughout southern Norway in the Late Neolithic. Based on the striking similarities in the distribution of lead artefacts between the two periods (figs. 3.9.1 and 3.9.2), we would suggest that they reflect a comparable landscape use from the Early Neolithic through to the Late Neolithic. Consequently, we would argue that the distribution pattern may also reflect the same subsistence economies, meaning that farming was practised in southeast Norway at an earlier stage than the Late Neolithic. It can also be noted that in the Late Neolithic the distribution of finds shows that the rich coastal resources were still exploited, just like they have been all the way up to modern times (*cf.* A.W. Brøgger 1925).

Furthermore, ever since the late 19th century, finds of what is referred to as South Scandinavian character (polished flint axes and ceramic vessels) from Norwegian contexts earlier than the Late Neolithic have often been discussed within the framework of cultural dualism, i.e. that hunting/fishing and farming were carried out by different communities living side by side (Rygh 1999 [1885]; Bjørn 1924; Gjessing 1945; Hinsch 1955; Ingstad 1970; *cf.* Sørensen & Karg 2014: 108–110 for a recent example from South Scandinavia). With regard to the Late Neolithic, cultural dualism is not considered a relevant explanation model. Even obvious traces of hunting, like arrowheads found in rock shelters in the high mountains, are interpreted as traces of exploitation of outfield resources, but within a wider framework of farming (e.g. Prescott 1995; *cf.* Jaksland & Kræmer 2012; Kilhavn 2013: 77; Fossum 2014b; see also Darmark, chapter 2.5.4, this volume, for discussion). The presence of Late Neolithic coastal sites (*cf.* fig. 3.9.2) does not alter the impression of a fully agrarian lifestyle. It can be claimed that the distribution of the stray finds from the Early or Middle Neolithic (*cf.* fig. 3.9.1) does not necessarily indicate cultural dualism any more than the Late Neolithic ones: As Brøgger so eloquently puts it; there is not a question of

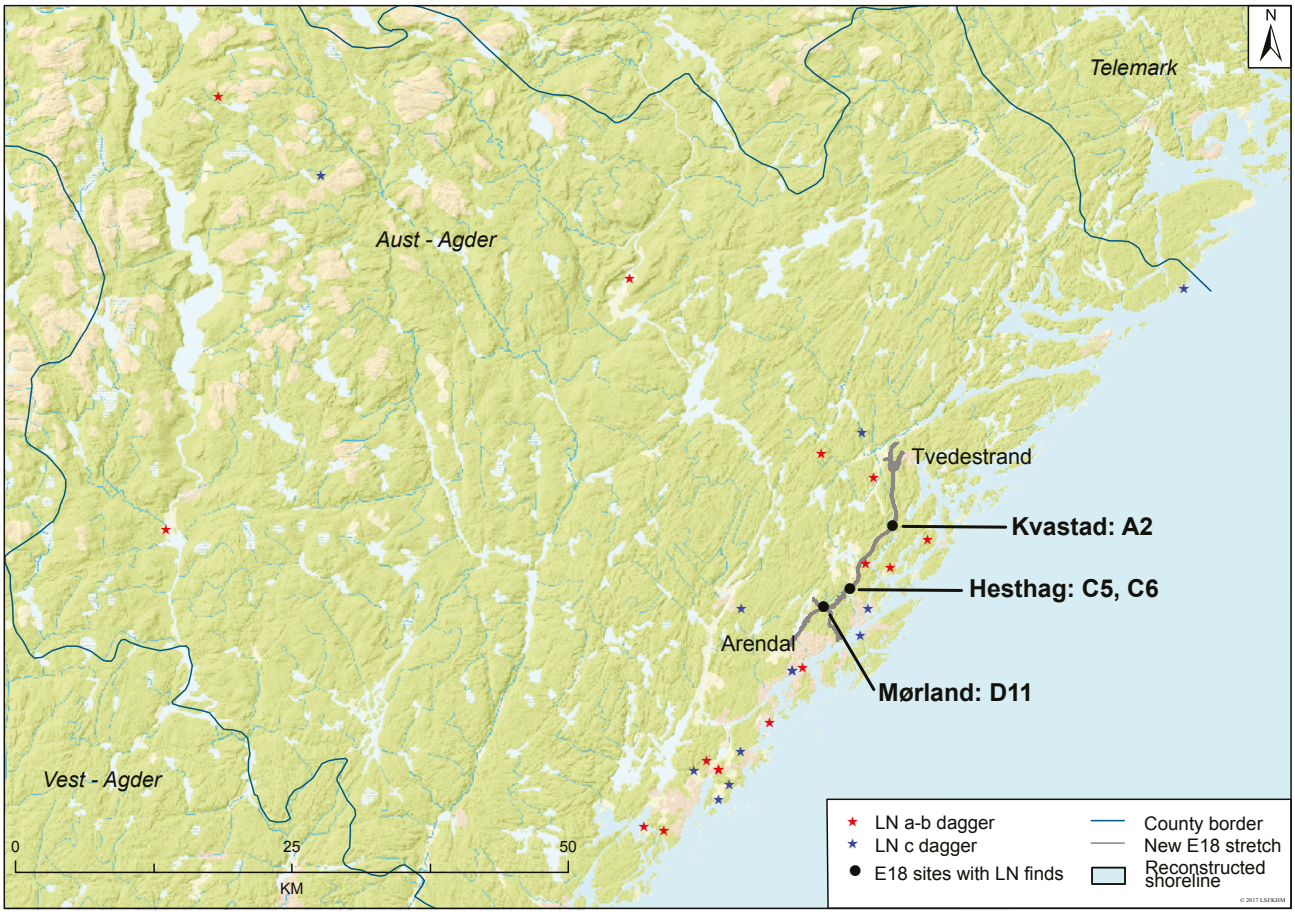

Figure 3.9.2: Map of Aust-Agder county displaying the distribution of Late Neolithic flint daggers. Sea level reconstructed at 10 m above present, approximately corresponding to the Late Neolithic/Early Bronze Age transition (*cf.* Romundset, chapter 3.2, this volume). Find distribution based on information from Kilhavn (2013). Ill.: L.S. Johannessen / KHM.

> *"[…] a pure farming culture and a pure foraging culture in the Younger Stone Age […], but rather a peculiar mix of both […], like two strands twined together into a rope in a manner which the landscape naturally fosters"* (A.W. Brøgger 1925: 19–21, *translation by the authors*).

Previous palynological analyses in Southeast Norway

Anthropogenic effects of land use can be detected through the presence of various pollens and charcoal particles in sediments at different depths, for example in a bog. As pointed out above, certain data may support the hypothesis of farming being practised as early as the beginning of the Early Neolithic along the coast in Southeast Norway. A series of pollen investigations, including one from *Lake Barlindtjern* in Lillesand *c.* 45 km south of Arendal (Høeg 1982; *cf.* Kilhavn 2013: App. XXI), have recorded increasing amounts of *Plantago lanceolata*, indicative of animal husbandry, and/or the occasional cerealia pollen, indicative of small-scale cereal growing (Fægri 1944; Danielsen 1970; Mikkelsen & Høeg 1979; Henningsmoen 1980; Høeg 1982, 1989, 1995; Prøsch-Danielsen 1996; Wieckowska-Lüth *et al.* 2017; *cf.* Solheim 2012a: Fig.4; Glørstad 2010: Table 9.1 for compilations). It may, however, be argued that in the earliest contexts the pollen investigations have identified only single pollen evidence indicating sporadic crop farming, not a continuous presence of cereal pollens. Besides, most of them stem from bulk samples, and the dates are in many cases interpolated and/or conventional and hence imprecise. The validity of these palynological data is hence ambiguous (*cf.* Lahtinen & Rowley-Conwy 2013; L. Sørensen 2014b: 473–474 for discussion). The conclusions drawn from the pollen analyses are most strongly criticized by Prescott, although he admits possible small-scale farming in the Oslo fjord area in the Early Neolithic (Prescott 1996, 2009: 197). Prescott points out that no direct evidence, such as cereal macrofossils, older than the Middle Neolithic–Late Neolithic transition have been recorded. The oldest known direct evidence of animal husbandry in Norway is a single cattle tooth from the rock shelter site *Stangelandshelleren* in Rogaland county, Southwest Norway, *c.* 185 km west of the project investigation area. The tooth has been radiocarbon dated to the Middle Neolithic A, 3335–2903 cal. BC (4405 ± 65 BP, see Høgestøl & Prøsch-Danielsen 2006: 23). Against Prescott's criticism of the early farming reflected by the pollen data it should be borne in mind that self-pollinating cereals like wheat and barley are characterized by pollen grains that are not easily dispersed. Such cerealia types are only detectable close to fields where they with certainty have been cultivated, and the pollen occurrences display a significant drop-off within a short distance from the field (*cf.* Behre & Kučan 1986; Diot 1992; Sørensen & Karg 2014: 100–101). This implies that cereal cultivation at a given site cannot be categorically excluded even though cerealia pollen grains are absent in sediments in, for example, a nearby bog.

In our opinion, and in line with Glørstad's (2009) reasoning, the fact that the pollen horizons appear at the same time just after 3900 BC, and contemporaneously with the introduction of pottery and polished flint axes into the artefact inventory, cannot be rejected as coincidental. Although the evidence is scarce, we would argue that the synchronous appearance of farming indicators dated to the Early Neolithic several places along the coast most likely reflects agricultural activities, but probably on a small scale.

This development, suggested by the archaeological and paleobotanical data, is not specific to southeast Norway. Although the cereal elements are less noticeable in the Early Neolithic in western Norway, and the flint axes are fewer outside the Oslo fjord region, a similar course can be traced simultaneously around the southern tip of Norway and along the west coast north to the Trøndelag counties in central Norway (e.g. Hafsten 1956; Bakka & Kaland 1971; Bruen Olsen 1992, 2013; Hjelle 1992; Hufthammer 1992; Kaland 1992; Soltvedt 1994; Prøsch-Danielsen 1996; Østmo 1997, 2005; Prøsch-Danielsen & Simonsen 2000; Hjelle *et al.* 2006; Høgestøl & Prøsch-Danielsen 2006; Asprem 2012, 2013).

NEW EVIDENCE OF EARLY AGRICULTURE FROM TWO SITES WITHIN THE E18 TVEDESTRAND–ARENDAL PROJECT

Kvastad A2, a site with two phases of cereal cultivation in the Neolithic

The site *Kvastad A2* was situated on a *c.* 2500 m^2 southeast-facing promontory, gently sloping from 50 to 44 m.a.s.l. The promontory was delimited by marshy lands towards the north, south and east, which were part of the large, now drained, Låmyr bog. The site itself was situated on well drained, light sandy soil. The Kvastad area is rich in Mesolithic sites (see chapters 2.2.4–2.2.7, this volume), and, based on the height above the present sea level, Kvastad A2 was assumed to be of Mesolithic age. The majority of the finds collected from Kvastad A2 can be dated

to the transition between the Early- and the Middle Mesolithic. During this period the site was shore-bound (Stokke & Reitan chapter 2.5.5; *cf.* Romundset, chapter 3.2, this volume). However, certain finds prove much later use of the site, including evidence of Neolithic farming.

Neolithic artefacts from Kvastad A2

Among the Neolithic finds are a fragmented, flint sickle of a common crescent-shaped, straight-edged type (fig. 3.9.3 a) and a handle fragment of a flint dagger (fig. 3.9.3 b). The flint dagger is either of Lomborg's (1973) type I or type VI. Furthermore, three bifacially flaked flint arrowheads with concave bases were found (fig. 3.9.3 c), and, lastly, five sherds of pottery were retrieved (fig. 3.9.3 d). One of them is a rim sherd, but all five are undecorated. Except being thin and fine-tempered, the pottery displays no diagnostic features. Hence the sherds cannot be dated with accuracy based on their attributes. However, as no indications of later activities were recorded at the site, it is reasonable to view the sherds in connection with the flint artefacts noted above.

Flint daggers of type I date to the earlier part of the Late Neolithic, whereas type VI daggers belong to the Early Bronze Age (Lomborg 1973:64–80; Vandkilde 1996; *cf.* Apel 2001:259–275). The flint dagger found on Kvastad A2 is too fragmented to be identified with certainty as a type I or type VI. The arrowheads and the sickle are tool types that were in use throughout the Late Neolithic and most of the Early Bronze Age. Overall, the collected assemblage of bifacial flint tools from Kvastad A2 cannot be dated more precisely on typological grounds (*cf.* Oldeberg 1932; Lomborg 1960, 1968, 1973; Vang Petersen 1993; Rasmussen 1993; Vandkilde 1996; Apel 2001; Mjærum 2012a).

The sickle from Kvastad A2 has a glossy sheen along the edge, a rather common feature on flint sickles. Use-wear analyses have shown that such gloss is caused by frictional mechanisms from cutting cereal stalks (*cf.* Meeks *et al.* 1982; Anderson 2013).

No artefacts can beyond doubt be dated to the Early- or Middle Neolithic.

Direct evidence of farming at Kvastad A2

The above-mentioned artefacts and the site's location on sandy soil at a distance from the Neolithic shore led to an active search for direct traces of farming. A number of diffuse patches with slight concentrations of charcoal particles, interpreted as possible remains of a quasi-coherent cultivation layer (A53485), were observed. These patches were mainly located on the same parts of the site as the Neolithic flint tools (see Stokke & Reitan, chapter 2.5.5: Fig. 2.5.5.33, this volume). Even so, this potential layer was difficult to delimit. In order to retrieve possible charred

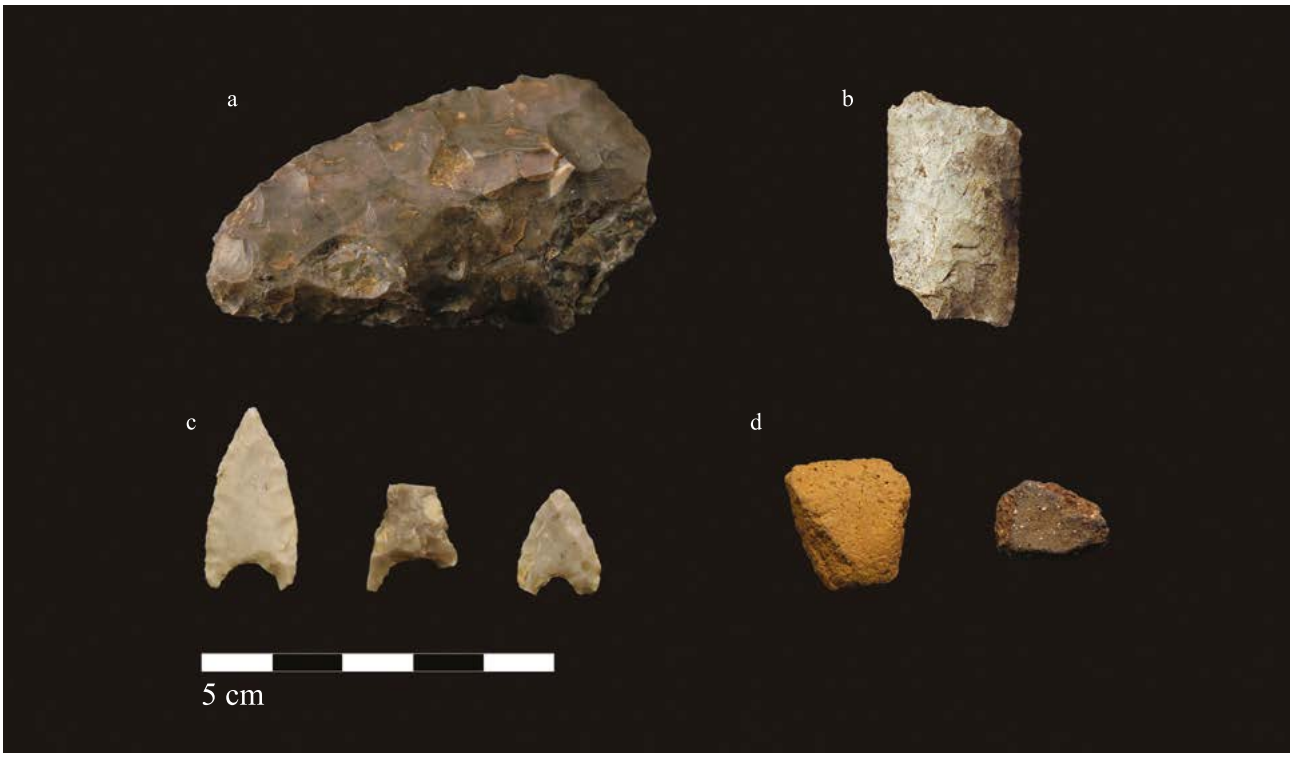

Figure 3.9.3: Diagnostic Late Neolithic artefacts retrieved from Kvastad A2: a fragmented sickle (a), a fragmented dagger (b), arrowheads (c). A small selection of potsherds (d) is likely to be linked to the flint finds. Ill.: J.-S.F. Stokke / KHM.

macrofossils, soil samples of *c.* 2.5 litres in volume were collected from both the possible cultivation layer and from an earth-dug feature (A54643), interpreted as a possible hearth (see fig. 3.9.4). By means of manual water flotation in the field, possible cereal grains were identified in one sample from the layer and one sample from the feature. The processed sample material was then subjected to a detailed analysis at Umeå University, Sweden (Östman 2015). The samples were shown to contain charred cereal kernels of naked, or hulless, barley, oats and emmer wheat, as well as seeds of both juniper and bearberry. An additional 13 charred cereal grains from one sample were not possible to identify with regard to species. Two more samples from the possible cultivation layer were also analysed. One of them contained seeds of juniper and raspberry, but no cereals, whereas the second sample contained no macrofossils (table 3.9.5).

Three kernels of oats (one from the possible cultivation layer, two from the feature) and one of naked barley (from the feature) were radiocarbon dated and yielded exactly corresponding Late Neolithic results (*c.* 1900–1700 cal. BC). Another kernel of naked barley and one of emmer wheat (both from the feature) were also dated, providing partly overlapping results to the Early-/Middle Neolithic A transition and the Middle Neolithic A, respectively, i.e. within *c.* 3500–2900 cal. BC (table 3.9.5 and fig. 3.9.6).

Analysis of a pollen core sampled from the adjacent Låmyra bog

Against the background of the conspicuous traces of farming recorded at Kvastad A2, we wanted to further assess the potential human impact on the vegetational history of the area. Accordingly, a pollen core was sampled from the adjacent Låmyra bog, *c.* 70 metres east of Kvastad A2 (fig. 3.9.4). The pollen core, too, was analysed at Umeå University (Wallin & Linderholm 2017). A total of 54 pollen samples were counted from depths between 356 cm and 170 cm, sediment layers deposited between *c.* 4700 and 1400 BC. Distinct increases of microscopic charcoal particles were identified in the core at depths of 327 cm, 276 cm and 188 cm (fig. 3.9.7). The deepest

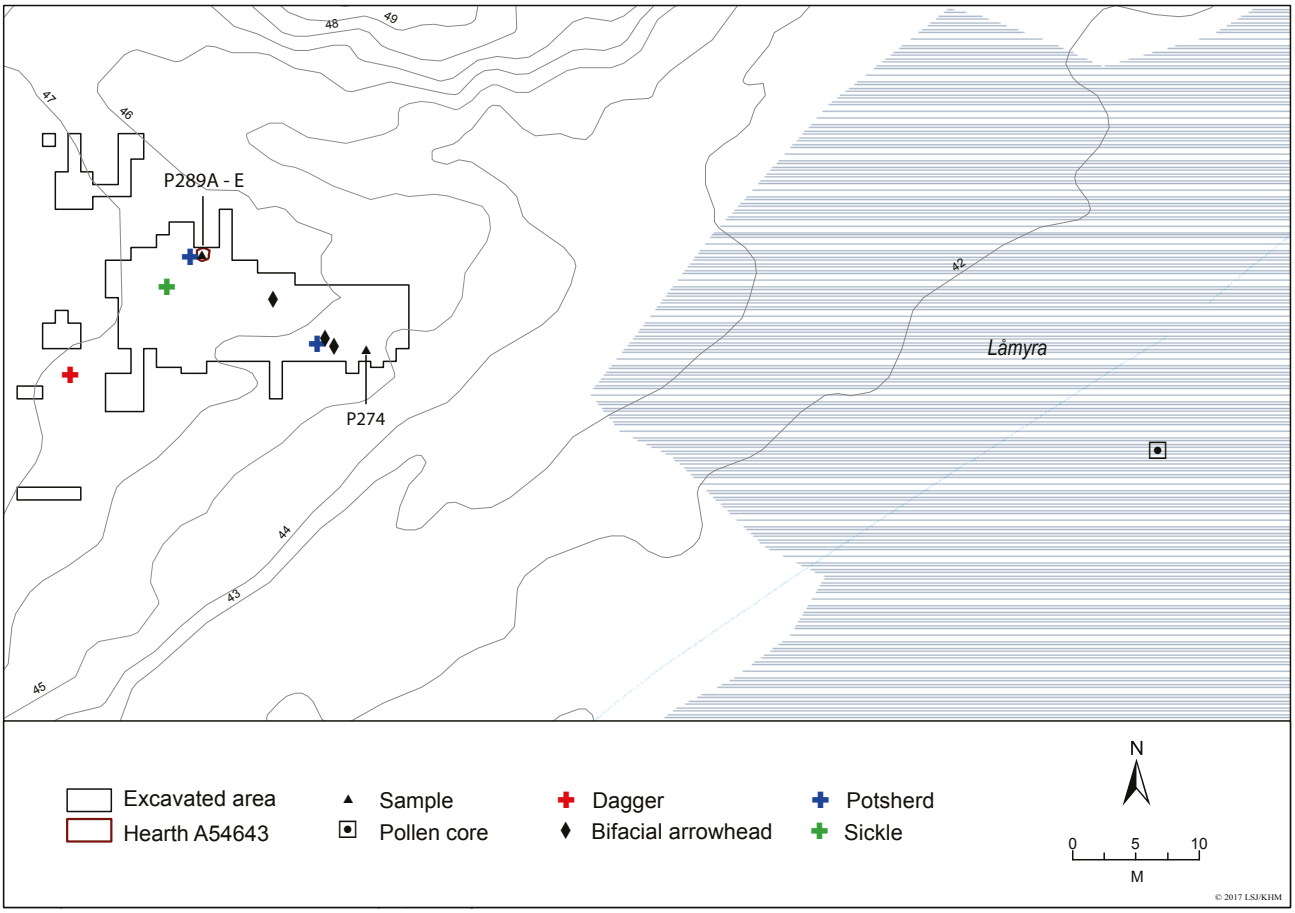

Figure 3.9.4: Map showing the location of Kvastad A2 adjacent to the Låmyra bog, and with reconstructed sea levels corresponding to the cultivation phases, *c.* 3000 BC/15 m above present (light blue) and *c.* 1800 BC/11 m above present (darker blue) (*cf.* Romundset, chapter 3.2, this volume). Ill.: L.S. Johannessen / KHM.

Context	Sample ID	Dated matter	C14-years BP	Cal. BC (2σ)	Lab. ref.	Identified macrofossils
A54643 Hearth(?)	P289 b	Hulless barley (*Hordeum vulgare var. nudum*)	4551 ± 56 BP	3498–3035 BC	Ua-52925	40 of which 5 kernels of hulless barley (*Hordeum vulgare var. nudum*), 1 of emmer wheat (*Triticum dicoccum*), 21 of oats (*Avena sp.*), 13 of indet. cereal (*Cerealia fragmenta*)
	P289 c	Emmer wheat (*Triticum dicoccum*)	4351 ± 55 BP	3310–2880 BC	Ua-52926	
	P289 d	Oats (*Avena sp.*)	3477 ± 28 BP	1886–1697 BC	Ua-52876	
	P289 e	Oats (*Avena sp.*)	3470 ± 29 BP	1884–1695 BC	Ua-52877	
	P289 a	Hulless barley (*Hordeum vulgare var. nudum*)	3464 ± 28 BP	1881–1694 BC	Ua-52875	
A53485 Cultiv. layer?	P274	Oats (*Avena sp.*)	3431 ± 28 BP	1886–1646 BC	Ua-52874	10 of which 1 kernel of oats (*Avena sp.*), 2 seeds of juniper (*Juniperus communis*), 7 seeds of bearberry (*Arctostaphylus uva-ursi*)
	P273	–	–	–	–	5 seeds, of which 4 of juniper (*Juniperus communis*), 1 of raspberry (*Rubus idaeus*)
	P272	–	–	–	–	–

Table 3.9.5: Table showing macrofossils identified by the analysis carried out at *Miljöarkeologiska laboratoriet* (MAL, The Environmental Archaeology Lab), Umeå University (Östman 2015) and radiocarbon date-results obtained from cereals found at Kvastad A2.

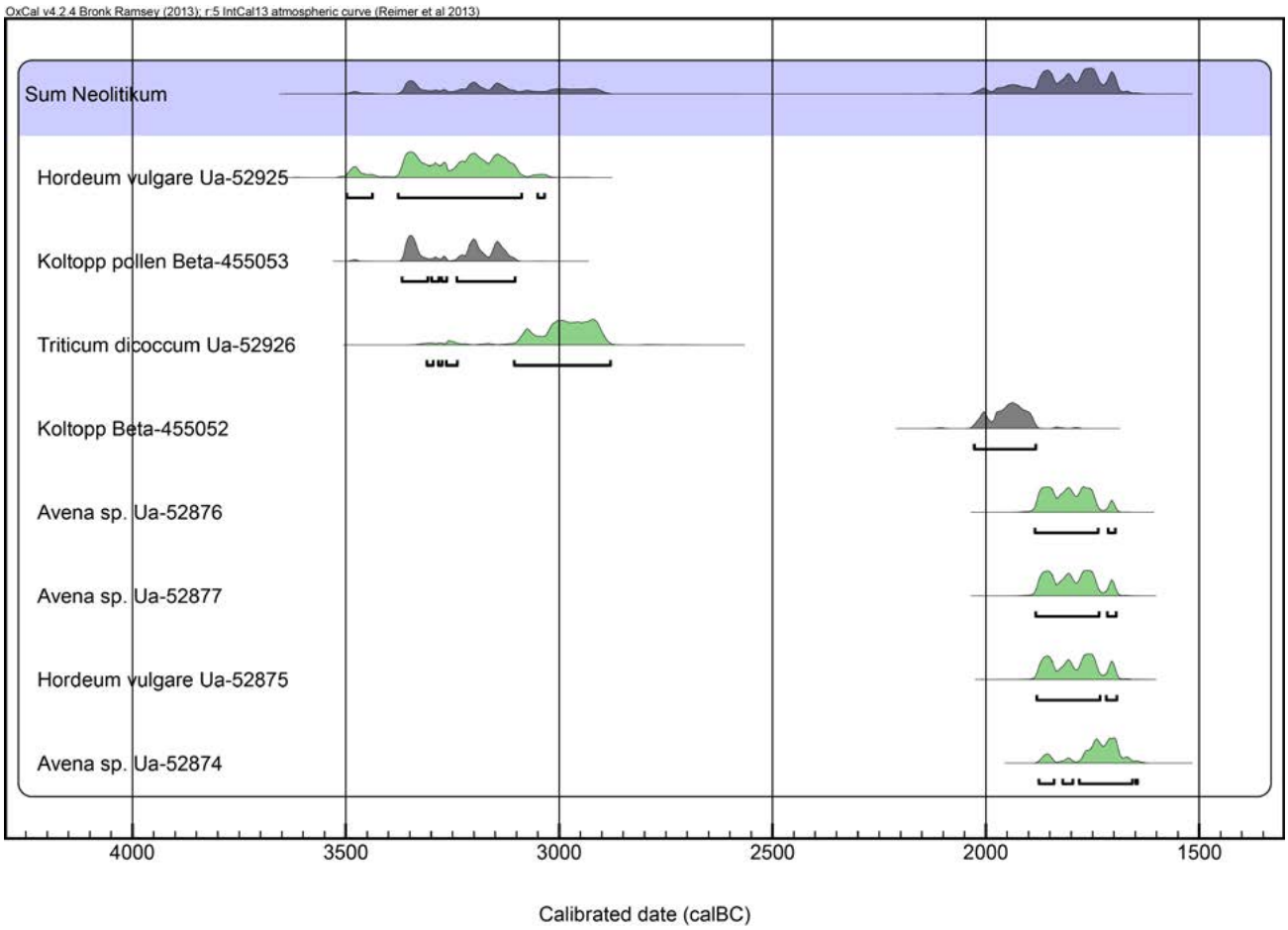

Figure 3.9.6: OxCal diagram showing the chronological distribution of dated cereals (green) and the charcoal peaks (Swed.: *Koltopp*) identified in the pollen analysis (black). A charcoal peak dated to the Late Mesolithic is not included (see fig. 3.9.7). Calibrated results obtained using OxCal v4.3 (Bronk Ramsey 2009) and IntCal13 atmospheric curve (Reimer *et al.* 2013).

of these three layers was dated to the Late Mesolithic (4361–4260 BC/5470 ± 30 BP, Beta-455054). This may be interpreted as being traces of one or several natural forest fires or as otherwise unidentified human impact in the area (see e.g Mjærum *et al*. 2008: 40–43; Wieckowska-Lüth *et al*. 2018 for parallels of probable human exploitation of forested coastal hinterland in the Late Mesolithic). Agricultural activities can, however, be ruled out as an explanation for this layer (*cf*. Behre 2007; Rowley-Conwy & Layton 2011; Bishop *et al*. 2015 for discussions).

The vegetation dynamics and the radiocarbon dates from the two other levels (276 cm: 3331–2931 BC/4440 ± 30 BP, Beta-455053, and 188 cm: 1955–1767 BC/3540 ± 30 BP, Beta-455052, respectively, see fig. 3.9.7), on the other hand, correspond very well with the Middle Neolithic A and the Late Neolithic dates obtained from the charred cereals of wheat, barley and oat found on Kvastad A2 (see fig. 3.9.6). Based on the date-results obtained from the cereal macrofossils from Kvastad A2, the coinciding increases in the amounts of charcoal are most likely traces of anthropogenic activities: clearances of the woodland near the bog by the use of fire, possibly in order to establish fields. The two later charcoal peaks also correlate with other significant vegetational changes which are far less pronounced in the Mesolithic sequence: changes in the undergrowth, such as increases of grasses (*Poaceae*) and sorrel (*Rumex acetosa*), light-demanding taxa which prosper in forest openings, may be indirect signs of agricultural activities. These dynamics are associated with reductions of birch and pine, the dominating species in the forest inventory surrounding the Låmyra bog throughout the period that the analysis covers. The continuous presence of trees around the bog probably demonstrates that the gaps in the forest canopy were limited to small-scale open areas or field plots.

However, and in spite of a meticulous counting of pollens around the dated levels in the bog core, no cereal pollen was identified. In our opinion the lack of cereal pollens in the analysed core does not exclude the possibility that cereal farming was practised at Kvastad A2, bearing in mind the distance from the bog core drilling spot to the Kvastad A2 site and the short-distance dispersion of cereal pollens, as pointed out above (*cf*. Behre & Kučan 1986; Diot 1992). Rather, the lack of cerealia pollens in the sample core from the Låmyra bog may serve to illustrate the challenges of basing conclusions on the absence or presence of cereal cultivation on pollen analyses.

Summary of the agricultural indications at Kvastad A2

The radiometric date-results obtained from the recovered cereals indicate two phases of crop farming at Kvastad A2: one during the Middle Neolithic A (two dates) and one during the Late Neolithic (four dates) (table 3.9.5, fig. 3.9.6), reflecting that this sandy promontory has provided favourable conditions for early farming. The fact that both phases are represented in the very same sample collected from a feature, A54643, is, however, puzzling. We find it unlikely that cereal grains that are more than one thousand years old have been disposed of in the earth-dug feature in the Late Neolithic. The two overlapping Middle Neolithic date-results make it less probable that sample contamination can explain the deviating dates. Besides,

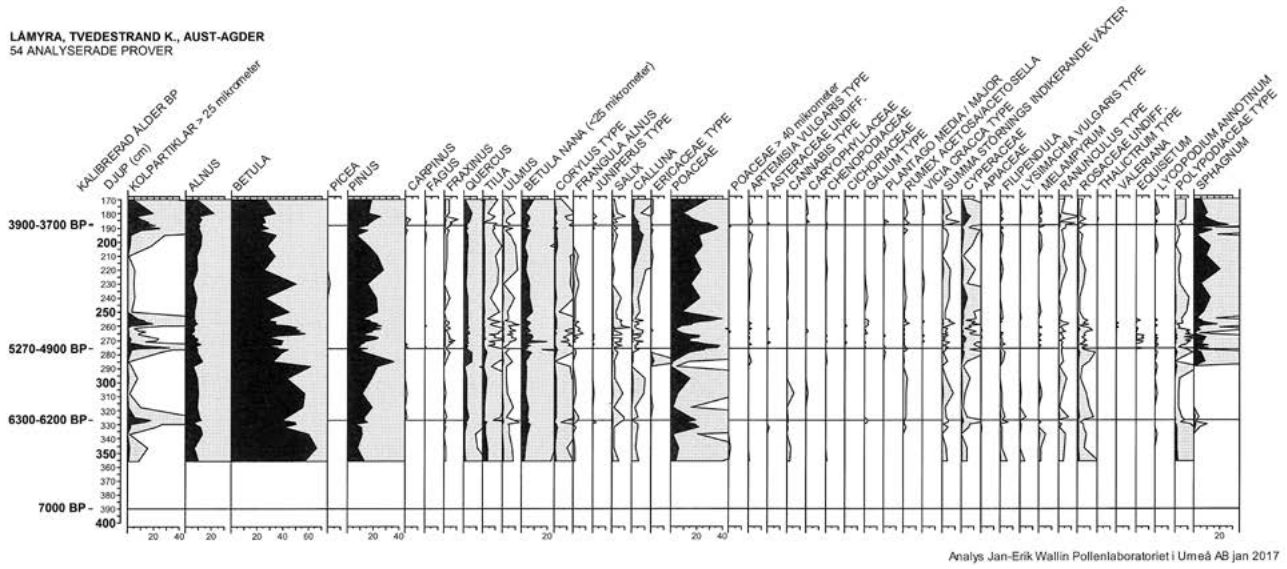

Figure 3.9.7: Pollen diagram showing the vegetation dynamics around the Låmyra bog adjacent to the site Kvastad A2. Note that the dated peaks of charcoal particles (Swed.: *kolpartiklar*) are in calibrated years before present. Analysis and diagram by Wallin & Linderholm (2017) at MAL (*The Environmental Archaeology Lab*), Umeå University.

both phases expressed in the date-results correspond well with the Neolithic charcoal peaks identified in the pollen core (fig. 3.9.6). A reasonable explanation is that feature A54643 actually is of Middle Neolithic age, and has contained cereals ever since, and that cereals from a later cultivation phase on the same spot during the Late Neolithic have been preserved in the same pit. Alternatively, the pit with cropping material in the fill may have been dug during the Late Neolithic (*cf.* Møbjerg *et al.* 2007), and grains from an earlier cultivation phase were mixed in by chance (see Reitan 2014d: 233–246 for a similar example of Late Neolithic finds from an earth-dug feature with fill dated to the Early-/Middle Neolithic; see also Persson 1999: 20, fig. 5).

Although they cover a time-span of up to *c.* 600 years, there is no reason to doubt the reliability of the Middle Neolithic A date-results. This is underlined by what we claim is a close interrelation between the cultivation phases and the increased charcoal occurrences in the adjacent bog: the synchronocity between the charcoal peaks and the directly dated cereal grains may indicate the use of slash-and-burn technique (Wallin & Linderholm 2017; *cf.* Lindman 1991: 14). The evidence for such small-scale clearance is extensive in Early Neolithic Europe (Jones 2005: 171).

Apart from these features, and to a certain extent also the possible cultivation layer, there was little charcoal on the site. This may rely on poor preservation conditions. Unburnt organic matter, not least threshed cereals, will have eroded and disappeared quickly. In line with this the recorded carbonized seeds probably represent only a small portion of the originally deposited amount. Based on this we suggest that the charring of the cereals was not accidental (see however Jones 2000), but a deliberate way of handling the harvested crop. This will be further discussed below.

Although certain blades and possibly a blade core might be of Neolithic date, there are no diagnostic lithic or ceramic artefacts from the site that can be convincingly associated with the Middle Neolithic A date-results obtained from the grains of barley and wheat. In addition, the lithic finds of Late Neolithic character were only scattered fragments, and no signs of tool production from this phase were identified. The investigated area at Kvastad A2 may therefore represent only (parts of) cultivated fields related to another as yet unidentified settlement site, possibly fairly close (*cf.* van der Veen 2005: 159; Jones 2005: 168).

A substantial research effort has been made in recent years to evaluate the transition to farming across Europe, and it is recognised that the first agro-pastoralism has been diverse. Several social and practical aspects of the process are still not entirely clear, for example its cultivation techniques (Whitehouse & Kirleis 2014, with references). The traces of cultivation documented at Kvastad A2 may stem from what can be designated as a form of horticulture – a type of small-scale, intensive cultivation, maybe not altogether unlike garden plots (see e.g. Leach 1997; van der Veen 2005). The level of cultivation intensity is of greater importance than scale when it comes to understanding past agricultural economies, i.e. the garden/field dichotomy (van der Veen 2005: 160). The practice of horticulture can be difficult to observe archaeologically, however. At Kvastad A2 neither ardmarks nor clearance cairns were observed – with regard to the latter this is most likely due to the sandy character of the soil.

Another aspect to consider when interpreting Kvastad A2 is that by the time of its Neolithic phases the site was located at a distance from the sea (*cf.* Darmark *et al.*, chapter 3.4, this volume). According to the local shoreline displacement curve the sea level during the Middle Neolithic stage was approximately 15 metres above the present level. At such a height, a very narrow inlet at the bottom of a present valley, approximately 350–400 metres southwest of Kvastad A2, was the nearest access to the sea. In the Late Neolithic the sea level was lower and the sea even further away. In this phase agriculture was once more practised on the site, suggesting that the vicinity to the sea was not a key localization factor for the use of Kvastad A2. Instead the light, sandy soils here, arguably favourable for early farming, seem to have been deliberately chosen for establishing crop fields. It is worth noticing that crops do not seem to have been grown at Kvastad A2 later than the Late Neolithic. This may indicate that later farming was practised in other areas (on heavier soils?), applying different techniques. Reversing this line of thought, our data may demonstrate that similar cultivation techniques were used throughout the Neolithic, or at least that roughly the same areas were exploited (see discussion below). It can be pointed out that this situation, with cultivation phases both in the Early-/Middle Neolithic and in the Late Neolithic, has been recorded elsewhere in equivalent settings, for example in Skee, Bohuslän, southwest Sweden, just southeast of the Norwegian border (Westgaard 2009).

Only one of the seven other Kvastad sites investigated within the project showed signs of use during the Neolithic: a Late Neolithic date-result from Kvastad A3, *c.* 200 metres south of Kvastad A2 (2279–2038 BC/3747 ± 29 BP, Ua-52881, see Bjørkli 2016a). Apart from this, the only evidence of Neolithic presence in

the area is a polished thick-butted flint adze of Middle Neolithic B type (C8753), found in the mid-1800s in a sand quarry roughly 250 metres southwest of Kvastad A2 (see picture in Reitan, chapter 1.2, this volume, *cf.* Kilhavn 2013: App. I).

Hesthag C6, a site with flints, directly dated potsherds and a cultivation layer from the Late Neolithic

Contemporary with the last phase of farming at Kvastad A2, more silty soils are taken in use to establish cultivation fields. The site *Hesthag C6* is an example of this. Here no signs of Early- or Middle Neolithic farming were recorded, but data from Hesthag C6 and the surrounding area demonstrate significant, and arguably continuous, farming activities from the Late Neolithic up to the present. A number of stray finds show a prominent Late Neolithic presence around the neighbouring present-day farms to the north (e.g. Oddersland), counting at least one simple shafthole axe, two flint axes, two flint sickles, two flint daggers and two flint dagger blanks, all found within a 1 kilometre radius from the excavated Hesthag C6 (*cf.* Ø. Amundsen 2000; Kilhavn 2013; Nielsen & Åkerstrøm 2016). The site Hesthag C6 was situated 38–40 m.a.s.l., but, like Kvastad A2, the adjacency to the sea has not been decisive for settling here. Instead, other resources, probably not least the character of the soils, have constituted the key localization factors.

Flints and potsherds from Hesthag C6

The collected assemblage from Hesthag C6 consists of *i.a.* a spoon-shaped flint scraper, two bifacial flint arrowheads with concave base, a bifacially produced, sickle-shaped implement of unknown purpose (fig. 3.9.9) and considerable traces of bifacial production debitage like wide and short ("wing-shaped") flakes (*cf.* Apel 2001). Typologically these finds date to the Late Neolithic or the Early Bronze Age (*cf.* Rasmussen 1993; Vandkilde 1996; Apel 2001; Mjærum 2012a).

Figure 3.9.8: Overview of Hesthag C6 during excavation. During the county's survey a cultivation layer dated to the Late Neolithic was discovered in the slope in the background to the right (Eskeland 2013: 252–257). Photo taken looking north. Photo: G. Reitan / KHM.

Another significant feature of the site is the presence of more than 330 sherds (totally 724 g) of pottery (fig. 3.9.10). Overall, the sherds are fragmented and weathered. Due to the heavy weathering of the sherds it is difficult to reconstruct the original sizes and shapes of the pots, but the sherds obviously represent several different vessels of different sizes. The external rim diameter of the vessels, when possible to estimate, varies between 11 and 25 cm. In general the necks seem to have been relatively short and straight, the rims generally slightly thicker and rounded, but some exhibit a flat rim-top. Just below 10 % of the sherds are

Figure 3.9.9: Selection of Late Neolithic flint artefacts from Hesthag C6: a fragmented spoon-shaped scraper (a), sickle-shaped bifacial implement (b), and arrowheads (d–e). Finds of *i.a.* regular blades, microblades (f–h), conical micro-blade cores, a tanged arrowhead (c) and a possible neck of a flint core adze (i) are traces of earlier use of the site, probably around the Early/Middle Mesolithic transition and in the Early Neolithic. Ill.: G. Reitan / S. Viken / KHM.

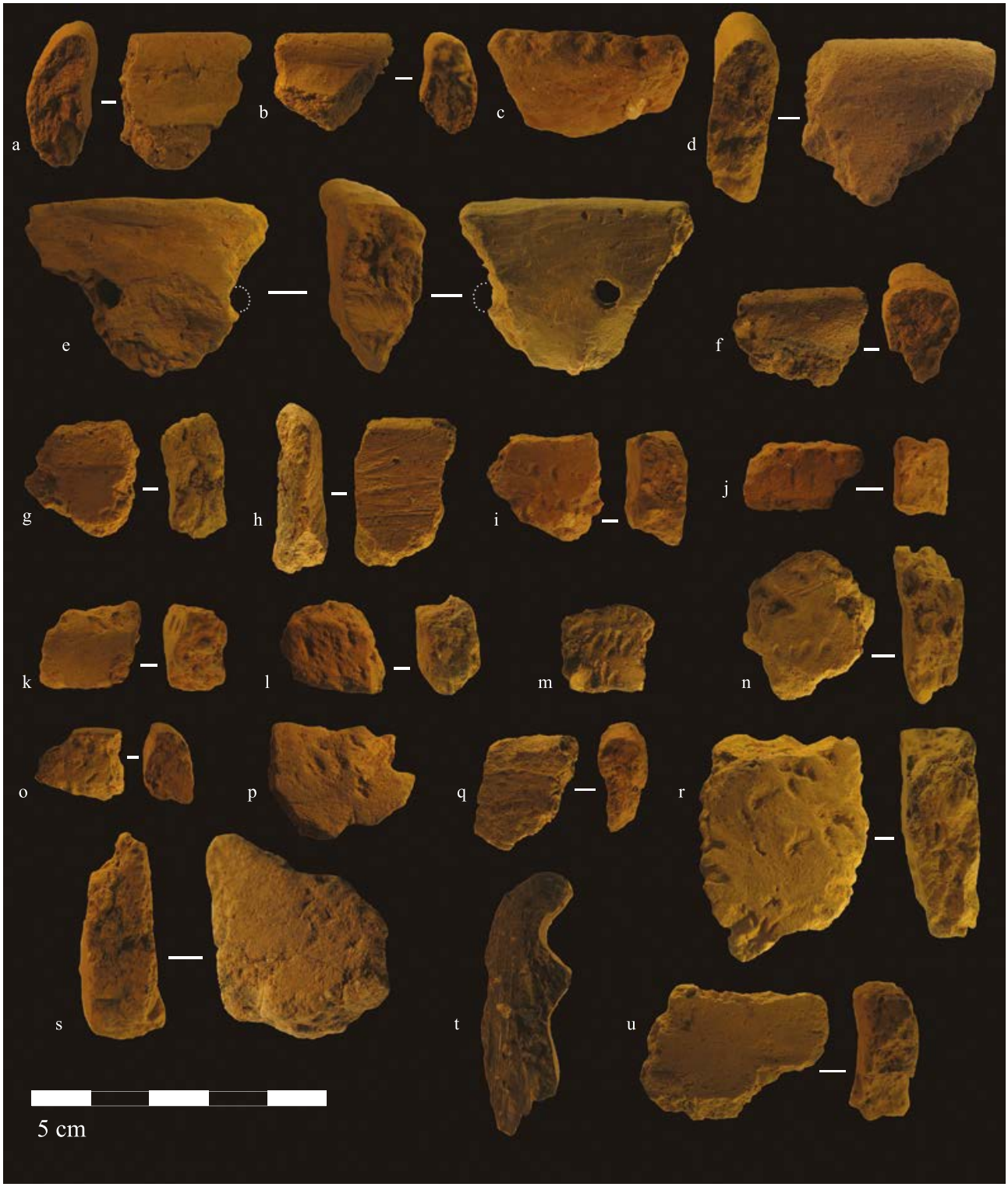

Figure 3.9.10: Selection of the *c.* 330 potsherds from Hesthag C6. The displayed sherds are mainly from the rim and neck of various vessels, but one (s) is probably from the lower part of the belly near the transition to the base. Some vessels have been decorated with faint lines, and holes (e) and ledges (t) also occur (g–h). However, the most frequent feature is series of small imprints, probably applied with comb-like implements, and cord stamps (i–r; note the possible cereal imprint on sherd *p* and the probable cord stamp on the rim top on sherd *c*). Fragmented and mainly undecorated potsherds are difficult to date on typological grounds, but soot extracted from the core of two sherds (of which sherd *t* is one) was directly radiocarbon dated to the Late Neolithic. For close parallels from Late Neolithic contexts in Sweden, see e.g. Holm *et al.* (1998) and Stilborg (2002). Ill.: G. Reitan / S. Viken / KHM.

decorated. The ornaments are predominantly applied to the shoulder and neck of the vessels.

The pottery can be linked to the above mentioned Late Neolithic flint artefacts from the site. Pottery from the Late Neolithic is in general very little known in Norway (*cf.* Skjølsvold 1977; Reitan & Berg-Hansen 2009; Østmo 2011). However, close parallels to the Hesthag C6 pottery are identified in settlement finds dated to the Late Neolithic from, for example, eastern central Sweden and southern Sweden, both with regard to rim and neck shapes and ornamentation (*cf.* Holm *et al.* 1997: Fig. 6.12 and Fig.6.23; Stilborg 2002: 80). Two directly dated sherds from two different vessels from Hesthag C6 confirm this: soot that had intruded into the clay during the production baking of the vessels was extracted from the core of the sherds and radiometrically dated to the Late Neolithic, 2136–1950 BC (3660 ± 30 BP, Beta-448124) and 1906–1743 BC (3500 ± 30 BP, Beta-448125). The two date-results give reason to assume that all or at least most of the potsherds from Hesthag C6 are of Late Neolithic age. No other radiocarbon date-results were obtained from the site, as no pits or other contexts with organic material suitable for radiocarbon dating were identified.

The potsherds were evenly distributed throughout the 102.5 m^2 manually excavated area on Hesthag C6. The heavy weathering of the sherds may indicate that they have been subject to some sort of mechanical wear. However, there were no visible traces indicating that the site had been cultivated at any stage. Still, we consider that the Late Neolithic finds from Hesthag C6 can be viewed as peripheral traces of a nearby, unidentified farm. If so, the potsherds may have been deliberately spread settlement waste material, maybe along with other unidentified substances, to increase the productivity of the fine-grained soil as a form of fertilising. It is widely assumed that this practice was introduced to northwestern Europe during the Pre-Roman Iron Age (Ethelberg *et al.* 2003: 22; Mjærum 2012c; Kanstrup *et al.* 2014; Reitan 2014c: 306; see however Bårdseth & Sandvik 2010). However, it cannot be ruled out that some form of enrichment of the soil may have been practised earlier, too, as suggested for a Late Neolithic farming site investigated at *Stensrød* near Svinesund in Østfold, close to the Swedish border. The theory that fertilising was practiced at Stensrød is based on the substantial thickness of the recorded cultivation layers, and on the premise that fertilising may have been required to keep the fields productive for the duration of two to three two-aisled long-houses built consecutively on the same spot (Rønne 2003b: 220–221; Glørstad 2004a: 73).

Traces of long-term farming at Hesthag: new cultivation techniques?

To judge from the present cultural landscape the south-facing slopes with fine-grained sand surrounding Hesthag C6 are well suited for extensive farming. This is supported by a fossil cultivation layer detected beneath the modern plough soil in the slope *c.* 60–70 m northeast of the excavated Hesthag C6. The layer was not excavated within the E18 Tvedestrand–Arendal project, but identified during the survey conducted by archaeologists from Aust-Agder County Council ahead of the excavation project, and flint scatters were associated with it (Eskeland 2013: 252–257). A charcoal sample from the layer was dated to the Late Neolithic, 1884–1695 BC (3470 ± 30 BP, Beta-360080). Further up, near the crest of the slope, both cooking pits and post-holes were recorded, along with more flint scatters. There are no radiocarbon dates from any of these features, and they were not further examined. Yet it is tempting to suggest that these may be traces of a Late Neolithic farmstead that can be linked to both the cultivation layer and the pottery collected during the investigation of Hesthag C6, although an Early Iron Age date is equally possible.

In conclusion we would suggest that the soils around Hesthag C6, along with the tilling techniques applied, possibly involving an early form of manuring, have enabled a more long-lasting and arguably planned character of the cultivation of the area. That there was more or less continuous cultivation is demonstrated by several thick cultivation layers in the nearby slopes at Hesthag, with dates spanning from the Late Neolithic through the Bronze Age, Iron Age and Middle Ages until the present day (*cf.* Viken, chapter 2.3.2; McGraw, chapter 2.6.1, this volume).

OTHER POSSIBLE EARLY FARMING SITES IN SOUTHEAST NORWAY

A few sites in the inner Oslo fjord area have generated Early Neolithic finds at places where such finds were highly unexpected, like at Kvastad A2, and where other chronological periods initially were in question (table 3.9.11): the investigations at *Haslum* (Schaller Åhrberg 2011) and *Gunnarsrød 5* (Reitan 2014d) were targeted at collecting Mesolithic finds, whereas the Neolithic data at *Dønski* (Demuth & Simonsen 2010), *Bratsberg* (Wenn 2012) and *Vøyenenga* (Østmo & Skogstrand 2006) were recorded during investigations designated for Iron Age settlement traces. Only two of the sites, *Svensrudsletta* (Bjørkli 2014) and *Vøyen I* (Mjærum 2010), were, due to finds from the

Site name	Settings, diagnostic finds and date-results	Source
Nøkleby, Ski municipality, Akershus county	The site was identified when a half of an EN polygonal stone axe was randomly recovered in a crop field. Situated at 130 m.a.s.l. on gently sloping sandy soil. Potentially 5,000 m² big. Not excavated, but systematic field surveying and digging of test squares in the plough soil yielded an assemblage featuring several diagnostic artefacts typical of the EN: transverse and tanged flint points, fragments of polished flint probably struck from a broken axe, as well as sandstone grinding slabs and *c.* 50 potsherds. The shapes of rimsherds and a couple of sherds with a horizontally impressed line of two-ply cord has led to the interpretation of them as sherds from funnel-beakers. In the EN the site was situated more than 10 km away from the contemporary seaside of which the present Lake Årungen is a remnant.	Amundsen *et al.* (2006); Mjærum *et al.* (2008)
Dønski, Bærum municipality, Akershus county	Situated *c.* 50 m.a.s.l. on a big, sandy plateau with no obvoius topographical barriers. In a big pit (nearly 2.8 m wide and up to 0.6 m deep) with a pale, organic fill a considerable amount of potsherds (*c.* 1.5 kg) from three different vessels were found: one has been a big funnel-beaker decorated with a horizontal line of small, trapezoid imprints just beneath the rim. Another, much smaller, bowl-shaped vessel has traces of a lug or an ear-shaped grip. The third vessel has been a small beaker with horizontal lines of a two-ply cord and imprints of a comb or similar in a geometrical pattern. Overall, the vessels are of dense ware with few parallels in Norway (see however Østmo & Skogstrand 2006; Koxvold 2017b), and possibly of South Scandinavian origin. A charcoal sample from the pit was radiometrically dated to 3931–3374 BC (4850 ± 95 BP, T-19326). Potsherds with similar character were also found in two other undated pits. The 50 m sea level approximately corresponds to 5000 BC (R. Sørensen 2002). In the EN the site will have been set c. 300 m away from the seaside.	Demuth & Simonsen (2010)
Vøyenenga, Bærum municipality, Akershus county	Located at the same altitude and only 1 km west of the Dønski site, the Vøyenenga site has been situated closer to the Neolithic fjord, now a river valley. In a pit (*c.* 0.5 x 1.0 m, 0.2 m deep) 60 sherds from a funnel-beaker were found. The vessel has been decorated with imprints of a two-ply cord along the transition between the neck and the softly pronounced shoulder, and evenly spaced, short vertical two-ply cord imprints directly beneath the horizontal line (*cf.* Reitan 2014a: Fig. 8.16 h, I for an EN vessel with similar decoration). Charcoal from the pit was dated to 3702–3382 BC (4810 ± 55 BP, T-17864), *i.e.* synchronous with the Dønski finds. The character of the sherds from the two sites is similar, too. No lithic material was collected at Vøyenenga. A series of post-holes in a row few metres from the dated pit with the pottery were documented, however. Although not radiocarbon dated, the post-holes are suggested to be traces of a long-house, indicating a durable character of the Vøyenenga EN settlement.	Østmo & Skogstrand (2006)
Vøyen I, Bærum municipality, Akershus county	Situated on a plain without any obvious demarcations, right between the two other mentioned Bærum sites, and at the same height above sea level. Beneath the plough soil a number of pits, postholes and other features were documented. A transverse flint arrowhead, a fragment of a thin-butted, polished flint axe and a small number of sherds of possible EN pottery were collected. Radiocarbon dates from contexts like post-holes, hearths and various pits clearly demonstrate a significant presence throughout the Neolithic period: three dates to the EN, four to the MN A, three to the MN B and six to the LN/EBA, three of the latter carried out on charred barley grains. It can also be noted that a considerable amount of Neolithic stray finds are recorded from the Vøyen area through the years.	Mjærum (2010)
Haslum, Frogn municipality, Akershus county	Situated 45 m.a.s.l. on slightly sloping sandy soil. Typologically, the majority of the finds can be dated to the EN, *e.g.* fragments of point- and thin-butted flint axes, tanged and transverse arrowheads, bone beads and *c.* 800 sherds (1.8 kg) from several ceramic vessels. The pottery assemblage displays a variety of ornamentation elements, *i.a.* parallel vertical belly lines, horizontal impressions of cord twine and various imprints. The decoration style along with details on sherds from rims, necks and shoulders indicate that the pottery is of EN type. A cremated bone of a black guillemot (*Cepphus grylle*) or a razorbill (*Alca torda*) found in a cooking pit was radiocarbon dated to 3761–3645 BC (4915 ± 25 BP, $\delta^{13}C$ -25,5 ‰, Tra-1574). One bone from the same pit was identified as possible goat/sheep. In the EN the site will have been situated *c.* 350 m away from the sea.	Schaller Åhrberg (2011)
Svensrudsletta, Hole municipality, Buskerud county	Located on a sandy plain at 85 m.a.s.l. on the Røyse peninsula in the big inland Lake Tyrifjorden (63 m.a.s.l.), and *c.* 500 m from the lake's shore. A fossil layer beneath the modern plough soil was interpreted as a cultivation layer. A sample from the layer was radiocarbon dated to > 40,000 BP, obviously contaminated. 44 potsherds were collected, probably from two different vessels decorated with diagonal imprints and parallel horizontal lines of two-ply cord. The pottery is of typical EN style, which is confirmed by a radiocarbon date of charred residue on the inside of a sherd: 3646–3521 BC (4793 ± 30 BP, Ua-46420). Lipid analyses carried out on the residues (food crusts) on two sherds identified mainly lipid remains from terrestrial animals as well as fatty plants. Hence, it is unlikely that the date-result is affected by any reservoir effect.	Bjørkli (2014)
Gunnarsrød 5, Porsgrunn municipality, Telemark county	Situated on a plateau with sandy subsoil in a recently cultivated field. If shore bound, the height above today's sea level corresponds to a date to c. 6500–6000 BC (*cf.* R.Sørensen *et al.* 2014). Certain finds do not match with the shoreline dating, *e.g.* two fragmented, polished stone axes of EN types, pieces of polished flint, tanged flint arrowheads, a fragment of a supposed cylindrical blade core and two fragmented slate arrowheads. Charcoal from a pit confirms use of the site in the EN, radiocarbon dated to 3632–3376 BC (4716 ± 16 BP, UBA-19160). At this stage the site was situated some 250–300 m away from the contemporary shoreline. Additionally, with steep slopes the seaside cannot have been easily accessible from the site during the EN. The damaged stone axes indicate a certain duration of the site use in this period.	Reitan (2014d)
Bratsberg, Skien municipality, Telemark county	Situated *c.* 60 m.a.s.l. on a ridge in a very rich environment. Nearby finds include *i.a.* the ruins of the manor and the private chapel of a High Medieval administration centre (Bergan 2002), in a slightly wider circumference also numerous flint daggers and simple shafthole axes as well as rich Bronze Age finds and rock art sites are recorded (Ø.Johansen 1981; Groseth 2001; Greiff 2017). During the EN fjords were located both east and west of the excavated site (*cf.* R.Sørensen *et al.* 2014b), but at a distance of c. 300 and 700 m, respectively. Various pits, post-holes, cooking pits and cultivation layers were recorded on the site. A flint scraper and a small number of scattered, undiagnostic flint artefacts were collected during the survey, but no flints or Neolithic pottery was found during the excavation. A total of 25 radiocarbon dates from the site reflect several phases of occupation and use: A layer interpreted as a cultivation layer was dated to the EN, 3709–3527 BC (4850 ± 40 BP, TRa-2501), as were two pits, 3932–3642 BC (4950 ± 50 BP, TRa-2488) and 3640–3530 BC (4800 ± 40 BP, TRa-2499), whereas a possible post-hole was dated to the MN: 2870–2491 BC (4090 ± 45 BP, TRa-2497). Another six samples were dated to the LN/EBA. Although Neolithic macrofossils and artefacts are lacking, the date-results demonstrate an unquestionable Neolithic presence.	Wenn 2012

Table 3.9.11: Previously investigated in the inner Oslo fjord area: other possible early farming sites? Additionally the sites Gunnarsrød 5, Bratsberg, Haslum, Vøyen I and Nøkleby have yielded Late Neolithic finds and/or dates. With a possible exception for Nøkleby, the listed sites cannot be termed *inland sites* proper, as the sea shore (Svensrudsletta: lake shore) has been within the reach of a relatively short walk from each. The same applies to Kvastad A2. It is likely that topography and geological conditions, for example, have been key localisation factors.

preceding surveys, investigated with questions about the Neolithic uppermost in the archaeologists' minds.

The sites briefly presented in table 3.9.11 have several traits in common: for instance, most of them were located on plains of sandy soils and without any obvious topographical demarcations. In addition, they were all situated on what can be referred to as 'Mesolithic altitudes', i.e. somewhat retracted from the Early Neolithic shoreline. Their locations thus stand in contrast to nearly all previously known and investigated Neolithic short-term occupational sites based on fishing/hunting/gathering. As for the *Nøkleby* (Amundsen *et al*. 2006; Mjærum *et al*. 2008) and the Svensrudsletta sites, an exploitation of marine resources can probably be excluded altogether. Although situated relatively close to the contemporary shoreline, it can be suggested that the other sites have also been more land-oriented than marine-oriented (*cf*. Hallgren 2008: 92–99). This conclusion is supported by the local topography. The same applies to Kvastad A2. Whereas shore-bound Early Neolithic sites often prove to be rich in lithic finds, large amounts of lithic production waste is not a typical trait for Neolithic farming sites as they are recorded from Sweden (e.g. Persson 1991; Hallgren 2000; Carlsson 2004; *cf*. Glørstad & Sundström 2014: 38–39). Although this may rely on the excavation methods, i.e. the stripping of the find-containing plough-soil, a limited amount of lithic artefacts is a trait that seems to apply also to the possible Norwegian farming sites presented in table 3.9.11 (*cf*. Rønne 2003a, 2003b; Gjerpe & Bukkemoen 2008: 32 on documented Late Neolithic farming sites).

Hence, and in spite of lacking direct evidence of farming, each of the sites constitutes an important glimpse into a part of the Early Neolithic settlement pattern and economy which so far has been very little known. This pattern involves the use of, and settlement in, the coastal hinterland and not only in the shore zones, a pattern that arguably has been more widespread than what we previously have had reason to think. In addition, such sites may represent the same kind of settlement and land use pattern as that expressed by the fairly abundant and widespread Neolithic stray finds from the region (*cf*. Rønne 2003b: 190; Mjærum 2012b: 15–19 with references). The Nøkleby site, for instance, was identified when a fragmented polygonal stone axe, a typical stray find, was found and led to a small-scale investigation of the site (Amundsen *et al*. 2006; Mjærum *et al*. 2008). The cereal grains from Kvastad A2 dated to the Middle Neolithic A are hitherto by far the earliest directly dated ones known in Norway. Still, there is a striking delay of several centuries between the earliest recorded cereal macrofossils from Norway and those from the neighbouring areas in Sweden and Denmark. However, in recent years a few sites have been investigated that have yielded Early Neolithic finds and dates and which *may*, in our view, represent potential farming sites. In addition to the sites listed in table 3.9.11, another site should be mentioned, which can hardly be interpreted as a representative hunter-gatherer settlement site: in 2010 a large site was investigated at *Hamremoen* near Kristiansand, in southernmost Norway, containing *i.a*. a large amount (10 kg) of typical early Funnel Beaker pottery. Ditches and dikes measuring more than 70 metres in length across a peninsula adjacent to a river outlet were documented. The ditches are interpreted by the excavators as traces of an extensive enclosure similar to excavated enclosures in south Scandinavia (Glørstad & Sundström 2014; Glørstad & Solheim 2015; *cf*. Madsen 2009 for a close parallel in Denmark). According to a series of radiocarbon dates, this structure was established *c*. 3900 BC and abandoned *c*. 200 years later.

We consider it difficult to interpret such a monumental structure as traces of a residentially mobile hunter/gatherer/fisher population, a question also raised by those who excavated the Hamremoen site (Glørstad & Sundström 2014). The Hamremoen enclosure arguably represents something quite different, and obviously with close ties to contemporary farming communities of the Funnel Beaker Culture in south Scandinavia (Glørstad & Sundström 2014: 42–44). In line with this, other and later monumental structures like the megalithic graves in the inner Oslo Fjord area may be linked to a farming population, as suggested by Østmo (2007b).

DISCUSSION

The growing number of excavated Early Neolithic occupational sites along the coast of southeast Norway has led to a significant increase in knowledge of many aspects of the phase in the region. However, the vast majority of the investigated sites have been shore-bound (Mjærum 2012b: 18). Their locations and the data collected from them strongly indicate a persisting subsistence economy based on fishing, hunting and gathering, as in the Mesolithic. Whereas solid evidence of farming, i.e. cereal macrofossils and bones from domesticated animals, have been recorded from the beginning of the Early Neolithic in both central and western Sweden, e.g. in Bohuslän just southeast of the Norwegian border (Sjögren 2013; *cf*. Hallgren 2008: 76–79; Sørensen & Karg 2014: 103), similar

coinciding finds have yet to be documented in Norway. These regions are closely linked in terms of material culture in this phase, most notably expressed in the decorated ceramic vessels with funnel-shaped necks and the four-sided, polished flint axes, but also in the small-tool inventory.

The earliest dated cereals recorded at Kvastad A2 backdate the cereal cultivation in Norway by around one thousand years, to the Middle Neolithic A. Where Early- or Middle Neolithic finds occur along with Late Neolithic ones, it seems that topographical and geological conditions, i.e. the availability of easily tillable, sandy soils, have been key localization factors (table 3.9.11; *cf.* Berg-Hansen 2009, 2010). The data from Kvastad A2 and the other possible early farming sites point strongly to an increased focus on sandy, but, in a modern perspective, infertile soils – for example, fields at present used for pasturing. In view of these material developments and the increased consciousness around the whole question of the introduction of farming, we expect that traces of early farming practice in Southeast Norway – that are as equivalently early as those in the neighbouring Scandinavian areas – will be discovered in the coming years.

In our view the image of the delayed introduction of farming to Norway is biased. This may be the result of several factors. Firstly, the efforts that have been made to identify and investigate the first farming settlement sites, e.g. where stray finds have been made, have been small, and only in very rare cases have archaeological investigations been initiated in response to unearthed stray finds (Hinsch 1955: 13). Secondly, investigations of even more shore-bound Neolithic sites do not seem to give insights into the first phase of farming, but instead merely reproduce the image of a persisting 'Mesolithic' lifestyle. Thirdly, there may be methodological shortcomings involved, for example when prehistoric farming settlements in modern farmlands are investigated. The focus is often heavily biased towards much later, predominantly Early Iron Age, predefined questions. Consequently, Iron Age cooking pits, postholes with distinct organic fill and other easily identifiable features are given priority. Comparably bleak features of potential Neolithic age on the same sites are given less attention in the field, or even considered as 'disturbances' that are hard to interpret (*cf.* L. Sørensen 2014b: 472). Furthermore, undiagnostic, leached features are prone to being downgraded when samples are considered for analyses and dating (*e.g.* Østmo & Skogstrand 2006: 75; Demuth & Simonsen 2010). Lastly, but not least important, Stone Age research in Norway has for decades been focused on well-preserved sites in presently forested, uncultivated areas (Mjærum 2012b:16). Due to lack of experience in dealing with ploughed-over Stone Age sites, the scientific potential of such sites may have been underestimated (Berg-Hansen 2009: 67; Mjærum 2012b: 16; *cf.* Åstveit 2012). More archaeological investigations in recently ploughed areas can potentially provide insights into aspects of Stone Age settlement patterns and resource exploitations that are poorly understood, for example Early Neolithic farming. However, later farming activities have most likely affected possible Neolithic cultivation layers, and the majority of the stray finds of Neolithic axes have been unearthed during soil tilling in the 19th and 20th centuries. This constitutes a problem of representation as to where the stray finds are found. Consequently, Glørstad (2006: 102–103) may be right in his assumption that the chances of identifying traces of the earliest agriculture are best in areas considered marginal in a modern agricultural perspective. At Kvastad A2, for instance, the traces of Neolithic farming would most likely have been heavily reduced if the area had been recultivated in later periods.

Fishing and hunting have clearly played a major role throughout Norwegian prehistory, in many regions even in historic times, and often in a mixed economy including small-scale farming (*cf.* A.W. Brøgger 1925). Nevertheless, agriculture must have altered several aspects of people's ways of life, such as *i.a.* ownership, cosmology and social relations, in a dramatic manner no matter in what form, with what intensity and to what extent it was introduced. A farming mode of production itself may, however, have been less important in terms of subsistence economy, at least in an initial phase (*e.g.* Hodder 1990). In line with this we would argue that the actual presence of farming is the key here, and not necessarily the extent of it.

A number of different theories and models have been suggested to explain the economic transition to farming (see e.g. Fischer & Kristiansen 2002; Hjelle *et al.* 2006; Sørensen & Karg 2014: 101, with references). The currently dominant trend within this field of research is to consider the first farming as a result of a regional or native history (*cf.* Glørstad & Prescott 2009: 18; see however Sørensen & Karg 2014). In a comprehensive study of the expansion of agriculture in southern Scandinavia, Fischer (2002) has rejected several previously prevailing explanations of this process, for example that it is caused by a decline in natural production and ecological stress. Instead he suggests that the transition to a farming economy was a gradual one, and a result of long-distance trade in prestige goods and material symbols. A prime motivation for growing cereals like barley, which

commonly occurs along with wheat in Neolithic contexts, may have been the possibility to brew beer and give feasts, according to Fischer (*cf.* Bender 1978; Kristiansen 1988: 37; Sherratt 1991: 56; Prescott 1996: 84; Sundström 2003: 33; Solheim 2012a: 252–254). In line with this, the value of cereals as a source for baking of bread as a nutritional addition has been secondary. If so, the often small, cup-sized Early Neolithic ceramic vessels may have functioned as drinking ware (Fischer 2002: 376–377, with references). In a recently published monography on Scandinavian prehistory, T.D. Price (2015: 130) also suggests that the brewing of beer was of key importance in the spread of early agriculture.

The importance of beer and alcoholic beverages is well documented in various sources from both prehistoric and later periods (Larsson *et al.* 2018). The production of beer encompasses the refining of cereals into malt, a process involving roasting or charring of the cereal kernels. As previously mentioned, the recorded amount of carbonised cereals on Kvastad A2 arguably represents only a small portion of the originally deposited quantity. It is tempting to view the charred cereal grains as a result of an intentional processing of the harvest in order to brew beer. It should be admitted, though, that the process of malting has yet to be convincingly documented in Neolithic contexts. The task of identifying, for example, germinated cereals (*cf.* Larsson *et al.* 2018) should therefore be an important undertaking in future research in order to test the validity of the explanation model with brewing of beer as a factor in the spread of agriculture.

The cereals on Kvastad A2 were "accidentally" identified at a site that was not shore-bound during the Neolithic, but instead assumed to be a far older, short-term fishing and hunting site from the Mesolithic (Stokke & Reitan, chapter 2.5.5, this volume). The finds and dates from Kvastad A2 demonstrate that cultivation of crops actually was practised, at least to a certain degree, in Southeast Norway in the first half of the Neolithic. Furthermore, they may serve to exemplify that the many rather small, shore-bound sites on terracing slopes may not reflect the full picture of the Early and Middle Neolithic settlement pattern. Although the unquestionable agricultural ecofacts are lacking from the mentioned sites with a possible farming background (table 3.9.11), such sites may contribute to a fuller and more realistic picture of the Early Neolithic settlement in the region, i.e. one that also includes farming.

The natural resources along the coasts of Norway provide rich grounds for a lifestyle based on hunting/fishing/gathering. This was convincingly pointed out by A.W. Brøgger (1925) as a specific trait for Norway – a trait that has endured until modern times. Hence, the adaption of farming cannot be understood in an evolutionary perspective as a necessity (*cf.* Nærøy 1999: 498–499). Instead, the expansion of farming must be seen as an aspect of a multi-faceted, complex socio-cultural process. The data presented in this paper suggest that Southeast Norway indeed, and to a certain degree even in terms of economy, was an integrated part of the networks that covered all of southern and central Scandinavia and beyond at the time (*cf.* Glørstad 2009 with references; Glørstad & Sundström 2014).

In a study of the expansion of agrarian societies towards Scandinavia at the Mesolithic-Neolithic transition, it is demonstrated that farming as a mode of production was spread over vast areas just after 4000 BC. The authors of the study point out that the agricultural techniques are complex and that their applications require both knowledge and long-term experience in order to succeed (Sørensen & Karg 2014: 109). In line with this, and when considering the speed of the farming expansion, it is suggested that this process probably involved groups of pioneering farmers migrating from central Europe to Scandinavia, as indicated also by studies of ancient DNA from Neolithic individuals from nearby western Sweden (Malmström *et al.* 2009). If so, these migrations of experienced farmers will probably also have reached southeast Norway.

If our interpretations concerning early farming along the coast of Aust-Agder county in the Neolithic are right, they breathe new life into the discussion of the validity of the early farming indicators identified through pollen analyses in Southeast Norway, not least bearing in mind that no cerealia pollens were identified in the core from the Låmyra bog. They also shed new light on the distribution of Neolithic stray finds which, over a century ago, was interpreted as traces of early farming based on their apparent connection to soils assumed suitable for early farming (A.W. Brøgger 1906). Future research will contribute to clarify questions relating to both migration and the pioneer phase of the agrarian economy in Norway.