Going against the grain?

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Going against the grain?

The transition to farming in the Dutch wetlands re-examined (5000–4000 BCE)

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Abstract

In general, the fifth millennium BCE in the Dutch wetlands and southern Scandinavia might be described in similar terms regarding the presence of ceramic hunter-gatherers who evidently had contacts of some kind with central European farming communities. Whereas the end of this millennium saw a relatively swift transition to farming in southern Scandinavia, the Dutch wetlands seem to have taken a different route. Here, the dominant opinion is that of a gradual and earlier start of animal husbandry and cereal cultivation, albeit of a limited economic importance. This contribution will question the Dutch dataset and discuss new data on the use of ceramics and the date and scale of the start of animal husbandry and cereal cultivation. We conclude that the transition to farming (cereal cultivation and animal husbandry) occurred around 4200 BCE, predating the transition to farming in the UK and southern Scandinavia.

Neolithisation; Swifterbant Culture; zooarchaeology; archaeobotany; ceramics

Introduction

Mapping the transition to farming might seem a rather straightforward process: one simply maps the earliest presence of domesticated plants and/or animals in a certain area. Nevertheless, for the Dutch wetlands there are currently three competing models to describe the transition to farming, notwithstanding the relatively high resolution of our dataset. The first model is the Long Transition Model (LTM), advocated by Louwe Kooijmans from the 1970's onwards and adopted by his Leiden-based pupils (*e.g.* Amkreutz 2013; Amkreutz and Dusseldorp 2020; Louwe Kooijmans 1976; 1993; Raemaekers 1999; Verhart 2000).

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Central to this model is the presence of sites in the wetlands with a low percentage of bones from domesticated animals until at least the end of the fourth millennium BCE (Vlaardingen-Stein Culture), creating a transition period of more than 1000 years.

The second model, the (Early) Short Transition Model (Raemaekers 2003), interprets these 'semi-Neolithic' sites as wetland elements of a logistical mobility system: throughout the 1000 years under study in the LTM, the bone assemblages of the wetland sites are rather similar, with 'true Neolithic' sites restricted to the coastal dune area. Because the fifth millennium coastal zone has been eroded, this allows for hypothetical early 'true Neolithic' sites on the coast, cutting down the long transition to a swift, fifth millennium transition (see Amkreutz 2013, 407–408 for a rebuttal).

The third model, the Late Short Transition Model, dismisses all fifth millennium finds of domestic animals (Rowley-Conwy 2016), and positions the transition to farming at the start of the fourth millennium. It is especially this third model that ties in very well with the renewed view of the transition to farming as a change driven by demography. Shennan's 2018 continental overview identifies the Dutch wetlands as a singular exception to his demographic narrative. When one dismisses the fifth millennium Neolithic assemblages, the singular position can be dismissed as well. These three competing models imply that the dataset is difficult to interpret (Çakirlar *et al.* 2020). What are the underlying problems?

Problems with the dataset

Dating evidence

The dataset comprises wetland sites embedded in Holocene sediments. As a result, focus has been on dating the sites or the phases of these sites by means of context dates. In other words, there are hardly any direct dates for the bones of domesticated animals or cereal grains. When we realise that the proposed early start of animal husbandry is based on small numbers of bones from domesticated animals, how can we be certain that these bones are an integral part of the (phase of) sites? How certain are we that they were not added to the assemblage at a later date as a result of site formation processes or revisits?

Dating precision

All available ^{14}C dates predate the current standards of high-precision dating and thus have relatively large margins of error. On top of that, there are relatively small sets of dates per site, presented with little attention to their quality and without statistical analysis (Bayesian modelling). Moreover, the crucial final part of the fifth millennium BCE is characterised by a plateau in the calibration curve. The resulting chronology is therefore rather coarse (Dreshaj *et al.* 2022).

Ambiguity of the zooarchaeological remains

Until recently, the start of animal husbandry was solely based on traditional zooarchaeological methods, such as size measurements and kill-off patterns. The fact that, in our area, aurochs and wild boar occur implies that we need to be very cautious in dating the start of animal husbandry by these methods alone. The Rosenhof assemblage is the best cautionary tale: aDNA analysis of the *Bos* bones made clear that the small bones

found there were not from domestic cattle but from small female aurochs (Scheu *et al.* 2008). Another cautionary tale is the fact that there was interbreeding between incoming domestic pigs and local European wild boar, making size measurements alone not sufficient to determine domestic status (Frantz *et al.* 2019).

The EDAN project

We used the Rowley-Conwy 2016 paper as a wakeup call: the relevance of the Dutch dataset for the international debate on the transition to farming required action. The Dutch Research Council (NWO) funded a large project that focused on the fifth millennium dataset. It allowed us to study the chronology (with new dates and Bayesian modelling), aDNA, and diet (C and N isotopes) of *Bos* and *Sus* from this period. Major sites are the two Late Mesolithic sites at Hardinxveld-Giessendam (Louwe Kooijmans 2003), covering the period 5400–4250 BCE. The final centuries of this millennium were studied on the basis of the Swifterbant site cluster, especially the largest assemblage, S3 (Zeiler 1997). The Emergence of Domestic Animals in the Netherlands project (EDAN) is taking place in the period 2020–2024. Here, we present our preliminary results (fig. 1).

Stage 1: Ceramic Late Mesolithic

Our analysis is based on the two sites of Hardinxveld-Giessendam (Polderweg and De Bruin). The new ^{14}C analysis re-dates these phased sites to the period 5400–4650 BCE (Dreshaj *et al.* 2023). Size measurements on the *Sus* from this period indicate they were wild boar, which is substantiated by their aDNA and isotopic signals. There is no isotopic evidence for animal husbandry in this period. Interestingly, the kill-off patterns of the various phases are not the same, indicating that people varied their hunting practices through time, perhaps according to the changing environmental conditions (Brusgaard *et al.* 2022). The pots were used to cook meals that consisted of fish and ruminants (Demirci *et al.* 2021). We have no evidence for cereal cultivation at this stage.

Stage 2: Mist in the middle

The final stage of De Bruin (phase 3) is re-dated to 4450–4250 BCE (Dreshaj *et al.* 2023). It is difficult to interpret because it concerns a small assemblage and the aDNA analysis failed to produce any useful data. The stable isotope results of the *Sus* are congruent with a wild boar diet. However, the size measurements indicate a number of significantly small suids at the site in this period, which would be domestic pigs (or butchered parts thereof) (Brusgaard *et al.* 2022). One of the pots of this phase may have been used for dairy (Demirci *et al.* 2021). We have no evidence for cereal cultivation at this stage.

Stage 3: Early Neolithic wetland farmers

Our analysis focused on two sites of the Swifterbant cluster, namely S3 and S4. The new ^{14}C analysis has tackled the problems with the plateau in the calibration curve by making use of high-precision dating, smart sampling, the minimal age difference between all the new ^{14}C dates and Bayesian modelling. It is now clear that S4 dates to 4250–4150 BCE, whereas S3 has a slightly younger date range of 4200–4000 BCE (Dreshaj *et al.* in prep.). The pig data are as of yet difficult to interpret. The assemblage consists of relatively small *Sus*, including many piglets, and had a diffuse isotope signature, while the aDNA results

Figure 1. Palaeogeographic setting of the sites discussed (after Vos 2015).

indicate that one *Sus* had a small percentage of domestic ancestry, indicating either contact with neighbouring domestic pig populations or perhaps that this *Sus* was heavily interbred with local European wild boar. In contrast, the *Bos* data clearly point to domestic cattle. The size of the bones is consistent with domestic cattle populations and aDNA analysis points at genetically domestic animals. The isotopic analysis reveals that some of the cattle were herded in an environment with elevated nitrogen values, while another part of the herd has a local nitrogen signal (Brusgaard *et al.* in prep). The lipid analysis of the S3 pottery suggests that meals with pork or beef were not produced in pots – we only have evidence of meals with fish (Demirci *et al.* 2020). Plant remains in pots (using SEM analysis) testify to the presence of emmer wheat in these same pots (Raemaekers *et al.* 2013), giving a more complete view of the cuisine at this site. The importance of cereal cultivation is clear from

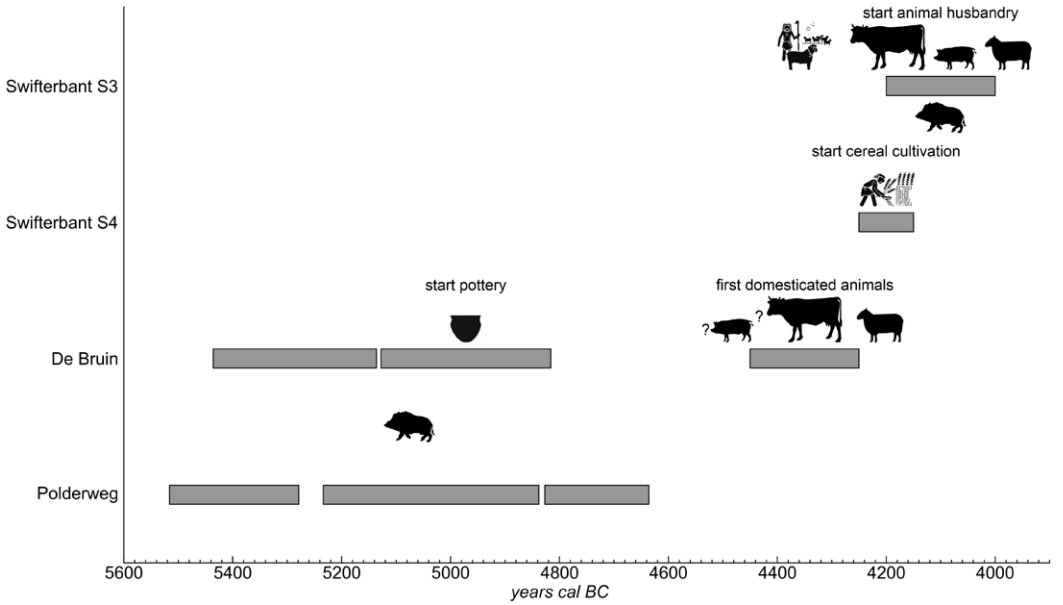

Figure 2. Overview of developments in animal husbandry and cereal cultivation in the fifth millennium BCE in the Dutch wetlands (figure: E. Bolhuis).

the presence of cultivated fields (Huisman *et al.* 2009; Raemaekers and De Roever 2020), botanical macroremains (see Schepers and Bottema-Mac Gillavry 2020 for the most recent overview) and coprolites (Kubiak-Martens and Van der Linden 2022).

Conclusions

The EDAN project has put flesh on the bones. The various types of analyses point to a start of both animal husbandry and cereal cultivation from *c.* 4200 BCE onwards (fig. 2). The domestic character of the *Bos* at Swifterbant is based on the small bone size, the stable isotopes and aDNA. Moreover, the isotopes suggest that there were two herds, one of which grazed in an area with high nitrogen values and was transported to Swifterbant. These high values are consistent with herbivores grazing in a salt-marsh region (Britton *et al.* 2008; Prummel *et al.* in prep.), which would make these bones the first clues of coastal exploitation at the end of the fifth millennium BCE – a landscape zone that cannot be studied directly due to its erosion. The isotope analysis included some sheep/goat bones with a similar 'coastal' signature, suggesting that pastoralism was an activity that included both types of animals. The *Sus* at Swifterbant remain difficult to interpret in terms of wild or domestic: both the isotopes and the aDNA are highly variable. These patterns might suggest a palimpsest of different human-pig relations or individual pig life histories, or both. Cereal cultivation is attested from the same time onwards.

The start of the Neolithic in the Dutch wetlands can now clearly be interpreted as a Short Transition Model, where both animal husbandry and cereal cultivation should not be interpreted as sort of 'play farming' (Graeber and Wengrow 2021, 266–273). The pastoralism of cattle and sheep/goat, and the abundance of evidence for cereal cultivation, imply mobility strategies and knowledge exchange that go beyond incidental subsistence

activities as envisaged in the use of the term 'extended broad spectrum economy' to describe these communities at Swifterbant (Louwe Kooijmans 1993). These were not hunter-gatherers with farming carried out on the side, but wetland farmers.

The impression is that this new type of Neolithic Package is rather similar to that of the Early Neolithic Funnel Beaker Culture in terms of subsistence data (Sørensen and Karg 2014 for Denmark; Demirci 2021, chapter 6 for a comparison between the two regions). For the same time and place, Swifterbant S3 yielded ceramic vessels that fall within the morphological and technological range of Early Neolithic Funnel Beaker Culture ceramics in Denmark and northern Germany (Raemaekers 2015; Demirci *et al.* 2022 for an inter-regional comparison), but predate these by some two centuries. This raises the question of the role played by the Swifterbant communities in the transition to farming in northern Europe.

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