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Traces Left by Ards and a Mouldboard Plough in the Prehistory of the Netherlands, especially in its Western Coastal Areas

Abstract

Over and again, arable land in the coastal areas of the western Netherlands was smothered by sand drift. The buried fields provide a unique insight into the way they were tilled. Tilling tools leave traces in the soil which appear during excavations. The study of these traces shows that more than one type of tool was in use during the last centuries BCE. The tools comprise several types of ard and a mouldboard plough. The latter was used in tilling the same soils as the ard and was a common implement far before the Middle Ages.

Keywords

The Netherlands / pre-Roman Iron Age / agriculture / tilling tools / buried fields

Tilling soils is an indispensable activity of almost all crop-producing societies. However, the traces left by this farming practice in the past are far from common. The reason is obvious: on most terrains tilling was and is repeated over and again, one century after another, and each tillage erases the traces of previous work. Traces of tilling are preserved when they get covered by a layer of sediment. This can be an artificial event such as the erection of a burial mound, or the coverage by a natural sedimentation process, such as sand drift. Even then, traces may go undetected. Fortunately, most arable soil is darker coloured than the original subsoil. If the tilling tool happens to cut deeper into the subsoil, the fill of its traces will stand out. Excavation will detect them in a horizon just under the bottom of the agricultural layer.

Early, rather simple, tools are the digging stick, the hoe and the spade[1]. These implements, held in the hands of people, are convenient in uneven and wooded areas. Their traces appear as holes. But on open land, where it is possible to work in straight lines, the furrow appears[2]. Furrows are created by ploughs, commonly drawn by animals. There are two main types of plough: one that only scratches the soil, and one that turns the soil. The first is known as scratch plough or ard, the second as mouldboard plough.

1 Haudricourt/Delamarre 1955, 26.

2 See for instance Bakels 2014.

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Most archaeologists look at the furrows in a horizontal plane, they record the lines, but leave it at that. In the case of furrows made by a mouldboard plough cross-sections might be made, but ard marks are seldom sectioned. Making cross-sections is not part of the regular procedure, although Danish archaeologists did so around 1950[3]. As H. Thrane[4] remarked: »descriptions and measurements of widths, distance between furrows, cross-sections through individual furrows etc. seem normally to be regarded as extravagances«. U. Tegtmeier[5] provided an overview of the few instances where such observations were made and published Neolithic and Bronze Age traces. In this contribution attention will be paid to cross-sections. The coastal areas of the Netherlands are very suitable for such an investigation as the burial of arable land often occurred, due to coastal sand drift. Over and again, fields were the victim of dune formation, and over and again, farmers have reclaimed the land.

Ploughs and the Traces they Leave in Cross-section

The scratch plough or ard is a longwise symmetrical instrument drawn by animals and leaves furrows in the topsoil. There is not just one type of ard. Although the tools must have been common in rural society, remains of the actual implements are rare. What is mainly known from excavations are the furrows. Most useful for the description of these traces is the classification proposed by F. Šach and refined by H. C. Dosedla[6]. F. Šach focused on the tip of the tool that works the soil and distinguished two main types: ards without and with a sole. The ard without a sole cuts its furrow with a pole (ard head), often strengthened at its tip by a share, set at a relatively steep angle with the soil. It leaves a symmetrical trace with a V-shaped cross-section. The width of the share determines whether this V is narrow or wide (**fig. 1a**). The ard with a sole cuts its furrow with a horizontally placed pole with a share. Its traces lack the V of the other type, but are wider with a rounded, or in rare cases even squarish, bottom (**fig. 1b**). This ard can be provided with wings: two boards which diverge away from the share. The wings push the loosened soil sidewards, and the result are traces with a wavy cross-section (**fig. 1c**).

A longwise asymmetrical tool is the plough-ard[7], which is essentially a winged ard in which one of the wings is abandoned. It pushes the soil to one side of the furrow but does not turn it. Its traces are asymmetrical rounded/wavy (**fig. 1d**). If the wing is able to topple the soil it is called a mouldboard plough and this implement is known as a true plough[8]. The cross-section of their furrows is quite different from that of furrows made by an ard (**fig. 1e**).

Obtaining Data from Excavations

For the study presented here, I asked archaeologists to document true cross-sections. Further data was obtained by studying a number of excavation reports.

Documenting traces is one thing, but dating them is another. Some arable soils contain matter that provide an age. This is the case when charcoal or sherds are incorporated in the soil. Such material was brought to the fields as manure, as part of household waste, a custom that has been widely documented[9]. However, this kind of matter may have already existed on the original surface and may have been mixed into the arable layer by tilling. In that case, the dates could be too old. Therefore, it should be ascertained that no earlier settlement was present on the terrain that was tilled afterwards. A second kind of date is provided when the fields can be brought into direct connection with farm buildings of known age. Unfortunately, this is not often the case, mostly due to the restricted size of the excavations. Excavations which cover an agricultural landscape are rare.

A third way is the position of the arable layer in the stack of sediments. As mentioned above, the fields are preserved through covering by younger sediments. In the coastal areas discussed here, repeated deposits of drifting sand covered arable fields

3 Ørsnes-Christensen 1952; Kjærum 1954.

4 Thrane 1989.

5 Tegtmeier 1993.

6 Dosedla 1984.

7 F. Šach in: Dosedla 1984.

8 Haudricourt/Delamarre 1955, 332.

9 Wilkinson 1982; Bintliff/Snodgrass 1988; Bakels 2018.

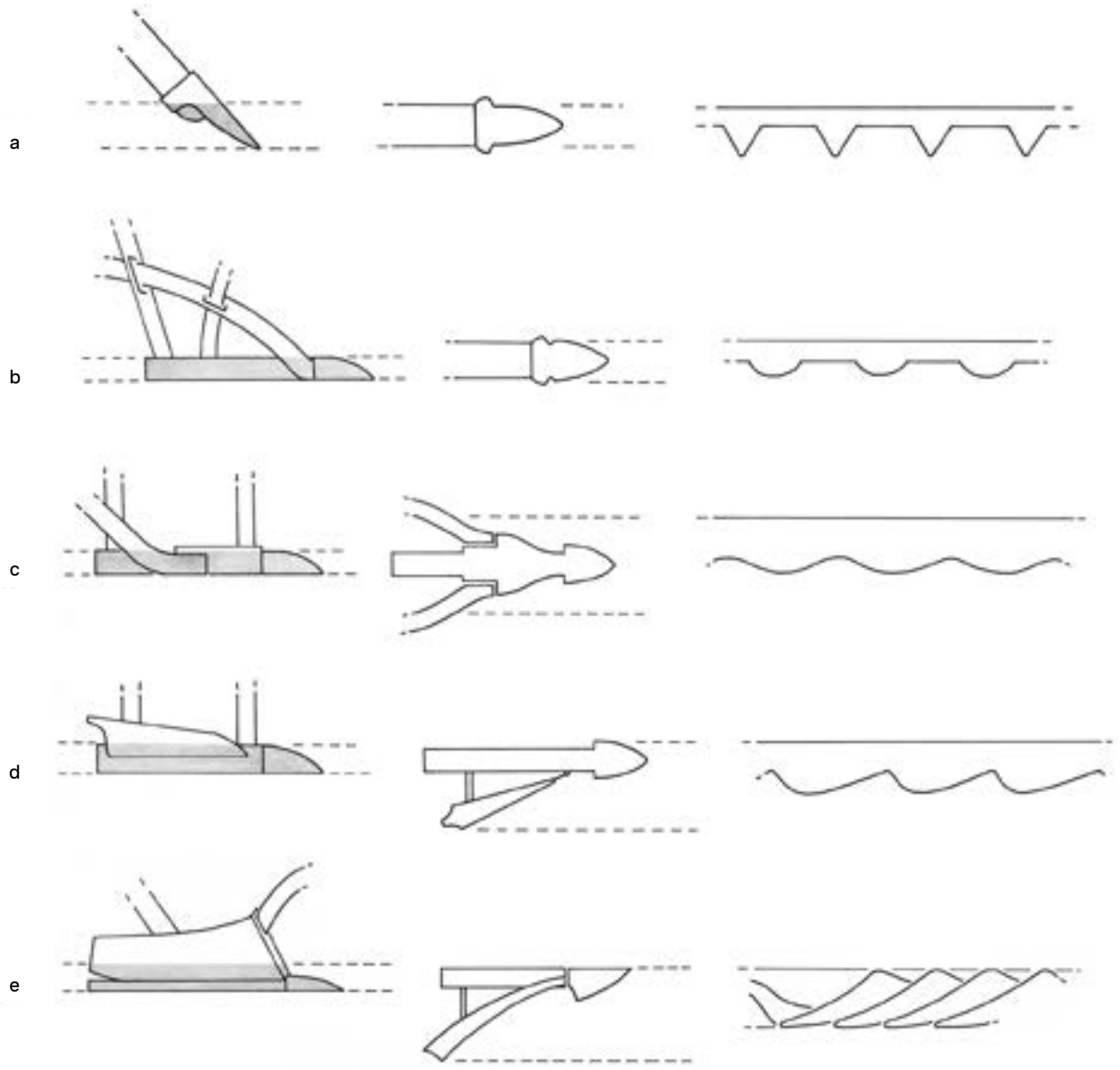

Fig. 1 Examples of furrow-making tools; depicted are the parts that enter the soil, seen from the side and above, the limits of their reach (shaded areas and dashed lines), and the cross-section of their trace: **a** ard without a sole. – **b** ard with a sole. – **c** winged ard. – **d** plough-ard. – **e** mouldboard plough. – (Drawings R. Timmermans after F. Šach in: Dosedla 1984; Haudricourt/Delamarre 1955).

over and again. The sand covered also settled areas which can be dated. In this way, entire horizons are provided with a date. Indirectly, arable fields are dated in this way. For instance, a field that is topped by sand that is underlying a Roman Age horizon, and that covers a Middle Iron Age horizon, must have a date in between. If the same horizon reveals a datable settlement elsewhere, the date becomes more secure. This is how many of the arable soils are provided with a date. Another method might have been OSL-dating of the sand, but this has not yet been tried.

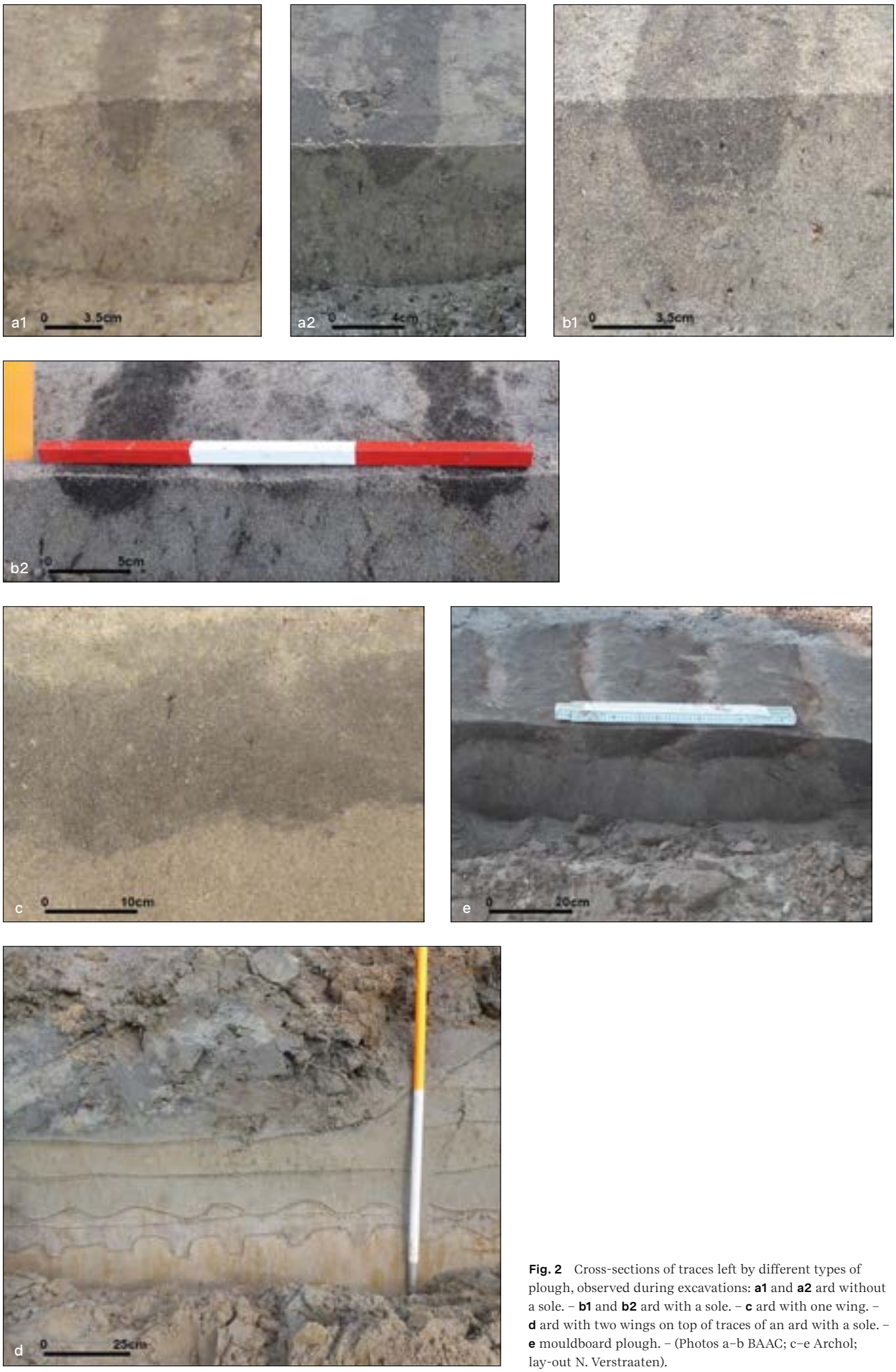

Fig. 2 Cross-sections of traces left by different types of plough, observed during excavations: **a1** and **a2** ard without a sole. – **b1** and **b2** ard with a sole. – **c** ard with one wing. – **d** ard with two wings on top of traces of an ard with a sole. – **e** mouldboard plough. – (Photos a–b BAAC; c–e Archol; lay-out N. Verstraaten).

Results

Traces of tilling with a hoe with a wide blade have been noticed in an Early Neolithic context, ca. 4200 BCE[10]. From the second half of the Middle Neolithic, 3400 BCE, the ard seems to have been the preferred tool. At that time, arable fields were cleared of trees and their stumps, which allowed working in straight lines[11]. As far as could be documented, the tool in question was the type without a sole. Cross-sections reveal, however, differences in the width of the shares (**fig. 2a1-a2**). From 500 BCE onwards, that is during the Middle Iron Age, more variation in the marks left by tilling tools is observed. Traces of ards with a sole are documented and, interestingly, they were used on the same complex of arable fields, witness, for instance, the site Noordwijk Offem-Zuid (prov. Zuid-Holland/NL) where I observed traces of ards with and without a sole in the same agricultural and time horizon[12]. It looks as if the farmers used both types of ard. The reason for it can only be guessed at, but it seems plausible that one type was preferred for opening up the soil after years of fallow, and another for working soil ready for tillage. Also, different crops might have asked for different ways of ploughing. Arable land with wavy traces of tilling are also observed (**fig. 2c-d**). It is often difficult to determine whether they are the result of an ard with two wings or one wing. A series of slightly asymmetrical traces from Heiloo (prov. Noord-Holland/NL) suggests a tool with one wing only (**fig. 2c**). More observations are certainly needed. In the site Katwijk Klei-Oost (prov. Zuid-Holland/NL) the field tilled with a winged ard was situated on top of a field tilled with a non-winged ard, with a layer of drift sand in between (**fig. 2d**)[13].

Next to the ard marks traces left by a mouldboard plough turn up. The tool left neat rows of furrows, but the turning of the sod was not yet as neat as achieved by modern mouldboard ploughs (**fig. 2e**). Traces of sod-turning ploughing are reported from several sites (**tab. 1; fig. 3**). The list suggests a dominance in the area in and around the city of The Hague (Den Haag; prov. Zuid-Holland/NL), but that is due to the fact that in this city many excavations took place. The mouldboard plough did not replace the ard. An overview of the traces reported from The Hague shows that from ca. 300 BCE both tools were in use to till the soil[14]. Moreover, in Den Haag-Churchillplein the arable horizon showed traces of both tilling with a spade and a mouldboard plough[15]. It seems that the local farmers could choose between different tools to till their land. Nevertheless, in cases where stacks of arable layers were found with drift sand between them, the arable land with mouldboard ploughing is always the top one[16].

Remains of the Tools

Remains of the actual tools, dating from the period considered here, are rare. They were made of wood, and wooden implements do not survive in the Netherlands and comparable countries unless they end up, intentionally or not, in wet, anaerobic, environments such as bogs and wells. And even then, if only parts are preserved, they may be classified as »worked wood«. The only other material associated with the tools is iron, but this metal can be recycled, and if not, it is apt to rust and fall apart. Iron parts comprise a sheath of the share tip and the coulter. The coulter is a knife, set vertically in the wooden beam of the tool, and precedes the share. It cuts the soil vertically, after which the share cuts the soil horizontally. Both ards and mouldboard ploughs can be fitted with a coulter[17]. Coulters do not leave traces in the soil, and that is the reason they have not been mentioned in this contribution before.

P. V. Glob[18] and after him U. Tegtmeier[19] provide an overview of the ard types discovered in northwest European contexts. Both ards without and with a sole are present. A well-known example of the first

10 Ramaekers 2016, 18.

11 Bakels 2014.

12 Excavation by Archol, personal observation.

13 Source Archol.

14 Lenoir 2014.

15 Rieffe 2011.

16 The dates mentioned in **tab. 1** are based on the connection with farm buildings of known age or the position of the arable in the stack of sediment. Only Monster 't Geestje is provided with a ^{14}C date: 2160 ± 50 BP (GrN-17131) calibrated with OxCal 4.4, 95.4 % probability, result 362-88 calBC (89.4 %), 82-53 calBC (6.0 %).

17 Haudricourt/Delamarre 1955.

18 Glob 1951.

19 Tegtmeier 1993.

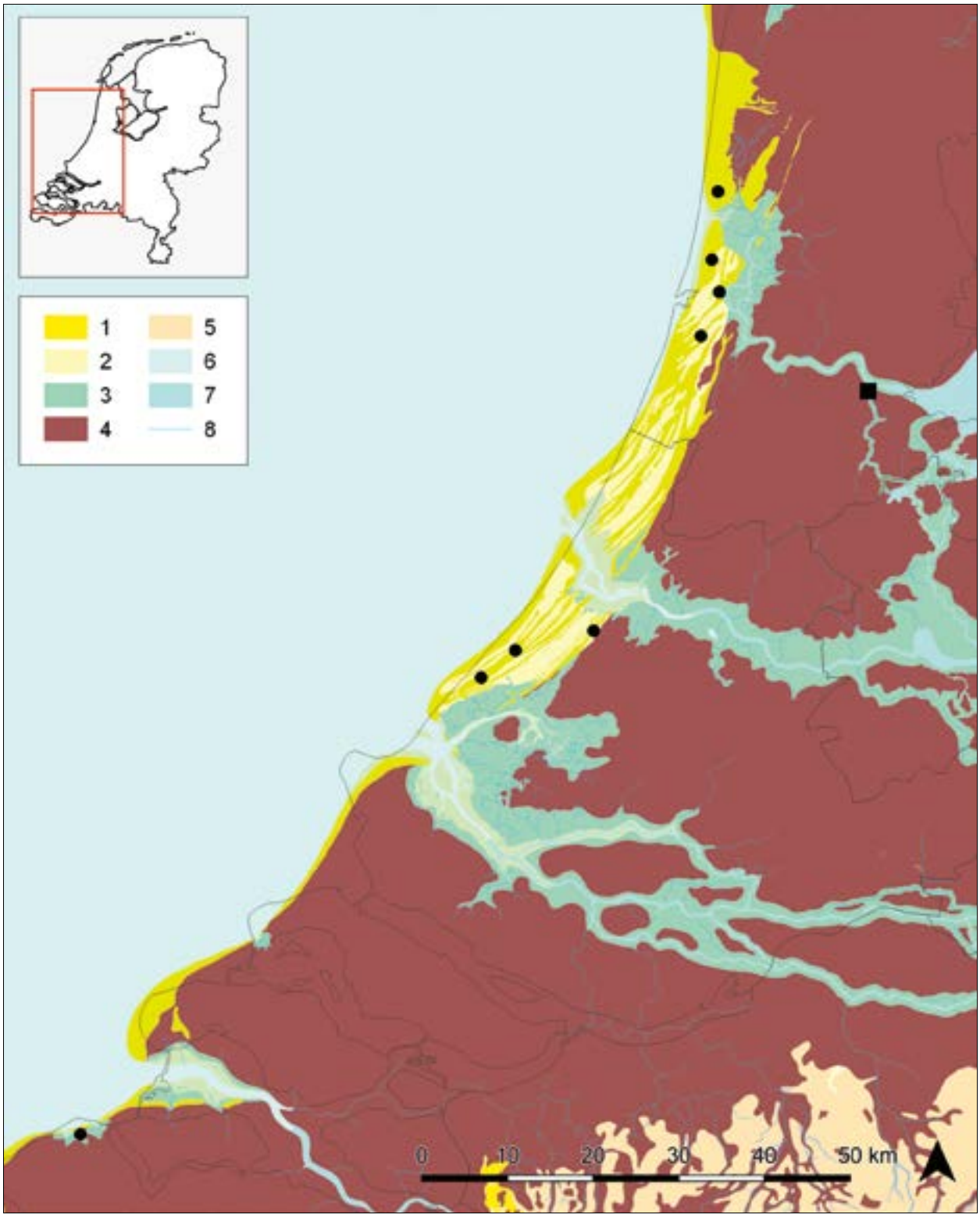

Fig. 3 Palaeogeographical map of the western part of the Netherlands, 250 BCE. Legend: **1** sandy ridge/low dune; **2** sandy flat between ridges; **3** river plain or salt marsh; **4** peat; **5** Pleistocene sand; **6** sea; **7** lake; **8** rivers and rivulets; ● sites with traces of a mouldboard plough; ■ present-day Amsterdam; thin black lines indicate the present-day geography. – (Source of the palaeogeography Rijksdienst voor het Cutureel Erfgoed, TNO and Deltares; map N. Verstraaten).

location	date	soil type	ref.
Den Haag-Madepolderweg 53	800-500 BCE	sand	1
Castricum	400 BCE	sand	2
Monster 't Geestje 1	362-88 (89.4 %) - 82-53 (6.0 %) calBCE	sand	3
Santpoort-Hagelingenweg 25A	300-200 BCE	sand	4
Velsen-Hoogovens	300-200 BCE	sand	5
Den Haag-Meer en Bos 2	200-100 BCE	sand	6
Den Haag-Monsterseweg 194 (Landgoed Ockenrode)	100-12 BCE	sand	7
Den Haag-Houtrust	100-12 BCE	sand	8
Den Haag-Congresgebouw/Statenhal	200-12 BCE	sand	9
Den Haag-Ockenburg	250-12 BCE	sand	10
Velsen-Broekerwerf	250-12 BCE	sand	11
Den Haag-Ockenburg	probably 250-12 BCE	sand	12
Den Haag-Kwartellaan	500-250 BCE or 250-12 BCE	sand	13
Den Haag-Churchillplein	800-12 BCE but most likely 250-12 BCE	sand	14
Serooskerke	350-12 BCE	clay	15
Velsen-Velserbroekpolder	500-12 BCE	sand	16
Voorschoten	500-12 BCE	sand	17
Den Haag-Vogelwijk	800-12 BCE	sand	18
Den Haag-gasleiding Monster-Gaag, Monster	250 BCE - 100 CE	sand	19
Den Haag-gasleiding Monster-Gaag, Den Haag	250 BCE - 100 CE	sand	20
Egmond-Binnen	250 BCE - 100 CE	sand	21
Velsen-hoogoventerrein	100 BCE - 100 CE	sand	22

Tab. 1 Traces of a mouldboard plough: location, date and the type of tilled sediment; the numbers in the last column refer to the list of references. Only no. 3 is provided with a ^{14}C date (see note 16), the others are dated in the way described in the text.

References:

1 Den Haag, Madepolderweg 53. Transect-rapport 1191, 2017, 15 and 29.
2 A. J. van Loon, Duingebied bij Castricum herbergt innovatieve ploegsporen uit de IJzertijd. NGV-Geonieuws 26, 2015, artikel 238.
3 van Heeringen 1992, 12: site catalogue 30-West-11, Monster 't Geestje 1.
4 van Heeringen 1992, 71: site catalogue 25-West-3, Santpoort-Hagelingenweg 25A.
5 van Heeringen 1992, 75: site catalogue 25-West-10, Velsen-Hoogovens.
6 van Heeringen 1992, 14–15: site catalogue 30-West-17, Den Haag-Meer en Bos.
7 Afdeling Archeologie, dienst stadsbeheer 2012. Monsterseweg 194 (Landgoed Ockenrode). Haagse Arch. Rapportage 1219, 2012, 11.
8 E. Bulten, Den Haag-Houtrust. Arch. Kroniek Holland 2003, 79–80.
9 L. Meurkens / T. Hamburg, Prehistorische bewoning op het World Forum gebied – Den Haag. Archol Rapport 83, 2007, 17.
10 E. Jakobs / M. M. van Veen / J. A. Waasdorp, 'S-Gravenhage: Ockenburg. Arch. Kroniek Zuid-Holland 1993, 423.
11 W. J. Bosman, Velsen-Broekerwerf. Arch. Kroniek Noord-Holland 1988, 289.
12 Afdeling Archeologie, dienst stadsbeheer 2014. Ockenburg. Gemeente Den Haag. Haagse Arch. Rapportage 1409, 2014, 17.
13 Afdeling Archeologie, dienst stadsbeheer 2012. Den Haag-Kwartellaan-noord. Gemeente Den Haag. Haagse Arch. Rapportage 1133, 2014, 16.
14 Afdeling Archeologie, dienst stadsbeheer 2011. Den Haag-Churchillplein. Gemeente Den Haag. Haagse Arch. Rapportage 1123, 2014, 10.
15 Dijkstra/Zuidhoff 2011.
16 van Heeringen 1992, 236 note 210: Velsen-Velserbroekpolder.
17 Personal observation 2022.
18 Afdeling Archeologie, dienst stadsbeheer 2018. Den Haag-Vogelwijk. Gemeente Den Haag. Haagse Arch. Rapportage 1803, 2018, 16.
19 P. W. van den Broeke / J. K.-A. Hagers, Den Haag-gasleiding Monster-Gaag, Monster. Haagse Oudheidkde. Publ. 1, 1994, 55
20 P. W. van den Broeke / J. K.-A. Hagers, Den Haag-gasleiding Monster-Gaag, Monster. Haagse Oudheidkde. Publ. 1, 1994, 58.
21 M. van Raaij, Egmond-Binnen. Arch. Kroniek Noord-Holland 1993, 398.
22 R. M. van Heeringen / H. M. van der Velde, Struinen door de duinen. Nederlandse Arch. Rapporten 52, 2017, 134.

type is the Donneruplund ard (Vejle Kommune/DK), and of the second type the ard found in Walle (Lkr. Celle/DE)[20]. Finds of more or less complete tools lack in the Netherlands, and only nine or ten shares and one iron sheathing of a share tip are reported[21]. All have an Iron Age date, between 800 and 12 BCE. The shares have the shape of an arrow and are made of oak. The shaft is rectangular in section and the blade is flat on one side and convex on the other. The maximum width of the blades varies from 5.0 to 11.5 cm. The best preserved tool has longitudinal grooves on the flat side, 1 cm wide and 0.5 cm deep. They are thought to have been used to attach a flanged iron sheath[22]. The only sheath found is indeed of the flanged type[23]. The tools are quite symmetrical and also traces of wear on the points suggest, as far as could be ascertained, that they were part of an ard. Prehistoric coulters have not yet been found, which is unfortunate, because a certain type of coulter is connected with mouldboard ploughs[24].

Traces of Ploughing in Adjacent, Comparable, Regions

Reports on traces of ploughing are found in the coastal areas of Belgium, Germany and Denmark, regions with a similar history of repeated sand drift and other kinds of burial. Furrows left by an ard are quite common if the right circumstances are present, but, as mentioned above, cross-sections are hardly made. U. Tegtmeier[25] found a few. She noted three kinds of marks: a V form, an U form and a slanting triangle. According to me the slanting triangle is the mark of an ard without a sole tilted to one side; if kept upright, it would have left a V. Indeed, she found the V and the slanting triangle side by side in the same section of a series of marks. Clear instances of other kinds of marks left by ards are not mentioned. Reports on mouldboard ploughs with a date in prehistory, that is before the arrival of the Romans north of the Alps, are few in number. Th. B. Anderson et al.[26] provide an overview of the introduction of the mouldboard plough but focus on its breakthrough in the Medieval period. Only one instance is mentioned with a date BCE: Feddersen Wierde, a site in the salt-marsh of northwestern Germany (Lkr. Cuxhaven/DE). J. Nicolay and H. Huisman[27] presented two sites in the salt-marsh of the northern Netherlands (both prov. Friesland/NL): Jelsum ($5^{th}-3^{rd}$ century BCE) and Dronrijp ($5^{th}-2^{nd}$ century BCE). J. Henning[28] looked for remains of the tools. His research takes the introduction of the mouldboard plough back to the Roman period, but earlier finds are absent.

Discussion and Conclusion

Traces of tilling preserved by sand drift in the coastal areas of the Netherlands reveal the existence of several kinds of plough. The ard without a sole seems to have been the common tool during the (Late) Neolithic and Bronze Age. Nevertheless, it is quite feasible that the ard with a sole was known as well, as this implement was present, witness the tool itself and its marks in adjacent regions. More observations of cross-sections are certainly needed.

Anyhow, the excavations reveal that in the Middle and Late Iron Age, at least from 300 BCE onwards, several types of ard were in use, including ards with two wings and one wing. And the most striking observation is the appearance of the mouldboard plough. Traces from this tool are far from rare (**tab. 1; fig. 3**). Although F. G. Payne[29] wrote that a mouldboard plough was already in use in Britain in Romano-British times, most literature attributes the common use of the mouldboard plough to the Middle Ages[30]. J. Henning[31] came to an earlier date, the Roman period. The observations made in the Netherlands give occasion to revise this general opinion.

20 See for more examples Tegtmeier 1993.

21 van der Poel 1960-1961; Lanting/van der Plicht 2005/2006, 329; Kranendonk et al. 2006, 611-613; Lange 2017.

22 Kranendonk et al. 2006, 612.

23 Modderman 1960-1961.

24 Henning 2009.

25 Tegtmeier 1993.

26 Anderson et al. 2014.

27 Nicolay/Huisman 2022.

28 Henning 2009.

29 Payne 1957.

30 Anderson et al. 2014.

31 Henning 2009.

The tool may have been developed out of a winged ard, but this has yet to be proven.

In the current literature, the introduction of the mouldboard is linked-up with working soils that were formerly avoided, i. e. clay and other difficult-to-till soils[32]. This does not seem to be the case. In only one instance, mouldboard traces are reported from a clayish soil, at Serooskerke (prov. Zeeland/NL)[33]. In all other cases, the soil was sandy and cultivated by ard in earlier periods (**tab. 1**). Nevertheless, its suitability for tilling heavy loamy or clayish soils may have triggered its further development into the tool it became in historical times.

The conclusion is that in the last centuries BCE farmers used more than one type of implement to till their fields and that some of them may be regarded as innovations. But more research is certainly needed.

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Bibliography

Anderson et al. 2014: Th. B. Anderson / P. S. Jensen / Ch. V. Skovsgaard, The Heavy Plough and the Agricultural Revolution in Medieval Europe. EHES Working Papers Economic Hist. 70, 2014. https://ehes.org/wp/EHES_70.pdf (1.7.2024).

Bakels 2014: C. Bakels, The First Farmers of the Northwest European Plain: Some Remarks on Their Crops, Crop Cultivation and Impact on the Environment. Journal Arch. Scien. 51, 2014, 94–97. DOI: 10.1016/j.jas.2012.08.046.

2018: C. Bakels, Maintaining Fertility of Bronze Age Arable Land in the Northwest Netherlands. Analecta Praehist. Leidensia 49, 2018, 65–76.

Bintliff/Snodgrass 1988: J. Bintliff / A. Snodgrass, Off-site Pottery Distributions: A Regional and Interregional Perspective. Current Anthr. 29(3), 1988, 506–513. www.jstor.org/stable/2743472.

Dijkstra/Zuidhoff 2011: J. Dijkstra / F. S. Zuidhoff (eds), Kansen op de kwelder. Archeologisch onderzoek op en rond negen vindplaatsen in het nieuwe tracé van de Rijksweg 57 en de nieuwe rondweg ter hoogte van Serooskerke (Walcheren). ADC Monogr. 10 (Amersfoort 2011).

Dosedla 1984: H. C. Dosedla, František Šach's Contribution towards Research on Pre-industrial Tilling Implements in Austria. Tools & Tillage 5, 1984, 43–57. DOI: 10.11588/diglit.49002#0045.

Glob 1951: P. V. Glob, Ard og plov i Nordens oldtid. Jysk Ark. Selskab Skr. 1 (Aarhus 1951).

Hägermann 1991: D. Hägermann, Technik im frühen Mittelalter zwischen 500 und 1000: Übernahmen und Neuerungen im Agrarbereich. In: D. Hägermann / W. König, Propyläen Technikgeschichte. 1: Landbau und Handwerk: 750 v. Chr. bis 1000 n. Chr. (Berlin 1991) 380–407.

Haudricourt/Delamarre 1955: A. G. Haudricourt / M. J.-B. Delamarre, L'homme et la charrue à travers le monde. Géogr. Hum. 25 (Paris 1955).

van Heeringen 1992: R. M. van Heeringen, The Iron Age in the Western Netherlands [Diss. Univ. Amsterdam] (Amersfoort 1992).

Henning 2009: J. Henning, Revolution or Relapse? Technology, Agriculture and Early Medieval Archaeology in Germanic Central Europe. In: G. Ausenda / P. Delogu / Ch. Wickham (eds), The Langobards before the Frankish Conquest: an Ethnographic Perspective. Stud. Hist. Archaeoethnol. 8 (Woodbridge 2009) 149–173.

Kjærum 1954: P. Kjærum, Striber på kryds og tværs. Om plovfurer under en jysk stenalderhøj [Summary: Criss-cross Furrows. Plough Furrows under a Stone Age-barrow in Jutland]. Kuml 1954, 18–28. DOI: 10.7146/kuml.v4i4.97142.

Kranendonk et al. 2006: P. Kranendonk / P. van der Kroft / J. J. Lanzing / B. H. F. M. Meijlink (eds), Witte vlekken ingekleurd, archeologie in het tracé van de HSL Zuid. Deel 2 – Catalogi en bijlagen. Rapportage Arch. Monumentenzorg = ErfgoedStud. Breda 3 (Amersfoort 2006) 595–621.

32 Pryor 1985; Hägermann 1991; Anderson et al. 2014.

33 Dijkstra/Zuidhoff 2011.

Lange 2017: S. Lange, Uit het juiste hout gesneden. Houten gebruiksvoorwerp uit archeologische context tot 1300 n. Chr. Nederlandse Arch. Rapporten 54 (Amersfoort 2017). www.cultureelerfgoed.nl/binaries/cultureelerfgoed/documenten/publicaties/2017/01/01/uit-het-juiste-hout-gesneden/NAR054_Uit_het_juiste_hout_gesneden_webA.pdf (8.7.2024).

Lanting/van der Plicht 2005/2006: J. N. Lanting / J. van der Plicht, De 14C-chronologie van de Nederlandse pre- en protohistorie, IV: bronstijd en vroege ijzertijd. Palaeohistoria 47/48, 2005/2006, 241–427. https://ugp.rug.nl/Palaeohistoria/article/view/25145/22599 (8.7.2024).

Lenoir 2014: M. L. Lenoir, Gegraven greppels in de duinen. Uitwerking opgraving Juliana Kinderziekenhuis en onderzoek naar ijzertijdsites in de Vogelwijk te Den Haag [BA scriptie, Hogeschool Saxion te Deventer 2014].

Modderman 1960-1961: P. J. R. Modderman, De Spanjaardsberg: voor- en vroeghistorische boerenbedrijven te Santpoort. Ber. ROB 10–11, 1960–1961, 210–251.

Nicolay/Huisman 2022: J. Nicolay / H. Huisman, Ploughing the Salt Marsh. Cultivated Horizons and Their Relation to the Chronology and Techniques of Ploughing. In: J. Nicolay / M. Schepers (eds), Embracing the Salt Marsh. Foraging, Farming and Food Preparation in the Dutch-German Coastal Area up to AD 1600; Studies in Honour of Annet Nieuwhof. Groningen Arch. Stud. 42 (Groningen 2022) 55–75.

Ørsnes-Christensen 1952: M. Ørsnes-Christensen, En gravhøj i Sevel Sogn [Summary: A Burial Mound in Sevel Parish]. Kuml 1952, 9–31. DOI: 10.7146/kuml.v2i2.24894.

Payne 1957: F. G. Payne, The British Plough: Some Stages in Its Development. Agricultural Hist. Rev. 5(2), 1957, 74–84. www.jstor.org/stable/40272824.

van der Poel 1960-1961: J. M. G. van der Poel, De landbouw in het verste verleden. Ber. ROB 10–11, 1960–1961, 125–194.

Pryor 1985: F. L. Pryor, The Invention of the Plow. Comperative Stud. Soc. and Hist. 27(4), 1985, 727–743. DOI: 10.1017/s0010417500011749.

Ramaekers 2016: D. Ramaekers, De Swifterbantcultuur. Een onzichtbare wereld op de kaart gezet. In: A. F. L. van Holk / A. W. Prummel / J. P. de Roever (eds), Swifterbant. Pionieren in Flevoland 6500 jaar geleden (Groningen 2016) 23–34.

Rieffe 2011: E. C. Rieffe, Willem Lodewijklaan-Eurojust, Gemeente Den Haag. Haagse Archeologische Rapportage 1123, 2011.

Tegtmeier 1993: U. Tegtmeier, Neolithische und bronzezeitliche Pflugspuren in Norddeutschland und den Niederlanden. Arch. Ber. 3 (Bonn 1993).

Thrane 1989: H. Thrane, Danish Plough-marks from the Neolithic and Bronze Age. Journal Danish Arch. 8, 1989, 111–125. https://tidsskrift.dk/jda/article/download/127404/173686/268968 (8.7.2024).

Wilkinson 1982: T. J. Wilkinson, The Definition of Ancient Manured Zones by Means of Extensive Sherd-sampling Techniques. Journal Field Arch. 9, 1982, 323–333. DOI: 10.1179/009346982791504616.

Zusammenfassung
Résumé

Spuren, die Hakenpflüge und ein Beetpflug in der Vorgeschichte der Niederlande, insbesondere in den westlichen Küstengebieten, hinterlassen haben

Immer wieder wurde das Ackerland in den Küstengebieten der westlichen Niederlande von Sandverwehungen völlig bedeckt. Die begrabenen Felder bieten einen einzigartigen Einblick in die Art und Weise, wie sie bestellt wurden. Bodenbearbeitungswerkzeuge hinterlassen Spuren im Boden, die bei Ausgrabungen ans Licht kommen. Die Untersuchung dieser Spuren zeigt, dass in den letzten Jahrhunderten v. Chr. mehr als eine Art von Werkzeug verwendet wurde. Die Werkzeuge bestehen aus verschiedenen Arten von Hakenpflügen und einem Beetpflug. Letzterer wurde zum Bestellen der gleichen Böden wie der Hakenpflug verwendet und war schon lange vor dem Mittelalter ein verbreitetes Gerät.

Traces laissées par araires et une charrue à versoir dans la préhistoire des Pays-Bas, en particulier dans ses parties côtières occidentales

À maintes reprises, les terres arables des parties côtières des Pays-Bas occidentaux ont été enfouies par des sables mouvants. Les champs enterrés fournissent des informations sur la façon dont ils ont été labourés. Les outils de labour laissent des traces dans le sol qui apparaissent lors des fouilles. L'étude de ces traces montre qu'au cours des derniers siècles avant notre ère, plus d'un type d'outil était utilisé. L'outillage comprend plusieurs types de l'araire et une charrue. Cette dernière était utilisée pour labourer les mêmes sols que l'araire et était un outil courant bien avant le Moyen Âge.

Schlüsselwörter
Mots-clés

Niederlande / Vorrömische Eisenzeit / Ackerbau / Pflüge / begrabene Felder
Pays-Bas / Âge du Fer préromain / agriculture / araire et charrue / sols enfouis