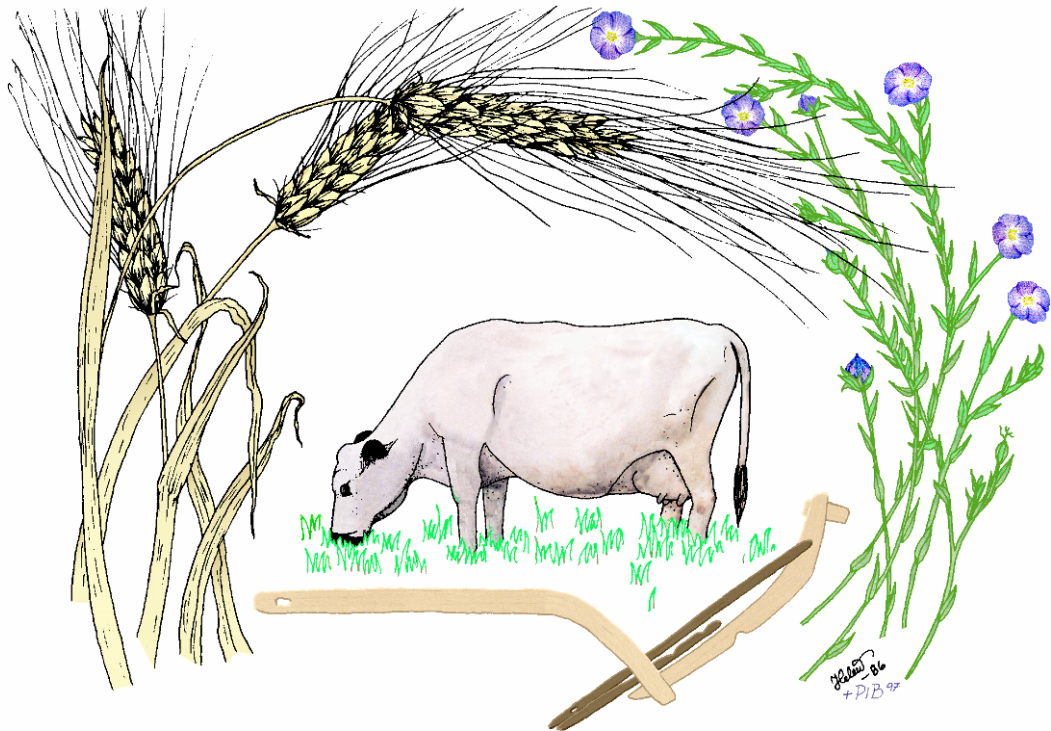


MILJÖARKEOLOGISKA LABORORIET

RAPPORT nr. 2023-045



Supplementary soil analyses to the
micromorphology samples from E18
Lanner-Preståsen, Porsgrunn kommune,
Vestfold and Telemark county, Norway.

Philip Jerand & Samuel Eriksson

INSTITUTIONEN FÖR IDÉ – OCH SAMHÄLLSSTUDIER



Supplementary soil analyses to the micromorphology samples from E18 Lanner-Preståsen, Porsgrunn kommune, Vestfold and Telemark county, Norway.

Philip Jerand & Samuel Eriksson

Project: E18 Lanner-Preståsen; Porsgrunn, Vestfold and Telemark

Project code: 101290

Projects subject number: 2020/536

Invoice number: E600024363

Introduction

The samples derive from Neolithic and Bronze Age cultivation layers.

This is a supplementary analysis to the micromorphology conducted by Dr Richard I Macphail at University College London.

All samples have been provided by John A. M. Havstein and Steinar Solheim, Kulturhistorisk museum, Universitetet i Oslo.

Sample treatment

Geochemistry

Prior to all analyses all samples were dried at 30°C. Samples were then passed through a 1.25 mm sieve and any presence of material of cultural significance noted (such as bone, charred material, ceramics etc.). The chemical methods employed here are the same as those used in Swedish soil chemical studies following the methodological approach of Engelmark and Linderholm (1996 and 2008). The parameters analysed and abbreviations used are explained in table 1.

Table 1. Geoarchaeological methods and abbreviations as used in this report.

Abbreviation	Method	Description
MS_{lf}	Magnetic Susceptibility	Magnetic susceptibility measured on 10g of soil, with a Bartington MS3 system with an MS2B probe (Dearing 1994). Data are reported as SI-units per ten grams of soil, (corresponding to X_{lf} , $10^{-8} \text{ m}^3 \text{ kg}^{-1}$) (Thompson & Oldfield 1986).
MS550	Magnetic Susceptibility after burning at 550°C	Magnetic susceptibility after 550° C ignition (units as above)
LOI (%)	Loss On Ignition	Soil organic matter, determined by loss on ignition at 550° C, in percent (Carter, 1993).
Cit-P	Inorganic phosphate content (mg P/kg dry matter, ppm)	Extraction with 2% citric acid (corresponding to the Arrhenius method (Arrhenius 1934))
Cit-POI	Total phosphate (mg P/kg dry matter, ppm) (inorganic & organic)	Extraction with 2% citric acid on ignited soil (Engelmark & Linderholm 2008)
P quota	Cit-POI/Cit-P	Ratio of inorganic & organic to inorganic phosphate

These methods have been developed and adapted for soil prospection and the bulk analysis of occupation soils and features. Analysed parameters comprise organic matter (loss on ignition [LOI, and pH], Carter 1993), two fractions of phosphate (inorganic [Cit-P], and sum of organic and inorganic [Cit-POI]) (Engelmark & Linderholm 2008, Linderholm 2007) and magnetic susceptibility (MS- χ_{lf} MS- χ_{hf}) and MS550- χ_{lf} (Crowther 1993, Linderholm 2007, Engelmark & Linderholm 2008). These analyses provide information on various aspects concerning phosphate, iron, red-ox potential and other magnetic components and total organic matter in soils and sediments, and their relationship to phosphate.

Results

Results from the various analyses are presented in table 1.

Table 1 analytical results

MALNo	FieldNo	FeatureNo	Northing	Easting	Z	MSlf	MS550lf	CitP (ppm)	CitPOI (ppm)	PQuota	LOI	MSQ
21 0040 001	4653	1100	6553287,4	540760,9	16,1	17	40	58,9	121,6	2,1	2,2	2,3
21 0040 002	4654	1100	6553287,4	540760,9	16,0	13	152	33,6	173,5	5,2	5,8	11,7
21 0040 003	4655	1100	6553287,4	540760,9	16,0	15	124	30,5	142,6	4,7	4,4	8,4
21 0040 004	4656	1100	6553287,4	540760,9	15,9	18	118	37,9	153,0	4,0	4,1	6,7
21 0040 005	4657	1100	6553287,3	540760,8	15,9	16	59	39,2	118,6	3,0	2,9	3,6
21 0040 006	4658	1100	6553287,4	540760,8	15,8	15	27	51,0	116,4	2,3	1,7	1,8
21 0040 007	4659	1100	6553287,3	540760,9	15,8	18	23	73,7	119,5	1,6	1,1	1,3
21 0040 008	5765	1561	6553286,6	540747,4	17,4	29	36	84,1	143,0	1,7	0,8	1,2
21 0040 009	5766	1561	6553286,6	540747,4	17,4	15	44	87,6	160,0	1,8	2,0	2,9
21 0040 010	5767	1561	6553286,6	540747,4	17,3	10	39	107,3	168,7	1,6	2,3	3,8
21 0040 011	5768	1561	6553286,6	540747,4	17,3	24	70	75,4	169,6	2,3	2,2	2,9
21 0040 012	5769	1561	6553286,6	540747,4	17,2	10	753	129,9	308,3	2,4	8,3	73,2
21 0040 013	5770	1561	6553286,6	540747,4	17,2	12	44	85,5	141,3	1,7	1,3	3,8
21 0040 014	5933	1711	6553286,5	540735,8	19,0	146	126	79,8	116,8	1,5	0,6	0,9
21 0040 015	5934	1711	6553286,5	540735,8	19,0	66	629	92,0	247,6	2,7	8,4	9,6
21 0040 016	5935	1711	6553286,5	540735,8	19,0	17	130	96,8	271,2	2,8	3,9	7,6
21 0040 017	5936	1711	6553286,4	540735,8	18,9	43	625	100,7	275,1	2,7	10,2	14,4
21 0040 018	5937	1711	6553286,4	540735,8	18,9	16	92	95,0	210,6	2,2	3,3	5,8
21 0040 019	5938	1711	6553286,5	540735,7	18,9	12	30	98,5	193,6	2,0	1,5	2,5
21 0040 020	5939	1711	6553286,4	540735,7	18,8	13	27	110,3	189,2	1,7	1,2	2,1

References

Arrhenius, O. 1934. Fosfathalten i skånska jordar. *Sveriges Geologiska Undersökningar*. Ser C, no 383. Årsbok 28, no 3.

Carter, M. R. 1993. *Soil Sampling and Methods of Analysis*. London.

Crowther, J. 2003. Potential Magnetic Susceptibility and Fractional Conversion Studies of Archaeological Soils and Sediments. *Archaeometry* 45, 685–701.

Dearing, J. 1994. *Environmental Magnetic Susceptibility*. Using the Bartington System. Bartington Instruments Ltd.

Engelmark, R., Linderholm, J., 1996. Prehistoric land management and cultivation: A soil chemical study, in: *6th Nordic Conference on the Application of Scientific Methods in Archaeology*. Esbjerg Museum, 315–322.

Engelmark, R. & Linderholm, J. 2008. *Miljöarkeologi: människa och landskap - en komplicerad dynamik*. Malmö: Malmö kulturmiljö.

Linderholm, J. 2007. Soil chemical surveying: a path to a deeper understanding of prehistoric sites and societies in Sweden. *Geoarchaeology* 22 (4), 417–438.

Thompson, R. & Oldfield, F. 1986. *Environmental Magnetism*. London: Allen & Unwin: Springer.



MAL
Miljöarkeologiska laboratoriet
Umeå Universitet
901 87 UMEÅ
090-786 50 00
<https://www.umu.se/mal/>
mal@umu.se