ARCHAEOLOGICAL FIELDWORK IN ESTONIA

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ARCHAEOLOGICAL INVESTIGATIONS OF LIME AND TAR PRODUCTION FACILITIES IN KURSI AND RANNU PARISHES

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INTRODUCTION

Two early and important advancements in the history of chemical technology are tar and lime. To address the production and use of these two substances, the research project 'Tar and Lime Production in Estonia during the prehistoric, medieval and modern times' is being carried out by Andres Tvauri and financed by the Estonian Science Foundation (grant no. 6690). The purpose of this project is to study tar and lime production sites. The secondary aim of the project is to serve as a basis for a further advancement in the research of production and industry as a whole. This topic has scarcely been dealt with in Estonian archaeology.

The project started in 2006. Fieldwork carried out that year is presented in an article by Tvauri and Saimre (2007). In 2007 and 2008 the work continued. Lime production sites were investigated in Kursi parish and tar production sites in the south of Rannu parish (Fig. 1).

FIELDWORK IN THE LIME PRODUCTION REGION IN KURSI PARISH

Lime has had a number of uses in plasters, mortars, lime wash, paints and agricultural soil additives. It was probably introduced in Estonia during the 13th century by German and Danish crusaders. The raw material for lime is limestone. Limestone bedrock outcrops occur naturally only in the northern, western and central regions of Estonia. Kursi parish is the southernmost area where abundant limestone can be found. Therefore it was an important source of lime for all of South-Estonia. During the 17th–18th centuries, the predominant force behind organising the production and usage of lime in Kursi parish was the town of Tartu (Kruus 1933).

Fieldwork during 2007–2008 included surveying the forested areas on the banks of the Kaave River and the Pedja River. A lot of limestone quarries and the remains of one limekiln remains were discovered. That brings the total count of limekiln discovered in 2006–2008 up to three.

The discovered limekiln remains (Fig. 2) are located on the eastern bank of the Kaave River, in a Soomaa property in Tammiku village. A detailed elevation map of the site was made using a total station (Fig. 3).

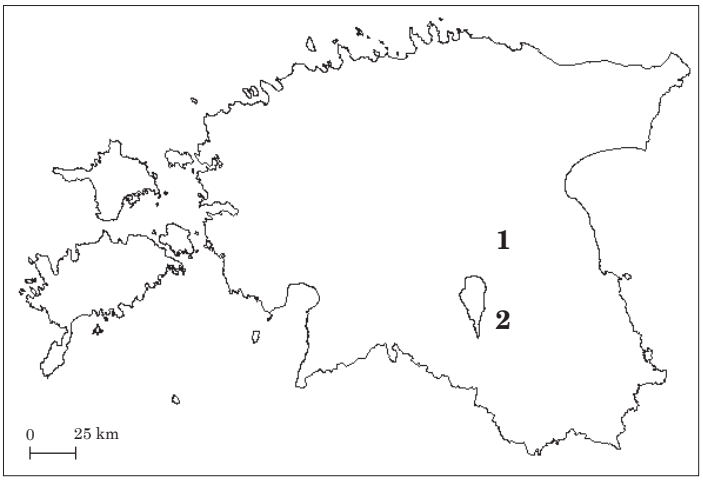

Fig. 1. The locations of research areas.
1 – Kursi parish
2 – southern part of Rannu parish.
Jn 1. Uurimispiirkondade paiknemine.
1 – Kursi kihelkond
2 – Rannu kihelkonna lõunaosa.
Drawing / Joonis: Tanel Saimre

Fig. 2. Limekiln in Tammiku village. View from the north.
Jn 2. Lubjaahi Tammiku külas. Vaade põhjast.
Photo / Foto: Tanel Saimre

Further excavations were carried out on a limekiln in Saduküla (Fig. 4), which was discovered and investigated already in 2006 (Tvauri & Saimre 2007). Previous excavations in 2006 did not reveal any charcoal, so the main objective was to find charcoal for dating purposes. Unfortunately, the search was unsuccessful again. A detailed elevation map of the kiln and surrounding limestone quarry was made of this site using a total station.

An elevation map was also made of the site of the previously known limekiln in Jõune village on the lands of the former Tolli farmstead (Figs. 5–6).

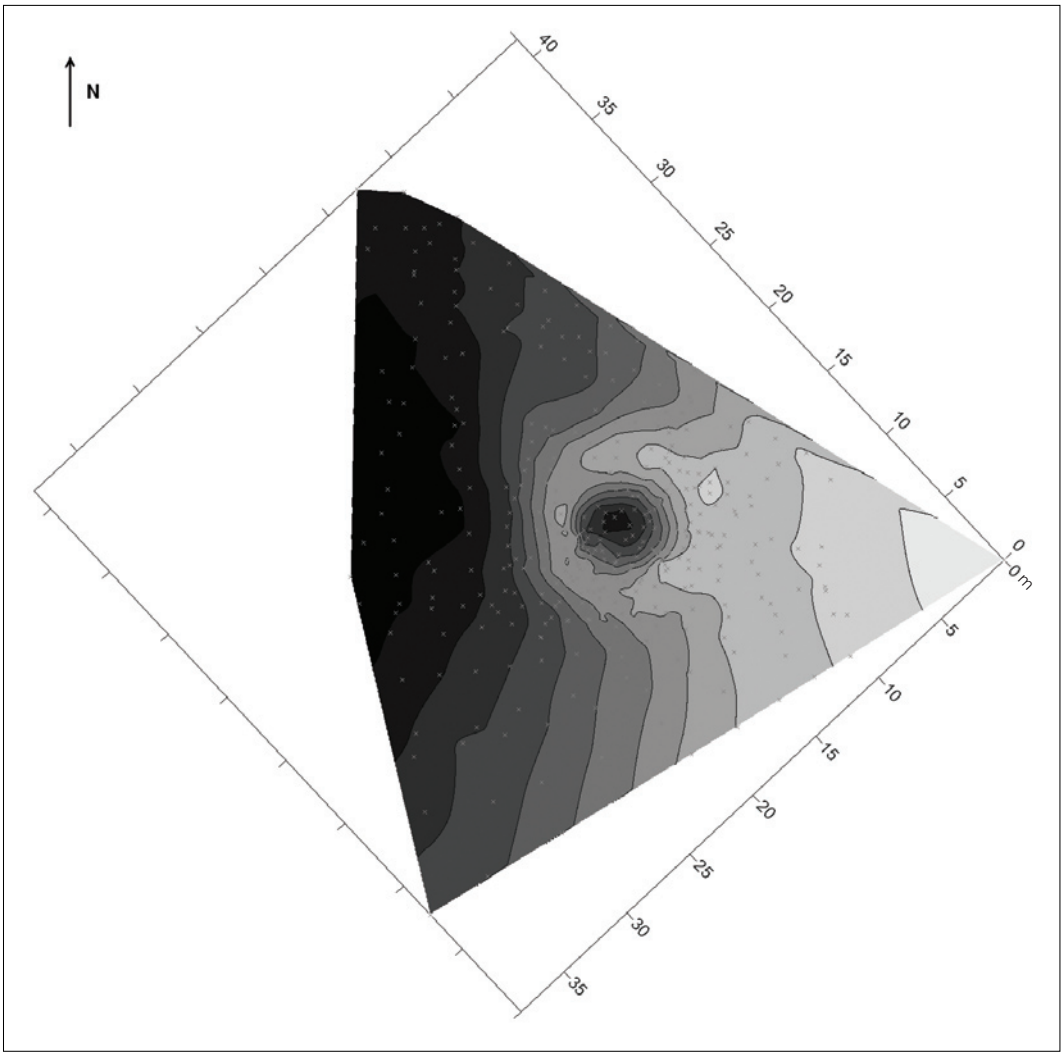

Fig. 3. Elevation map of the limekiln in Tammiku village, Soomaa lot.
Jn 3. Tammiku külas Soomaa kinnistul paikneva lubjaahju plaan.
Drawing / Joonis: Tanel Saimre

FIELDWORK ON THE TAR PRODUCTION SITES IN RANNU

Tar is probably the oldest man-made synthetic material. It has been produced and used extensively since the Stone Age as a gluing and waterproofing agent, for wood preservation, inflammable substance, lubricant, medicine, etc. There is no reason to believe that the situation was any different in Estonia. According to written sources there was an abundance of seaworthy ships in Estonia at the beginning of the Middle Ages, so the quantities of tar consumed here had to be significant. This tar was most probably produced locally as Estonia

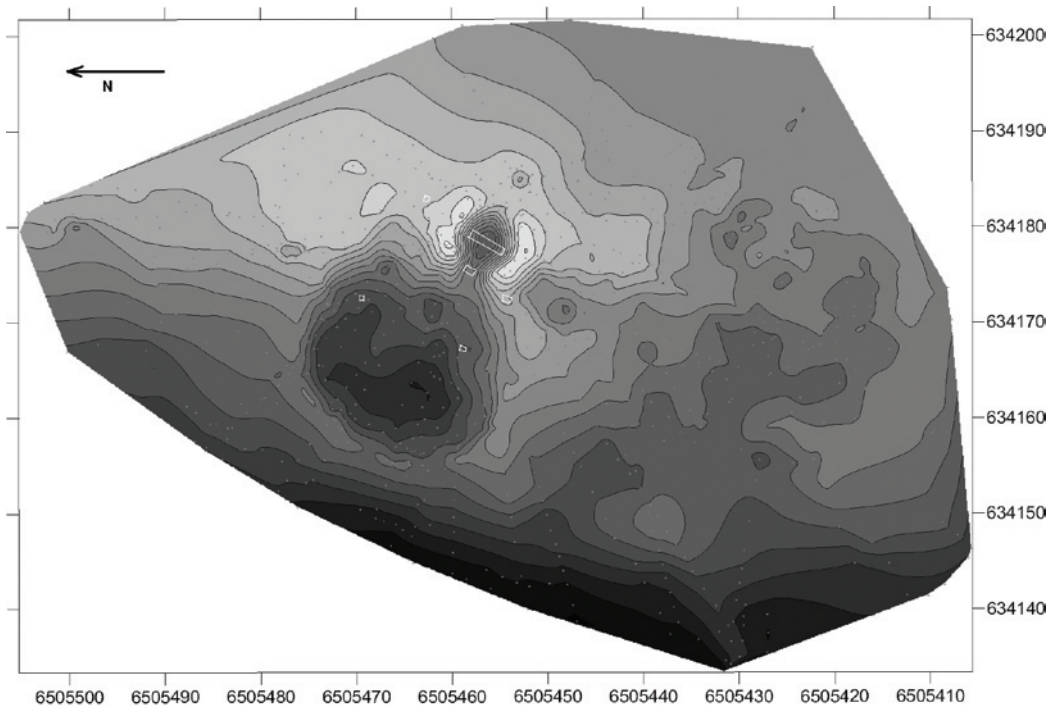

Fig. 4. Limekiln and the surrounding lime quarry in Saduküla village.
Jn 4. Lubjaahi ja seda ümbritsev paemurd Sadukülas.
Drawing / Joonis: Tanel Saimre

has good premises for tar production. From the Middle Ages onwards, historical sources reveal a lot of information about tar production – in some cases it was an extremely important source of income for peasants and local lords. Until now, however, no tar production site had been investigated archaeologically.

This project selected the southern part of the historical Rannu parish as the research site. There are several refe-rences to tar production in this region. The area is much forested. During 2008 many inspections were carried out in the local pine forests, systematic inspections were carried out in higher sandy areas around Vallapalu, Vehen-di and Rannaküla. The purpose was to find man-made depressions in the terrain, which could be remains of tar pits or charring pits. All depressions found were examined with a drill to look for charcoal, ashes or burn marks.

In spite of extensive areas studied, relatively few depressions were found. Only 8 pits in 4 different locations around Vehendi were discovered. These were 5–10 m in diameter, round or elliptical, up to 1.2 m deep pits that exhibit a layer of charcoal at the bottom, under moss and 25–80 cm thick caved in sand. The natural sand under the charcoal had become hard and red from fire. The pits were surrounded by the sand excavated from

Fig. 5. Stone inner lining of a limekiln in Jõune village prev. Tolli farmstead.
Jn 5. Jõune küla endise Tolli talu õuel paikneva lubjaahju kivivooder.
Photo / Foto: Tanel Saimre

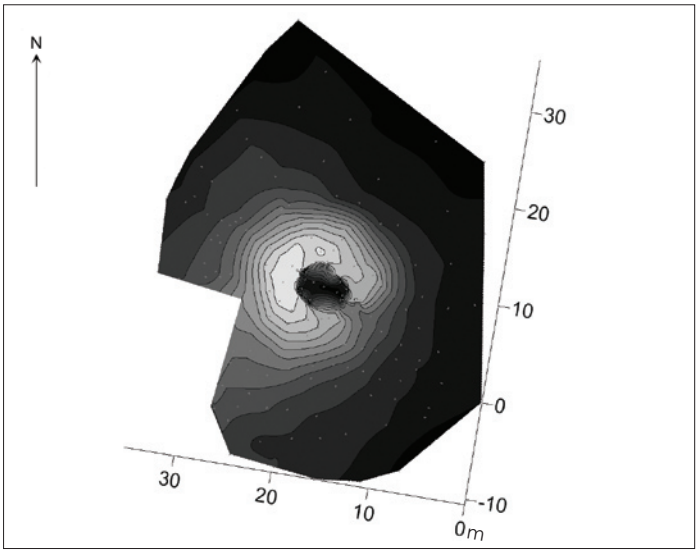

Fig. 6. Elevation map of a limekiln in Jõune village prev. Tolli farmstead.
Jn 6. Jõune küla endise Tolli talu õuel paikneva lubjaahju plaan.
Drawing / Joonis: Tanel Saimre

the pit. The charcoal taken from the pits was dated on four occasions. Three of them were from the 19th century or even a later period.

One pit that contained charcoal, located in a forested area east of Vehendi village (Fig. 7), provided a sample that was dated to 166±45 BP.[1] After calibration this turned out to be slightly older than the others: 1650–1960 AD. This pit certainly cannot originate in the 20th century because the local pine forest was cut only a few years ago and was on average 120 years old according to the tree-rings on the stumps. Further investigations have to show what this pit was and what period it dates to.

[1] Tln-3074.

Fig. 7. Tar pit or charring pit east of Vehendi village. View from the east.
Jn 7. Tõrva- või miiliauk Vehendi külast ida pool. Vaade idast.
Photo / Foto: Tanel Saimre

SMALL PITS IN RANNU PARISH FORESTS

In addition to the large pits with burn marks there were many pits about 2 m in diameter, which were usually located in rows on old sand dunes and coastal dunes. The pits were completely covered by turf, surrounded by sand excavated from the pits and were up to 0.5 m deep. Originally they must have been at least 1.5 m deep, which is indicated by the fact that the underlying natural sand layer was not reached by a 1 m long drill.

The largest of such group of pits was found in Vehendi, on the same dune as the previously mentioned tar pits or charring pits (Figs. 8–9). The pits are too far from inhabited areas to be 19th century potato storagepits. Further investigations should reveal their actual purpose.

RECORDING TERRAIN ELEVATION ON ARCHAEOLOGICAL SITES WITH A TOTAL STATION

The terrain reliefs at selected tar and lime production sites were recorded with a total station by taking hundreds of elevation readings across the site. The reasons for employing such a method are following.

First, the tar pits and limekilns both consist mostly of soil. They are in fact just soil (and stones) shaped in a certain manner. There are practically no finds, no human or animal remains, no cultural layer. Therefore, documenting these types of sites means documenting terrain relief. Second, photography is not clear enough for recording the three dimensional shape of such objects. This is because of photography's inherent inability to record depth, and also because the kilns and pits are often covered by thick vegetation, bushes, trash and other obstructions which make visual recognition of the terrain underneath impossible.

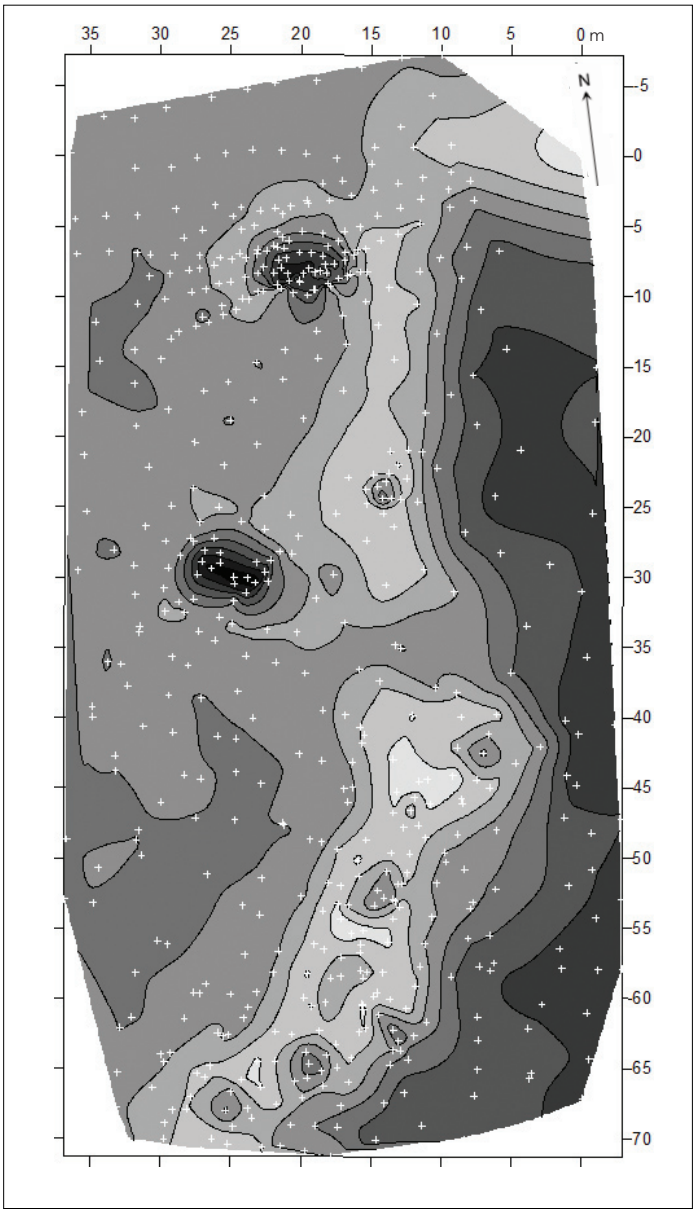

Fig. 8. A fragment of a group of tar pits or charring pits and small pits east of Vehendi village.
Jn 8. Osa Vehendi külast ida pool paiknevast arvatavate tõrva- või miiliaukude ning väiksemate aukude rühmast.
Drawing / Joonis: Tanel Saimre

To illustrate this point we can compare photos and elevation plans presented in this paper (see for example Figs. 2–3). Third, a digital total station presents a cheap and effective way of recording terrain elevations of a site very precisely. Once the total station is set up, it takes about four hours to record approximately 500 points, which should be enough to cover a site of medium complexity and about 50 m by 50 m in size.

Fig. 9. One of the small pits east of Vehendi village.
Jn 9. Üks väikestest aukudest Vehendi külast ida pool.
Photo / Foto: Tanel Saimre

The process of recording the terrain was the following. First, hundreds of elevation readings were taken all over the site. This data is in the form of three numbers: x-coordinate (northing), y-coordinate (easting) and z-coordinate (elevation). The points do not need to be spaced regularly. In fact, it is better to take more readings in areas of higher variability and fewer readings in large flat areas. This data was then processed by a computer to interpolate elevations between the measured points. Several methods of interpolation are available for this task, and choosing the best one is subject to the researcher's judgment. This topic is complex enough for at least another separate article.

A similar method has already been used in Estonia at least once. The fossil fields of Saha-Loo were mapped using a surveyor's level, taking measurements according to a regular rectangular grid of 1 m steps. These measurements were then processed in MapInfo to produce a contour line map of the site. The procedure and results are published in an article by V. Lang, H. Kaldre and M. Laneman (2005). Unfortunately the interpolation procedure is not described.

There are a number of other software suites, besides MapInfo, that could be used to achieve the same results, including free open source software like GRASS. We used Surfer 8 for its wide range of interpolation abilities and greater user-friendliness. It is important to note, that the elevation plans generated by a computer on the basis of the interpolation data are not precise. It does not constitute tachymetric measurement data itself but it is already an interpretation of that data. Therefore the original measurement data file must always be preserved.

CONCLUSION

In Kursi parish the remains of one limekiln were discovered, along with several limestone quarries. Three limekiln sites were mapped with a total station. In Rannu parish several possible tar pits, charring pits and other small pits were located. One group of pits was mapped with a total station.

First steps towards establishing the tradition of archaeology related to industry and production activities have been made. In the future, the recording of terrain reliefs of limekiln and tar pit sites must continue. Different interpolation methods and possibly sampling patterns should be experimented with in order to find the best method of recording terrain relief data.

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TÕRVA- JA LUBJATOOTMISE JÄLGEDE UURIMINE KURSI JA RANNU KIHELKONDADES

2008. a jätkati lubja ja tõrva tootmisega seotud muististe uurimist Eesti Teadusfondi rahastatava grandi nr 6690 raames. Nagu juba varasematelgi aastatel, tegeleti lubjatootmisega seotud muististe uurimisega Kesk-Eestis ajaloolise Kursi kihelkonna alal ja tõrvatootmisega seotud muistiseid uuriti Kagu-Eestis Võrtsjärve idakaldal Rannu kihelkonna lõunaosas (jn 1).

Lubjaahjude uurimiseks jätkati 2007. ja 2008. a kevadel süstemaatilisi inspektsioone Pedja ja Kaave jõe äärsetes metsades. Õnnestus leida hulgaliselt paevõtuauke ja üks seni teadmata lubjaahi Tammiku küla Soomaa kinnistu maal Kaave jõe idakaldal (jn 2–3). Sadukülas uurisime juba 2006. aastal avastatud lubjaahju. Valmistati detailne kõrgusplaan ahjust ja seda ümbritsevast paemurrust (jn 4–5). Kuna varasemate kaevamiste käigus ei õnnestunud leida sütt ahju dateerimiseks, laiendati ahju sisemusse tehtud kaevandit lootuses sütt seekord avastada, kuid otsingud ei andnud tulemust ka sel korral. Jõune külas plaanistati endise Tolli talu õuel paiknev lubjaahi (jn 6).

Tõrvatootmisega seotud objektide uurimise alaks valiti käesoleva projekti raames Rannu kihelkonna metsane lõunaosa, kus on rohkesti teateid tõrvatootmisest ajaloolisel ajal. 2008. a tegeleti maastikuinspektsioonidega siinsetes männimetsades. Selleks käidi süstemaatiliselt läbi eelkõige kõrgematel liivastel aladel paiknevad metsad Vallapalu, Vehendi ja Rannaküla ümbruses. Otsiti inimtekkelisi lohke maapinnas ja loodeti neist mullapuuriga saada sütt, tuhka, või põlenud pinnast, mis võiksid osutada tõrvapõletamisele või söemiilimisele. Hoolimata läbikäidud alade ulatusest osutusid taolised süvendid suhteliselt haruldaseks. Õnnestus leida vaid 8 süvendit neljas erinevas kohas Vehendi küla metsades. Need on 5–10 m läbimõõduga ümarad või ovaalsed, kuni 1,2 m sügavused lohud, mille põhjas sambla ja peale varisenud 25–80 cm paksuse liivakihi all leidub söekiht. Viimase all oli kollane looduslik liiv põlenud kõvaks ja punaseks. Lohke ümbritseb ringikujuliselt väljakaevatud liivast koosnev madal vall. Lohkudest võetud söest tehti neli radiosüsinikudateeringut. Neist kolme süsi dateerus 19. sajandisse või veelgi nooremasse aega. Ühe lohu (jn 7) dateering väärtusega 166 ± 45 radiosüsinikuaastat osutus aga pärast kalibreerimist teistest veidi vanemaks (1650–1960 pKr). Kindlasti ei pärine see 20. sajandist, sest lohkude peal veel mõni aasta tagasi kasvanud mets oli kändude aastarõngaste põhjal otsustades keskmiselt 120 aastane. Millega täpsemalt on tegemist ja mis ajast lohud pärinevad, peavad näitama edasised uuringud.

Lisaks eelpoolkirjeldatud suurtele lohkudele leiti metsadest hulgaliselt väiksemaid süvendeid. Need on umbes 2 m läbimõõduga lohud, mis reeglina paiknevad ridamisi vanadel rannavallidel ja liivaluidetel. Lohud on täiesti kamardunud, nende ümber on madal vall väljakaevatud liivast ning nende sügavus on kuni 0,5 m. Algselt on need lohud olnud vähemalt 1,5 m sügavused, mida näitab asjaolu, et 1 m pikkuse mullapuuriga pinnast sondeerides ei jõua loodusliku pinnaseni. Suurim avastatud selliste lohkude rühm paikneb Vehendi külas samal luitel koos ülalmainitud tõrva- või miiliaukudega (jn 8–9). Lohud on sedavõrd vanad ja asustusest kaugel, et 19. saj kartulisäilitusaukudeks neid pidada ei saa. Millega on tegemist, peaksid näitama edasised uuringud.

Nii lubjaahjude kui ka tõrvaaukude dokumenteerimisel kasutati uudset metoodikat: tahhümeetriga mõõdeti muistise pinnalt sadadest punktidest maapinna kõrgus. Seejärel interpoleeriti nende kõrguspunktide järgi arvuti abil muistise reljeefi plaan. Fotod ei anna edasi piisavat informatsiooni pinnareljeefi kohta (eriti kohtades, kus see on võsastunud või kaetud paksu taimestikuga). Seevastu tahhümeetriga oli võimalik kiiresti ja lihtsalt talletada pinnase reljeef suure täpsusega. 50 × 50 m suuruse muistise dokumenteerimiseks piisas enamasti umbes 500 punkti mõõtmisest, milleks kulus umbes 4 tundi. Tihedamini tasub mõõta suure varieeruvusega aladel, samas kui suured lamedad alad saab katta vaid mõne üksiku mõõtepunktiga. Täpse interpolatsioonimeetodi valik ning tarkvaralised lahendused selleks moodustavad juba omaette artikli ainestiku ning vajavad ühtlasi veel täiendavat uurimist. Tähtis on siinkohal mainida, et interpoleeritud reljeefiplaan ei kujuta endast mitte mõõtetulemust, vaid mõõteandmete tõlgendust. Seetõttu tuleb algsed mõõtmisandmed kindlasti alles hoida, et vajadusel saaks neist mõne teise interpolatsioonimeetodi abil vajaliku plaani tuletada.

Edaspidi ongi plaanis jätkata muististe reljeefide talletamist, eksperimenteerides ühtlasi erinevate mõõtepunktitiheduste ja paigutusmustritega ning erinevate interpolatsioonimeetoditega. Samas tuleb kindlasti jätkata uurimist ka traditsioonilisi arheoloogilisi meetodeid (st väljakaevamisi ja inspektsioone) kasutades.