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## **ARCHAEOLOGICAL INVESTIGATION OF LIME AND TAR PRODUCTION FACILITIES IN THE HISTORIC TARTU COUNTY**

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The research of historical lime and tar production sites in the area of Kursi and Rannu parishes in the historic Tartu County was accomplished in the framework of the Estonian Scientific Foundation grant no. 6990 ‘Tar and Lime Production in Estonia during the Prehistoric, Medieval and Modern Times’.

### **INVESTIGATION OF LIME PRODUCTION FACILITIES**

During 2009 several lime production facilities were discovered and inspected in the area historically known as the Kursi parish. During 2006–2008 extensive archaeological surveys revealed 26 limekiln remains or limekiln sites. In addition to that, information was found from written sources about 17 limekilns that were impossible to locate on the landscape because they had been completely destroyed (Tvauri & Saimre 2007; 2009, 195–198, fig. 8).

One of the motives that inspired the research work was an article by Hans Kruus from 1933 about lime burning in the Pedja River area. The article gives a thorough account of lime burning in the Kursi parish based on archival records. Kruus also describes the technological aspect of lime burning as he himself remembered it (he spent his childhood in the Jõune village) and information obtained by a questionnaire distributed among the older lime burning specialists in the area during the summer of 1933. The research work done by Hans Kruus covers the ethnographic and historical aspects. The current project aims to complement that work with the archaeological aspect.

### **REMAINS OF LIME PRODUCTION FACILITIES DISCOVERED IN 2009**

In 2009 the earlier archaeological surveys were continued. Large scale landscape surveys, mapping and also some excavations were carried out by the authors and by Andres Vindi (TÜ). In the course of these surveys 8 more limekilns and some additional lime quarries were discovered (Fig. 1).

One of the most important sources in the research of limekilns in landscape is the above mentioned article by Kruus which includes the distribution map of limekilns known to him (Kruus 1933, 181–182). Another important source was the map collection in the Estonian Historical Archives, specifically the historical maps about the Kursi area, and especially the plans of the Saduküla and Puurmani manors from the period from the end of the 17th until the beginning of the 20th century. The maps depict both limekilns and limestone quarries. The common sign denoting a limekiln on



Fig. 1. Lime production facilities in Kursi parish identified by end of 2009.

Red triangles – preserved limekilns or remains;

Blue triangles – limekilns mentioned in written sources but indistinguishable on the landscape;

Yellow circles – limestone quarries.

Jn 1. 2009. a lõpuks välja selgitatud lubjatootmisega seotud muistised Kursi kihelkonnas.

Punased kolmnurgad – maastikul säilinud lubjaahjud või lubjaahju asemed;

Sinised kolmnurgad – kirjalikest allikatest teada lubjaahjud, mis on hävinud või mida ei leitud;

Kollased ringid – paemurrud.

Drawing / Joonis: Tanel Saimre

the plans is a schematic depiction of a limekiln with an explanatory text in German: *Kalk Ofen* or *Kalkofen*. The third important source of information was the Estonian basic map and the orthogonal aerial photographs of Estonian Land Board, which were used to draw conclusions about land melioration of the 20th century and to identify the most promising areas of lime production.

In the Jõune village a well-preserved and unpolluted limekiln was discovered 100 m north-west of the Vana-Venesaare farmhouse. No lime quarries could be detected

in the vicinity. According to Hans Kruus this kiln was used between 1901 and 1912 (Kruus 1933, 181–182). Another limekiln was discovered in the yard area of Kaarlimetsa farmstead (Fig. 2), 300 m north-east of the Pedja River. According to Kruus this kiln was used between 1810 and 1906 (Kruus 1933, 181). In the Tõrve village we located the former limekiln of the Umba farmstead, on the right bank of the Pedja River. It was very well preserved, with an inner diameter of 4–5 m. The inner lining made of granite was preserved up to a height of 3 m. The kiln is surrounded by a quarry, where limestone outcrops can still be seen today. According to Hans Kruus this kiln was last used in 1906 (Kruus 1933, 181). Two more limekilns were discovered in the same village in Tõrvesoo cadastral unit, one of which has been preserved in its entirety. The kilns are located approximately 30 m south of the Tammiku–Tõrve road, in a brushy patch 100 m west of the Kuke farmhouse.

Strangely enough Hans Kruus, after having thoroughly investigated the history of lime production in the area, does not mention any other limekilns in the Tammiku village except the ones on the Männiku farmstead. In the scope of this project already six other limekilns have been located.

On the lands of the Tani farmstead in the Tammiku village we were fortunate to get the assistance of a local villager Madis Alabert, who lead us to the remains of two limekilns, both on the right bank of the Kaave River. One of them is located about 170 m north-west of the Tani farmhouse, the other about 270 m westward in the woods. The first has been practically levelled, the other, on the contrary, is quite well preserved. Madis Alabert also directed us to the limekiln remains located in the same village, in the woods 500 m south-southeast of the Tani farmhouse. On the south-eastern side of



*Fig. 2. Remains of a limekiln found in Jõune village, Kaarlimetsa farmstead in 2009.*

*Jn 2. 2009. aastal Jõune külas Kaarlimetsa talu maal leitud lubjaahju jäänused.*

*Photo / Foto: Andres Tvaauri*





Fig. 3. Pikknurme 1st and Pikknurme 2nd limekilns on the boundary map of Saduküla and Pikknurme manors from 1799.

Jn 3. Pikknurme 1. ja 2. lubja-ahi 1799. a Saduküla ja Pikknurme mõisate piirikaardil.

(EAA 2623-1-2036a/5.)

/34) a limekiln is located about 400 m north of the crossroads of the current Tallinn–Tartu road and the road to Pööra. The same kiln is also depicted on a map dated to 1841 (EAA 2623-1-2036a/19). On this location, in the woods north of Hundioja Creek which flows into the Pikknurme River, we found a large limestone quarry, but no traces of a limekiln.

A large limestone quarry was found on the left bank of the Kaave River in Laasme village on the lands of the former Iisaku farmstead. It was located in a forested area just west of the village road, west of the sawmill buildings. No limekilns were found, nor did the landowner know of any limekilns on his lands. The kiln was most probably located there, but has been destroyed, since according to Hans Kruus the remains of two limekilns stood here at the beginning of the 20th century (Kruus 1933, 181–182).

In conclusion the investigations of lime production in the year 2009 were successful. As a result of the project, Tanel Saimre defended his Master's thesis in archaeology in the University of Tartu (Saimre 2009). Practical landscape experience obtained during the earlier years of the research project and the information provided by local people were of great assistance to the discovery of limekilns.

### **ARCHAEOLOGICAL RESEARCH OF LIMEKILN REMAINS IN PIKKNURME**

On the boundary map of Saduküla and Puurmani manors dating from 1799 two limekilns are depicted. Both of them are located in the southern part of the present Pikknurme village, on farmed land east of the Pikknurme River (Fig. 3). The northern limekiln (Pikknurme 1) is visible to this day as a horseshoe-shaped feature about 0.5 m high. In the 20th century a large spruce growing on top of the kiln remains probably protected it against agricultural activities by. The southern kiln, however, is located on flat farming land (fallow at the time of research). While visiting the site in early spring of 2009 a patch of vegetation caught our attention. This patch was located approximately

these, there is a limestone quarry overgrown with brush and about 250 × 150 m in size. In the Tammiku village three well-preserved limekilns were found on the lands of the Männiku farmstead. The owner had cleared the kilns of overgrowing brush quite recently. Hans Kruus mentioned four kilns in that location, but he had no information about the time of their usage (1933, 181–182). There, too the local inhabitants helped to locate a limekiln of the former Sarve farmstead, situated about 300 m north-northeast of the Sarve farmhouse ruins. The kiln was used in the beginning of the 20th century or earlier.

On a map of Pikknurme village dated to 1810–1813 (EAA 2623-1-2036a

at the site where the limekiln was expected to be. The rest of the field was covered by the previous year's dried grass, only this particular patch about 3 m in diameter contained a large amount of ground-elder (*Aegopodium podagraria*) (Fig. 4). Soil drill samples demonstrated large amounts of rocks, burnt clay, charcoal and lime fragments. These preliminary observations showed that the remains of the limekiln were located about 20 m south of a creek flowing into the Pikknurme River, on the edge of the creek's floodplain, facing north-west. In the spring of 2009 we carried out archaeological excavations on the site. The goal was to investigate whether the underground remains of a limekiln that has been completely destroyed on the surface could hide any significant information.

First, a 10 m<sup>2</sup> pit was dug on the southern edge of the remains. Under the layer of ploughed soil *ca.* 20 cm thick yellowish sandy clay was unearthed in which a circular red burnt area was clearly distinguishable (Figs. 5–6). We presumed these indicated the contours of the kiln's fireplace. Then we extended the pit towards the north to investigate parts of the fireplace and the area in front of the kiln. The area of the pit totalled 18.75 m<sup>2</sup>. The fireplace had been dug into the natural sandy clay to a depth of at least 0.9 m. It was filled with large burnt boulders and red burnt clay, caved in from the stone inner lining of the kiln. The inner diameter of the fireplace was approximately 4.3 × 3.5 m. Here we only cleared out the boulders, but did not remove them. We partly removed the boulders from the northern edge of the pit to clear out a vertical profile of the kiln.



Fig. 4. The location of Pikknurme 2nd limekiln in early spring of 2009. Tanel Saimre is standing on the location of the limekiln which contains a lot of ground-elder in contrast to the dry grass of the surrounding field.

Jn 4. Pikknurme 2. lubjaahju ase 2009. aasta kevadel. Tanel Saimre seisab tasandatud ahju põletuskambri asukohal, mis eristub varakevadisel heinamaal rohke naadi kasvualana.

Photo / Foto: Andres Tvauri



Fig. 5. The excavations of the Pikknurme 2nd limekiln.

Jn 5. Pikknurme 2. lubjaahju kaevamine.

Photo / Foto: Andres Tvauri

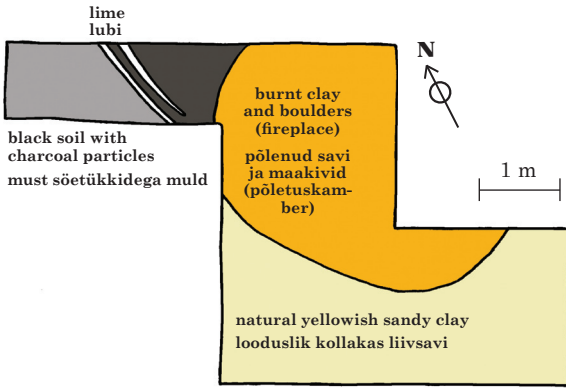


Fig. 6. Plan of the excavation pit at the Pikknurme 2nd limekiln.

Jn 6. Pikknurme 2. lubjaahju aseme kaevandi plaan. Drawing / Joonis: Andres Tvauri

the natural peat, contained a lot of birch bark. This probably originates from firewood. Samples were collected for <sup>14</sup>C dating. Unfortunately the results were not yet analysed by the laboratory by the time this article was published.

### INVESTIGATION OF TAR PRODUCTION FACILITIES

In 2006–2008 a few tar burning facilities were identified in the southern part of Rannu parish in the course of landscape survey trips. Of these a complex of six tar pits located in the state forest east of the fields of the Vehendi village was chosen for archaeological research. Four of the tar pits are situated at the crossroads of four forest

The pit also extended to the area in front of the kiln. Here immediately under the ploughed layer a 90 cm thick mixture of charcoal and lime was uncovered (Figs. 7–8). A very important characteristic was that the charcoal and lime layers, each a few centimetres thick, were laid alternately to the depth of approximately 130 cm, where the natural peat layer started. We assumed that one pair of lime and charcoal layers stands for one lime burning event. In the stratigraphic profile of the pit 20 layers pairs were distinguishable; hence at least 10 loads of lime have been burnt in that kiln. The lowest charcoal layer, right on top of

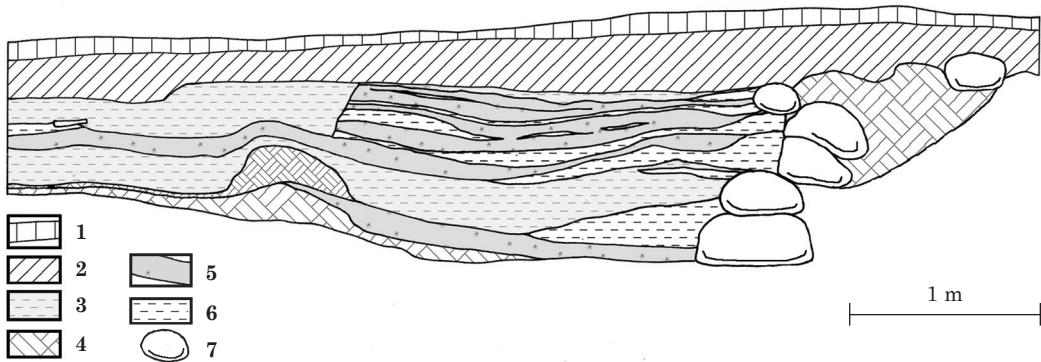


Fig. 7. North-east profile of the Pikknurme 2nd excavation pit.

1 – turf; 2 – ploughed soil; 3 – soil with lime and charcoal particles; 4 – burned clay; 5 – charcoal; 6 – lime; 7 – boulder.

Jn 7. Pikknurme 2. lubjaahju kaevandi kirdeprofiil.

1 – mättakiht; 2 – künnikiht; 3 – lubja- ja söesegune muld; 4 – põlenud savi; 5 – süsi; 6 – lubi; 7 – maakivi.

Drawing / Joonis: Andres Tvauri, Kristel Külljastinen



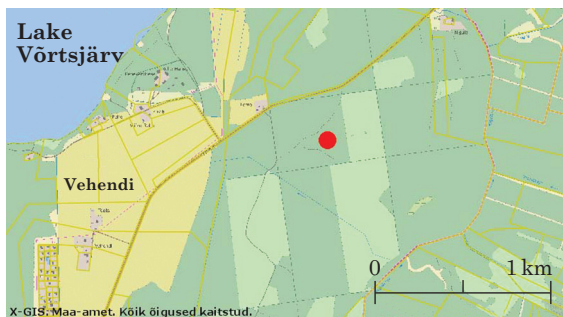


Fig. 8. The location of the tar production site in Vehendi.  
 Jn 8. Vehendi tõrvapõletuskoha asukoht.  
 Drawing / Joonis: Andres Tvauri



Fig. 9. Tar pit during excavations.  
 Jn 9. Tõrvaauk kaevamise käigus.  
 Photo / Foto: Tanel Saimre



Fig. 10. Tar pit unearthened.  
 Jn 10. Tõrvaauk lahti kaevatuna.  
 Photo / Foto: Tanel Saimre

trails (Fig. 8). Two other tar pits, surrounded by dozens of smaller round depressions in terrain, are located 200 m east-northeast of these. The close surroundings of the two latter tar pits were mapped in 2008 with a digital total station (Tvauri & Saimre 2009, 195–198, fig. 8).

Since tar pits have never been investigated in Estonia before nor even recognised as an archaeological monument, we defined the goal of the excavations: to determine what kind of information can be obtained from studying these objects and what kind of methods should be used for its excavation. Also, we aimed to determine the type of the tar pit under investigation and to specify its date.

#### **ARCHAEOLOGICAL FIELD WORK ON A TAR PRODUCTION SITE IN VEHENDI**

In the spring of 2009 the northern most of the two eastern pits among the group of tar pits located east of the Vehendi village was excavated. In addition to the authors of the present article the students of archaeology Päivi Jantunen (University of Helsinki), Ingmar Noorlaid and Kristo Siig (University of Tartu) participated in the fieldwork.

The studied tar pit was situated on a dune of yellow sand. Before the excavation the tar pit was observable on the ground as a  $9 \times 7$  m big and up to 1.5 m deep oval depression (Fig. 9). We had previously determined with the aid of a soil drill that beneath the turf and the collapse layer of sand lies an approximately 10 cm thick charcoal layer with red-burnt sand under it.

We decided to dig through the inside of the tar pit by peeling thin layers.



After removing the turf layer sand with charcoal particles was exposed on the walls and in the bottom of the depression. In the course of the excavation the remains of burnt pieces of wood were found from the slopes of the depression whereas all better preserved wood remains were situated upright on the slopes, directed towards the bottom of the depression. The location of the wood used for extracting tar undoubtedly referred to a tar pit and not a charring pit used for burning charcoal. Namely, in the tar pit the pine splinters were placed so that the tar running out of them in the course of burning would accumulate into one area in the bottom of the depression.

After being unearthed the tar pit turned into a  $9 \times 7$  m big and up to 2 m deep oval funnel-shaped depression (Figs. 10–11). The bottom of the depression reached the natural silt layer of the

base of the dune that had been burnt completely hard. This funnel-shape of the depression, in addition to the position of the burnt pieces of wood, also indicated that we might be dealing with a tar burning site and not a charring pit for charcoal burning.

No indication could be found that the tar running out of the pine splinters would have been led into a flume or by means of a channel into the depression next to the tar pit. Thus it might have been a tar pit of the most primitive type where tar concentrated to the bottom of the hole in the course of burning and was removed only after the burning process had terminated. Apparently the tar must have accumulated into a cauldron in the bottom of the pit.

In the surroundings of the two easternmost pits of the group of tar pits of Vehendi, dozens of depressions with the diameter of 1.5–3 m and depth of 0.5–1.2 m can be found on sand dunes running in rows in the range of several hundred meters. In order to find out what the nature of these objects is, one of these depressions, lying 100 m south of the studied tar pits, was investigated in 2009. Its diameter prior the excavations was 2.5 m and the depth 75–90 cm.

In order to obtain the profile of the depression, its southern part was opened (Fig. 12). Sand removed from the pit had been accumulated on the edge of the pit as a circular wall with a height of 36 cm from the initial ground and a width of 1.5 m. Grey natural podzolic layer consisting of quartz sand and located above the yellow dune sand could clearly be followed under the wall (Fig. 13). 40 cm below the podzolic layer under the wall the investigated depression passed through another podzolic layer. It originated from the period before digging of the pit. Yellow dune sand continued under the layer. Measured from the ground level of the period of the pit's formation the diameter of the

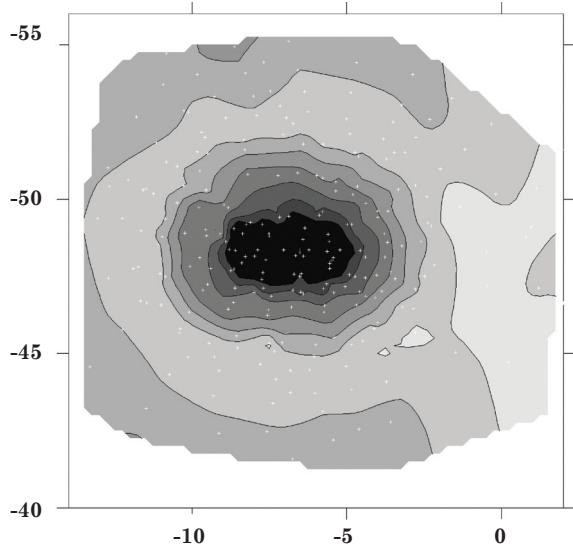


Fig. 12. The plan of the tar pit after excavation. Depth between two consecutive contour lines is 40 cm.

Jn 12. Tõrvaugu plaan pärast lahti kaevamist. Samakõrgusjoonte vahe on 40 cm.

Drawing / Joonis: Tanel Saimre

depression directly after digging was approximately 2.2 m. Deeper down the depression became narrower, reaching the layer of hard clayey moraine exposed at the depth of 1.55 m from the initial terrain. Neither charcoal nor other traces of burning could be found from the pit. The considerable age of the pit is demonstrated by the fact that the podzolic layer was formed in the bottom and on the banks surrounding the pit after its collapse.

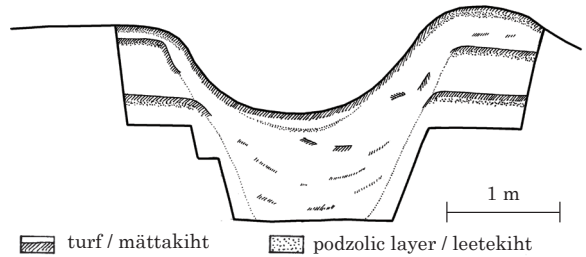
### **ETHNOGRAPHIC PARALLELS TO THE VEHENDI TAR PRODUCTION SITE**

The ethnographic sources of the 19th–20th century Estonia offer extremely scarce and vague information about tar making in tar pits or, in other words, tar graves. For single users tar was commonly produced in an overturned cauldron; for gaining larger quantities in aboveground stone kilns they were later lined with metal on the inside (see Viires 1975, 64–65; Leetmaa 2000, 170). However, tar making in tar pits has been very widespread in Finland during the 17th–20th century. Moreover, in the Finnish tar pits of the oldest type tar accumulated on the bottom of the pit similarly to the pit studied in Vehendi. Since the 17th century the tar gathered on the bottom was directed out of the pit by means of a wooden flume, which led the tar directly into a barrel next to the pit (Talve 1979, 79).

Considering the fact that smaller depressions are located in the surroundings of tar pits and away from dwelling areas, they can be associated predominantly with tar production. In 19th–20th century Estonia the stumps of pines approximately a hundred years old that had been resting in the ground for 20–30 years were believed to be the most suitable raw material for tar making. Their exterior had already had sufficient time to rot and tar had accumulated into the center. Sandy and stoneless terrain was preferred for extracting stumps. Soil was removed from around the stump, roots were cut through and the stump was lifted out of the ground using a 4–6 m long spruce lever (Leetmaa 2000, 169). The numerous smaller depressions on sand dunes close to the Vehendi tar pits are most likely the holes left from extracting the stumps.

### **DETERMINING THE AGE OF THE VEHENDI TAR PRODUCTION SITE**

The age of the tar production site in question still remains unclear. The radiocarbon date gained already in 2008 from the now excavated tar pit showed the age of 166±45 BP



*Fig. 13. The profile of the extraction hole of a tree stump.  
Jn 13. Kännujuurimisaugu profiil.  
Drawing / Joonis: Andres Tvauri*



*Fig. 14. The extraction hole of a tree stump during excavations.  
Jn 14. Kännujuurimisauku kaevamiste käigus.  
Photo / Foto: Andres Tvauri*

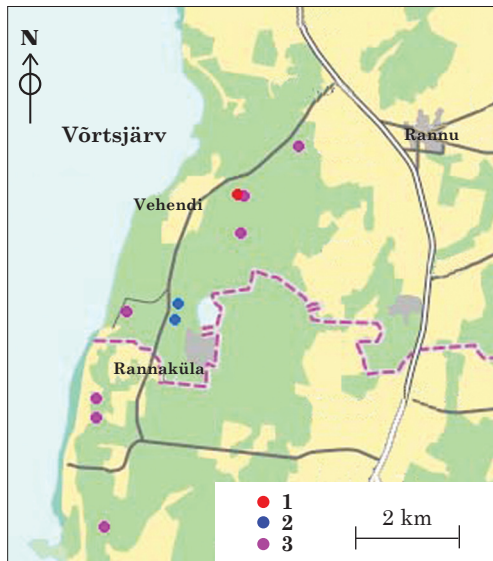


Fig. 14. Tar pits (1), tar or charring pit (2) and groups of extraction holes of tree stumps (3) discovered in the Rannu parish.

Jn 14. Rannu kihelkonna alal avastatud tõrvaugud (1), tõrva- või müliaugud (2) ja kännujuurimisaukude rühmad (3).

Drawing / Joonis: Andres Tvauri

(calibrated with the probability of 95.4% to 1650–1960 AD).<sup>1</sup> Tar has been produced here definitely before the 20th century since the pine forest felled on top of the tar pits a few years ago was, judged by the growth rings on stumps, 120 years old on the average.

Clues for the age of the tar production site under discussion can be found from the thorough description by Alice Moora, which is based on the fieldwork of 1949–1951 and concentrates on the folk culture of the villages of Tamme, Vehendi and Noormaa in the southern part of the Rannu parish (Moora 1951). The inhabitants of the villages back then did not remember that tar making would have taken place anywhere else than in the Petseri farmstead in the Rannaküla village. According to stories, an aboveground tar kiln with metal lining had been built there in the beginning of the 20th century (Moora 1951, EA 103, 36). The population of Vehendi was not of local origin back then. All the farmsteads in Vehendi fell into the hands of people from the western bank of Lake Võrtsjärv from Viljandimaa during the process

of buying the farmsteads from the manors in the 1860s. The peasantry of Vehendi was forced to move elsewhere (Moora 1951, EA 104, 23). Since nothing was known of tar production in Vehendi or the neighbouring villages in the middle of the 20th century, it had to take place before the migration of people in the 1860ies. The peasantry of Vehendi was forced to move elsewhere (Moora 1951, EA 104, 23). Since nothing was known of tar production in Vehendi or the neighbouring villages in the middle of the 20th century, it had to take place before the migration of people in the 1860ies. Most likely tar was made here in the first half of the 19th or in the 18th century.

Since the holes surrounding the tar pits in the state forest of Vehendi apparently turned out to be the extraction holes of stumps connected with tar making, it implies that other groups of depressions discovered in the forests of the southern part of Rannu parish are also connected with tar production (Fig. 15). In addition to Vehendi, the extraction holes of stumps could be located in the forests of the neighbouring villages of Rannaküla in the south and Vallapalu in the north. The appearance of these other remains visible on the landscape and connected with tar production in the research area suggest that they are approximately contemporary with the tar production facility of Vehendi.

<sup>1</sup> Tln-3074.

## CONCLUSION

The present Puurmani municipality, historically known as Kursi Parish, has probably the highest concentration of historical limekilns in Estonia. These are significant artefacts of industrial archaeology and are certainly worth protection and exposition. Although the kilns are not old in an archaeological sense (most of them date from the 18th–19th century), they are a witness to a form of industry totally lost by now. All these kilns deserve to be listed as cultural heritage objects. In addition, the most characteristic, better preserved and oldest ones should also be listed as archaeological monuments.

The second important conclusion is that archaeological means are sufficient to investigate limekiln remains. The excavations of Pikknurme 2 proved that a limekiln that has been totally destroyed by levelling and agriculture on the ground surface may still possess structures and a cultural layer intact below.

In 2009 a tar pit and an extraction hole of stumps were archaeologically excavated at a tar production site in the forest east of the Vehendi village on the eastern bank of Lake Võrtsjärv. Since this was the first time that the monuments connected with tar production have ever been archaeologically investigated in Estonia, we set the following goal to the excavations: to find out what kind of information can be obtained from the research of these objects and what kind of methods should be used for excavating a tar pit. It was discovered that archaeological excavations enable us to determine the type of the tar pit. In addition, there is sufficient charcoal preserved that enable us to use radiocarbon dating. In Vehendi, tar was produced in primitive tar graves which are only scarcely and vaguely described in Estonian ethnographic material. Tar was probably produced here in the 1st half of the 19th or in the 18th century.

*Acknowledgements: This research was supported by the European Union through the European Regional Development Fund (Centre of Excellence CECT) and Estonian Scientific Foundation (grant no. 6690). Our gratitude goes to the inhabitants of the Puurmani parish, especially Ell Maansoo, who helped with locating limekiln remains.*

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## LUBJA- JA TÕRVATOOTMISEGA SEOTUD MUISTISTE ARHEOLOOGILINE UURIMINE AJALOOLISE TARTUMAA ALAL

Andres Tvauri ja Tanel Saimre

2009. aastal uuriti ajaloolises Kursi kihelkonnas lubjatootmise ja Rannu kihelkonnas tõrvatootmisega seotud muistiseid Eesti Teadusfondi grandid "Tõrva- ja lubjatootmine Eestis muinas-, kesk- ja uusajal" raames.

Aastatel 2006–2008 õnnestus Kursi kihelkonnas maastikuinspeksioonidega leida 26 säilinud lubjaahju või lubjaahju aset, lisaks saadi kirjalikest allikatest teateid 17 ahjust, mis tänapäevaks on hävinenud või mida seni pole avastatud.

Lubjaahjude otsimisel maastikul oli üheks olulisemaks allikaks ajaloolase Hans Kruusi 1933. aastal ilmunud artikkel ja Eesti Ajalooarhiivi kaardikogus leiduvad Puurmani mõisate plaanid 17. sajandi lõpust kuni 20. sajandi alguseni. Neile on märgitud nii lubjaahje kui ka paemurde. Enamasti on lubjaahju tähistavaks tingmärgiks plaanidel stiliseeritud lubjaahju kujutis ning selgitav tekst: *Kalk Ofen* või *Kalkofen*. Kolmandaks oluliseks infoallikaks oli Eesti põhikaart ja Maa-ameti ortogonaalsed aerofotod, millelt tegime järeldotsi 20. sajandi maaparandustegevuse kohta ja identifitseerisime lootustandvamad piirkonnad, kust lubjatootmise järgi otsida.

2009. a jätkasime maastikuinspeksioone, mille käigus leiti veel 8 lubjaahju ja mitmeid ajaloolisi paemurde (jn 1). Jõune külas leidsime hästi säilinud lubjaahju Vana-Venesaare talu juurest ja Kaarlimesa talu õuel (jn 2), mida kasutati vastavalt 1901–1912 ja 1810–1906. Tõrve külas lokaliseerisime endise Umba talu hästi säilinud lubjaahju, siseläbimõõduga 4–5 m, mille maakividest ahjuvooder on alles vähemalt 3 m kõrguselt. Ahju ümbritseb paemurd, kus paas tänaseni paljandub. Kruusi andmetel põletati selles ahjus lupja viimati 1906. a. Tõrve küla Tõrvesoo maaüksusel leidsime kaks ahju, millest üks on säilinud terviklikult. Tammiku küla Tani talu maal leidsime kohaliku elaniku Madis Alabardi juhatusel kaks lubjaahju, mõlemad Kaave jõe läänekaldal. Neist esimene on lõhutud maatas, teine on seevastu säilinud üpris hästi. Kolmas ahjuvare tuli välja Tani talu hoonetest umbes 500 m lõunakagu pool metsas, selle kaguküljel paiknevad 250 × 150 m suurusel alal võssa kasvanud paemurrud. Tammiku küla Männiku talu maal registreeriti ühest hästi säilinud ja kolmest ahjuvarest koosnev ahjurühm ning õnnestus leida

ka endise Sarve talu lubjaahi, mida kasutati 20. sajandi alguses või varemgi.

Puurmani külas, Tallinn–Tartu maantee ja Põõra küla tee ristist u 400 m põhjas on kahel ajaloolisel plaanil (aastatest 1810–1813 ja 1841) märgitud lubjaahi, ent seal leidsime vaid paemurru. Ulatusliku paemurru tuvastasime Kaave jõe idakaldal Laasme külas endise Iisaku talu maal. Lubjaahju siit ei leitud ja ilmselt on ahjuasemed hävinud, sest Kruusi andmetel on siin veel 20. sajandi algupoolel olnud kahe ahju asemed.

1799. aastast pärineval Saduküla ja Puurmani mõisate piirikaardil on märgitud kaks lubjaahju tänapäeva Pikknurme küla lõunaosa alale (jn 3). Neist põhjapoolse ahju hobuserauakujuline kontuur on umbes poole meetri kõrguseni säilinud ja arvatavasti on seda põllutöömasinate eest kaitsnud ahjul kasvav suur kuusk. Lõunapoolse ahju kohal aga on tänapäeval lage ja sile põllumaa (hetkel söötis), ent ahju asukohta 2009. a varakevadel aitas tuvastada erinev taimkate arvatava ahju asukohas. Kogu söötis põldu kattis kuivanud ja lamanud hein, vaid u 3 m läbimõõduga alal kasvas peamiselt harilik naat (*Aegopodium podagraria*) (jn 4). Mullapuuriga tegime kindlaks, et erinevalt ümbritsevast alast on selles kohas maa sees palju kive, põlenud savi, sütt ja lubjapuru. Väliselt täiesti hävinud lubjaahju uuriti 2009. a kevadel väljakaevamistega.

Selleks rajati ligikaudu 10 m<sup>2</sup> suurune kaevand ahjuaseme lõunaserva. Pärast künnikihi eemaldamist paljandus looduslik kollakas liivsavi, milles oli selgelt jälgitav sõõrikujuline punaseks põlenud ala (jn 5–6), mis eeldatavasti järgib ahju põletuskambri kontuuri. Kaevandit laiendati põhja suunas, uurimaks ka ahju põletuskambrit ning ahjuesist ala, saades seeläbi kaevandi suuruseks 18,75 m<sup>2</sup>. Selgus, et põletuskamber on vähemalt 0,9 m sügavuselt kaevatud loodusliku liivsavi sisse ja täitunud suurte põlenud maakivide ja punaseks põlenud saviga, mis on varisenud ahju kivivooderdisest. Kambri läbimõõt on olnud umbes 4,3 × 3,5 m.

Kaevand ulatus ka kunagisele ahjuesisele, kus künnikihi all paljandus u 90 cm paksune söe ja lubja segune kihistus (jn 7). Paari sentimeetri paksused söe- ja lubjakihid paiknesid vaheldumisi maapinnast u 130 cm sügavamal paljastunud

loodusliku turbani. Võib oletada, et üks söe- ja lubjakihi paar tähistab ühte põletuskorda. Profiilil loetletud 10 kihipaari näitavad, et ahjus on lupja põletatud vähemalt 10 korda.

Kõige alumine looduslikul turbal paiknev söene kiht sisaldas rohkesti kasetohtu, mis ilmselt on pärit küttepudest. Kogusime tohtu radiosüsinikdateeringu jaoks. Paraku pole laborisse antud proovi dateering käesoleva artikli trükkimise hetkeks veel selgunud.

Rannu kihelkonna lõunaosas õnnestus aastatel 2006–2008 maastikuinspeksioonidel välja selgitada mõned tõrvapõletuskohad, millest Vehendi küla põldudest ida pool riigimetsas paiknev kuuest tõrvaaugust koosnev kompleks valiti arheoloogiliseks uurimiseks. Tõrvaaukudest neli paikneb nelja metsatee ristis (jn 8). Neist u 200 m idakirde pool paikneb veel kaks tõrvaauku, mida ümbritseb mitukümmend väiksemat ümarat süvendit maapinnas. 2009. a kevadel kaevati Vehendi külast ida pool paiknevas tõrvaaukude rühmas kahest idapoolsemast august põhjapoolsemat.

Kuna Eestis pole vanu tõrvaauke seni uuritud ega isegi mitte arheoloogiamälestiseks tunnistatud, seadsime käesolevate kaevamiste eesmärgiks välja selgitada, millist infot sellise objekti uurimisel üldse saada võib ning milline peaks olema tõrvaaugu kaevamise meetodika. Eesmärk oli ka välja selgitada uuritava tõrvaaugu tüüp ja täpsustada dateeringut.

Uuritud tõrvaauk paiknes madalal kollasest liivast luitel. Enne kaevamiste algust oli tõrvaauk jälgitav  $9 \times 7$  m suuruse, kuni 1,5 m sügavuse ovaalse süvendina maapinnal (jn 9). Mullapuurriga oli eelnevalt kindlaks tehtud, et augu põhjas ja nõlvadel paikneb mättakihi ja liivast varingukihi all umbes 10 cm paksune söekiht, mille all on omakorrald punaseks põlenud liiv.

Pärast mättakihi eemaldamist paljastus lohu seintel ja põhjas sõepurune liiv. Kaevamisel leiti lohu nõlvadelt põlenud tukkide jäänuseid, kusjuures kõik tervemalt säilinud puidujäänused paiknesid nõlvadel püstiselt, suunaga lohu põhja suunas. Tõrva põletamiseks kasutatud puidu selline paiknemine on kindlaks tõendiks sellest, et tegemist on tõrvaaugu, mitte söepõletamiseks kasutatud miiliauguga. Nimelt paigutati tõrvaaugus männipuidust pilpad selliselt, et põletuse käigus neist välja valguv tõrv augu põhja ühte kohta kokku valguks.

Lahti kaevatuna osutus tõrvaauk  $9 \times 7$  m suuruseks, kuni 2 m sügavuse ovaalseks lehtrikujuliseks süvendiks (jn 10–11). Süvendi põhi ulatus luite aluse loodusliku saviliivakihini, mis oli põlenud

täiesti kõvaks. Lisaks põlenud tukkide asendile osutas ka maasse kaevatud süvendi lehterjas kuhu sellele, et tegemist on just tõrva põletamise kohta, mitte söe põletamiseks kasutatud miiliauguga.

August ei leitud mingeid märke sellest, et augu põletuse käigus välja valgunud tõrv oleks juhitud renni või kanali abil tõrvaaugu kõrval olevasse süvendisse. Seega näib olevat tegemist kõige algelisemat tüüpi tõrvaauguga, kus tõrv põletuse käigus valgus augu põhjal ja eemaldati sealt alles pärast põletuse lõppu. Arvatavasti kogunes tõrv augu põhjas olnud patta.

Tõrva põletamisest tõrvaaukudes ehk tõrva-haudades võib Eesti 19.–20. sajandi etnograafilistest allikatest leida vaid äärmiselt vähest ja ebamäärast teavet. Tavaliselt aeti tõrva oma tarbeks kummuli pööratud paja abil ja suuremate koguste saamiseks maapealsetes kivist ahjudes, mille hilisemal ajal oli metallist siseosa. Tõrva põletamine tõrvaaukudes on aga olnud väga laialdaselt levinud Soomes 17.–20. sajandil. Sealjuures kogunes Soome vanimat tüüpi tõrvaaukudes tõrv samamoodi augu põhjal nagu Vehendis uuritud auguski. Alates 17. sajandist hakati seal augu põhjal kogunevat tõrva spetsiaalse puitrenni abil augu kõrvale juhtima, kus see otse tünni valgus.

Vehendi tõrvahaudade rühma kahe idapoolsema tõrvaaugu ümbruskonnas, mitmesaja meetri raadiuses, paikneb liivaluidetel ridadena mitukümmend 1,5–3 m läbimõõduga ja 0,5–1,2 m sügavust lohku. Selgitamaks, millega on tegemist, uuriti 2009. a ka üht sellist, 100 m uuritud tõrvaaugust lõuna pool paiknevat lohku. Selle läbimõõt enne uuringuid oli ligikaudu 2,5 m ja sügavus 75–90 cm. Et saada lohu profiil, kaevati lahti lohu lõunapoolne osa (jn 12). Selgus, et august välja kaevatud liiv oli kuhjatud augu servale ringikujulise vallina, mille kõrgus algsest maapinnast oli kuni 36 cm ja laius kuni 1,5 m. Valli all oli selgelt jälgitav looduslik leetekiht, mis paiknes kollasel luiteliival (jn 13). Vallialusest leetekihist, teisisõnu augu kaevamise aegsest maapinnast, 40 cm sügavamal läbis uuritud süvend veel ühte leetekihti, mille all jätkus kollakas luiteliiv. Augu kaevamisega maapinna kõrguselt mõõdetuna on augu läbimõõt olnud vahetult pärast selle kaevamist umbes 2,2 m. Süvend muutus sügavamal kitsamaks, ulatudes algsest maapinnast 1,55 m sügavusel paljastunud kõva savise moreeni kihini. Sütt ega põlemisjälgi august ei leitud. Augu suhteliselt suurt vanust näitab ka asjaolu, et leetekiht oli jõudnud tekkida ka juba kinni varisenud augu põhjale ning auku ümbritsevatele vallidele.

Arvestades asjaoluga, et väiksemad süvendid paiknevad tõrvaaukude ümbruses ja eemal asustusest, võib neid seostada eelkõige tõrvatootmisega. Tõrvapõletamise toorainena peeti Eestis 19.–20. sajandil kõige sobivamaks ligi saja aasta vanuseks kasvanud mändide 20–30 aastat maa sees seisnud kände. Nende väliskiht oli jõudnud juba ära mädaneda, tõrv aga koguneda nende südamikku. Kändude juurimisel eelistati just liivast ja kivideta maapinda. Känd kaevati ümbert lahti, raiuti juured katki ja kangutati 4–6 m pikkuse kuusepuust kangi abil maa seest välja. Kõige tõenäolisemalt ongi Vehendi tõrvaaukude juures liivaluidetel leiduvaid arvukaid väiksemad süvendid kännujuurimisest jäänud augud.

Jätakuvalt jääb oletuseks vaadeldava tõrvatootmiskoha vanus. Juba 2008. a saadud radiosüsinikdateering nüüd lahti kaevatud tõrvaaugust andis tulemuseks  $166 \pm 45$  radiosüsinikuaastat (kalibreerituna 95,4% tõenäosusega 1650–1960 pKr). Tõrva on siin toodetud kindlasti enne 20. sajandit, sest tõrvaaukude pealt mõned aastad tagasi langetatud männimets oli kändude aastarõngaste põhjal otsustades keskmiselt 120 aastat vana.

Vihjeid kirjeldatava tõrvapõletuskoha vanuse kohta võib saada etnograaf Alice Moora aastatel 1949–1951 tehtud välitöödele tuginevast Rannu

kihekonna lõunaosa külade Tamme, Vehendi ja Noormaa rahvakultuuri käsitlevast põhjalikust kirjeldusest. Nimelt ei mäletanud nende külade elanikud tollal, et tõrva oleks siinkandis põletatud mujal, kui Rannaküla Petseri talus. Sinna olevat 20. sajandi alguses ehitatud maapealne metallkestaga tõrvaahi. Vehendi küla tollane rahvastik ei olnud aga kohalikku päritolu. Kõik Vehendi talud läksid 1860. aastatel talude mõisalt päriseks ostmise käigus Võrtsjärve läänerannalt Viljandimaalt pärit inimeste kätte. Vehendis varem elanud rahvas pidi mujale kolima. Kuna 20. sajandi keskpaigas Vehendis ega naaberkülades keegi tõrvapõletamisest midagi ei teadnud, pidi see toimuma enne rahvastikuvahetust 1860. aastatel. Kõige tõenäolisemalt valmistati siin tõrva 19. sajandi I poolel või 18. sajandil.

Kuna Vehendi metsas olevaid tõrvaauke ümbritsevad lohud osutusid suure tõenäosusega kännujuurimisaukudeks, võimaldab see tõrvapõletusega seostada ka muid Rannu kihelkonna lõunaosa metsades avastatud lohkude rühmi (jn 14). Lisaks Vehendile õnnestus kännujuurimisaukude rühmi leida lõunapoolse naaberküla Rannaküla ning põhjapoolse naaberküla Vallapalu metsades. Välimuse järgi otsustades on need Vehendi tõrvatootmiskohaga ligikaudu samaaegsed.