

# Vessels for Milk Processing from Kaman-Kalehöyük and Kuşaklı

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K. Matsumura's thesis on Iron Age pottery from the western Anatolian site of Kaman-Kalehöyük presents a ceramic vessel type which has not been researched much until now (Matsumura 2005; Omura 1988). Judging by its form, this vessel type appears to be a butter-making vessel (Turkish *yayık*, as well as *taş yayık* or *tombul yayık*)<sup>1)</sup>. During a visit to Japanese Institute of Anatolian Archaeology at Kaman-Kalehöyük in July 2007, the author was allowed to examine these Iron Age vessels<sup>2)</sup>.

In this paper, the proposed function of these vessel types is explained, and other examples from the Iron Age and from more recent periods are presented.

The characteristic features of this type of vessel are a bulbous, oval shape, a narrow, often oblong neck and a sometimes outwardly curved and thickened rim (Fig. 1, no. 1). In relation to the total height of the vessel, the largest diameter can be measured in the upper half. The shape is comparable to the shape of a bottle rather a jug. The vessels found to date have a flat bottom with a rather small diameter, leading to the assumption that they were not built to stand solidly on their own.

The special feature of these vessels is a ribbon handle located at the crossing of the vessel's belly and shoulder in a vertical position. The single and relatively small handle seems to be too weak to be able to carry the whole vessel when it is filled. Moreover, the position of the handle would be unfavorably chosen if designed for carrying the vessel.

As a rule, the handle is found very close to a small hole positioned on the vessel's shoulder on the left

or right side of the handle. In most cases the hole is strengthened and decorated by a bulging rim (e.g., Fig. 1, no. 6, 7, Fig. 2).

The possible use of these vessels for milk processing was demonstrated by U.-D. Schoop (1998). His article refers to his own recent observations of a nowadays rarely used method of butter making. The process of butter making in a vessel of the type described here is easily understandable thanks to his detailed description of the steps (Fig. 3)<sup>3)</sup>. Milk is mixed with a small amount of yoghurt to start the fermentation. It is also diluted with water. The opening (neck) and hole of the vessel must be well sealed. However, it must be possible to open the hole easily to let out the pressure that originates during fermentation. The main technique of processing is to lay the vessel down on a soft pillow and to rock or sway it to and fro by means of the handle at the highest position. This causes a separation of the liquid into buttermilk and small lumps of butter that have to be pressed after finishing this process.

Schoop compares Chalcolithic vessels from Yarikkaya to the modern ones, though the agreement is not complete. The Yarikkaya vessels do not have a handle, the hole is located in the lower half of the vessel, and the largest diameter is larger in relation to the whole vessel (Fig. 4). However, a chemical scientific investigation of the Yarikkaya vessels proved long-term contact with animal fats (Sauter *et al.* 2003). This result led Schoop to assume that milk processing existed during the Chalcolithic Period in a way that is comparable to the procedure he observed in recent times. In his opinion, the hole in the lower part of the vessel had the additional

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<sup>1)</sup> The additional terms *taş* (stone) and *tombul* (round) refer in the first case to the material and in the second case to the shape.

<sup>2)</sup> I am very grateful to Dr. S. Omura, head of the Kaman-Kalehöyük excavation, and to his members of staff, especially to Dr. K. Matsumura, for their trust and friendly support. The permission for research on Iron Age findings from Kaman-Kalehöyük is a great honor to me.

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<sup>3)</sup> According to my own observations it is also possible to produce several other milk products for daily use in this type of vessel (like *ayran*, a mixture of yoghurt and water, that has to be given a good shake in a vessel).

function to let out the liquid (buttermilk) after the separation process was complete. Only the butter lumps would stay inside to be processed further.

A frieze from the temple of Ninhursag at Tell el-Obeid (about 2500 B.C.) obviously shows the use of a *yayık*. The depicted scenes present various methods of processing milk that give us new information (Fig. 5).

The basic shape of the vessel shown is still very similar to the Chalcolithic examples except for the design of the neck and rim (Fig. 6). A sitting person is busy rocking the vessel that is probably lying on soft ground. He is gripping the vessel at its largest diameter to use the best leverage for his work. If a real vessel was shown, one might expect that the notches seen on part of the surface where the person puts his hands are actually a roughening of the surface so that the user has a better grip.

The vessel opening is obviously closed but turned away from the user. The hole for letting the pressure out is not visible. By analogy with the examples from Yarikkaya, the hole can be expected to be in the lower half of the vessel between the legs of the user, so that the user could easily reach it.

A cone-like detail at the clasp of the vessel (Fig. 6) allows the assumption that the aperture was probably closed by an extra stopper that was additionally tied to the vessel by a cord to be on the safe side and to make sure that the stopper did not get lost when suddenly pushed out by the rising pressure inside the vessel.

The temple frieze depicts a working process that is comparable to what Schoop describes for the more recent milk processing procedures. One difference is that in more modern usage, the opening is turned towards the user; this might explain why the position of the hole is on the shoulder rather than in the lower part of the vessel, to be within reach of the user.

Obviously the modern, slimmer vessels with their largest diameter located in a lower position have poorer leverage. A handle was evidently able to rectify this shortcoming. In recent times the handle also has a counterpart on the opposite side of the hole which might make the act of milk processing by means of pushing and shaking the vessel easier.

The formal affinity of the modern *yayık* with the Iron Age examples from Kaman-Kalehöyük (Fig. 1,

nos. 1-9) becomes very clear. The largest diameter is positioned in the upper half of the vessels which all become very narrow towards their necks. Their rims are strengthened and designed so that the aperture can be closed well and easily. The handle and the hole are located on the shoulder of the vessel. From this comparison of the shapes, the conclusion can be drawn that the examples from Kaman-Kalehöyük were used for butter making.

A shard from one of the Kaman-Kalehöyük vessels was examined for fat content.<sup>4)</sup> The aim of the examination was to prove contact with animal fats. The surface of each sample first had to be removed to exclude human fat traces that had resulted from touching the pieces.

*Examination of two ceramic fragments for organic elements (from Dr. Klaus Steinbach)*

*The top layer of the ceramic fragments was removed ( ~ 2 mm) because of superficially foreign contamination. 5 gramme of each piece were pulverized and afterwards extracted in an ultrasound bath for 20 minutes. For the bath 5 ml of Dichlormethan were used.*

*By filtering the Dichlormethan-solution it was narrowed down to just a few µl and then given into a sample pot. After the remaining solvent had evaporated the sample was examined by the method of mass spectrography. During this examination no significant organic elements have been found.*

*Mass spectrography machine: Finnigan MAT 95*

*Direct intake: 50-300°C*

*Ionization method: electron ray 70eV*

*Mass spectrum: 20-1000*

The result of the analysis was negative. But this does not necessarily mean that the vessels had been used for something other than milk processing. In my opinion

<sup>4)</sup> The chemical examination was kindly carried out by Dr. Klaus Steinbach, Department of Chemistry at the Philipps-Universität Marburg.

it rather shows that, on the one hand, the proportion of fat must not have penetrated into the probably denser Iron Age ceramic and, on the other hand, it might have decreased over time.

The vessels from Kaman-Kalehöyük have a special feature that the author also observed while working on Iron Age examples from Kuşaklı (Powroznik, in press; Schachner 1998). Ceramic cones were placed on the inside bottom before the vessels were fired (Fig. 7). These ceramic cones were found together with additional ceramic protrusions at the base of the neck inside butter making vessels from Kaman-Kalehöyük and Kuşaklı (Fig. 8). The example from Kuşaklı shows distinctive cones in the neck area which might have been broken off inside the Kaman-Kalehöyük piece (Fig. 1, no. 2).

The roughening of the inner surface of the vessels from both sites is another important characteristic. Spiral grooves and bulges are found in the lower half of the Kaman-Kalehöyük vessel (Fig. 7). The piece from Kuşaklı shows irregular grooves in the same location (Fig. 9). In my opinion, these working traces and protrusions improve the friction and support the mixing of the liquid thoroughly.<sup>5)</sup> Up to now this kind of roughening seems to be an innovation from the late Iron Age as it was not documented in the earlier and later examples compared here.

The interpretation by analogy that the archaeological vessels described here were used for milk processing is not yet completely supported because the result of the chemical examination was negative.

But research concerning Iron Age settlements and lifestyle at Kuşaklı are revealing. The widespread distribution of several fragments of butter making vessels over the Iron Age settlement (Period VI) indicates a domestic, private use of this piece of equipment. The milk, a sustainable raw material, probably came from private cattle ownership. This argument is based on the fact that comparatively small stables were found within nearly each of the Iron Age houses at Kuşaklı. These stables indicate housing for rather small livestock sufficient only for the families' own use. If the necessary diet of animal proteins is mainly secured by milk and

milk products rather than mainly by meat, the number of the animals does not have to be very big.

If these arguments concerning the butter making vessels are true, it can be assumed that during the late Iron Age at both Kaman-Kalehöyük and at the comparable Iron Age settlement of Kuşaklı, a self-sufficient and non-centralized society structure predominated in which people were taught to produce milk products for their own personal use.

Further investigation at other archaeological sites is necessary to prove these statements for Anatolian Iron Age settlements and lifestyle. Research should include the search for more milk processing vessels (and other tools for milk processing like sieves as seen on the frieze), a detailed examination of settlement architecture, an analysis of the various rooms of the houses and their use, and an analysis of the faunal remains to gain more insight into Iron Age cattle farming.

Schoop's essay on a recent technique of butter making using a *yayık* is a successful example showing that an ethnographic approach looking at the so-called traditional lifestyle found especially within rural areas can be very instructive for an archaeological perspective.

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<sup>5)</sup> The extent to which these features are useful for the working process is not known and has not been tested.

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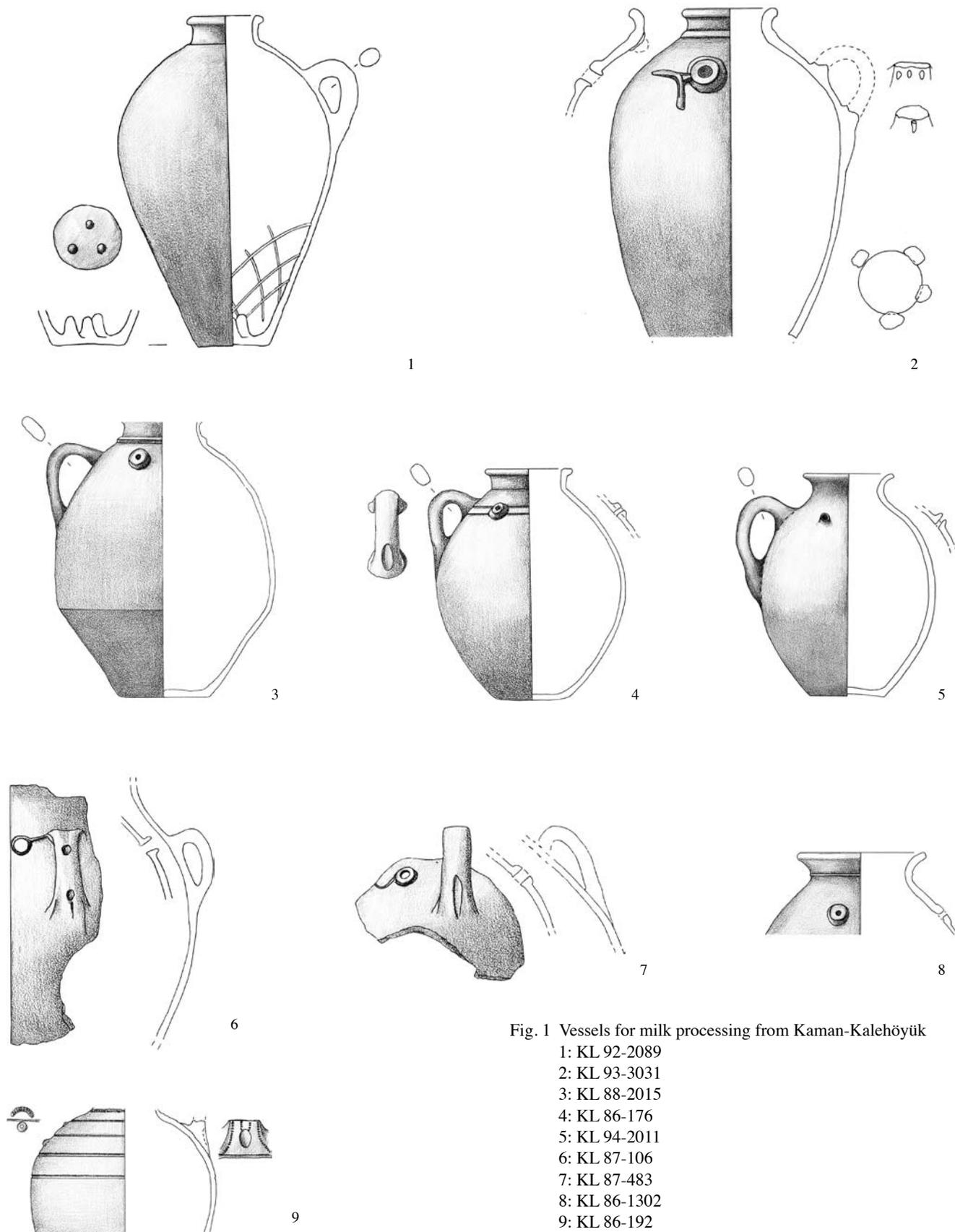


Fig. 1 Vessels for milk processing from Kaman-Kalehöyük

- 1: KL 92-2089
- 2: KL 93-3031
- 3: KL 88-2015
- 4: KL 86-176
- 5: KL 94-2011
- 6: KL 87-106
- 7: KL 87-483
- 8: KL 86-1302
- 9: KL 86-192



Fig. 2 Detail of a decorated hole

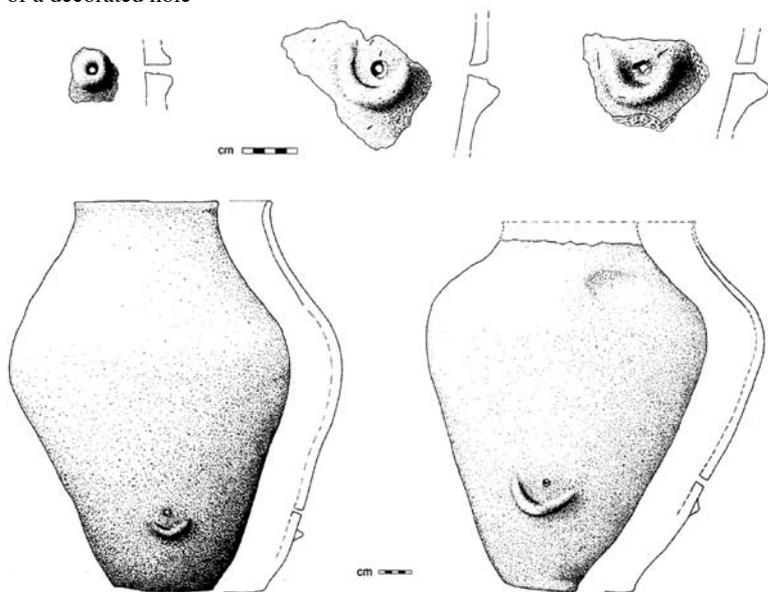


Fig. 4 Chalcolithic vessels from Yarikkaya



Fig. 3 Modern vessel for milk processing from Avanos 2006



Fig. 5 Frieze from the temple of Ninhursag at Tell el-Obeid



Fig. 6 Detail of a person shaking the vessel



Fig. 7 Ceramic cone on the inside bottom of the vessel

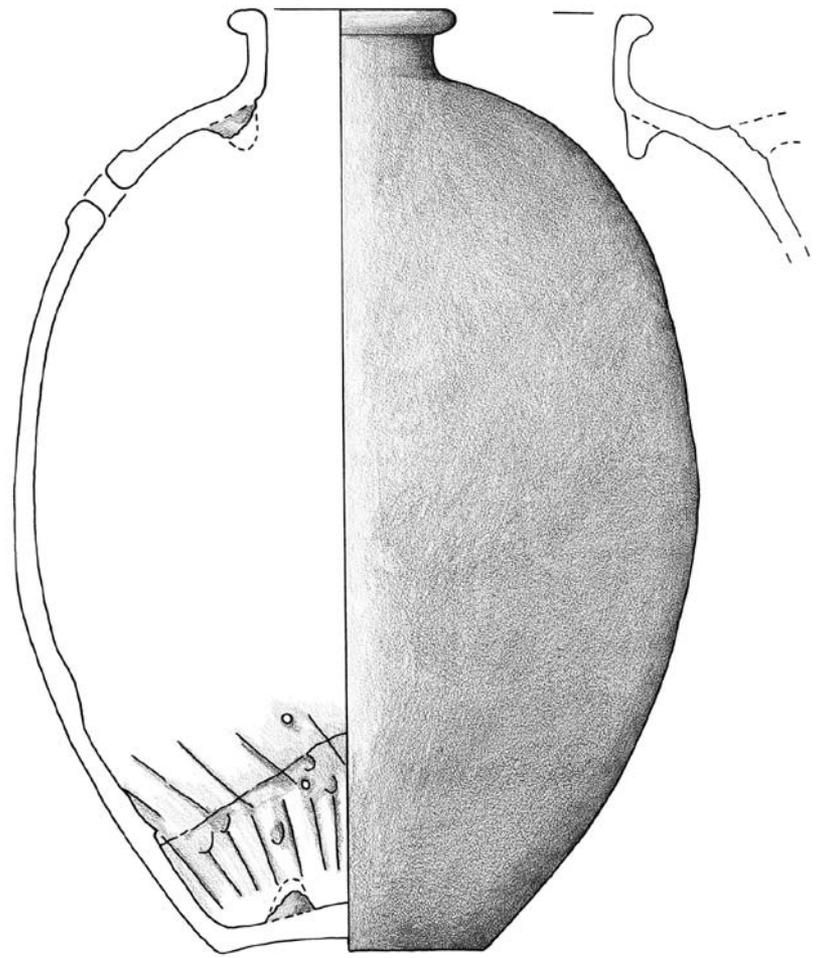


Fig. 8 Vessel for milk processing from Kuşaklı



Fig. 9 Detail of the inside bottom of the vessel from Kuşaklı

