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Tracing crop processing in the Bandkeramik culture

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This article is concerned with tracing crop processing on the basis of carbonised plant remains. Other kinds of data relevant to the problem, such as the presence of flint sickles, underground silos or grinding stones, will not be considered here.

The Bandkeramik culture is the earliest Neolithic culture in Central and Western Europe. It is dated to the sixth millennium BC (calibrated date). Its cultural heritage consists of post-holes, wall-trenches and pits which are filled with a mixture of dark-coloured soil, domestic refuse and industrial waste. The carbonised fruits, seeds and chaff fragments, which may throw light on crop processing as practised by the Bandkeramik farmers, are part of this rubbish.

A reconstruction of crop processing must be based on the analysis of true assemblages of plant material. One must try to discern single stages within the process by identifying material thrown away at the same time. When working with Bandkeramik material, this poses a problem. Most soil samples taken from Bandkeramik pit-fills do not meet the requirement of containing significant collections of relevant plant remains. The majority reveal very few remains such as carbonised seeds etc. The density of finds, as expressed in number of finds per litre of soil, in a typical Bandkeramik pit is illustrated in Figure 21.1. Figure 21.2 shows the frequency of densities in a systematically sampled Bandkeramik settlement (Schwanfeld, West Germany). Small amounts prevail. The overall pattern follows a Poisson distribution, supplemented with something else which is responsible for a trail with high densities. This means that the samples with a low density of finds most probably do not contain remains discarded at the same time. Each carbonised particle may have got there on its own. True assemblages are found mainly in the trail. It must be noted that they are probably always contaminated by the scattered waste which is the source of the low densities. This is present everywhere as a kind of background or 'noise'.

The analysis presented here is based on samples with densities of 100 or

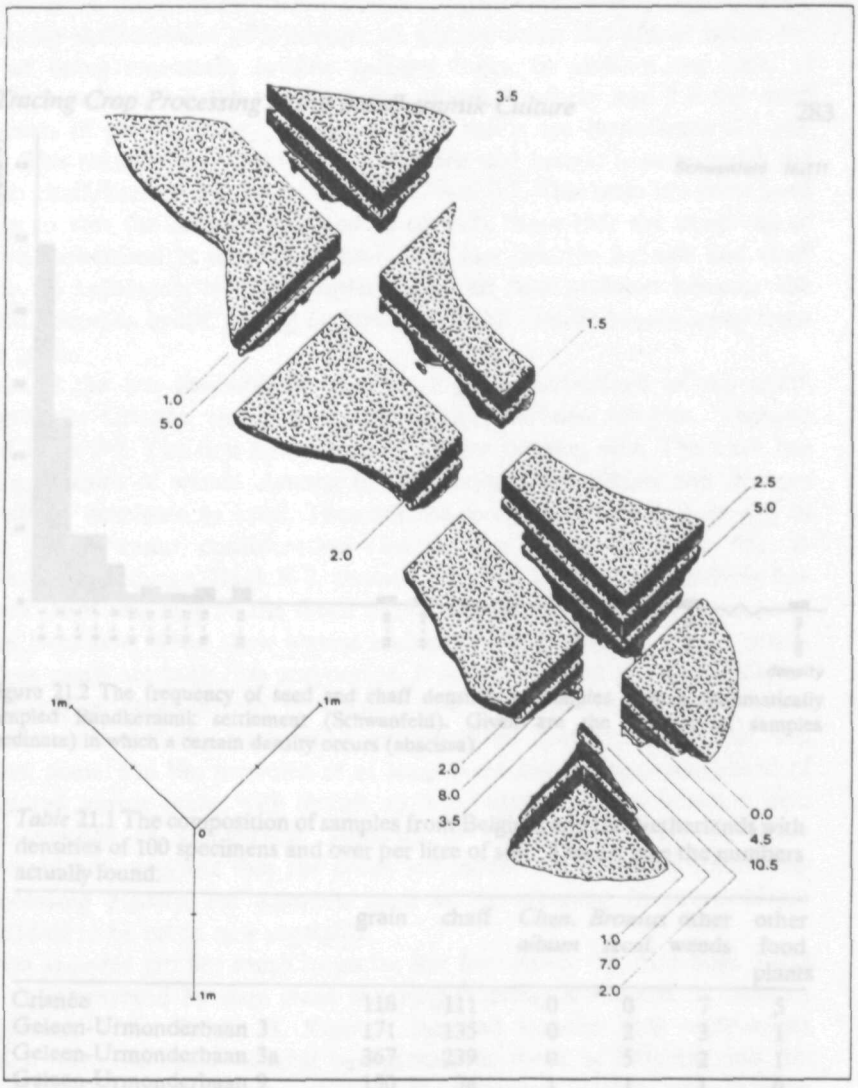

Figure 21.1 The distribution of carbonised seeds and chaff in a typical Bandkeramik pit (provenance Beek-Molensteeg). The figures shown are the numbers of specimens per litre of soil. The densities were measured in samples taken from exposed sections. The artificial layers are 10cm thick. Copied by H. Delorm from his drawing in *Helinium 25* (1985).

more fruits, seeds and chaff remains per litre of soil. The analyses began with the published material from Belgium and The Netherlands (Bakels and Rousselle 1985). Ten out of 88 samples had the required density. Their composition is given in Table 21.1. The list shows that the carbonised waste consists mainly of cereal grains, chaff, a small number of other food plants, and weeds. The grain is always a mixture of emmer

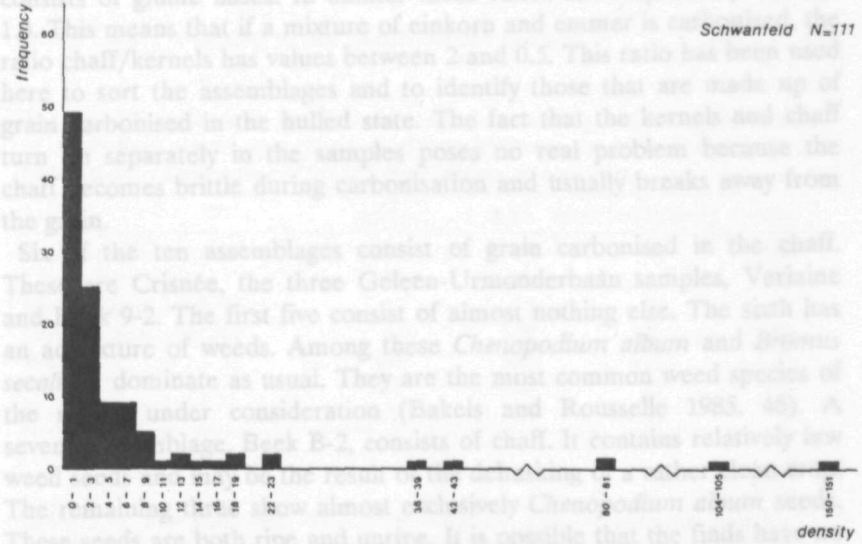

Figure 21.2 The frequency of seed and chaff densities in samples from a systematically sampled Bandkeramik settlement (Schwanfeld). Given are the number of samples (ordinate) in which a certain density occurs (abscissa).

Table 21.1 The composition of samples from Belgium and the Netherlands with densities of 100 specimens and over per litre of soil. The list give the numbers actually found.

	grain	chaff	*Chen. album*	*Bromus secal.*	other weeds	other food plants
Crisnée	118	111	0	0	7	5
Geleen-Urmonderbaan 3	171	135	0	2	3	1
Geleen-Urmonderbaan 3a	367	239	0	5	2	1
Geleen-Urmonderbaan 9	150	34	1	1	1	0
Verlaine	76	99	2	1	1	3
Beek 9-2	311	137	301	132	51	3
Beek 8-2	48	5000	0	62	23	7
Beek 5-2	21	30	2690	5	5	11
Geleen-Haesselderveld 1	2	3	671	4	7	0
Geleen-Haesselderveld 1a	8	7	978	7	5	1

and einkorn. The chaff also belongs to these wheat species. The food plants include pea, linseed, poppy, hazelnut and sloe. The weeds belong to species which can be interpreted as field weeds.

Remains of food plants other than cereals are so scarce that they are thought to belong to the 'noise'. The significant assemblages are therefore composed of cereal grains, chaff and field weeds. These may provide some indication as to the processing of cereal crops.

The crop grown was clearly a blend of einkorn and emmer, because the

remains of these wheats were found together everywhere. The accompanying chaff consists of a mixture of spikelet forks and glume bases, the latter being essentially broken spikelet forks. In einkorn the ratio of chaff/kernels is 1 if the chaff consists of spikelet forks and 2 if the chaff consists of glume bases. In emmer these ratios are respectively 0.5 and 1.0. This means that if a mixture of einkorn and emmer is carbonised, the ratio chaff/kernels has values between 2 and 0.5. This ratio has been used here to sort the assemblages and to identify those that are made up of grain carbonised in the hulled state. The fact that the kernels and chaff turn up separately in the samples poses no real problem because the chaff becomes brittle during carbonisation and usually breaks away from the grain.

Six of the ten assemblages consist of grain carbonised in the chaff. These are Crisnée, the three Geleen-Urmonderbaan samples, Verlaine and Beek 9-2. The first five consist of almost nothing else. The sixth has an admixture of weeds. Among these *Chenopodium album* and *Bromus secalinus* dominate as usual. They are the most common weed species of the region under consideration (Bakels and Rousselle 1985, 46). A seventh assemblage, Beek B-2, consists of chaff. It contains relatively few weed seeds and may be the result of the dehusking of a rather clean crop. The remaining three show almost exclusively *Chenopodium album* seeds. These seeds are both ripe and unripe. It is possible that the finds have no meaning as traces of crop processing. One *Chenopodium* plant develops many seeds and the carbonised concentration may represent just one burnt plant. But the presence of at least three assemblages composed of ripe and unripe seeds, with almost no other species, in combination with the absence of comparable amounts of *Chenopodium* in the other assemblages, suggests that the seeds are indeed the result of some crop processing activity, for example such as the cleaning of green plants intended to be eaten as a vegetable.

Ten samples are not much to go by, but fortunately the data base could be supplemented by data from the neighbouring Rhineland in western Germany. Here Dr K. H. Knörzer sampled Bandkeramik settlements which have the same cultural background as those in Belgium and the Netherlands. As a matter of fact, the German, Dutch and Belgian settlements occupied one single belt of loess soils north of the Eiffel and the Ardennes. Small regional differences do exist, but they are minor. There is no reason to assume that the inhabitants did not share economic procedures.

The work of Knörzer published up to 1985 shows seventeen samples with densities of 100 and more. Seven of these contain more remains of 'other food plants' than can be accounted for on the basis of mere 'noise'. They are given in Table 21.2. Such samples represent mixtures of waste from different sources and cannot be used for the purpose of tracing

Table 21.2 Samples from the Rhineland which, according to the large numbers of 'other food plants', contain material from different sources. They have not been used for the purpose of tracing crop processing activities.

	grain	chaff	other food plants	weeds
Bedburg-Garsdorf 44	174	79	90	1868
Lamersdorf 55mi	193	57	1358	5883
Langweiler-9 1061/17	17	75	20	48
Langweiler-9 1061/19	63	849	101	88
Wanlo 1	479	955	102	627
Wanlo 188	39	656	25	676
Wanlo 202/3	55	60	many	78

Table 21.3 The combined data from Belgium, The Netherlands and the Rhineland. All available concentrations have been used, except those mentioned in Table 21.2.

	grain	chaff	*Chen. album*	*Bromus secal.*	other weeds
Crisnée	118	111	0	0	7
Geleen-Urmonderbaan 3	171	135	0	2	3
Geleen-Urmonderbaan 3a	367	239	0	5	2
Geleen-Urmonderbaan 9	150	34	1	1	1
Verlaine	76	99	2	1	1
Beek 9-2	311	137	301	132	51
Langweiler-2 89	95	149	52	94	105
Langweiler-2 397	327	337	250	185	121
Langweiler-6 C 6	137	73	470	140	113
Beek 8-2	48	5000	0	62	23
Langweiler-9 146/108	39	1349	16	6	15
Langweiler-9 146/389	16	117	5	2	17
Langweiler-9 561 B	4	128	0	2	2
Bedburg-Garsdorf 28	442	2577	1155	3203	1803
Langweiler-2 306	29	412	134	3	4
Langweiler-3 Graben B	70	4422	292	24	15
Wanlo 177	73	7	0	2	0
Beek 5-2	21	30	2690	5	5
Geleen-Haesselderveld 1	2	3	671	4	7
Geleen-Haesselderveld 1a	8	7	978	7	5

stages in the processing of crops. Once the stages are known, the mixtures can be sorted afterwards.

The remaining ten can be analysed as mentioned above. They follow the pattern set by the Dutch and Belgian samples quite well (Table 21.3). Nothing is added to the category 'grain with few weeds and carbonised in

the chaff', but the 'chaff with few weed seeds' is present in three samples from Langweiler 9. The class of 'grain carbonised in the chaff together with weeds' has three more representatives in two Langweiler 2 samples and one from Langweiler 6. Its chaff counterpart is now also present with three samples. The category containing only *Chenopodium album* is missing in the German material. The Wanlo 177 find may represent the first cleaned, dehusked grain found, but the sample was unfortunately very small.

To summarise, at least three categories of carbonised waste, each represented by at least three examples which may be the result of some stage of crop processing, can be identified.

1. Grain carbonised before dehusking. This grain may be either clean or accompanied by weeds.
2. Carbonised chaff, again with weeds or without.
3. Carbonised *Chenopodium album* seeds, many of which are unripe.

For the first-mentioned stage the parching of the wheat spikelets necessary for a successful dehusking is the stage suggested here. Small accidents during the process result in a kind of refuse as found in category 1. After parching the kernels are freed from their husks and sieving or some other process separates the grain from the chaff fragments. The chaff is found as assemblage type 2. It is thought that it was burned on purpose. It may have been used as fuel or discarded as superfluous matter.

The observation that spikelets exposed to parching need not contain any weed seeds calls for an explanation. Why were some stocks mixed with weeds and others not at all? The first possibility is that some grain was cleaned before it was parched, by sieving for instance. An argument against this supposition is that the weed seeds found in the samples have several different sizes, ranging from as big as einkorn (*Bromus secalinus*) to very small (*Phleum sp.*). The composition of the weed in Langweiler 2, 89, for instance, is 94 *Bromus*, 52 *Chenopodium*, 26 *Phleum* cf. *nodosum*, 22 *Polygonum convolvulus* and some other species in smaller numbers (Knörzer 1973). *Bromus* and *Polygonum* are not readily discarded by sieving without serious losses of grain as well.

A second explanation is that some fields were weeded while others were not. According to the provenance of the samples, this would imply that the inhabitants from the settlements Crisnée, Verlaine, Geleen-Urmonderbaan and Langweiler 9 did weed their fields, whereas those from the other settlements did not. Only Beek shows both categories of finds. The conclusion seems absurd.

A third possibility is that some grain was harvested with special care, but this conclusion seems unlikely for the same reason.

A fourth answer may be that some of the crops came from new fields laid out in a recently felled forest, whilst others came from fields with a

history of cultivation. In this respect it is useful to know that the settlement Geleen-Urmonderbaan was founded in a very late phase of the Bandkeramik and on virgin soil. The same applies to Crisnée and Verlaine. For the Langweiler series of settlements a seriation of the decorated pottery found with the seeds is available. It was composed by P. Stehli from Frankfurt. His seriation places the Langweiler 9 finds earlier than those of Langweiler 2 and 3. The Langweiler 6 pit did not contain enough sherds.

It has already been suggested that a third type of crop processing might be the removal of seeds from green, *Chenopodium album*, plants. This does not mean that *Chenopodium* was a crop on its own. According to the composition of the other samples, it was certainly a field weed. It is thought that it was gathered in the fields with the purpose of being used as a vegetable. The author has observed something similar on the island of Java, where poor people go out into the rice fields to collect a certain leafy plant which is sold on the local market. The practice is very common.

Now that at least three crop processing activities have been traced, the activity areas within the settlement can be looked for. This is a new subject, the investigation of which has only just begun. One thing has already become clear: the practices of parching grain and burning chaff must have been very common. This can be concluded from the ubiquitous presence of the scattered waste called 'noise'. The bulk of this waste has a composition which reflects the composition of the 'true' assemblages. It is thought to have the same sources. It appears every household parched its own wheat. Whether every household also burned chaff regularly is less clear at the moment. Investigations carried out by Knörzer in the as yet unpublished site of Langweiler 8 suggest that carbonised chaff is found mainly near the larger houses. Future research will certainly throw more light on this matter.

The stages in wheat crop processing traced above are only two stages out of the whole series necessary before the grain is fit to be eaten. The observation made by Dr G. Hillman on recent practices in Turkey make this sufficiently clear (Hillman 1981). The problem is whether the other stages can be discerned at all in the matter preserved in an archaeological context. Obviously they left no traces in the normal Bandkeramik settlement waste. Only the remains of real disasters, such as the burning down of a house or even a whole settlement, may provide indications of other activities, but such events were obviously rare. This may also be the reason why the processing of crops other than wheat cannot be described yet. Some of the relevant data are concealed in the category 'other food plants' but a sufficient number of concentrations of distinct species is as yet lacking.

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